

Sebastian Gurtner · Katja Soyeze *Editors*

Challenges and Opportunities in Health Care Management

 Springer

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Preface

The economy we live in is constantly changing. Technology fuels challenging developments like digitalization, the Internet of things, smart objects, or cloud computing. No less significant are changes derived from the mind-set of people interacting with those technologies. Producers, customers, and users face rising complexity in technologies and handle steadily increasing amounts of information.

In this vibrant economic framework, changes tremendously influence man's most valuable asset: health. The healthcare sector is affected by the trends of technology push and shift of needs, but also affects the economic systems of regions and countries in return. The digitalization of society reduces information asymmetries between patients and medical experts. Patient empowerment challenges the patient–physician relationship. However, it is also a chance to integrate patients in decision making or product development. As healthcare technologies become smarter and easier to use, the point of care shifts from hospitals to homes. Stakeholders like governmental or regulatory bodies, providers, suppliers, and patients have to align their strategies and actions to achieve the common goal of efficiency.

We wanted to address these hot topics and draw a vital picture of current challenges in healthcare management. The invited authors of our edited volume present essays from different stakeholder perspectives and describe current research projects, best practices and cases studies from various countries and thereby healthcare systems. The essays analyze the potential of concepts and technologies and derive managerial implications for healthcare providers and technology-driven companies. We thank all authors who have contributed to the present book and wish all interested readers a pleasant journey to “Opportunities and Challenges in Health Care Management”.

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Contents

Part I Health Care System

The Cost Problem in Health Care	3
Ronny Reinhardt and William J. Oliver	
Conceptual Modeling for Cooperation-Based Evolution of Medical Treatment	15
Sina Lehrmann, Hannes Schlieter, and Martin Burwitz	
Diversity Management in the European Health Care Sector: Trends, Challenges, and Opportunities	27
Thomas Köllen	
Health Care Innovation Across Health Systems	47
Sandra C. Buttigieg and Dorothy Gauci	
Alternative Futures for Individualized Connected Health	61
Petri Ahokangas, Maritta Perälä-Heape, and Timo Jämsä	
Medical Care Centers in Germany: An Adequate Model to Improve Health Care Delivery in Rural Areas?	75
Ines Weinhold	

Part II Hospital

Acceptance of Process Innovations in Hospitals: Insights from the German Arthroplasty Register	89
Jan Sternkopf	
Fostering Evidence-Based Design Towards Patient-Oriented and Knowledge-Driven Hospital Design	99
Anja Jannack and Gesine Marquardt	

Quality of Care Assessment in Pediatrics: Are Parents the More Challenging Patients?	111
Tonio Schönfelder, Peter Peschel, and Joachim Kugler	

Part III Teams in Health Care

Collaborative Work Development as a Resource for Innovation and Quality Improvement in Health Care: An Example from a Hospital Surgery	123
Anu Kajamaa	

Mobilizing the Potential of Interprofessional Collaboration	135
Mariline Comeau-Vallée	

Managing Cross-Functional Collaboration to Improve Innovativeness in Hospitals: An Overview of Hospital-Specific Characteristics and Success Factors	145
Giso Labitzke	

From Multi-professional to Trans-professional Healthcare Teams: The Critical Role of Innovation Projects	161
François Chiocchio and Marie-Claire Richer	

Part IV Patients Perspective

Patient Choice and Consumerism in Healthcare: Only a Mirage of Wishful Thinking?	173
Sophia Fischer	

From Shared Decision Making to Patient Engagement in Health Care Processes: The Role of Digital Technologies	185
Ines Weinhold and Luca Gastaldi	

Trick or Treat: Assessing Health 2.0 and Its Prospects for Patients, Providers and Society	197
Sophia Fischer and Katja Soye	

Part V Technology and Innovation

Adoption and Diffusion of Innovations in Health Care	211
Ronny Reinhardt, Nadine Hietschold, and Dimitrios Spyridonidis	

Usability Assessment of Medical Devices from a User Perspective: Results of a Focus Group Discussion	223
Daniel Schubert, Jens Mühlstedt, and Angelika C. Bullinger	

Open Innovation in Health Care	237
Ronny Reinhardt, Angelika C. Bullinger, and Sebastian Gurtner	
Stakeholder Variety in Healthcare and Their Integration in the Medical Device Development Process	247
Claudia Symmank, Jana Krause, and Sebastian Gurtner	
Disruptive Prescription for the German Health Care System?	259
Stefanie Steinhauser, Philipp Ramin, and Stefan Hüsigg	
 Part VI Toolkit for Organizing Health Care	
A Review of Scientific Evidence for Public Perspectives on Online Rating Websites of Healthcare Providers	279
Sophia Fischer and Martin Emmert	
Applying Tool-Kit-Based Modeling and Serious Play: A Japanese Case Study on Developing a Future Vision of a Regional Health Care System	291
Klaus-Peter Schulz, Silke Geithner, and Takaya Kawamura	
Telemonitoring: Criteria for a Sustainable Implementation	307
Ines Weinhold, Luca Gastaldi, and Dennis Häckl	
Empowering Knowledge Transfer in Healthcare: A Framework of Knowledge Transfer Methods	319
Paul Kruse, Christian Kummer, and Anja Jannack	
 Part VII Case Studies	
“Was hab’ ich?” Makes Medical Specialist Language Understandable for Patients	331
Anja Bittner, Johannes Bittner, and Ansgar Jonietz	
Project “Weisse Liste”: A German Best Practice Example for Online Provider Ratings in Health Care	339
Sophia Fischer	
Challenges of E-Health Communication: Implementation of Electronic Insurance Payment Receipts	347
Doreen Reifegerste	
How ICH Uses Organizational Innovations to Meet Challenges in Healthcare Management: A Hospital Case Study	355
Stefano Cazzaniga and Sophia Fischer	

Multidisciplinary Collaboration for the Development of Innovative Solutions in Health Care: The Case of the IMED Project	363
José M. Franco-Valiente, Miguel A. Guevara-López, and Raúl Ramos-Pollán	
Group Medical Visits: Primary Care for the Next Century? Rethinking Chronic Care	371
Benedikt Simon	
Authors Biography	377

Part I

Health Care System

The Cost Problem in Health Care

Ronny Reinhardt and William J. Oliver

Abstract Healthcare costs are hotly and widely debated, with conflicting perspectives each claiming individually to explain the rising cost of health care. Yet, the global cost problem in healthcare might not be as simple or clearly understood as some hold it out to be. The following chapter presents and elaborates on five theoretical perspectives for understanding the issues underlying rising healthcare costs. Each of these suggests a different path for costs and cost reduction. On one hand, two of the perspectives suggest the inevitability of healthcare cost increases, either because costs are largely for personnel or because patient demographics reflect adverse global population trends. On the other hand, three of the perspectives imply that healthcare costs might be inflated because of regulatory and industry forces unique to health care. Thus, the chapter challenges overly-simplistic explanations of the cost problem, attempting to frame a more rigorous and thoughtful debate among payers, providers and policy makers.

1 Introduction

The rising cost of health care is a demanding challenge for industrialized countries. In all Organization for Economic Co-operation and Development (OECD) countries health care expenditures have been growing faster than the GDP (Pammolli et al. 2012). This trend challenges many developed societies and initiates pressure to change for a multitude of different actors in the health care system. For decades, policy makers have tried to “bend the cost curve”. Surprisingly, the explosion of health care costs affects various industrialized countries with different healthcare systems. The cost problem apparently constitutes of common underlying causes.

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Before discussing the causes, we turn to the question: What is the cost problem? The cost problem splits into a static and a dynamic component: (1) costs are perceived as too high (e.g., caused by inefficiency) and (2) health care costs are rising (i.e., rising beyond increases in GDP). Both viewpoints are valid and define the cost problem. Moreover, healthcare practitioners and policy makers seem at a loss as to both what are the mechanisms that have caused cost to rise faster than GDP, and how to “bend the cost curve” to encourage costs to decline. It is the final challenge that presents the most troubling situation and the one to which the chapter is addressed: what are the factors underlying the cost problem? Better understanding of these will help practitioners and policymakers find ways to affect positive change.

There is no single factor underlying the cost problem in health care. Instead, this chapter will review five diverse explanations from different lines of research in order to synthesize the findings for each perspective. This multi-perspective approach will help practitioners and scholars from different backgrounds to gain a richer understanding of why the debate around solving the cost problem has been so challenging. Section 3 summarizes the findings and presents recommendations for policy makers and practitioners. Section 4 concludes with implications for further research and for practitioners working to address the cost problem in health care.

2 Perspectives About the Nature of the Cost Problem

Multiple theoretical perspectives each claim independently to explain the rising share of health care costs. This chapter presents (1) the cost disease perspective, (2) the technology perspective, (3) the system perspective, (4) the information perspective and (5) the patient characteristics perspective. We explain the underlying logic of each perspective and discuss recent research to examine whether the perspectives are supported by empirical findings.

2.1 *The Cost Disease Perspective: It’s Inevitable, But It’s Not a Problem*

What if rising health care costs are not caused by mechanisms inside the system but by mechanisms in other industries that spill over to the health care sector? The cost disease perspective is probably the least well-known perspective about rising health care costs (Bates and Santerre 2012) but offers an interesting explanation of external effects.

According to the cost disease perspective, costs of personal services such as health care, education or theater rise beyond the rate of inflation and will continue to do so (Baumol 2012). In contrast to other industries such as the electronics or the

auto industry, health care is unable to generate substantial productivity gains. This is because personal services dominate the health care sector. Compared to machines, people are limited in their ability to increase throughput. Other products such as computers and cars do achieve productivity gains and become less labor intensive. However, wages in the economy rise for all professions including health care. (If this would not be the case, people would gradually take jobs in productivity-gaining sectors until the difference becomes so large that health care professions die out.) As health care is unable to compensate for rising wages with labor productivity gains, health care's share of national income rises inevitably. Hence, not only the health care system itself is responsible for rising health care costs, but the rising productivity in other industries and the growth of wages in all industries (Hartwig 2008; Baumol 2012).

In addition to these theoretical arguments, there is strong evidence that Baumol's cost disease process is actually happening. Several empirical studies show that health care expenditures are strongly influenced by productivity growth in other industries and the related increase in wages (Hartwig 2008; Bates and Santerre 2012; Pammolli et al. 2012). Although the cost disease perspective may sound depressing at first, there is a positive aspect. Because all other industries except labor intensive industries like health care increase productivity, societies will always be able to afford health care services, even if the percentage of GDP spent on health care continues to rise (Baumol 2012). The growth of the pie more than compensates that health care expenditures demand a larger piece of the pie.

2.2 *The Technology Perspective: Expensive Progress*

In contrast to Baumol's cost disease perspective, the perspective that new technologies cause rising health care expenditures is more prevalent. On the whole, technological progress and innovation has led to better outcomes at higher cost (Okunade and Murthy 2002; Glied 2003). For example, neonatal intensive care, incubators, or ventilators successfully improved the survival rates among low-birth weight babies (Thorpe 2005). Innovation affects cost in two ways. First, some innovations improve cost by enhancing performance—for example proton radiation machines, magnet resonance tomography or improved incubators. Second, other forms of innovation reduce cost by enhancing productivity—for example glucose meters for patients or electronic medical records for hospitals.

Many technology innovations increase both performance and cost (Sood and Tellis 2011). Technological innovation and progress lead to improvements in treatment of diseases. As more diseases become treatable, the share of health care expenditures rises (Thorpe et al. 2004; Thorpe 2005). In addition, when the goal is better outcomes, costs per disease rise with improved technologies such as new drugs or devices (Thorpe 2005). Christensen and colleagues (Christensen and Bower 1996; Christensen 1997; Christensen et al. 2000) term this process sustaining innovation because new technologies sustain and improve performance

attributes that have always been improved. For instance, health care research seeks ways to improve imaging technologies to allow physicians a detailed look in the human body. New generations of x-ray, computed tomography or magnetic resonance tomography improved the main performance (i.e., image quality) at higher costs.

However, not all new technologies that cost more actually improve outcomes. For instance, the use of hormone therapy in postmenopausal women was found to be ineffective and expensive treatment for breast cancer produced no better results than conventional chemotherapies (Prasad et al. 2013). Yet, some of these practices continue to be used. In a large study on a multitude of different practices, only about 40 % of established practices were found to be useful while the remaining 60 % had ineffective, harmful or unknown effects (Prasad et al. 2013). Distinguishing innovations which improve outcomes from those that lead to higher costs, are ineffective or are even harmful remains a challenge. For instance, electronic medical records could save time and effort for physicians and administrative staff (Hillestad et al. 2005). Another example concerns blood glucose meters that shifted the point of care from physicians to patients (Christensen et al. 2000). Prior to the existence of easy to use miniature glucose meters, patients had to use unreliable tests or a physician's expensive laboratory equipment. With the introduction of glucose meters for patients, endocrinologists' required working time declined. Improving productivity with these types of innovations helps to catch up with other industries' productivity gains and alleviates Baumol's cost disease.

Disruptive, like sustaining innovations may fall short of delivering either lower cost or better patient care. From time to time, some lower cost technologies disrupt existing technologies (Sood and Tellis 2011) and therefore address the cost problem. Some disruptive innovations such as patient glucose meters, small sonographic units or \$25-incubators have the potential to reduce costs in the health care sector. In addition, balloon angioplasty disrupted surgical treatment of atherosclerosis at significantly lower cost with modestly lower outcomes. Compared with heart surgery, angioplasty delivered similar patient outcomes to a portion of the patient population at substantially lower cost (Shaddy et al. 1993; Hamm et al. 1994; Weintraub et al. 1995; Hlatky et al. 1997). In health care, however, disruptive innovations often face serious challenges. Innovations that offer treatment at slightly lower effectiveness than existing interventions at dramatically lower the cost have faced mixed reaction from regulators and third party reimbursers (Dowie 2004). In addition, strong stakeholders such as medical associations or regulatory bodies inhibit new models of care that threaten existing practices or bear risks (e.g., nurse practitioners). Stakeholders with conflicting interests pose a serious challenge for low-cost innovations (Aquino Shluzas and Leifer 2012).

Thus, the technology perspective is not in conflict with the cost disease perspective—they offer companion explanations of the increase in health care costs. Technology can increase the cost of care (or reduce it), while at the same time other industries experience a greater rate of cost reduction causing the cost disease.

2.3 The System Perspective: Incentives and Constraints

The health care market is not an unbridled free market. Instead, health care systems are subject to special regulations, which increase the costs of a multitude of different actors in the system. Health care systems in many countries include incentives for over-diagnosis and over-treatment of patients. These can be legal incentives that punish under-diagnosis, economic incentives that reward over-diagnosis or cultural and individual predispositions such as risk averseness (Moynihan et al. 2012). Technological advancement enables physicians and other actors to follow the path of incentives to diagnose and treat diseases that might not need treatment. For example, with the introduction of diagnose-related groups (DRG) in Germany, regulators were able to cut average hospital stay (Böcking et al. 2005). However, the number of treated cases often rises with the introduction of DRGs. For example, knee and hip replacement surgeries have soared beyond increases that can be explained by an ageing population or other justifiable reasons. Germany carries out twice as much hip and knee replacements than the average of the European Union (OECD 2012).

In addition, regulation often impedes change. As a result, the health care system is a slowly changing system compared to other industries. For example, the new business model of low-cost airlines has significantly lowered the cost of air travel. In contrast, health care regulation might have the effect of discouraging the natural forces of cost reduction. For example, Christensen has argued that lower costs would be achieved if providers' services were reorganized into two different types: intuitive medicine and precision medicine (Christensen et al. 2009). Intuitive medicine refers to the treatment of complicated diseases, which requires experimentation and creative solutions. In contrast, precision medicine, the other type of health care service, describes a rule based diagnosis and treatment that does not require experimentation but high-quality and precise processes. For example, the Shouldice Hernia Center is a hospital that specializes in hernia repair only. Through specialization, the center achieved successful outcomes at low costs. Implementing these changes in both types of services that are important to achieving desired outcomes at low cost requires a system that embraces new business models. However, established health care stakeholders have been successful in exerting pressure on regulators to restrict any fundamental change in industry structure—thus perpetuating higher costs structures.

2.4 The Information Perspective: Hidden Targets

Even if regulations were able to reverse incentives for overtreatment and enable business model innovation, actors in health care still suffer from insufficient information about value and costs of interventions. The health care system limits information as a source for cost reduction. For instance, reimbursement rates for

service providers are typically used as proxies for actual costs. Kaplan and Porter (2011) argue that hospitals often use reimbursement rates as a surrogate for costs. Reimbursement rates, however, rarely reflect true costs. In health care, measuring inputs, processes and outputs remains a challenge. Health care service providers lack adequate measurement instruments to determine costs of care and to identify unnecessary activities. Providers should abandon the use of available but untruthful proxies such as reimbursements. Instead, activity based costing should be used to determine actual treatment costs (Kaplan and Porter 2011). Activity based costing calculates the costs per hour for each resource and then allocates those costs to each treatment depending on the time the resource is used. With more accurate information on costs of treatments, more rational decisions are possible and managers will be able to eliminate unhelpful but costly processes.

Besides lacking understanding of true costs, healthcare lacks a full understanding of patient value (Porter 2010). Obviously, a patient is better off who survives or fails to acquire an infection in the hospital—factors which can be measured with precision. However, this is a very limited view of patient value. It is unlikely that a patient’s “customer value proposition” would be limited to avoiding death. Instead, patient value is a function of higher patient outcomes at lower cost. However, healthcare lacks a clear understanding of how to measure patient outcomes (see for example: Sitzia 1999; Mead and Bower 2002). Lacking clear understanding or agreement on how to evaluate patient outcomes, regulators have tried to simulate the customer in the equation, such as the US’ expansion of quality and patient satisfaction measures in the Patient Protection and Affordable Care Act. However, even these do not portend a complete view of patient outcomes compared to the richer understanding typical of other industries. Lacking a full understanding of patient outcomes, the industry is unable to make patient value a key objective.

Providers are unable to address cost drivers and bring down true costs because they lack models that tell them what they really are. In addition, discussion of cost reduction alternatives quickly collides with an amorphous sense of patient value—but since neither can be measured, the argument is relegated to one of ethics, with a plethora of conflicting viewpoints. Thus, the inadequate cost information has the effect of driving costs up, or at least allowing them to increase.

2.5 The Patient Characteristics Perspective: It’s Complicated

The cost problem in health care not only consists of system specific internal causes but is also influenced by external changes in society. Many industrialized countries face a major problem: an aging society. Profound medical and technology improvements have increased life expectancy in the developed world from 61 in the 1930s to nearly 80 today (HMD 2012). In addition, the “baby boom” is reaching old age. As a higher percentage of people are above the age of 65 and people in that age group demand more health care, health care expenditures are expected to rise. However, there is mixed evidence that ageing populations are a major driving

force of health care costs (Getzen 1992; Martin et al. 2011). Gradually aging populations only marginally influence the growth of health care expenditures (Reinhardt 2003; Breyer et al. 2010). Although individuals older than 65 years have higher health care expenditures, this effect diminishes when the data is controlled for remaining life years. Hence, not age itself but the last period before death determines health care costs. Shifting this period to higher ages does not influence health care costs (Zweifel et al. 1999). This so-called red herring hypothesis (because the perceived ageing effect distracts policy makers from real issues) explains why many studies were unable to find a strong influence between aging populations and health care costs.

In addition, research has examined the opposite of the perspective that ageing causes rising health care costs, that is that a greater amount of health care expenditures buys more life years. The causality of the relationship between change in aging populations and health care expenditures is not clearly defined. Yet, the perspective that aging is the driving force of health care costs is ubiquitous.

In addition to aging, changes in behavior of populations might also cause rising health care costs. Expectations are increasing. Some have observed a long term trend toward expecting more from the health care system (Epp 1986). Additionally, risky population behavior has shifted a burden to the healthcare system. For example, diabetes is more often diagnosed and treated due to more obese populations in industrialized countries (Thorpe et al. 2004). Obesity is strongly influenced by the environment in which a population lives. The availability of cheap, energy-dense food and the reduction of physical activity strongly contribute to the problem (Hill et al. 2003). Consequently, the cost problem in health is strongly influenced by changes in cultural environments, which in turn influence patient behavior and characteristics. Thus, solving the cost problem requires a comprehensive approach that includes environmental factors.

3 Summary and Recommendations

The cost problem in health care addresses the issue that societies perceive expenditures as being too high and that costs are projected to continue climbing. We have reviewed five perspectives that purport to independently explain the cost problem. In the following, we present the conclusion for each perspective and briefly describe a set of implications.

First, if we follow the logic of the cost disease perspective, there are two conclusions: (1) accept that health care costs will continue to rise and make health care costs affordable by productivity-enhancing innovations in other sectors and/or (2) foster productivity-enhancing innovations in health care to reduce the productivity gap between industries. The first conclusion suggests open and honest communication to the public and the second conclusion suggests that new measures and incentive schemes are needed to foster cost-reducing innovations.

Second, health care costs also rise because technologies improve outcomes and increase the number of treatable diseases. Hence, health care innovations serve the purpose to improve outcomes and when this goal is achieved rising health care costs are justified. However, a high number of innovations that do not improve outcomes contribute to high health care costs. Current systems possess an insufficient capacity to avoid the use of low-benefit, high-cost interventions (Thorpe 2005). In addition, innovations that have the potential to reduce costs face barriers in the health care system. Eliminating inappropriate high-cost technologies through systematic review systems and fostering low-cost technologies through a change in the reimbursement system and a change of physicians' resistance would allow to bend the cost curve while maintaining or improving outcome levels (Macdonnell and Darzi 2013).

Third, the health care market is understood to be "special" and thought to require special regulations. Policy makers need to be aware of constraints on business model innovation and unintended effects of regulations that increase health care expenditures. Health care needs special areas for experimenting with new technologies and business models. These experimental areas can be pilot projects or observations of natural experiments in different countries. Systematic screening and analysis of successful policies and a systematic process that describes how these policies are transferred ensures advancements towards a better health care system—for example, incentives from a combination of areas contribute to overtreatment and over-adoption. Financial rewards for conservative practice, measurement systems, collaboration, or coordination are paramount for controlling the cost problem (Fisher et al. 2009).

Fourth, costs are poorly measured, and measurements fail to fully account for patient value. Accordingly, efforts to reduce cost (or improve value) are limited in effectiveness. Cost reduction efforts therefore collide with a moral perspective that health care should provide services at any cost. While spending an infinite amount on health care is obviously not possible, the industry lacks the ability to effectively respond to the moral argument. Cost reduction is rendered immoral and undesirable. What practitioner or policy maker wants to wear that label?

Fifth, ageing is not a major but a minor cause of the cost problem. Policy makers need to avoid being distracted by the demographic perspective. Instead, they need to focus on environmental changes in behavior that influence patient characteristics. Behavioral changes are more likely to contribute to the cost problem. Identifying these changes and finding preventive solutions such as effective and efficient campaigns will be a major challenge for health care in the coming years.

Individually, these five cost perspectives present an imperfect understanding of the causes of the cost problem. Clearly, the level of technical efficiencies realized in the general economy is not a sufficient explanation. Such an argument would assume there are no additional efficiencies available to the industry. It would assume that unbridled cost increase is inevitable, when instead technology can and does reduce the cost of health care. Likewise, the notion that technology inevitably increases health care cost is no more a truism than that it always decreases it. As the health care needs of an aging population increase the

importance of chronic disease management, remote technology can allow the industry to adapt. Accordingly, the discussion of health care cost reduction must consider each of the five perspectives. None is independently sufficient. Thus considering the cost problem from these many perspectives changes the cost debate. Potential solutions lie not in solutions addressing one, but several dimensions of the cost problem simultaneously.

4 Implication for Further Research and for the Practice of Health Care

Although this chapter is aimed at better understanding the cost problem in health care, it may have posed more questions than it answered. Many of these questions have not yet been comprehensively addressed by research. A small selection of research fields that warrant further inquiry are described below.

One of the most important implications from this chapter is that low-cost innovations may be one of the means to tackle the cost problem. However, how the health care system can specifically foster cost-reducing innovation is not clear. For instance, what are the best ways to create and capture value of low-cost innovations in health care? How should the value be distributed in the value chain to foster low-cost innovations? And related to these questions: Who should finance and regulate innovations? In Germany, for example, a multitude of actors finance innovations (e.g., states for large medical devices in hospitals, private institutions for private practices), leading to confusion for innovators and entrepreneurs.

Tied to the above, how can health care labor become subject to the labor efficiencies that have allowed other industries to avoid Baumol's cost disease. Why does it seem in health care that many potentially labor saving technologies lead to more, not less labor? Why should adding a magnetic resonance imaging (MRI) test to a patient's care add extra office visits—hence additional labor? What has prevented this technology from driving new business models that reduce instead of increase labor costs? What about the potential for new technologies such as telemedicine or smart phone apps—will these realize their potential for reducing health care labor, or is there something unavoidable in the industry that will cause them to miss their potential, and perpetuate the cost disease?

Additional research could also help answer the question of why other highly regulated industries are more successful in implementing new low-cost business models. Why, for example have regulations constrained disruptive innovation in healthcare, but not as much in other heavily regulated industries including banks, airlines or pharmaceuticals? Furthermore, why does the power of regulation limit innovation for cost reduction? Researchers could also approach the question of how the multitude of stakeholders influences innovation or find solutions to transforming health care from a local market with weak competition towards a

more global market with stronger competition. One simple measure could be that service providers publish prices for services in a public domain.

This chapter presented five perspectives that explain the cost problem in health care. Health care stakeholders seeking to find solutions to the cost problem have to understand its underlying causes and every possible solution needs to be compared to the underlying causes. Policy makers need to determine whether the solution contributes to alleviating the causes of the complex cost problem in health care. Likewise, understanding the many perspectives of the cost problem can help health practitioners adjust their thinking about cost, allowing them to improve treatment and competitive position. For example how can awareness of Baumol's cost disease focus practitioner's thinking on how to ensure that new technologies are allowed to reduce the labor component of health care? Thus, how can the practitioner better realize cost improvements, armed with a richer understanding of the challenge? Thus, this chapter may serve to channel researchers and practitioners thinking more broadly on the cost problem, which proves to be more complex than addressed in much of the previous literature. More complete thinking about the problem may allow researchers to be of more assistance to practitioners in their quest for better ways to solve the cost problem.

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Conceptual Modeling for Cooperation-Based Evolution of Medical Treatment

Sina Lehrmann, Hannes Schlieter, and Martin Burwitz

Abstract Chronic diseases, cross-sectoral treatment chains, variations in lengths of stay and a multitude of treatment options along the treatment chain with significant economic and social impacts characterize the domain of psychological and psychosomatic treatment. This kind of treatment sector is facing major challenges like evaluating the treatments by economic criteria whilst ensuring at the same time a certain quality level, to facilitate coordinated cross-sectoral cooperation and to promote systematic exchange of knowledge. On the basis of analyses of structured interviews with different stakeholders of the psychological and psychosomatic sector, we designed a framework for the evolutionary development of Clinical Pathways. This framework covers a novel organizational paradigm derived from managerial theories and adapted for cooperative health care provision. Evolutionary reference models should serve as a means of organizational learning and should provide potential for improving both the quality of medical treatment and the cost-benefit ratio. The evolutionary approach contains a permanent generation of organizational experiences from daily care and using them for evaluation and improvement of standardized treatment modalities. Beyond the framework of evolutionary Clinical Pathways we discuss necessary adjustments of conventional modeling approaches applied within the health care sector.

1 Introduction

Chronic diseases, cross-sectoral treatment chains, variations in lengths of stay and a multitude of treatment options along the treatment chain with significant economic and social impacts characterize the domain of psychological and psychosomatic treatment. Additionally, the complexity of evaluating treatment results (outcome) is more comprehensive than in the field of somatic cases, e.g. a positive outcome for

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one patient could be the maturity to pass a graduation, as the ability to participate in social life would be for another.

Unlike in other areas of care, where the case-based compensation was introduced in 2004 (so-called DRG system), the introduction of such compensation models within the sector of psychological and psychosomatic treatment has been delayed due to the specific characteristics.

Meanwhile, a case-based compensation model (so-called Pauschalierende Entgelte Psychiatrie und Psychosomatik—PEPP) has been rolled out on January 1, 2013. The aims of this new direction are to achieve a better remuneration justice and to implement an incentive system for a more economical treatment. In the first phase of roll out (until 2016), this system will be implemented in practice. From the year 2016, the system will be the basis for budgeting. The psychological and psychosomatic treatment sector is facing major challenges. In particular, the care providers have to make efforts to evaluate the treatments from an economic point of view to accomplish an assurance of the quality level.

To achieve a better understanding of the outlined challenges, we examined a situation analysis by conducting several structured interviews with different stakeholders of the domain. Thereby, we can observe a high potential for standardization in the care processes; but it also revealed little coordination of care in the inter-sectoral treatment chain and an often unsystematic exchange of knowledge as well as low IT support in documentation and the management of patients' individual pathways.

Referring to these results, we designed a framework for cooperation-based evolution of medical treatment. Our considerations here are based on managerial theories and research results in the information systems discipline. The framework should support a cooperative health care provision by strengthening and reorganizing inter-partnership information flows. Especially, integration technologies should enhance the medical knowledge transfer and facilitate novel cooperative learning concepts. We defined the instruments of Clinical Pathways and conceptual modeling as key concepts for process related knowledge documentation and management. Due to their wide acceptance within health care and business management, respectively, these approaches seemed to be appropriate for the challenges defined above.

The contribution of this research follows the design science research process (Hevner et al. 2004; Hevner 2007), presenting the first research cycle with the steps of requirements engineering and artifact building. Therefore the chapter is structured as follows: First, we outline the results of the survey concerning the upcoming challenges and needs from the view of its stakeholder (Sect. 2). In Sect. 3 we discuss theoretical background on conceptual (reference) modeling as important technique of organizational design and accepted means in health care. On this basis, we derive central requirements for a novel organizational framework, which is delineated in Sect. 4. We conclude the paper with a discussion of research implications and opportunities for further research in section Conclusion.

2 Challenges in Psychological and Psychosomatic Treatment

We conducted and transcribed structured interviews with different stakeholders of the psychological and psychosomatic sector:

- Practicing physicians represented by doctors from the outpatient and stationary sector
- Institutional layer represented by the medical director
- Education represented by the educational institution
- Patient represented by an interest group

In the first step of the survey, the aim was to characterize the status quo of treatment standards, their documentation and observation. Additionally, we asked for the existing potentials of standardization in treatment.

In the further course of the survey, the situation of a treatment related information exchange and corresponding deficits are analyzed successively according to the following aspects: clinic internal and cross-sectoral experience exchange, national coordination of new findings, the measurement of the outcome as well as intra- and cross-sectoral benchmark instruments.

Initial Question Can psychological and psychosomatic treatment be standardized and if yes, how is it documented and monitored?

The survey showed that processes are particularly defined, but their documentation is not supported by any information system except the standard office suite. Process descriptions are implemented by prosaic procedure instructions or part of the paper-driven documentation system. The review of processes in case of deviations is performed more or less informal and not standardized. Deviations often occur when novel treatment concepts have to be applied. The general direction of the answers indicates that there are high potentials for standardization, but also a need for a methodological foundation and appropriate instruments.

Question 1 Establishment of new findings: How are new findings evaluated, agreed on national level and implemented in practice?

According to the interviewees, clinical practice guidelines (CPG) are the most applied instruments for the coordination of new findings. CPGs are developed by medical associations to aggregate evident knowledge and best practice. These guidelines are used to communicate best practices and establish a standard care quality by providing decision support for health care providers (e.g. hospitals) deduced from evidence-based research and/or practice (AWMF and ÄZQ 2001; Bögel et al. 2011). They are used to reduce inappropriate variations in practice and to promote the delivery of high quality, evidence-based health care (Wollersheim et al. 2005; Schlieter 2012). However, the conception and building of CPGs is a very time-consuming and expensive process. They are high quality instruments, but findings of practice are implemented slowly due to different consensus between

medical experts and the weak empirical basis. This has also been criticized even by the respondents, who argue that there is a different knowledge level within the physicians based on different knowledge from studies and scientific papers. Even if the members of staff already reach a consensus on best clinical practice, the relevant recommendations of the CPGs have not yet been revised.

Implication 1 To enhance the development of CPGs, it is necessary to foster the identification and transfer of knowledge between academia and practice. Furthermore, a systematic evaluation of results would allow generating hypotheses for further research.

Question 2 Internal exchange: To what extent is an experience exchange between the involved experts supported?

Today, the experience exchange is strongly oriented on an informal communication between colleagues. The dissemination of experience is neither structured nor documented. However, the analysis of the interviews showed, that knowledge exchange between physicians with similar cases is an important instrument for the physicians making decisions in daily work. Furthermore, the interviewees underlined the limitation of this procedure if a colleague leaves the organization. In this situation the knowledge of his cases is typically lost. All interviewees see a high potential in an IT-based support and documentation of treatment processes that also allows historical grounded recommendation system for actual treatment cases.

Implication 2 There is a need for a holistic, IT-based documentation and process control that allows a historical analysis of old cases to support clinical decision making in similar context.

Question 3 Cross-sectoral exchange: How is cross-sectoral cooperation and experience exchange conducted?

A wide variety of counseling, treatment and care options are available, especially in Saxony. Inpatient, outpatient, semi-residential and social services are provided by various addiction counseling centers, psychiatric hospitals, addiction specialty hospitals, socio-therapeutic assisted living facilities and self-help organizations.

Due to different compensation systems of each sector, there is only an unsystematic coordination for integrated care currently. The interviewed physicians regret losing the access to follow-up information when the patient is treated in another sector or institution.

Regulars' tables of physicians and other care providers are actually the most used instruments discussing acute problems of multi-sectoral care. There is no methodical procedure for coordination of cross-sectoral activities.

Implication 3 There is a need for a holistic approach, which provides a method for coordinating cross-sectoral knowledge exchange.

Question 4 Outcome and Benchmarking: How is the medical outcome measured and what are the relevant criteria?

The evaluation of treatment results is actually carried out by criteria that are predefined by an administration or quality system. Individual criteria are rarely defined and monitored. This is surprising because almost all interviewees stated that a quality benchmark is solely possible on the basis of a set of individual criteria. Additionally, the survey showed that a holistic evaluation of outcome is only feasible beyond the acute therapy in the normal environment of a patient.

Implication 4 A continuous experience exchange and the systematic monitoring as well as evaluation of treatment success are needed to enable quality assurance and quality improvement of care. Additionally, it must be possible to define individual success criteria for each patient and to pursue these overall treatment steps.

Overall, we can conclude that the outlined research and development tasks generally require a documentation and communication of treatment processes and their measured success as prerequisite. Within the research areas of business management and information systems conceptual modeling is a successful and accepted means for this kind of task. This technique is also increasingly applied within health care in recent years. Therefore, our following considerations concentrate on the adoption and utilization of this proven method.

3 The Use of Conceptual Models Within Health Care Systems

Technological progress, increased pressure to economical behavior and a higher degree of specialization and labor division along the treatment chain causes the need for new management concepts in health care management (Juhrisch et al. 2011, 2012). In this context conceptual models became increasingly important especially for management of specific operational structures and the process landscape, documented by Clinical Pathways (for a discussion of the term Clinical Pathway see De Bleser et al. (2006)). Clinical Pathways should support the decision making and the organization of care (Burwitz et al. 2011). Therefore they include not only medical treatment, but also care processes, administrative and other supporting processes (Schlieter and Esswein 2010). Beyond the improvement of medical care, the utilization of Clinical Pathways also aims at optimizing resource allocation (Juhrisch et al. 2011).

But the previous usage of Clinical Pathways is usually constricted on the organizational level, so that the pathways are used just as descriptions and documentation of the treatment and provide only minimal operational support. To operationalize Clinical Pathways, conceptual models¹ can be used providing a

¹Challenges of standardization issues are addressed by conceptual models in business and information system research since decades (for an overview of relevant application areas see Davies et al. (2006) and Fettke (2009)).

knowledge base with clinical, medical and administrative knowledge, as well as formal process descriptions as the foundation for future IT of hospital information systems (HIS) (Burwitz et al. 2013).

In addition to the standardization task, the applicability of conceptual models has been increasingly discussed for ensuring the quality of medical treatment. A specific type of conceptual models, namely reference models, has been investigated with regard to its suitability as means of default declaration.

A reference model is a specific model, which is reused to construct another specific model in a similar but not necessarily identical situation (vom Brocke and Buddendick 2004). Reference models are built on the basis of common-practice or best-practice solutions. With the use of reference models it is expected that the design risk will be minimized and the acceptance of the users increase (Lehrmann et al. 2010).

The specifications are defined within Clinical Practice Guidelines. How Clinical Practice Guidelines could be implemented into Clinical Pathways by means of reference models has been presented by Jacobs et al. (2007) and Schlieter (2012). Reference modeling is a specific modeling method for constructing individual conceptual models by means of existing (configurable) models (for a detailed definition see Thomas (2006)). Thus, reference models are generic models deliberately designed for reuse in various (but similar) problem situations (Lehrmann et al. 2010). Beyond the common modeling techniques, reference modeling requires special modeling concepts (design principles) for defining adaptation rules in order to derive valid conceptual models (for further details see vom Brocke (2003)). Schlieter and Esswein (2011) demonstrate the application of the theoretical knowledge of reference modeling by presenting the construction of a reference model for a common electrocardiography. An integrated model-based approach could significantly support the alignment of clinical processes to Clinical Practice Guidelines (e.g. see Bögel et al. (2011)). Such methods have to provide means for structuring the content of existing medical guidelines, reusing clinical algorithms adapted to local conditions and combining them to a single pathway (Schlieter 2012). But the above-mentioned approaches only focus on a cascade-like construction of the conceptual (reference) model. Novel approaches try to implement evolutionary ideas in order to gain benefit from the model modifications due to local circumstances (for a classification of reference model types see Esswein and Lehrmann (2012)). Evolutionary reference models could serve as a means of organizational learning within a health care system. First approaches for a formal analysis of performed model changes have been already developed (see Weber et al. 2009). Referring to the introductory problem outline, reference models provide an untapped potential for improving both the quality of medical treatment and the cost-benefit ratio. In the next section we will seize the idea of evolutionary development of reference models, adapt it to the current requirements of health care systems and broaden it by integrating the analysis of experiences.

4 The Principle of Experience-Based Evolution of Clinical Pathways

The developed framework for a cooperation-based medical treatment, illustrated in Fig. 1, is based on the idea of evolutionary development of Clinical Pathways. Evolutionary development in this case means permanently generating perceptions and experiences² from daily care using them for evaluation and improvement.

As an initial step, Clinical Pathways are developed on the basis of relevant Clinical Practice Guidelines. In doing so, the Clinical Pathways support the implementation of medical guidelines—and thus also the transfer of knowledge into practice (see ① in Fig. 1).

The Clinical Pathways have been adapted to local conditions and imply an interdisciplinary and inter-professional description of the treatment chain defined for a specific patient group (Juhirsch et al. 2011). The conceptual model of the Clinical Pathway serves as a reference model for the construction of a conceptual model for patient-specific treatment. These individual therapy plans could deviate from the proposed treatment due to specific conditions related to symptoms, desires of the patient, facilities and so on. An analysis of the deviations and/or performed changes related to an adequate performance analysis could reveal potential for general improvement of the Clinical Pathway (see ② in Fig. 1).

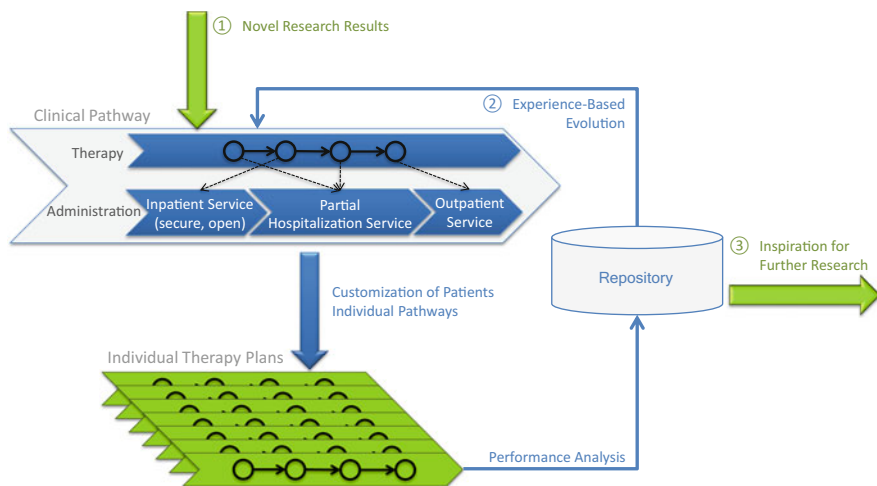


Fig. 1 Evolutionary development of clinical pathways

² On the basis of etymological and philosophical thoughts on the term *experience* (Hammel 1997) we define the term *organizational experience* as follows: An organization gains experiences by drawing a conclusion from the perception and interpretation of real-world-phenomena. (For a more detailed description and definition, we refer to Esswein and Lehrmann (2009).)

In a broader sense, the analysis results could also be valuable for a revision of Clinical Practice Guidelines and/or for inspiring further research (see ③ in Fig. 1). But the experience-based evolution requires a systematic evaluation method to determine the need for further development of the pathway reference model. The key issue is to decide whether the particular experiences should be included in the statements of the reference model or not.

4.1 Classification of Experiences

The organizational capability to gain experiences has to be enabled by adequate measuring tools, e.g. performance measuring instruments. In addition the captured experiences have to be interpreted and assessed regarding related objectives. The value of an organizational experience is here determined by its assumed contribution to future achievement of organizational objectives. The analysis of experiences regarding its impact on existing process descriptions is suggested as follows:

First, the novelty of the experience has to be assessed. Both types of experiences, confirmation and contradiction, are of value. Experiences, which confirm the underlying assumptions and expectations, are used to justify the design of the reference model. On the contrary, experiences, which contradict underlying assumptions and expectations, could trigger innovation and/or improvement projects. Beyond the novelty, the impact of the experience, its causality, its scope and its likelihood of recurrence are decisive factors of the assessment. If the experience is only of minor importance or its causality is unclear, a systematic single-experience-management, e.g. a case-based-reasoning system, could be used for capturing and utilizing interesting experiences. A systematic evolution of the reference model is triggered only by experiences, which satisfy the following requirements:

1. The experience is novel/unexpected.
2. The experience has significant impacts on the achievement of objectives.
3. The causality of the experience is known.
4. The scope of the experience is consistent with the scope of the reference model.
5. There is a high likelihood of recurrence of the particular experience.

If the assessment of the experiences is proceeded as described, only obvious and mature improvements are included in the reference model. But interesting experiences without enough evidence are neglected. But the stock of experiences, captured within the repository, could be a remarkable inspiration for further research. For instance, a number of similar experiences with unknown causality could induce a scientific research project. Its research results could trigger the further development of the reference model in turn. A similar situation applies to experiences with small scope. Even if a restricted scope obstructs the evolution of the reference model, the experience itself could be interesting enough for further scientific research. Figure 2 indicates what kind of experiences could be attractive to further research.

	I	II	III
Novelty	Known	Expected	Contradicts to Expectations
Impact	Negligible	Noticeable	Critical
Likelihood of Recurrence	Unimaginable	Conceivable	Certainty
Causality	Known		Unknown

Fig. 2 Classification of experiences

As described in Fig. 2 experiences could be assessed regarding their novelty, impact and likelihood of recurrence. The defined evaluation scheme allows a classification of experiences and their potential contribution to reference model evolution or further research. The first category (medium grey in Fig. 2) consists of experiences without any impact on the achievement of objectives and/or their recurrence is inconceivable. This kind of experiences is disregarded for both the reference model evolution and further research. The second category (light grey in Fig. 2) consists of experiences, which confirm the statements of the reference model. In this way, they contribute to the sustainable establishment and strengthening of novel treatments and/or procedures. The third category (white in Fig. 2) consists of experiences, which contradicts the statements of the reference model. These experiences are potential triggers for reference model evolution or further research. Experiences without clear causality (dark grey in Fig. 2) constitute a subset of this category. These experiences should not be considered for further development of the reference model but for focused scientific research.

4.2 The Need for Adapted Reference Modeling Techniques

In order to make the described approach workable in practice, significant shortcomings in current modeling approaches have to be addressed. Besides issues of suitable modeling languages (e.g. Juhrišch et al. 2011; Burwitz et al. 2013), specific challenges of the model domain (i.e. health care), have to be met.

To enable experience-based evolution and inspiration for further research, reference modeling techniques have to be adapted in a way that they reflect the special requirements of treatment processes. They contain patient-centered therapy plans on the one hand, which is the *medical* knowledge deduced from research perceptions of medical studies and clinical practice guidelines as well as experiences of individual practitioners in daily care. On the other hand, these treatment processes are affected by heterogeneous *administrative* structures of interdisciplinary treatment partners from inpatient, outpatient, semi-residential and social care who are all involved in the treatment of a single patient. These organizational structures vary from individual expertise and specialization over internal routines and standard operating procedures to daily schedules of activities (e.g. therapeutic consultations, kinesiatrics, ergotherapy, medication, subsistence, leisure). Hence,

an integrated pathway is the combination of both, the medical therapy plan as well as the administrative constraints of the participating treatment partners. A corresponding reference model should provide an instrument for a coordinated collaboration as well as the foundation for a systematic measurement of the treatment success and an experience-based improvement. To meet the latter, a reference model of an integrated pathway should first differentiate between a *medical pathway* and an *administrative pathway*.

This would facilitate the integration of new research findings, i.e. reviewed guidelines, since this knowledge only affects the medical pathway. To be an integrated treatment plan, a reference model should further allocate therapy activities of the medical pathway to the responsible care partners and their component of the administrative pathway. This allocation defines responsibilities along the treatment chain and systematizes the networking and collaboration of the involved treatment partners.

Experiences gained from practical use of the model could be allocated to either the medical pathway or to the administrative pathway offering different potentials. Analyses assessing aspects of medical quality, i.e. the achievement of therapy goals or figures like relapse or mortality, are the foundation for implications to evaluate the medical pathway and supplement the integration of guideline knowledge. Hence, the proposed framework has the potential to establish a promising evaluation mechanism for medical research findings, measuring their practicability. The evaluation of the administrative pathway fosters transparency and comparability along the treatment chain between partners, but also cross-treatment between competing institutions. Besides measuring the quality of a treatment, economic figures expressing the monetary cost-benefit-ratio are valuable indicators for improving the organizational structures and administrative processes of one or more treatment partners.

Conclusion

Concluding, the presented framework pursues three main goals. First, reference models should operate as a connecting piece between academia and addiction treatment practitioners by translating research into continuously improved policies and procedures (see implication 1). Reference modeling methods should serve as a central means for transparency and standardization within addiction treatment. Since conceptual models (e.g. for visualization of clinical pathways) are prominent means for communication and problem analysis, they should facilitate the comparability of different approaches as well as performance analyses and systematic change management (see implication 2). Beyond that, the reference model approach should foster networking among researchers, practitioners, social service providers and other stakeholders. Second, the networking, constituted by the application of the reference model approach, finally accelerates and systematizes the

(continued)

knowledge transfer and experience exchange among system relevant partners (see implication 3). A systematic experience gathering and knowledge transfer could result in continuous improved design of integrated services provided by network-partners. Third, systematic analyses of documented experiences may be of low evidence, but they could be a valuable suggestion for further, rigor research (see implication 4).

The presented framework is currently tied to the area of the introduced scenario of psychosomatic treatment. However, there is potential for transferring the results into other areas of inter-sectoral care, since psychological and psychosomatic treatments are a forerunner for the trend of individualized medicine.

Future challenges and consequential further research around the proposed framework are various. Novel medical research findings have to be identified systematically and estimated regarding their relevance for actual services in addiction treatment and prevention to provide the content for the pathway reference models. Along with engineering suitable modeling techniques (see Sect. 4.2), methods for defining therapy goals and appropriate metrics to analyze and assess the quality of therapy as well as methods and tools to support decision making in change management for pathway improvement have to be developed. For practical use, appropriate education and training opportunities for implementing the research results—documented by the mentioned reference models—have to be developed and evaluated. In order to ensure an effective bidirectional knowledge-transfer between research and practice, the implementation of the reference model approach has to be supported systematically while the involved employees have to be trained how to apply the proposed method. The quality of such a transfer concept will have a significant impact on user acceptance.

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Diversity Management in the European Health Care Sector: Trends, Challenges, and Opportunities

Thomas Köllen

Abstract The European healthcare sector is undergoing fundamental shifts towards becoming more diverse, in terms of its patients, as well as its employees. Alongside the core dimensions of diversity—gender, age, nationality/ethnicity, sexual orientation/gender identity, and disability status—this article outlines the crucial developments in the different European regions, and their relevance to health care management. It shows that the situations and developments within Europe are quite heterogeneous. Almost the whole of Europe is confronted with aging populations, but in recent years, this has been counterbalanced in Western and Northern European countries with an augmenting replacement migration of predominantly younger migrants. As this migration partially comes from Eastern and Southern Europe, this additionally accelerates populations' aging in these countries. In the whole of Europe, although to different degrees, a weakening of stereotypic gender roles as well as an increase in societal acceptance of homosexuality can be observed. In order to provide an efficient health care service for increasingly diverse patients, health care practitioners and policy makers should develop a comprehensive awareness and sensitivity for health care-related mechanisms of inclusion and exclusion working around every dimension of diversity. In aiming to create a supportive and equitable health care environment for both patients and employees, any kind of “othering”, disrespect, or judgmental behavior towards “other” nationalities, ethnicities, sexualities, genders or life styles should be avoided and critically reflected. The article discusses these issues alongside the varying actual situations within Europe and outlines connecting points for future research.

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1 Introduction

European societies are facing ongoing fundamental demographical and social shifts that are germane to the health care sector. Every European nation, to some degree, is confronted with an aging population, increased immigration to Europe and (as a consequence of the free movement of labor within the European Union and several associated states) large-scale movement of nationals between different European nations. As a corollary to progressive globalization, the latter development is related to an increasing linguistic, cultural, religious, national, and ethnic pluralization of Europe (Rechel et al. 2013b). Furthermore, ongoing attitude changes are observable in terms of the weakening of stereotypic gender roles, and in terms of societies becoming more accepting about non-heterosexual sexual orientations. All of these trends occur to different extents in different European countries, but they generally lead to a higher degree of diversity in the European population (e.g. Danowitz et al. 2012). For the health care sector this means an increasing diversity of patients and customers; at the same time, the labor supply for the health care sector is becoming more diverse. Nevertheless, diversity-related mechanisms of inclusion and exclusion working within the health care sector are responsible for several hierarchical and sector-related segregations within the workforce. Management positions are still predominantly held by male natives, whereas more menial work, at least in Western Europe, is often done by female immigrants (e.g. Lantz 2008). Equivalent processes work alongside every dimension of diversity. Furthermore, health care management frequently struggles to satisfy the diverse needs of increasingly diverse patients (Moseley et al. 2011; Weech-Maldonado et al. 2012). Research on diversity in the health care sector focuses mainly on the USA (e.g. Dansky et al. 2003), and, within Europe, the UK is by far the most analyzed country in research terms, when compared with other European countries. Against this background, this article broadens this perspective by explicitly highlighting the situation in Europe in a comparative way, not by primarily drawing on national borders, but on different constellations in terms of populations' diversity. From this, the main lines of development in terms of diversity are derived and contextualized. Methodically a semi-systematic literature review is applied using the databases "ISI Web of Knowledge" and "google scholar". A search was carried out for the words "health care" in combination with the word "management" and the name of each dimension of diversity focused on by this article, and, additionally, some related words, such as homosexuality. For each combination, the 100 most cited articles, as well as articles from 2013, were taken from each database to check their relevance for the European context, by either being based on European data or addressing a topic that in the same way is relevant for Europe. Furthermore quantitative data representing the actual situation for each dimension of diversity in Europe was collected from several databases. In the following, alongside the core dimensions of diversity—gender, age, nationality, ethnicity, sexual orientation, and mental and physical abilities—the crucial developments in the different European regions, and their relevance for health care management will be outlined. In this context health

care management includes a wide range of groups that are involved in the health care system, such as physicians in private practices, personnel in hospitals and personnel in health insurance companies, etc. Implications for both policy makers and health care practitioners will be discussed.

2 Diversity in Europe

Summarizing different indicators for diversity within the different nations, Tables 1 and 2 (see Appendix) give an overview of the recent situation in the whole of Europe. It shows that Europe consists of quite heterogeneous countries that face different situations. For this article, Russia and Turkey as a whole count as European countries as it is hard to obtain separated data for their European territories, and both countries are heavily involved in the European migration-movement. Following the UN schematization the countries are grouped as Northern, Eastern, Southern, and Western Europe.

In the following, these indicators will be explained and discussed in more detail, to identify trends, challenges, and opportunities for the European health care sector in terms of the different dimensions of diversity.

2.1 *Ethnic and National Diversity in Europe*

As this article focuses on actual developments in terms of European diversity, migratory waves that occurred before the year 2000 will not be considered, such as the large scale migration from Turkey, Russia, and Kazakhstan to Germany and to other Western European countries (Dietz 2000; Ogden 1991; Schiffauer 2005), or from the Maghreb to Europe, mainly to France (Hargreaves 2007). However in recent years, large-scale migration streams within Europe, and from other countries into the continent; which are partially still ongoing and shaping the new European diversity in terms of nationalities and ethnicities, were also observed. As most of the European countries are part of the European Union, or at least have association agreements with it, the inner European migration has been facilitated by the free movement of workers within the EU, as one constitutive pillar of the common market (Guild and Bigo 2005). After the accession of several Eastern European states to the EU in 2004 and 2007, Sweden, Ireland, and the United Kingdom directly opened their labor markets for these countries. After 2004, and largely due to this, large-scale emigration to Great Britain and Ireland took place, especially from Poland, Latvia, and Lithuania, and to a lesser extent also from the other new member countries. Between 2004 and 2007 about two thirds of the immigrants that came to the UK from the new EU member states came from Poland, making the UK the second biggest destination country for Polish emigrants, after Germany (Burrell 2010). Both before and after they joined the EU in 2007, there was a second big

intra-European wave of emigration from Romania and Bulgaria (Düvell 2008). Attracted by a period of intensive economic growth around the turn of the millennium, Italy and Spain were by far the most popular target countries, with about one million Romanians living in Italy and 800,000 Romanians and 160,000 Bulgarians living in Spain today (United Nations 2013). A second important wave of immigrants coming to Spain, and also to Portugal (Corkill 2001), in this time of economic growth came from outside Europe, from Latin America. By 2013 more than two million people from this region live in Spain (United Nations 2013), but both migration streams, from Latin America as well as from Romania and Bulgaria, abated with the beginning of the economic crisis (Domínguez-Mujica et al. (forthcoming); Hierro (forthcoming); Köllen 2012).

Using a maximum period of transition of 7 years, Germany and Austria have opened their labor markets for the acceding countries from 2004 in 2011, and, as well as the rest of the EU members, they will do so for Romania and Bulgaria in 2014 (Paul 2013). Thus, it can be expected that new migratory streams from these countries to the other EU members will take place after 2014. A very recent trend in intra-European migration is due to high unemployment rates because of the economic crisis, especially affecting the Southern European countries Spain, Portugal, Italy, Greece and, partially, France. The very high youth unemployment rates in these countries indicate that those entering the job market for the first time are especially heavily affected by the crisis (Maguire et al. 2013; Mendola and Busetta 2013). Thus, it can be expected that within the next years more and more young people from Southern Europe will start working in Northern or Western Europe (Bijak et al. 2013). Furthermore it can be expected that the different migration networks that already exist in the economically more stable countries of Western and Northern Europe may attract more migration (Portes 1997), as these networks lower the risks and costs of migration, and increase the expected net return (Boyd 1989; Massey et al. 1993).

Due to the fact that almost every single European country has its own official language, an increasing intra-European migration has led, and still leads, to a continuing linguistic pluralization (e.g., Kraus 2008). The same is true for immigration from outside Europe. Several studies show that a successful health treatment of migrants is often impeded by linguistic and cultural barriers, thus, increasing migration is a fundamental future challenge for the quality of European health care management, especially in Western and Northern Europe (Rechel et al. 2013b). Linguistic barriers can negatively affect the non-native speakers' access to medical care and prevention, the quality of their medical treatment and satisfaction, as well as the satisfaction of the health personnel (Junge and Schwarze 2013). These barriers can be alleviated through professional interpreters, such as bilingual health practitioners, or through other types of translation services (Moseley et al. 2011). Larger institutions especially, should try to reflect the linguistic diversity of their patients within their workforce, e.g. through focused recruitment (Flores and Combs 2013). Making patients feel respected and valued as people is a key element of a trustworthy and effective health care interaction (Dickert and Kass 2009). This includes avoiding any kind of "othering"

in health care encounters, such as applying essentializing, culturist, and racializing explanations that are based on the patient's origin or nationality. Health care institutions with, in particular, a nationally and ethnically very diverse patient structure should constantly try to unmask any kind of "othering practices" in order to create a supportive and equitable health care environment (Johnson et al. 2004), without disrespecting other national or cultural backgrounds (Skott and Lundgren 2009). Diversity training can help qualifying health care personnel for this balancing act (Anderson et al. 2003; Betancourt et al. 2005).

2.2 *Aging and Disability*

The aging of the European population is one of the biggest challenges for European health care management. Aging, as a "process, by which older individuals become a proportionally larger share of the total population" (United Nations 2002, p. 1), is a direct consequence of a longer life expectancy and low fertility rates (Bijak et al. 2013). Table 2 gives an overview of the fertility rates and the median age of the total population for the European countries. Both indicators are related, and they show different developments in different European regions. The European replacement fertility rate is about 2.1 births per woman (Espenshade et al. 2003), a number that, despite its recent rise in Europe (Bongaarts and Sobotka 2012), is reached only by France, Iceland and Ireland. Besides these countries, only the Scandinavian countries, Turkey, the UK, Belgium and the Netherlands have a fertility rate above 1.8. The Southern and Eastern European states, as well as Austria and Germany, have much lower rates, between 1.2 and 1.5 (see Table 2). Thus, there are big differences in terms of fertility rates within Europe that will affect health systems in different ways, depending upon their level (Pritchett and Viarengo 2013). European population structures are strongly related to intra-European migration, as migration influences both the sending and the receiving countries. In Eastern Europe especially, the younger people are the ones who decide to emigrate and who often leave their parental generation at home. Thus, the effect the low fertility rates in these countries have on aging in society is intensified even further by emigration. Furthermore, young emigrants often build their life in the destination countries in a way that makes them elect to stay there permanently. For their former home country this means a dwindling in size of the next generation of potential parents (Botev 2012, p. 72). In these countries of the former Eastern bloc, the high emigration rates amongst younger persons leave many people from the parental generations without any direct family support. For older women in particular this often worsens their access to an infrastructure of care provision they may well need because of "the excessive gender differences in mortality and life expectancy, and the ensuing high rates of widowhood amongst older women" (Botev 2012, p. 73). Whereas these migration streams moderate the aging structure for the Northern and Western European countries to a certain extent, they aggravate the situation in the

Eastern states. For the health care sector in these states it is also particularly problematic that a lot of health professionals chose to leave these countries (Gerllinger and Schmucker 2007; Hussein et al. 2013).

As a consequence for the whole of Europe, the health care sector has to be prepared for an increasing number of older people, having health problems that occur more frequently in older generations, such as dementia, cancer, strokes, and fractured hips (Rechel et al. 2013a). The health sector can respond to this, by actively offering disease prevention or health promotion and by “enabling better self-care, ensuring capacities of health services, improving coordination of care and management of hospital admissions and discharges, and addressing the ageing of the health workforce” (Rechel et al. 2013a, p. 1312). As counteraction the European Commission proposed the promotion of “healthy and active aging” (Avramov and Maskova 2003; Boudiny and Mortelmans 2011). For the welfare systems, population aging is related to a moderate increase of expenditures on acute care and stronger increases of spending for long-term care (Meijer et al. 2013). This might be cushioned by raising the pensionable age, and the imbalance within Europe might be smoothed by a more Europeanized system of health care insurances in the long run, at least within the European Union (Gerhards and Lengfeld 2013).

A population with an increasing life expectancy does not have to be accompanied by an increasing disability level, that is defined as the need for assistance in daily life (Sarkeala et al. 2011). For Europe, no clear trends are observable in terms of disability, but it seems that the proportion of people spending a life disability-free at ages 65 years and older is not shrinking because of an increasing life-expectancy (Christensen et al. 2013). One emerging disability-related issue in Europe is obesity, that has increased in the whole of Europe to different degrees (Devaux and Sassi 2013; Schorb 2013; Webber et al. 2012), and demands adequate health care facilities and physically strong staff. The latter might be affected negatively by an aging workforce (Vedder 2013).

2.3 Gender Equality, Gender Identity and Sexual Orientation

The European Institute for Gender Equality, an agency of the EU, has developed a gender equality index that aims at illustrating the degree of general equality between men and women in the EU member countries alongside six categories between 0 and 100 %; one of these categories is health and access to health care (EIGE 2013a). Table 2 shows a divide between Northern and Western Europe, which have higher values, and Eastern and Southern Europe, which have lower values. All of the European countries are some considerable way from gender equality. Nevertheless, Scandinavia, especially, has quite high values whereas the former Eastern bloc, Italy, Portugal and Greece seem to be very far away from equality. The same picture emerges when comparing equality in terms of sexual orientation and gender identity in Europe. The International Lesbian, Gay, Bisexual, Trans and Intersex Association (ILGA) has developed a Rainbow Europe Index

that “rates each European country’s laws and administrative practices according to 24 categories and ranks them on a scale between 17 and –7” (ILGA 2012). In terms of sexual orientation equality (i.e., equal treatment of homosexual, bisexual and heterosexual persons) and gender identity equality (i.e., equal treatment of transgender persons and others) Table 2 shows the same divide as in gender equality, with the exception of the positive values for Spain and Portugal.

In terms of gender in the whole of Europe inequalities in access to health-promoting resources can be observed which negatively affect women’s health and wellbeing. On the one hand, this is due to inequalities in wealth and income. On the other hand, sometimes doctors tend to regard women as of less importance than men, giving them less access to clinical resources (Doyal 2000; Raine 2000; Raine et al. 2002; Risberg et al. 2006). Within the European Union Poland, Romania, Bulgaria, and Latvia have the highest gender-imbalance in terms of access to health care (EIGE 2013b). Another gender related inequality, that might partially compensate the health-care related “advantage” of being male, emerges from the stereotypic linkage between masculinity and “risk taking”. Though not for every community exactly the same attributions are attached to masculinity, “the development and maintenance of a heterosexual male identity usually requires the taking of risks that are seriously hazardous to health” (Doyal 2000, p. 1062). This includes risky “proofs” of masculinity, such as dangerous sports and excessive drinking, as well as the refusal of health promotion advices in order to seem “hard” (Buckley and ÓTuama 2010; Doyal 2000; Robertson 2007). For overcoming both biases, the one related to inequalities in access to health-promotion as well as the one related to masculine “risk taking” behavior, Celik et al. (2011) propose the further development of a gender-sensitive health care by fundamentally changing its structures and system. This includes raising awareness of these issues and developing skills for those who work in the health care sector. These skills have to contain the ability to overcome stereotypical attributions in everyday encounters with patients.

Although, in general there is an increasing level of acceptance of homosexuality, and also transsexuality, there are huge differences within Europe, and the former Eastern bloc states, especially, along with Turkey and Greece maintaining a decidedly non-accepting climate (Fernández and Lutter 2013; Gerhards 2010; van den Akker et al. 2013). Therefore, in recent years, many lesbians and gays from these states have migrated to Western Europe, especially to cities that are assumed to be more gay-friendly, such as Berlin, London, Amsterdam or Cologne (Binnie and Klesse 2013; Bruce and Harper 2011). The whole health care sector, especially the HIV prevention services in these cities (as HIV over-proportionally occurs among bisexual and gay men (Hogg et al. 1997)), have to adapt their campaigns and information to reach these migrants (Alvarez-del Arco et al. 2013). Homosexuals and transsexuals more often have mental health disorders, especially anxiety and depression, mainly because of experiencing social marginalization or the stress of having to hide one’s sexuality (Khobzi Rotondi 2012; Meyer 2003). Besides knowledge about special medical needs for these patients (Coker et al. 2010; Coleman et al. 2012), health care professionals should be sensitive to the history of stigmatization, and they should be trained to speak in a gender-appropriate and

non-judgmental way to provide optimal health care (Mayer et al. 2008; Rutherford et al. 2012). In Central and Eastern Europe especially, there remains considerable work to be done in order to reach a higher level of acceptance and inclusion for homo-, bi- and transsexual patients (Takács et al. 2013; Köllen 2013).

3 Implications

3.1 Implications for Policy Makers

The whole of Europe will be confronted with an aging population within the next few decades. In relation to this, the Western and Northern European nations might compensate their shrinking workforce by young immigrants from Eastern and maybe Southern Europe and other regions, but for the Eastern European nations these emigration tendencies can lower their quota of working people in relation to retired people. The whole of Europe will inevitably have to adapt pensionable ages or pension and health care contributions to this new situation. As a response to a general diversification of the European population and workforce, political directives aiming at a higher degree of inclusion might help health care institutions to cope with these fundamental changes in terms of more working women and non-natives, and a pluralization of life-conceptualizations. To reach a more diverse population, it will be increasingly important to provide access to the health care system in more languages than solely the official language of the country. Governments, or the EU itself, might be able to help the whole sector by providing IT-tools to at least translate online-information. In terms of an adequate diversity management for the policy makers themselves, they could focus on representing the diversity within the countries also in their institutions, e.g. through focused recruitment, or at least through establishing a working-climate that would potentially allow this representation.

3.2 Implications for Health Care Practitioners

Besides knowledge of the above mentioned special needs in terms of health care and medical treatment for increasingly diverse patients, the biggest challenge for health care practitioners is to develop a comprehensive awareness and sensitivity for diversity and the health care-related mechanisms of inclusion and exclusion working around its dimensions. Every person that is involved in the health care system should have this sensitivity that includes the avoidance of any kinds of “othering” in health care encounters alongside any dimension of diversity. Those practitioners especially, who work with very diverse patients, e.g. in the bigger cities, should constantly try to unmask any kind of “othering” practices. In aiming

to create a supportive and equitable health care environment, any kind of disrespect or judgmental behavior towards “other” nationalities, ethnicities, sexualities, genders or life styles should be avoided and critically reflected. The same is true for collaborating with diverse colleagues in the health care sector. One first step to promote a more inclusive working climate can be diversity training for qualifying health care personnel. In terms of destabilizing discriminatory hierarchies alongside certain diversity dimensions within the health care workforce, more focused recruitments and, also, encouraging mentoring programs for disadvantaged groups could help to reflect the composition of society as a whole in the health care sector. This can help to bring more women, non-natives, or disabled people into more responsible positions, and this also might enable lesbian and gay health care practitioners to not have to hide their sexual orientation.

3.3 Implications for Future Research

As already mentioned above, most research on diversity issues in health care and health care management is done from an Anglo-American perspective. Nevertheless, research already done in the European context (beyond the United Kingdom), in combination with actual data on diversity-constellations within Europe, allowed the picture presented in this article to be drawn. Nevertheless, as almost every European nation has its own language that, at least to a certain degree, makes every nation a linguistically isolated discursive space, each country is worth considering in greater depth. This can be done by analyzing the situation in terms of certain manifestations of single dimensions of diversity for certain segments of the health care sector. An example could be analyzing the situation for female nurses in psychiatric hospitals in, say, France, in comparison to the situation in, say, Italy. Another connecting point for future research is to have a closer look at the intersections of different dimensions of diversity. These intersections can be analyzed by focusing on the dimensions of diversity themselves, such as investigating the relationship between an aging population and the degree of disability. Furthermore, intersectional analyses can focus on the intersection of specific manifestations of at least two dimensions of diversity in a certain context. An example for this kind of analysis can be analyzing the difference of making use of preventative health care between lesbians and gays, or, by adding a third and fourth dimension of diversity, between lesbian and gay elderly with a migratory background. These kinds of analyses can also be conducted in a comparative way between different countries.

Conclusion

For the whole of Europe a development trend could be identified towards societies becoming more heterogenic and diverse. Alongside the demographics of gender, age, nationality/ethnicity, sexual orientation/gender identity, and disability status it was shown that the intensities of these trends differ between the European nations, but their developmental direction shows in the same direction for all countries. Thus, the challenges arising from these trends for the national health care sectors affect the whole continent, although the necessity to respond to these challenges with immediacy might differ between countries. Nevertheless in any case, regardless of the intensity of necessity to react, adjusting for these changes can create a competitive advantage for health care institutions. Against the background of a common market for most of the European countries, a proactive approach to embracing workforce diversity as well as patient diversity can help to attract qualified employees as well as patients from all over Europe. Therefore, aggregated to the national or regional level, diversity policies can help to raise the competitiveness of the whole health care sector in a European context. However, economic reasons aside, diversity management can help provide an effective health care service to diverse patients, and it can contribute to make diverse employees feel more accepted and appreciated, and, as a consequence, more comfortable in their workplaces. Thus, beyond having a positive economic impact, implementing diversity management in the health care sector can help to ameliorate the working climate, as well as the treatment climate for diverse patients. To specify and better understand these interrelations for the European context, there are numerous connecting points for future research.

Appendix

Table 1 Diversity indicators for Europe 1

	Population 2013 ^a	Δ Population since 2004 ^b (%)	Migrant Stock 2013 ^c	Share of migration stock ^d (%)	Δ Migration stock since 2000 ^e (%)
<i>Europe (incl. Russia and Turkey)</i>	814,628,497	2.12	74,314,797	9.12	29.56
<i>Eastern Europe</i>	295,121,841	−1.12	19,678,250	6.67	−4.72
Belarus	9,463,800	−3.91	1,085,396	11.47	−3.40
Bulgaria	7,282,041	−6.66	84,101	1.15	93.96
Czech Republic	10,516,125	2.98	432,776	4.12	96.01
Hungary	9,906,000	−2.08	472,798	4.77	59.21

(continued)

Table 1 (continued)

	Population 2013 ^a	Δ Population since 2004 ^b (%)	Migrant Stock 2013 ^c	Share of migration stock ^d (%)	Δ Migration stock since 2000 ^e (%)
Poland	38,533,299	0.90	663,755	1.72	−19.38
Republic of Moldova	3,656,843	1.37	391,508	10.71	−17.47
Romania	21,305,097	−1.87	198,839	0.93	48.12
Russian Federation	143,500,000	−0.46	11,048,064	7.70	−7.10
Slovakia	5,410,836	0.57	149,635	2.77	26.32
Ukraine	45,547,800	−3.99	5,151,378	11.31	−6.80
<i>Northern Europe</i>	<i>100,548,337</i>	<i>5.50</i>	<i>12,429,626</i>	<i>12.36</i>	<i>57.10</i>
Denmark	5,602,628	3.80	556,825	9.94	50.08
Estonia	1,286,479	−4.78	209,984	16.32	−15.84
Finland	5,426,674	3.96	293,167	5.40	115.24
Iceland	321,857	10.77	34,377	10.68	116.32
Ireland	4,598,418	14.14	735,535	16.00	91.11
Latvia	2,017,526	−13.01	282,887	14.02	−34.24
Lithuania	2,971,905	−13.75	147,781	4.97	−30.34
Norway	5,051,275	10.35	694,508	13.75	132.56
Sweden	9,555,893	6.46	1,519,510	15.90	51.38
United Kingdom	63,715,682	6.73	7,824,131	12.28	66.27
<i>Southern Europe</i>	<i>226,242,203</i>	<i>4.52</i>	<i>17,863,086</i>	<i>7.90</i>	<i>114.77</i>
Albania	2,787,615	−10.64	96,798	3.47	26.21
Andorra	84,082	16.26	45,086	53.62	6.98
Bosnia and Herzegovina	3,835,645	−0.05	23,197	0.60	−75.84
Croatia	4,290,612	−3.40	756,980	17.64	22.91
Greece	11,290,067	2.26	988,245	8.75	35.06
Italy	59,394,207	2.60	5,721,457	9.63	169.67
Malta	421,230	5.34	34,455	8.18	67.23
Montenegro	622,777	0.24	50,708	8.14	
Portugal	10,487,289	0.12	893,847	8.52	40.77
San Marino	32,471	11.05	4,857	14.96	20.07
Serbia	7,241,295	−3.07	532,457	7.35	−37.85
Slovenia	2,058,821	3.12	233,293	11.33	33.74
Spain	46,006,414	8.65	6,466,605	14.06	290.19

(continued)

Table 1 (continued)

	Population 2013 ^a	Δ Population since 2004 ^b (%)	Migrant Stock 2013 ^c	Share of migration stock ^d (%)	Δ Migration stock since 2000 ^e (%)
TFYR Macedonia	2,062,294	1.60	139,751	6.78	11.21
Turkey	75,627,384	6.98	1,864,889	2.47	62.10
<i>Western Europe</i>	<i>192,716,116</i>	<i>2.80</i>	<i>24,343,835</i>	<i>12.63</i>	<i>18.88</i>
Austria	8,488,511	4.25	1,333,807	15.71	33.84
Belgium	11,183,350	7.57	1,159,801	10.37	31.94
France	65,633,194	5.36	7,439,086	11.33	18.48
Germany	82,020,688	−0.62	9,845,244	12.00	9.48
Liechtenstein	36,842	7.43	12,208	33.14	8.85
Luxembourg	537,039	18.04	229,409	42.72	62.92
Netherlands	16,779,575	3.21	1,964,922	11.71	23.94
Switzerland	8,036,917	9.14	2,335,059	29.05	48.66

^aSource: Eurostat 2013^bSource: Own calculation based on data of Eurostat 2013^cSource: United Nations 2013^dSource: Own calculation based on the data of Eurostat 2013 and the UN 2013^eSource: Own calculation based on Data of the UN 2013

Table 2 Diversity indicators for Europe 2

	Fertility rate 2010 ^a	Median age of total population 1990 ^b	Δ Median age 1990 to 2000 (in years) ^b	Female activity rate (2065) ^a	Gender equality index (EU) ^c	REI sexual orientation ^d	REI gender identity ^d
<i>Europe (incl. Russia and Turkey)</i>		34.6	5.7				
<i>Eastern Europe</i>		33.6	4.9				
Belarus	1.51	33.0	5.9	–	–	–2	–2
Bulgaria	1.49	36.6	5.9	63.0	37.0	2	1
Czech Republic	1.47	35.3	4.2	71.5	44.4	4	0
Hungary	1.25	36.4	3.5	62.1	41.4	5	3
Poland	1.38	32.4	5.6	64.7	44.1	0	1
Republic of Moldova	1.35	29.9	5.3	–	–	–2	–2
Romania	1.33	32.8	5.7	63.8	35.3	3	0
Russian Federation	1.57	33.3	4.7	–	–	–3	–1
Slovakia	1.38	31.2	5.9	65.1	40.9	2	0
Ukraine	1.35	35.1	4.3	–	–	–3	–3
<i>Northern Europe</i>		35.6	4.1				
Denmark	1.87	37.2	3.4	75.4	73.6	9	1
Estonia	1.64	34.4	6.1	72.1	50.0	2	1
Finland	1.88	36.4	5.6	74.0	73.4	7	0
Iceland	2.19	30.0	4.9	81.8	–	10	0
Ireland	2.13	29.2	5.1	63.7	55.2	6	0
Latvia	1.17	34.6	6.6	68.2	44.4	0	0
Lithuania	1.55	32.7	6.0	68.7	43.6	2	–1
Norway	1.97	35.4	3.3	79.9	–	10	1
Sweden	1.98	38.3	2.4	79.4	74.3	11	2
United Kingdom	1.95	35.8	4.0	74.2	60.4	9	4.5

(continued)

Table 2 (continued)

	Fertility rate 2010 ^a	Median age of total population 1990 ^b	Δ Median age 1990 to 2000 (in years) ^b	Female activity rate (2065) ^a	Gender equality index (EU) ^c	REI sexual orientation ^d	REI gender identity ^d
<i>Southern Europe</i>		34.6	6.7				
Albania	1.33	23.1	8.9	–	–	1	1
Andorra	1.25		0	–	–	5	–1
Bosnia and Herzegovina	1.27	29.9	8.8	–	–	1	0
Croatia	1.47	35.8	6.1	55.3	–	5	2
Greece	1.52	36.1	5.7	55.3	40.0	2	1
Italy	1.43	37.0	6.3	61.0	40.9	1	0
Malta	1.35	31.9	8.2	63.1	41.6	1	0
Montenegro	1.85	29.7	6.6	–	–	1	1
Portugal	1.32	34.2	6.8	66.5	41.3	8	3
San Marino	1.36	–	–	–	–	–1	–1
Serbia	1.36	32.9	4.9	–	–	1	1
Slovenia	1.57	34.2	7.4	68.3	56.0	6	0
Spain	1.39	33.7	6.5	59.3	54.0	10	3
TFYR Macedonia	1.55	29.4	6.7	–	–	–1	–2
Turkey	1.99	21.8	6.5	–	–	–1	–1
<i>Western Europe</i>		36.3	6.0		–		
Austria	1.44	35.7	6.1	75.6	50.4	4	3
Belgium	1.82	36.5	4.6	67.2	59.6	10	1
France	2.07	34.8	5.3	68.8	57.1	6	0
Germany	1.37	37.7	6.6	76.7	51.6	6	5

Liechtenstein	1.41	–	–	–	–	–	–1	–1
Luxembourg	1.62	36.4	2.5	71.4	50.7	5	0	0
Netherlands	1.81	34.4	6.4	77.2	69.7	10	1	1
Switzerland	1.57	36.9	4.7	82.0	–	5	0	0

^aSource: Eurostat 2013
^bSource: United Nations 2012
^cSource: EIGE 2013a
^dRainbow Europe Index, Source: ILGA 2012

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Health Care Innovation Across Health Systems

Sandra C. Buttigieg and Dorothy Gauci

Abstract Despite the challenges being faced by health care systems worldwide, the implementation of innovations within and across health systems remains slow. While the term ‘innovation’ has become the buzzword in health care literature, collaborative research on an international level is scant. To understand the successes and failures of health care innovations, it is important to review the complex pathways that lead to workable innovations. Furthermore, it is essential that successful innovations are not removed from the outer context in which they were borne, namely the environmental and operational characteristics of the healthcare system. This chapter discusses the extent to which innovation is strategically considered in health systems by comparing three different health systems in three countries, namely the United States, the United Kingdom and Germany. It is clear that there are wide variations in innovation capacity across systems, which may influence the extent to which innovations are transferred. Thus research should adopt a more international perspective so as to push towards more equitable global health care delivery through innovative solutions.

1 Introduction

Despite the frequent emergence of evidence-based innovations in health care systems over the years, dissemination, diffusion, adoption and implementation remain slow both within and across systems (Herzlinger 2006). This, despite the challenges faced today by health systems worldwide, begs for innovative solutions. The often mentioned major challenges include globalization of health problems, financial crises, high and rising health care costs, increasing population demands, shortage of trained health care professionals to cater for expanding services, as well as medico-legal issues (Fineberg and Hunter 2013; Kleinert and Horton 2013). Indeed this highlights the need for governments across the world to be more

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receptive towards the adoption of innovative best practices that can render their health systems more efficient and effective. However while the term ‘innovation’ has become the buzzword in health care literature, collaborative research on an international level addressing innovation in health care is still scant. This partly explains the slow pace with which innovation is implemented on a global scale.

There are various definitions of innovation in the literature, but for the purpose of this chapter, we will use the one by Omachonu and Einspruch (2010), namely “Healthcare innovation can be defined as the introduction of a new concept, idea, service, process, or product aimed at improving treatment, diagnosis, education, outreach, prevention and research, and with the long term goals of improving quality, safety, outcomes, efficiency and costs” (p. 5). This definition led Omachonu and Einspruch (2010) to create the conceptual framework, which articulates the intervening variables that drive innovation in healthcare, putting patients firmly in focus, without neglecting the needs of providers/practitioners. Information technology also plays a vital role in healthcare innovation, but it is only a means to an end. The dimensions of good quality health care and improving patient experience should remain the top priorities.

However, to fully understand successes or failures of innovations, as well as to grasp the reasons why the various processes, namely dissemination, diffusion, adoption and implementation remain slow, it is important to delve deeper into these complex pathways. It is equally important to conceptually define these distinct albeit related processes, which potentially lead to successful and workable innovations. Moreover, as clearly explained by Greenhalgh et al. (2004), these processes cannot be isolated from the outer context, namely socio-political and economic climate, legal structure, environmental stability, incentives and mandates, as well as inter-organizational norm-setting and networks.

Therefore an assessment of the strengths and weaknesses inherent in the health system antecedents of innovation provide a roadmap on how to overcome barriers in the transformation of these processes. It is for these reasons that this chapter will not only review the literature on innovation in health care but will also look at the broader contextual mechanisms that may be influencing innovation in different health systems. Indeed, comparing and contrasting three distinct health systems, namely the US, UK and Germany should lead us to better understand why innovations in one health care system may not easily be adopted in another. In other words, the differences between health systems may provide the reason for the slow transfer of innovation across geographical regions.

2 How Are Dissemination, Diffusion, Adoption and Implementation of Innovation Conceptually Linked?

Several scholars have provided theoretical explanations as to what influences innovation in healthcare. Rogers (1962) was the first to describe the diffusion of innovation theory, which addresses the process of adopting innovative ideas and is

used to follow the endorsement of innovations by target groups. The theory seeks to explain how, why, and at what rate innovations spread through cultures. It also helps us to answer the relevant question: Why do certain innovations spread more quickly than others? According to Rogers (1962), there are four main elements that influence the spread of a new idea, namely the innovation itself, communication channels, time, and social system. Rogers' focus is on interpersonal networks and social systems that influence decisions and attitudes towards innovation. However, it ignores issues of equity, for example, whether or not developing countries are being fairly and equitably considered.

Glasgow et al. (2004) expanded Rogers' work by identifying 12 attributes that contribute to how widely and rapidly an innovation is adopted. The twelve attributes are: 1. Advantage: Is it better than the existing one? 2. Compatibility: Does it serve the target population? 3. Complexity: Is it complicated? 4. Trialability. Can we pilot test it? 5. Observability: Are there measurable results of its efficacy? 6. Impact: Will it have negative consequences? 7. Reversibility: Can it be stopped and its effects reversed? 8. Communicability: Is it easy to understand? 9. Time: Does it take long to implement? 10. Risk: Are there risks involved in its implementation? 11. Commitment: Does it involve a substantial commitment? 12. Modifiability: Can it be adapted to needs and settings? More recently Berwick (2003) argued that the rate of diffusion is largely influenced by contextual and managerial factors within health care organizations, as well as by perceptions of innovations and by the characteristics of individuals who may adopt change. Indeed, Berwick (2003) provides seven recommendations to accelerate dissemination, namely to find sound innovations, to find and support innovators, to invest in early adopters, to make early adopter activity observable, to trust and enable reinvention, to create slack for change and finally to lead by example. However it was Greenhalgh et al. (2004) who conceptually linked diffusion, dissemination, adoption and implementation of innovation by developing a framework of the determinants of the interrelated steps in innovation, which brings to the forum of discussion the complexity, involved.

Empirical evidence of this complexity was also outlined by Fleuren et al. (2004) who identified 50 determinants of innovation processes that influence the success or otherwise of innovations. Therefore in theory, by outlining steps in these processes as well as identifying determinants of innovation, barriers to achieving success in the setting where the innovation was developed, can be better tackled. However 'one size does not fit all' which is to say that even if innovators get to the bottom of this complexity, the biggest challenge that still remains is the diffusion of innovation across geographical regions.

It is evident that there are major differences between health systems as regards their priorities, which to some extent are largely influenced by wealth, political systems and culture. However as strongly argued by Dare and Macaulay (2011), all health care systems are struggling with similar challenges namely that of delivering high quality, efficient, effective and accessible health care against a background of financial constraints and rising costs. Specifically in health technology, Hwang and Christensen (2008) explicitly stated, "In health care, most technological enablers

have failed to bring about lower costs, higher quality and greater accessibility” (p. 1332), thereby motivating innovators to think more ‘outside the box’. Indeed, these authors claim that the solution is to encourage the development of disruptive business models for affordability and accessibility to health care. An example is the MinuteClinic based in Minneapolis, which is a chain of walk-in clinics located in retail stores and is an example of disruptive innovation. Hwang and Christensen (2008) referred to the MinuteClinic as ‘solution shops’ that offer value-added services.

In the next section, we will discuss the extent to which innovation is strategically considered in three different types of health systems. This analysis is important so as to achieve a better understanding of the environmental and operational dimensions within each system that motivate or affect the introduction of innovation as described in the model by Omachonu and Einspruch (2010).

The classification of health systems, which is used in this chapter is based primarily on governance structure and financial models for funding health services and secondly on evidence of system redesign and transformation using innovation (Snowden and Cohen 2011).

3 How Is Innovation in Health Care Perceived Across Health Systems?

Atun (2012) referred to innovations in health systems as being “new medicines, diagnostics, health technologies, new ideas, practices, objects or institutional arrangements perceived as novel by an individual or a unit of adoption” (p. iv). At the system level Berwick (2004) identified politics, infrastructural problems, red tape, dependency on external advisers, poor leadership, fossilized and dysfunctional roles as barriers to innovation. Similarly, Hwang and Christensen (2008) identified fragmentation of care, lack of retail market, regulatory barriers and lower reimbursement as challenges for hospitals and physicians to struggle to adopt new business models. It is evident from the following account that innovation is considered, as well as prioritized, differently across health and political systems.

Private mixed health services model (United States of America) is based on the principles of high quality of care, advanced medical technology and best models of specialist care but not on solidarity and commitment to universal coverage. The health system is financed by mixed private (55 %) and public (45 %) insurers (US National health expenditure projections 2008–2018). The state-run systems include Medicare, Medicaid, the State Children’s Health Insurance Program and others such as the Veterans Affairs program. US citizens with no insurance coverage are federally supported through safety net providers and community health centers. Most of the literature on health care innovations stems from the United States, which has the highest per capita health expenditure (17.7 % of GDP) (OECD Health Data 2013).

Berwick (2003), Herzlinger (2006) and Curfman et al. (2013) are by and large critical of the American Health Care System, which lacks commitment to universal health coverage, and is described as expensive, inefficient, inaccessible, consumer-unfriendly, and unsustainable. However, it is widely reported that the United States is a world leader in medical innovations, namely basic medical sciences, diagnostics and therapeutics, and maintains a solid reputation for having the world's best-equipped health facilities with highly specialized services, making it the destination of choice for advanced health care services (Pipes 2013). Nevertheless, despite huge investments in the US health care system, Herzlinger (2006) argues that many innovation efforts fail because of the many barriers encountered, amongst which the vested interests of powerful stakeholders.

The US health system has recently been faced with the challenge to widen health care coverage while maintaining a solid investment in innovation. It is no surprise, that in recent years, health care has been the subject of intense debate for reform as the current system is accounting for an increasing percentage of the GDP in the US. Indeed, the main goal of ObamaCare is to give more Americans access to affordable, quality health insurance and to reduce the growth in health care spending in the U.S. (ObamaCare Facts 2013). However, a common criticism of ObamaCare is that the high taxes on pharmaceutical and medical device companies will diminish their capacity to invest in innovations, which in the long run can save lives and lower overall health care costs (Pipes 2013). Cannon (2012) goes as far as claiming that innovation is the best alternative to ObamaCare. This debate largely stems from the fact that the US system is consumer-driven, and therefore innovation, including new technologies, is successfully adopted if it is part of a strategy, which attracts the privately insured and which generates revenue. Additionally, at a system level, innovation has mainly focused on the use of information technology to support innovation, system integration, and continuity of care that achieve the quality of health service delivery which is appealing to health consumers (Snowden and Cohen 2011).

State as owner-operator model of health services (United Kingdom) is based on the principles of equality and universality. The State as the "owner and operator" of the health system provides both operational, as well as strategic direction. So as to ensure universal coverage, the government as a single payer, funds the national health system through public health insurance. The UK NHS is often contrasted with the US system since it has a historic commitment to universal coverage and quality of care through engagement in the measurement of key health indicators (Snowden and Cohen 2011), but which by comparison has a lower innovation capacity. Indeed US critics refer to UK NHS as socialized medicine, which according to Testa and Block (2013) is inefficient and ineffective. Examples include long waiting lists, insufficient investment in health care facilities, poor responsiveness to health needs and access to care, low productivity, low motivation, and lack of appropriate incentives for providers, as well as various forms of rationing care. The inefficiencies in the UK NHS were also laid bare by the Francis report on the mid-Staffordshire NHS Trust scandal (Davies and Mannion 2013) which identified serious gaps in quality of health care delivery, thereby putting

pressure on British health authorities to develop innovative ways to overcome the crisis.

Unlike the US system, the UK NHS is not consumer-driven. Since the State determines type, place and accessibility of care that is offered, patients have few choices rendering them somewhat passive. Patients' active participation is improved for those having private insurance. Additionally, apart from the inherently competitive non-publicly funded services, the UK NHS offers little competition that can stimulate change or improvement. One important difference between the US and UK health systems is that the latter only spends 9.4 % of the GDP as compared to 17.7 % in the US (OECD Health Data 2013). The main reason for this stark difference in health expenditure between the two systems is that the UK NHS focuses innovation at a system level by shifting the paradigm from hospital-based services to management of chronic mostly non-communicable diseases in the community (Bevan 2012). In contrast to the US, the UK NHS puts the onus on GPs to serve as gatekeepers for more expensive investigations and hospitalization, as well as to manage care coordination. In this manner, GPs in the UK play a decisive role in the allocation of scarce resources in health service delivery. Maher et al. (2010) refer to innovation in the UK NHS as "doing things differently and doing different things" but remaining faithful to the principles of equality and universal coverage that created the NHS in the first place. In stark contrast to the criticisms directed at the US system, Nicholson (2011) claims that "The (UK) NHS is a national success story. It is woven into the fabric of our society and is a public expression of social values" (Department of Health 2011, p. 4) but still acknowledges the importance of innovation by stating "It is widely accepted that more of the same will not do...Innovation can help provide the route-map, improving quality at the same time as driving productivity and efficiency in a difficult financial environment" (p. 10). It is evident that in the UK, the focus of health system innovation is on the redesign of health services that can lead to more cost savings and efficiencies.

State as guardian model of health services (Germany) (Snowden and Cohen 2011), is based on the principle of solidarity similar to the UK system, mainly because the State obliges availability of comprehensive benefit packages for all citizens. The State is the guardian and administrator of health care services, and is managed by both insurance agencies and providers, whereas patients openly negotiate on several issues, mainly on payment, quality of services, and patient volumes (Saltman 2004). It is financed by employers through pay-related contributions, as well as by individuals through premiums paid directly to their insurers. A major difference between the UK and German systems is the lack of gatekeeping in Germany that leads to fragmentation of care.

In Germany, about 180 health insurance or sickness funds compete for contracts with patients/clients. It is fundamentally and efficiently self-regulated through competition between insurance funds, although selective contracting with care providers is not unusual since private health insurance agencies are responsible for payments of health services rendered. Additionally, Germany's system permits opting out of social insurance in preference to private insurance. Indeed, Germany

is the only country using the social insurance type approach that allows this choice. Germany’s expenditure on Health Care as a percentage of GDP is 11.3 % (OECD Health Data 2013). While this is considered to be relatively high in relation to health outcomes, Germany is often regarded as a benchmark country in terms of patient safety (Schoen et al. 2006). Indeed similar to the US, at a system level, Germany is adopting a consumer-driven approach to innovation while also focusing its initiatives on strengthening primary care and management of chronic illness involving both providers and consumers similar to the UK system. However in contrast with the UK, the German system uses approaches involving both providers and consumers. The key component that backs these initiatives is enhancement of information technology as an innovation strategy that supports business process re-engineering of health services.

In line with the six forces as identified by Herzlinger (2006) as affecting innovation efforts, Table 1 provides a comparative analysis of these forces in the US, UK and Germany which highlights the variance in the operation and environmental dimensions in the systems.

In a consumer driven system, such as the US, innovation is focused on new technologies and on attracting customers to generate revenue. However, the US system may lack a strong commitment to universal care. On the opposite end of the spectrum is the ‘state as owner’ model as found in the UK that focuses on universal coverage but offers little competition to stimulate change. The German ‘state as guardian’ model appears to be the middle ground between the systems in the US and the UK by offering equity in health care while also stimulating innovation and

Table 1 Comparative analysis of health systems on the six forces identified by Herzlinger (2006) that affect innovation efforts

Six forces	Type of health system		
	Private mixed model (US)	State as owner-operator model of health services (UK)	State as guardian (Germany)
1. Players (powerful stakeholders)	Dominance of medical profession. Agencies for approving innovations in health care	Government, NHS innovation agencies. Health care professions (medical dominance)	Collective negotiations between social insurance funds and professionals: very powerful stakeholders as they make policy decisions and influence health policy
2. Funding	Complexities involved in third-party payment system confuses investors (mixed private and public insurers)	General taxation. Government as single payer: public health insurance. Low incentive for competition and innovation	Financed by employers (pay-related contributions) and by individuals through premiums to insurance agencies. Innovations are encouraged

(continued)

Table 1 (continued)

Six forces	Type of health system		
	Private mixed model (US)	State as owner-operator model of health services (UK)	State as guardian (Germany)
3. Policy (regulators)	Federal Regulation to carry out public policy. Agencies (e.g., Agency for Health-care Research and Quality, Centers for Disease Control and Prevention, Centers for Medicare and Medicaid Services, Food and Drug Administration, Health Resources and Services Administration, National Institutes of Health) are authorized by Congress to create regulations	The Government directly owns hospitals and employs specialist doctors and other health care professionals. Government contract with independent practitioners for primary care	Self-regulation by social insurance funds and professionals
4. Technology assessment	US are world market leaders in drugs, medical devices and information technology. Competition exists within technology (e.g., different drugs for the same disease category) and across technology types (e.g. vaccinations that eliminate diseases previously treated by drugs, devices and services).	UK's National Institute for Health Research, the multidisciplinary Assessment of Technology Centre for Healthcare and National Institute for Health and Clinical Excellence are important players in carrying out Health Technology Assessment to bridge the world of research and the world of decision-making	German companies are the third largest supplier of medical technology products after US and Japan. The most important bodies involved in Health Technology Assessment are Federal Joint Committee, Institute for Quality and Efficiency in Health Care and the German Institute for Medical Documentation and Information
5. Customers	Customer-driven, therefore powerful	Customers as recipients of care, therefore less powerful	Driven by both insurance agencies and customers, therefore power is shared
6. Accountability (audit bodies)	National Committee for Quality assurance Joint Commission on Accreditation of Health Care Organizations	The Health Ministry, Care Quality Commission, National Institute for Health and Clinical Excellence	Federal Joint Committee, Federal Chamber of Physicians, Federal Insurance Authority, Federal Association of Sickness Funds, Institute for Quality and Efficiency in Health Care

change. The German model may provide the impetus for development of innovation in Europe, and reduce the reliance on countries such as the US, which have historically been the drivers of innovation in health care. This may therefore push healthcare innovation to the forefront of the international agenda and improve the process of cross-country adoption.

4 Why Is Innovation in Health Care So Hard to Achieve?

From a theoretical perspective, the diffusion of innovation model has a pro-innovation bias in that it assumes that all innovations should be diffused and adopted. However, some innovations may not fit the local context with the consequence that they would need to be rejected, modified or re-invented. Additionally, resources may not be available to diffuse innovations and therefore it is wise to critically assess benefits vs. costs to decide whether to diffuse or not. The three country examples discussed previously, amply show differences in the principles on which these systems are developed that might influence transfer of innovations from one system to another. Hence it is no surprise that there is consensus among scholars in the field, that innovation in health care has still been slow to develop and to disseminate. There are several possible explanations, which will be discussed below.

The absence of clear innovation strategies tends to weaken efforts and to fragment processes. Paulus et al. (2008) argued in favor of health systems/organizations developing clear and dynamic innovation strategies that can oversee the full pathway of successful innovations from inception of ideas to the implementation stage. For example, they attributed the success of the redesign of Geisinger's physician-led health care system of North-Eastern and Central Pennsylvania on the health system's innovation strategy, backed up by effective clinical leadership, a dedicated innovation team, state-of-the art electronic health information systems and financial incentives. De Savigny and Adam (2009), as well as Atun (2012) advocated the use of systems thinking and the consideration of key components of complex adaptive health systems to effectively analyze success or failure of adoption of innovation. These key components include contextual factors, health systems characteristics, institutions within health systems, and the adoption of entities within these institutions that act together to influence the receptiveness of health systems to innovations. Whether or not innovations are successfully implemented, as well as the speed and scale of adoption and diffusion, is also influenced by the challenges that the innovations are attempting to address. It is further influenced by the type of innovations, by the individuals adopting the innovations, and by the adoption systems and institutions. Plisek (2001) referred to the US health care system as a complex adaptive system that should adopt simple rules, formulate a good enough vision, and offer a wide space for innovation if the goals of quality, efficiency and accessibility are to be achieved.

Secondly, failure to gauge the power, agenda and roles played by key stakeholders in the planning stages will run the risk of losing substantial investments simply because major players may eventually inhibit innovation. It is therefore crucial for innovators to carry out a solid stakeholder analysis (Gilson et al. 2012). Herzlinger (2006) compared two innovations that were developed for a similar purpose, namely that of providing accessible primary health care in the community but which met different fates. As highlighted earlier, the MinuteClinic, was successful because it was manned by nurse practitioners and therefore did not antagonize community physicians. In contrast, Health Stop—walk-in health care centers in Eastern and Midwestern US failed because it found itself antagonizing local community doctors who labelled Health Stop as being of low quality. Furthermore, it is difficult to change the behavior of clinicians (Boaz et al. 2011), who traditionally tend to protect their individual autonomy and reputation. They often function within a culture of blame and secrecy that inhibits organizational learning and generation of innovations (Huntington et al. 2000; Omachonu and Einspruch 2010). For these reasons, it is difficult to change current medical practices and healthcare organizations (Desir et al. 2011). Fitzgerald et al. (2002) referred to networks populated by a diverse set of professional groups as enrollers or controllers of health care innovation, as well as to opinion leaders as accelerators or facilitators of change. Historically across health systems, the medical profession has shown dominance in the influence exerted on whether or not new innovations are adopted. Ferlie et al. (2005) qualitatively studied cases of innovation in the UK NHS and concluded that professions have social and cognitive boundaries that retard spread of innovation. One reason is that health professions are still by and large unidisciplinary in practice. This may help explain the problems faced by multi-professional health care organizations in the spread of innovation. Another challenge is that healthcare innovations, which are often regulated by laws, require political support for their acceptance in the adopting country (Crossan and Apaydin 2010).

Thirdly, by using Lewin's force field analysis (2008) and managing forces, namely driving forces that direct behaviour away from the status quo, and restraining forces that hinder movement from the existing equilibrium, should in time lead to the change as part of the innovation. This can only be achieved with a clear strategy, robust stakeholder analysis, and identification of determinants of innovation, as well as of barriers through the detailed analysis of the innovation process steps. In an attempt to reconcile health policy and innovation agendas, Lehoux et al. (2008) suggested using three attributes, namely relevance, usability, and sustainability to render innovations attractive from a health system perspective. These attributes should form the basis for outlining a policy-oriented agenda so as to link upstream design processes with downstream needs and priorities. Berwick (2004) advised that it is better to adopt scalability of innovations by having a vision of where and how these can be diffused and disseminated rather than assuming ideal conditions for immediate full implementation. Indeed when comparing and contrasting three health systems, it was clear that environmental and organizational dimensions of the system preclude a 'one size fits all' innovation that can be implemented across all systems.

Last but not least innovation measurement should happen in real time. Several scholars (Hagedoorn and Cloudt 2003; Smith 2005; Alegre et al. 2009) have pointed out that although innovation may be inherently impossible to quantify and to measure, its characteristics do not prohibit measurement of key dimensions of processes, outputs and outcomes. Indeed, they advocate innovation performance conceptualization as a latent construct with two dimensions, namely innovation efficacy and innovation efficiency. Furthermore, the development of innovation performance indicators is particularly important for international comparability.

Conclusion

Innovation in health care should adopt more of an international perspective, as there are wide variations between health care systems as regards innovation capacity. Several questions remain largely unanswered which may direct future research on international innovation. These questions are: Is the variation in innovations between systems a question of ability, resources or type of political system? Does the healthcare industry put patients' interests above profits? What are the costs of delaying innovation? These and other relevant questions should guide us to achieve a more equitable global health care delivery. What has definitely become a top priority for all health systems is to achieve high quality of care delivery, efficiency, effectiveness, accessibility and population coverage while keeping in check the rising health care costs.

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Alternative Futures for Individualized Connected Health

Petri Ahokangas, Maritta Perälä-Heape, and Timo Jämsä

Abstract The future of individualized connected health has attracted increasing interest in recent years. In this chapter, we outline some of the present trends and challenges that have been identified as influencing connected health, and present 16 alternative, exploratory future scenarios for individualized connected health. We present both optimistic and pessimistic scenarios and assess their probability, plausibility, and preferability. Our research indicates that to reach some of the preferred futures, we should pay attention to the coverage and content of offerings, the use and ownership of data, and the role of the individual when offering connected health systems, devices, or services through public or private channels.

1 Introduction

The future ain't what it used to be—Yogi Berra

The future of and opportunities for individualized connected health technologies, applications, and services, and their subsequent delivery to users has attracted increasing interest from health professionals in recent years.¹ However, the increased range of opportunities opened up by connected health as a whole has brought with it confusion over the impact connected health might have on individual patients, health professionals, health businesses, and society as a whole. While it

¹ In this chapter, connected health is used to commonly denote to any ICT-based connected health technologies, applications, and services.

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has been forecast that the European e-health market will register close to 20 % annual compound growth (European Commission e-Health Action Plan 2012–2020), a variety of obstacles to the wider adoption and use of connected health has been identified. In addition, the complexity of approaches, ideologies, policies, and values encompassing connected health does not make it any easier to map its future. A good example of the challenges of mapping what connected health might become or where it might take us is the European Commission's Digital Patient Roadmap by Diaz et al. (2012).

Atkins and Cullen (2013) pointed out that many of the trends of connected health are already visible (see also Ilves 2012):

- connected health will become a central part of the care-delivery system;
- patients will be able to control their own data and who has access to that data;
- an increasing volume of the data available will be provided by patients rather than clinicians;
- information technology tools will become a key element of ongoing efforts to promote and assist behavioral changes of patients;
- more and more data will be centrally aggregated and the presentation of the data will become increasingly customized;
- standardization of data will allow system performance to be assessed in real time;
- service providers will be able to understand their patients within the context of the population;
- “big data” will give rise to new tools to help with diagnostic and therapeutic decisions; and finally;
- researchers will have improved access to robust national datasets and documentation on them.

To what degree these trends will be realized and implemented remains an open question. In the past, primary care delivery was dominated by acute care interventions. Today this is shifting: Health care systems in both industrialized and developing countries are confronted by a change in demand from acute to chronic or preventive care.

Among the trends already visible in the domain of personalized connected health, we are still lacking a coherent context for understanding where connected health might take us. Traditionally the care-delivery system around the patient has been a “white zone” regarding marketing (Crié and Chebat 2013), but the increasing complexities of and convergences within the system have brought about changes that are difficult to manage and even more difficult to predict. Connected health as a part of the health care and well-being ecosystem can be regarded as facing three different kinds of constraints: network interrelations among stakeholders; ethical and economic injunctions of the state, citizens, and regulatory bodies; and the development of technological and medical knowledge (Crié and Chebat 2013). Fostering change, innovation, and the adoption of new technologies in this kind of context requires new organizational cultures and a market orientation (Thakur et al. 2012).

Harvey et al. (2012) argue that the future of technology in the personalization of health services and medicine requires us to pay attention to standardization, integration, and harmonization. In standardization, the key role is given to data

collection, its analysis to produce information, and the procedures to generate knowledge. In integration, attention should be paid not only to integrating data from different sources but also to integrating sites and organizations at multiple levels to generate knowledge and find a translation of it that is meaningful for patient-citizens, health care professionals, and science. Finally, harmonization should ensure the scientific practices, communication across disciplines, and ethical and regulatory schemes around health and well-being are aligned.

Despite overly optimistic views of the future presented by some scholars, Thimbleby (2013: 161) claimed that “technology does not have an agenda for helping healthcare.” Rather, it is there to provide profit opportunities. Researchers working around the topic of future healthcare emphasize the need to transform our view from seeing patients to seeing customers and citizens instead, and connected health fosters the personalization of services regardless of the type of service. The literature has identified the following perspectives or domains in its attempts to outline the futures of connected health, and there may be others: the human, technical, and technological (Thimbleby 2013; Harvey et al. 2012); medical and regulatory (Harvey et al. 2012; Thakur et al. 2012); business, market, and economic (Crié and Chebat 2013). In addition, we identify social, political, and governmental domains, too. Sheraz et al. (2013) presented four future scenarios for e-health in Bangladesh and identified roadmaps to reach those futures, and all these domains appear to have a role in their research. Indeed, as Thimbleby (2013) argued, there are many possible futures that we need to plan for and take seriously. In doing so, we can utilize the futures triangle (Inayatullah 2005) consisting of the a) pull of the future, including the visions and images of the future that we find attractive; the b) push of the present, in the form of trends driving us toward the future; and the c) weight of the past, consisting of all the patterns and structures that are resistant to change.

2 Research Objectives and Method

In the context of the above background discussion and in light of the trends mentioned by Atkins and Cullen (2013), it can be difficult to identify and assess the possible routes toward the alternative futures of connected health. This chapter attempts, through the use of exploratory scenarios (Van Notten et al. 2003; Van Der Heijden 2007; Rhydderch 2009), to outline and assess some of the alternative futures of connected health in a time frame of the coming 5 years. Exploratory scenarios describe events, trends, and choices as they could evolve based on alternative assumptions as to how these events, trends, and choices may influence the future. Exploratory scenarios provide a plurality of plausible alternative futures and they can be created through the anticipatory action learning process (Stevenson 2002; Inayatullah 1998, 2005), in which professionals from different fields come together to generate scenarios. The alternative futures presented in this chapter were created and assessed through group work, and special attention was paid to the coherence, variation, and validity of the scenarios (Stewart 2007; Collins and Hines 2010).

Foresight, by definition, is future-focused and its reliability and validity cannot be controlled directly. Instead, the quality of research can be evaluated by how probable, plausible, and preferable the outcomes appear to be.

The data for the alternative connected health futures presented in this chapter were mapped within the Finnish INDICO (Individualized Connected Health) research project funded by Tekes (National Funding Agency for Innovation and Technology). The scenarios were generated in early 2013 in two facilitated scenario workshops by a group of 20 health professionals including researchers, public health service providers, and health business managers. The scenario work process discussed in this chapter was carried out in two sessions (lasting 1½ days) consisting of the following steps:

- identification and evaluation of trends by choosing critical trends based on their anticipated impact and predictability of consequences;
- setting up the scenario logic by selecting two unrelated scenario dimensions;
- creating the scenarios by building on different perspectives of connected health and identification of drivers, limitations, and challenges emerging from the created scenarios; and
- assessment of scenarios based on their probability, plausibility, and preferability.

A total of 16 scenarios were generated by the workshop participants in four teams composed so each team ensured maximum variation in the participants' backgrounds.

3 Alternative Scenarios for Individualized Connected Health

3.1 The Scenario Dimensions

The results of the four teams' scenario dimensions are summarized in Table 1 below. The scenario dimensions chosen by the workshop participants included

Table 1 The critical change dimensions for the scenarios

End 1	<Dimension>	End 2
High	Technology and health knowledge	Low
Individual	Power and responsibility	Society
Fully	Utilization of wellness information as data	Not really
High	Individual involvement in maintaining health	Low
Citizen	Individual involvement in producing healthcare services	Authority
Well-being	Experience of wellness/health	Ill-being
Enthusiasts	Individual motivation with regard to wellness	Do-not-care
Private	Wellness data	Public

degree of health technology and knowledge (high/low), utilization of health information as data (fully/not really), nature and ownership of health data (private/public), power over and responsibility for health activities (individual/society), individual involvement in maintaining health (high/low), motivation to maintain health (enthusiasts/do-not-care), individual involvement in producing health services (citizen/authority), and individual experience of well-being (well-being/ill-being). The scenario dimensions selected by the teams reflect the notions of Atkins and Cullen (2013) rather well, reflecting the professionalism of the participants and indicating the validity of the outcomes.

The dimensions selected for the axes of the alternative scenarios by the workshop participants can also be seen as being partly overlapping thematically. The roles of information and knowledge, degree of involvement of people, motivation, and experience of health and wellness issues, division of power and responsibilities, and technology within connected health were discussed extensively during the creation of the scenarios.

3.2 *The Alternative Scenarios*

This chapter presents the connected health scenarios created by the four teams in the workshops. Each team's results are presented as they were created, including the names of the scenarios. Each team developed a unique style of approaching the scenarios and the outcomes of their work. These approaches are described in the beginning of each scenario description. In addition, we present the scenarios contrasted as "baseline" and "alternatives" in order to clarify the approaches the teams developed during their work.

TEAM 1 The classification-oriented Team 1 used technology and health knowledge (high/low) and power and responsibility (individual/society) as the dimensions framing the scenarios (Fig. 1). The baseline *Present* scenario was characterized as a continuation of the current situation, in which limited use of technology and little health knowledge was combined with power and responsibility over health issues within society. Fragmented data, closed systems, and political decision-making were seen as the rule in this scenario. The key drivers perpetuating the current situation in the future included a lack of willingness to make decisions (both political and in-house within health care), medicalization, legislation, and a purchase bureaucracy. The team saw the key limiting factors to be a limited likelihood of modernization, funding cuts, and a shortage of health care personnel. The key challenges for connected health in this scenario included increasing costs and the role of leadership.

The *Guerillas* scenario represented an alternative in which limited use of technology and knowledge was combined with power over and responsibility for health issues resting with individuals. This scenario was seen as being characterized by healthy lifestyles, alternative treatments, private services, and a merging of

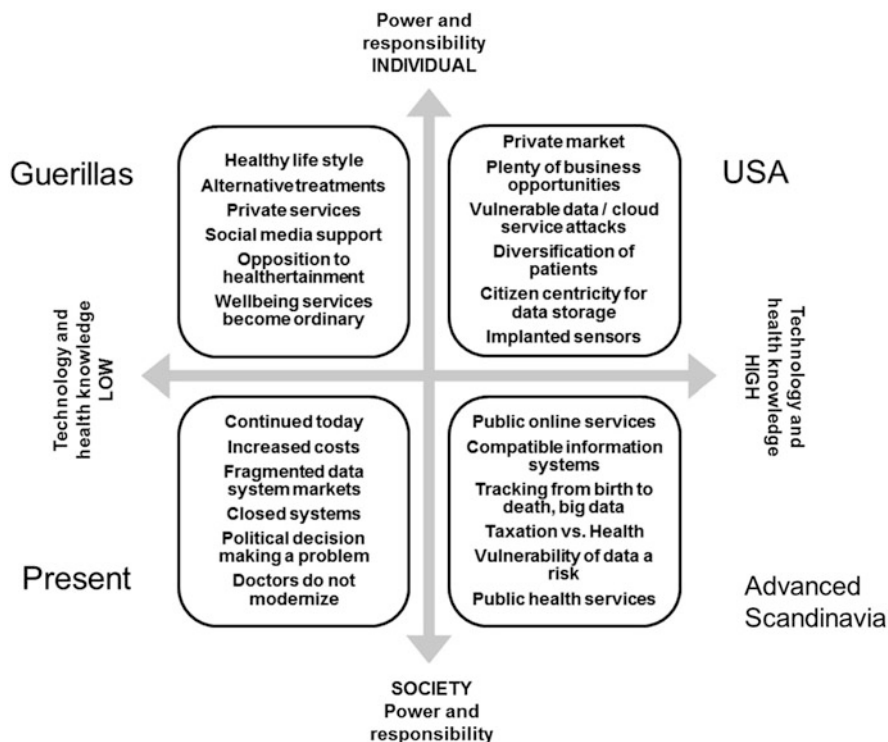


Fig. 1 Team 1 scenario matrix

health and well-being services. A risk identified by the group was that part of health services would turn entertainment: healthertainment. The key drivers taking us toward this future scenario included the *I know myself best until a severe disease comes along* and *I want to make decisions myself* attitudes of people, as well as increased use of social media and networks. The team found the key limiting factor in this scenario to be that this belief system fails in times of severe illness, as connectivity to professional health care might prove difficult to arrange. Communications and achieving trust among the players with the availability and funding of public services were seen as the key challenges in this scenario.

The *USA* scenario was seen as describing a future situation in which high use of health technology and knowledge was combined with individual responsibility for health issues. This scenario is characterized by private markets offering a range of business opportunities and marked by the diversification of patients and citizen-centricity in data management. The key drivers in this scenario were business, individualization, fast technology adoption, and a sufficiently large population of interested and wealthy people. As the key limiting factors, the team listed consumers' purchasing power and the ability of the health sector to adjust to change. The key challenges in this scenario included business having issues in getting

through to markets, adjustment of the health sector, and public-private collaboration.

The *Advanced Scandinavia* scenario was seen as the ideal. It is marked by extensive use of technology and highly developed health knowledge being combined with power over and responsibility for health issues resting with society rather than individuals. Public online services, compatible information systems, and tracking of individuals from birth to death to collect big data were seen as the key characteristics of this scenario. Its key drivers included increasing costs, public-private collaboration, and the goal of equality, demand, and mobility. The key limiting factor listed by the team was again the goal of equality in terms of generated costs, and the key challenges of the scenario were how to obtain citizen-centered services and the ethical issues related to big data.

TEAM 2 The process-oriented Team 2 adopted the utilization of wellness information as data (not really/fully) and individual involvement in maintaining health (high/low) as the dimensions framing the scenarios (Fig. 2). The baseline scenario of the team was called *Lottery*, in which public health services dominated the market with differentiated customers (meaning they are divided into groups) and the accessibility of services varying. Public healthcare services were seen as a

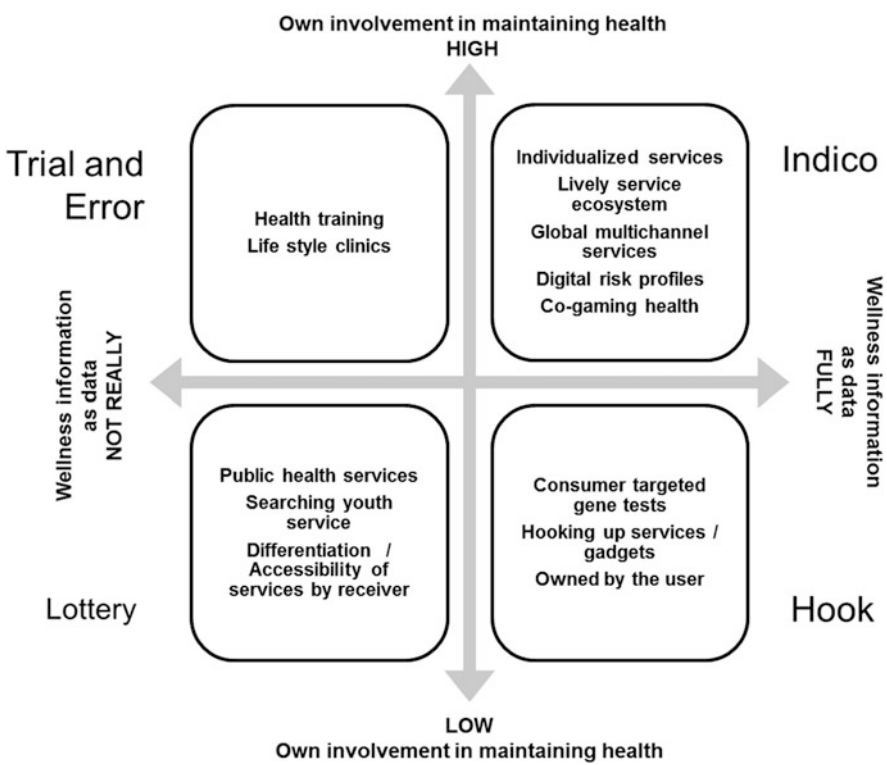


Fig. 2 Team 2 scenario matrix

lottery in which individuals either have no interest, or are compelled by the system to participate in the co-production of the individual's own health. Similarly, health data were seen as poorly managed and fragmented due to a lack of access regarding, for example, where the data are saved, who can use the data, and the channels to distribute data to wellness/health users. The key drivers maintaining the *Lottery* in the future were closed data systems, high security needs, and regulation. The limiting factors in this scenario were a lack of collaboration at the system and individual levels, lack of money and enabling technologies, challenges in decision-making, available resources, and lack of trust.

The *Trial and Error* scenario was this team's first alternative scenario, in which wellness information was not used fully as data but individual involvement in maintaining health was high. Here, health and wellness professionals and service providers tried to meet the challenges of patients' and service users' needs, but people were living in the midst of dispersed and unstructured information. Moreover, data ownership and management were seen as unclear and people themselves were seen as responsible for health issues. The team saw that in this scenario people would be divided into two groups: those that could afford high quality services and those that could not or did not care about them. The team saw personalization and increasing demand as the key positive drivers of the scenario and health data access as the key limiting factor. In addition, the team thought that this scenario could result from extreme liberalization, competition, and the privatization of public health services.

The second alternative scenario was called *The Hook*, and was characterized by people having little involvement in maintaining their own health, and by wellness information being used as data supporting the provision of services. In this scenario, the team saw a society-driven, public-private-partnership model in which the citizens owned the wellness data. The scenario may create efficiency challenges in service provision but also lead to hooking up health gadgets or applications that individuals use for health care and well-being services in a self-service mode. The key driver in this scenario was the good intentions of society, but the scenario was seen as limited by resistance to change and ignorance on the part of decision makers. In this scenario, the team was again concerned about the emergence of a dual-level society.

The ideal alternative scenario proposed by the project behind the workshop was called *Indico*. In this scenario, the individual's own involvement in maintaining their health was high and wellness information was fully utilized as data to support the provision of services. Here, individualized connected health services were organized through an ecosystem composed of individuals, organizations, and businesses. Individuals played the central role and society provided the service framework and data platforms that were also utilized by private companies in their service offerings. For example, health game developers were seen as new kind of companies in this respect. Collaboration was seen as the key driver in this scenario, limited by the amount of available money and data/knowledge. Decision-making was seen as the key challenge in this scenario.

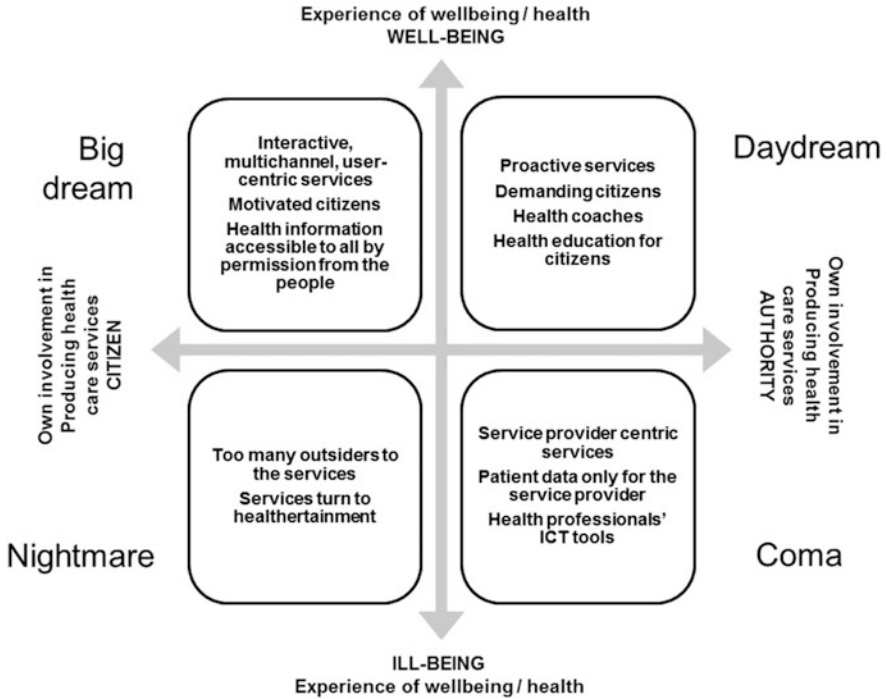


Fig. 3 Team 3 scenario matrix

TEAM 3 The action-oriented Team 3 used the experience of well-being/health (well-being/ill-being) and individuals’ own involvement in producing health care services (citizen/authorities) as the scenario dimensions (Fig. 3). The baseline scenario of the team was called *Coma*, and was characterized by an authorities-driven experience of ill-being by the people. High costs and ineffective services and data that were oriented toward service-providers led to consumers being regarded as passive patients by service providers.

The first alternative scenario of the team was called *Nightmare*, in which an unsupported, non-validated, confusing, and fragmented selection of services was offered to confused and marginalized citizens. Information related to well-being was fragmented and difficult to access. People experienced ill-being and were not motivated to change unhealthy lifestyles. The team saw business thinking by public service providers and decision makers as being the key driver of this scenario and resources as being the key limiting factor.

The second alternative scenario was called *Daydream*, and was characterized by the experience of well-being on the part of the people for whom the authorities produced health services. In this scenario, proactive services were offered to demanding citizens who were seen as obedient objects of the services. Health coaches and health education played an important role in the services. An efficient

society and authorities were seen as the key drivers of this scenario, which was limited by resources and challenged by the interoperability between the health care and well-being service stakeholders.

The ideal scenario of the team was called *Big dream*. This scenario was characterized by the experience of well-being by the people, who were seen as consumers that were themselves involved in producing the health and well-being services. In the scenario, interactive, multichannel, and user-centric services were offered to motivated citizens and health information was seen as being accessible to all owing to individuals giving their permission to utilize it. Motivated, demanding customers and communal, participation-based service validation were seen as the key drivers in the scenario. This scenario was seen as being limited by the resources of individuals and challenged by the interoperability of the stakeholders. In addition, new business models were anticipated in the provision of health and well-being services.

TEAM 4 The behavior- and values-oriented Team 4 used wellness data (public/private) and motivation to achieve wellness (enthusiasts/do-not-care) as the dimensions for creating the scenarios (Fig. 4). *Ice age*, the baseline scenario of the team, was characterized by publicly-held wellness data and a do-not-care level of motivation of the people. Public health services, hospitals, and other aids with no

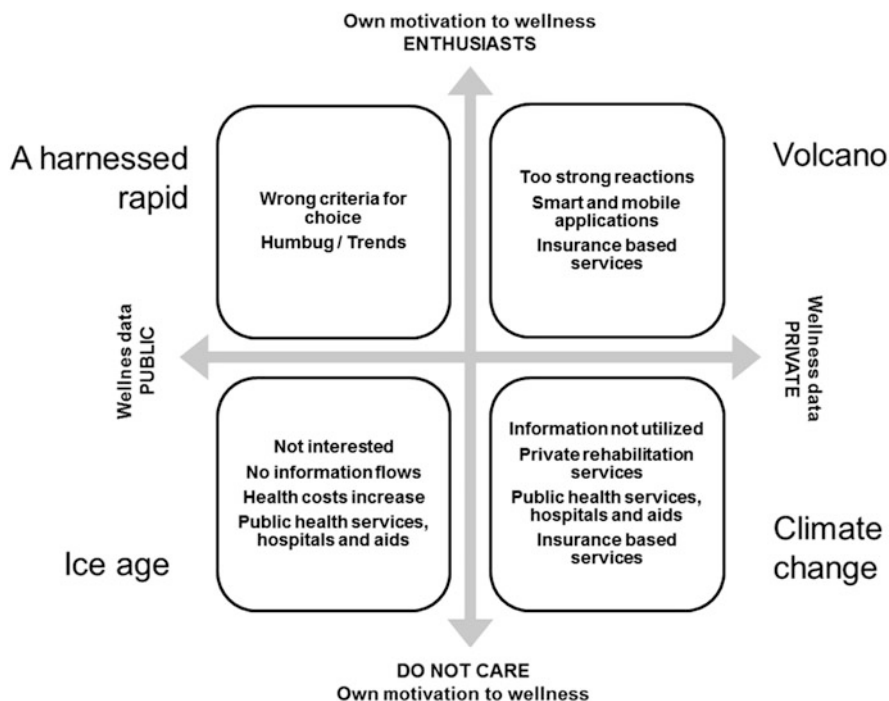


Fig. 4 Team 4 scenario matrix

information flows among the stakeholders, as well as increased health costs, were seen as typical of the scenario. Legislation and increasing cost levels were seen as the key drivers, limited by the availability of money and the weak motivation of the people. The team saw the key challenges in the scenario as being how the public and private sectors could use wellness data when access was controlled by law, and how behavioral changes in the system could be implemented. Significant opportunities were seen for insurance businesses utilizing big data.

The first alternative scenario of the team was called *Harnessed Rapid*, in which wellness data were publicly held and the people were motivated and enthusiastic about their own wellness. Information was seen as flowing well among stakeholders and the available data as being used to make the best possible choices regarding services and treatment. Opportunities for service businesses were seen in a wide range of wellness services, especially with the use of smart and mobile applications. The team saw humbug and short-lived health trends as the risks associated with the scenario, and the money-saving potential and the motivation to enhance their own wellness of the people as its key drivers. The challenges inherent in the scenario were privacy and the ability to utilize the available information.

The second alternative scenario was called *Climate change*, and was characterized by wellness data being privately owned and a do-not-care attitude of the people. In this scenario, information was not utilized, private rehabilitation and public health services were offered, and private health and wellness businesses were insurance-based. The team saw private businesses and public cost savings to be the key drivers in this scenario. However, other than private services, the team was unable to suggest specific key limiting factors or challenges.

The ideal scenario, *Volcano*, was characterized by wellness data being privately owned and services targeted at enthusiasts. Smart and mobile applications and insurance-based services offered the business potential in this scenario, and it required open platforms and sharing of wellness and health data as enablers. The key drivers of the scenario identified were insurance costs and business potential, and the team saw the challenges involved in the scenario to be establishing public-private partnerships and the sharing and analysis of the available data required to provide services.

4 Discussion

To summarize the discussion on the alternative future scenarios for individualized connected health, the teams proffered both optimistic and pessimistic scenarios, but the reasons for optimism and pessimism varied by scenario. The teams assessed the scenarios at the end of the workshops. The first step was to assess the likelihood of the created scenarios coming into being. The probability of the scenarios arising was assessed against the trends identified as influencing the scenarios. The second step involved assessing the plausibility of the scenarios by looking at the potential

events that could occur within them. The final step in the assessment was to see what scenarios were the most preferred within the teams. The preferability assessments of the scenarios were based on the choices the teams made regarding the alternative futures. Typically, the teams assessed probability and plausibility as clearly correlating, whereas the preferable scenarios were only considered probable or plausible in a few cases.

Team 1 was very direct and rather pessimistic in its assessment of the scenarios, as probability and plausibility were considered to decrease together from the most probable and plausible *Present* to the *Guerillas*, *USA*, and *Advanced Scandinavia* scenarios. The teams' assessment of the preferability of the scenarios was the opposite, as the least probable and plausible scenarios were seen as the most preferable and preferability decreased directly as the plausibility and probability of the scenarios increased. Similarly, the more positive Team 2 saw that their most probable scenario, *Lottery*, was the least preferable scenario and the most preferable scenario, *Indico*, the least probable. However, the scenario *Trial & Error* scored the lowest, whereas the scenario *Hook* scored relatively well on all three measures. In the likewise rather optimistic Team 3, the assessments of probability, plausibility, and preferability were rather similar across the four scenarios. *Daydream* was ranked the highest in both probability and plausibility, and was also seen as rather preferable by the team members. *Nightmare* was ranked lowest on all three measures. *Big Dream* was seen as the most preferable scenario, but was ranked rather low on plausibility and probability. Finally, the scenario *Coma* was ranked only slightly better than *Nightmare*. The assessment style in Team 4 resembled that of Team 1. In Team 4, the *Harnessed Rapid* scenario was optimistically ranked as the most preferable and plausible scenario, but as only moderately probable. The *Volcano* scenario was ranked as the second-most probable and plausible, and as moderately preferable. *Ice Age* and *Climate Change* were seen as the lowest ranked scenarios on all three measures.

The analysis revealed the causes of the problems likely to beset the pessimistic *Present* and *Lottery* scenarios to be different, namely society and individuals, respectively. In the optimistic *Volcano* and *Daydream* scenarios, individual involvement was seen as the common denominator and the role of the individual to be the key factor differentiating the plausible and probable pessimistic scenarios. In terms of plausibility, the teams ranked *Present* and *Harnessed Rapid* highest. The plausibility of the scenarios was seen to decrease in three directions: toward individual responsibility in the pessimistic scenarios *Hook* and *Guerillas*, toward individuality and well-being in the *Daydream* scenario, and toward enthusiasm in the optimistic *Volcano* scenario. In the preferred scenarios, the interplay among society, businesses, professionals, and individuals was seen as the key factor, and the most preferred scenarios were astonishingly similar in all groups. The preferability of the scenarios was found to decrease in three directions: toward individuality and lower use of knowledge in the somewhat pessimistic scenarios *USA* and *Hook*, toward individuality and well-being in *Daydream*, and toward individual responsibility in the scenarios *Guerillas* and *Volcano*.

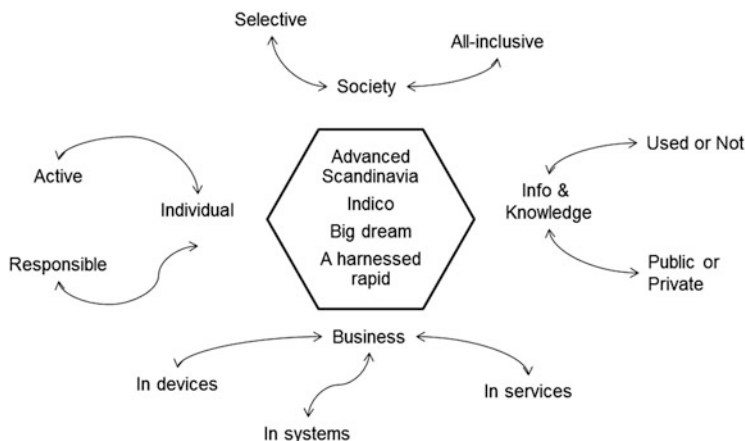


Fig. 5 Choices essential to developing preferred connected health futures

To summarize, we identify four key perspectives (Fig. 5) regarding the choices for developing the future of individualized connected health. These perspectives should concern policy makers. First, for society the key challenge is the coverage and content of services offered to citizens. Along with the aging population and rapidly increasing health and wellness costs, the question is how a wide service portfolio can be offered to citizens affordably. At the same time, it is not evident that all citizens can be offered the same level of services. The policy choices emerging from these challenges concern the basis on which, and to whom, the selected services are offered. Second, these choices are connected to how the role of the individual is seen in the future by health and wellness service providers and by policy makers. It is pertinent to ask whether individuals are seen as active (or passive) players in the connected health context or as responsible (or not responsible) for their own health and well-being. Third, policy makers have to decide the degree to which personal health data will be used in providing the services. In many respects the possibility of using the data depends on the ownership of the data (whether public or private) and on the management and decision-making rights of the stakeholders regarding health and well-being issues. These issues will also influence the development of health- and well-being-related services and solutions. Fourth, for businesses, the opportunities in the connected health domain evidently emerge from systems, such as information systems, and from the availability of the devices and equipment necessary to deliver the services and solutions to customers. Furthermore, health and well-being services could be increasingly opened up to the private sector in order to enable the development of combinations where innovative solutions and technologies could better complement existing or new services.

The findings and conclusions of this chapter reflect the five levers for change identified in the *Redesigning health in Europe for 2020* paper by Ilves (2012). The contribution of this chapter, however, lies more in its identification and clarification

of potential futures. It offers insight into what the connected health domain of the future might look like in light of the various risks, opportunities, and decisions that will shape its development. Although this research acknowledges the trends listed by Atkins and Cullen (2013) in the introduction, it should not be assumed that the outcomes of these trends would be positive, the pessimistic scenarios presented counter that argument (see Thimbleby 2013). Indeed, we face the challenge of making the decisions that will enable us to enjoy a positive future.

You've got to be very careful if you don't know where you are going, because you might not get there—Yogi Berra

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Medical Care Centers in Germany: An Adequate Model to Improve Health Care Delivery in Rural Areas?

Ines Weinhold

Abstract Sufficient health care delivery is a challenge in rural areas of many industrial nations. Already existing problems in modern societies' health systems become more severe in rural areas due less favorable conditions for health care providers, shifts in age structures and continuously declining attractiveness of rural practice. In order to maintain high quality care and safety of services, several innovative approaches are taken into consideration on the political and operational level. The following article discusses the suitability of German Medical Care Centers (MCC) to address the particular challenges of sufficient health care in rural areas and summarizes which accompanying measures and further developments are necessary, in order to make MCC an effective tool to improve health care delivery in rural regions.

1 Introduction

Worldwide many industrialized nations are facing increasing regional inequalities in the distribution of health care services. Especially rural areas are vulnerable and often not sufficiently supplied with medical care (Rygh and Hjortdahl 2007). Due to the shifting demographic structure of physicians, provider shortages will considerably increase in the near future. Particularly critical is the shortfall of primary care physicians,¹ e.g., general practitioners (GPs), as they are the first—and sometimes only—nearby source of care in remote regions (Fülöp et al. 2010).

To date, single practices are the predominant model of ambulatory health care in Germany.² The following article analyses an alternative approach of health care

¹ Primary care includes general practitioners, general internists and pediatricians (Schlette et al. 2009).

² 86 % of primary care physicians work in single practice (Schlette et al. 2009).

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delivery called *Medical Care Center* (MCC), established in Germany in 2004, regarding its potential to reduce shortages and improve the provision of medical services in rural areas. The first section summarizes the various reasons for the emergence of regional GP shortages.

Afterwards, the concept of MCC to provide interdisciplinary, coordinated care under one roof is briefly introduced. The subsequent paragraph assesses the strengths and weaknesses of the MCC model concerning its potential to increase rural practice attractiveness and improve health care delivery. However, actual developments in Germany demonstrate that MCC remain relatively rare in rural areas. The article concludes with summarizing additional necessary measures and developments, in order to improve the current situation by means of MCC effectively.

2 Challenges in Rural Health Care Delivery

The high average age of GPs is a challenge for health care systems in many industrialized countries (German Medical Association 2012; The Health and Social Care Information Centre 2013; Hansen et al. 2013). As the current physician workforce is aging and medical students are refraining from working as GPs in rural areas (Steinhäuser et al. 2012), the need for countermeasures and precautionary strategic action becomes immanent. The consequences of regional provider shortages and distributional inequalities, prevalently affecting rural areas, emerge in many industrialized countries (Rygh and Hjortdahl 2007), no matter how diverse they are with respect to geographical conditions or the health systems structure.

In Germany, statutory health insurances and health care providers are by law obliged to guarantee an equal and needs-based provision of health care services (§70 (1), Social Code Book V—Statutory Health Insurance). In practice, these requirements raise several difficulties. A regulatory planning instrument to control and even out the distribution of physicians in given geographical areas was introduced in 1993 with the main objective of reducing a presumed provider surplus (Fülöp et al. 2008). This tool however, seems to be ineffective in stopping the meanwhile increasing regional provider shortfalls. Furthermore the regulatory planning instrument is claimed to not adequately represent the actual health care needs of regional populations (Fülöp et al. 2010). Geographical planning units, which are by means of calculation sufficiently supplied with primary care providers, might in fact suffer from a considerable maldistribution of providers and regional shortfalls.

2.1 *Insufficient Recruitment and Retention to Rural Practice*

Reasons for the declining number of rural GPs are manifold but very similar in many countries. The root causes for this development can be distinguished between

Table 1 Challenges of rural health care delivery

	Recruitment and retention of professionals	
Supply side	Professional aspects • Poor image • High workload • High responsibility and social control • Lack of variety in everyday work • Professional isolation • Lack of development/career options • Shortfalls of sophisticated equipment • Economic unviability, investment risk	Private aspects • Social isolation • Lack of cultural facilities • Rural way of life • Lack of job opportunities for partners • Insufficient educational institutions • Unfavorable work-life balance
Demand side	Peculiarities • Population-specific need for services (e.g., care for chronic/multi-morbid patients) • Quantity rationing (e.g., due to long waiting times) • Additional costs for health care (e.g., distance cost, opportunity cost) • Individual preferences (e.g., rejection of innovative approaches)	

professional and *private* issues (Table 1): General practice becomes increasingly unpopular among medical students; its image seems to deteriorate (Natanzon et al. 2010). Medical education only gradually implements effective strategies to promote rural and general practice, despite international evidence proving the crucial role of experiences during studies (Ballance et al. 2009). Similar to the situation in other industrialized countries (Colwill and Cultice 2003; Matsumoto et al. 2010), the motivation of physicians to settle down as a GP in rural areas is low in Germany (Kiolbassa et al. 2011). One of the main problems pointed out recently is the high workload (Hansen et al. 2013; Weeks and Wallace 2008; Matsumoto et al. 2004) accompanied by too much bureaucracy and administrative tasks (Natanzon et al. 2010). Compared to their urban counterparts, rural GPs are more often required to provide on call duties (Steinhäuser et al. 2011a) and need to carry out more home-visits, including longer travel times (Heymann et al. 2009). Thus, the amount of time for individual patient care decreases (Natanzon et al. 2010). Some physicians also refuse rural practice as they fear a lack of variety in their work (Kiolbassa et al. 2011) and additional responsibilities or social control (Steinhäuser et al. 2011b). An assumed lower income (Weeks and Wallace 2008), investment risks associated with a rural practice (Steinhäuser et al. 2011b), concerns about being professionally isolated (Steinhäuser et al. 2011b) and lacking continuous medical education opportunities (Matsumoto et al. 2004) discourage providers as well. However, physicians do not only assess rural practice as less attractive due to professional reasons related to work, organization and income. *Private* reasons, including concerns about an inappropriate work-life balance (Kiolbassa et al. 2011), lacking job opportunities for partners (Steinhäuser et al. 2011b) as well as a shortfall of cultural and educational facilities in rural areas (Richards et al. 2005) are of equal importance, especially for younger professionals.

2.2 *Demand Side Peculiarities*

Besides the insufficient supply of health care in rural areas, additional demand-side effects contribute to the problem. Life-expectancy increased, especially due to improved prevention and considerable advancements in the treatment of chronic diseases (Klenk et al. 2007). However, (multiple) chronic conditions tend to increase with age and often require constant treatment. The continuing out-migration of young people and the rising average age in rural communities constitute a tremendous challenge for health care delivery in rural areas (Gibis et al. 2012; Rosenthal and Fox 2000). Especially the maintenance of emergency care is endangered in many countries, including Germany (Natanzon et al. 2010). Increasing workloads for remaining health care providers and related declines of individual time, unavailable services, the need to overcome large distances and long waiting times compromise the quality of care for rural patients (Allan et al. 2007) and restrict demand and utilization quantity. Besides, individual preferences influence how people make use of health care services (Ensor and Cooper 2004).

Table 1 summarizes the main challenges of rural health care delivery, differentiating between the supply- and demand side.

In order to ensure comprehensive delivery of health care in the future, several strategies are considered in research and practice. One example, the German MCC as a model to provide centralized and interdisciplinary outpatient care, is discussed in the following paragraph.

3 The German Medical Care Center

In Germany, the trans-sectoral integration of providers is an ongoing challenge (Schlette et al. 2009). Closer inter-professional cooperation and coordination, e.g., between primary care providers and specialists, is assumed to improve the processes of health care and its more efficient utilization (Schlette et al. 2009). The option to establish MCC for outpatient health care delivery as a supplement to the existing single- and group practices was implemented by German legislation in 2004.

3.1 *Characteristics of the Medical Care Center Model*

The approach to provide interdisciplinary, coordinated care within health centers is not new in Germany. The polyclinic model, established to provide interdisciplinary and accessible care, has a long history in former East Germany (Geidel 2009) and can be considered the historic archetype of MCC.

Furthermore, there are many international examples of health care centers that provide cooperative and integrated services, e.g. *Kaiser Permanente Medical Centers* providing managed care in the USA (Kaiser Permanente 2012), *Municipal Health Centers*, covering primary, preventive and public health services in Finland (WHO 2008) or the UK trend to move away from single-practices to larger facilities that employ more GPs (The Health and Social Care Information Centre 2013).

MCC can be established by registered³ physicians, by hospitals and by other health care providers e.g., dialysis centers (§95 (1a), Social Code Book V—Statutory Health Insurance). An operating association is required whereas different legal forms are possible. MCC are characterized by the provision of interdisciplinary⁴ ambulatory health care, with no restrictions regarding the cooperating professions and leadership that is assumed by a physician. Self-employed physicians in single practices deliver most of the ambulatory health care services in Germany. In contrast, MCC provide additional options for physicians to work as employees in the outpatient sector. They can be run by several registered, self-employed physicians⁵ or staffed with employed physicians only. Mixed-forms and flexible part-time arrangements are also possible (Gibis et al. 2009; Rudolph et al. 2013). Thus, MCC yield the potential to maintain or improve the delivery of comprehensive regional health care as they (i) constitute a model of practice that might be more attractive for office-based physicians and (ii) provide an option for hospitals to provide ambulatory services. The following paragraph assesses the strengths and weaknesses of MCC in more detail and discusses whether the approach actually meets the challenges of rural health care delivery.

3.2 Strengths and Weaknesses of Medical Care Centers

Leveraging on the main supply- and demand side problems of rural health care delivery, strengths and weaknesses of the MCC in Germany have to be considered from different perspectives.

MCC constitute an interesting opportunity for physicians, who want to work in the outpatient sector. The model addresses several of the *professional aspects* that deter many physicians from rural practice (see Table 1). Consultations between colleagues are facilitated substantially (Gibis et al. 2009), reducing the high responsibility many rural providers are criticizing. As MCC frequently employ administrative personnel, physicians' bureaucratic workload can be reduced (Gibis et al. 2012). Other main strengths are the increased employment options for physicians in the outpatient sector.⁶ Compared to the traditional single practice,

³ Registered in a regional association of statutory health insurance physicians.

⁴ At least two different sub-specializations.

⁵ Equivalent to the conventional group practices.

⁶ In Germany's ambulatory health care is mainly provided by self-employed physicians in single practices (Schlette et al. 2009).

MCC offer fixed salaries, financial planning security and diminish investment risks (Rudolph et al. 2013). In line with the increasing importance of work-life-balance aspects, flexible employment models are especially attractive for young professionals (Knieps and Amelung 2010; Gibis et al. 2009) as well as for older practitioners, who intend a gradual transition into full retirement. The potential to save costs and improve the quality of care due to economies of scale and scope, resulting from sharing resources and equipment (Gibis et al. 2012; Rudolph et al. 2013), is another important advantage. Apart from the often superior technical equipment, strengths of the MCC are organizational improvements for physicians' everyday practice and increased educational opportunities for professional development (Rudolph et al. 2013).

Disadvantages that have to be taken into account include the loss of economic and organizational autonomy of employed physicians (Rudolph et al. 2013) including more coordination and communication tasks within the MCC. Although MCC provide attractive conditions, most of the private aspects against rural practice remain. An enticement of local physicians from their rural practices to more central regions could exacerbate regional inequalities.

With regard to the demand side, i.e., the patient perspective, the provision of inter-disciplinary, centralized care can be considered the greatest advantage of MCC. In particular older people and/or patients with (multiple) chronic conditions benefit from higher integration of care (Gibis et al. 2012). The integrated approach of MCC can potentially improve the coordination of care, especially with regard to information- and time management (Knieps and Amelung 2010). Patients benefit from the cooperation and professional exchange of different providers working under the same roof, better access to specialists, reduced waiting times and better organizational accessibility, e.g. in terms of opening hours (Rudolph et al. 2013). The quality of care is assumed to increase, as MCC tend to work with electronic medical records, standardized processes and treatment guidelines (Schlette et al. 2009). However, the risk of overuse of specialty care services, due to the close links within an MCC, cannot be denied (Schlette et al. 2009).

MCC imply a centralization of health care, as most of them are established in urban centers or district towns (Gibis et al. 2012; Knieps and Amelung 2010). As a result, distance and travel times for remote patients increase even more. This in turn endangers sufficient health care, especially for vulnerable, immobile patient groups in regions with deficient public transportation infrastructure. Thus, it has still to be clarified whether MCC impede or improve access to care (Schlette et al. 2009). The organization of care in MCC may influence the individual physician-patient-relationship since the level of anonymity in MCC is higher when compared to the traditional practice model (Rudolph et al. 2013). As patients in Germany are free to choose their health care provider,⁷ their acceptance of MCC as an alternative form of health care delivery is crucial. First evidence indicates patients' satisfaction,

⁷ Obviously, this is assuming that accessible alternatives are available.

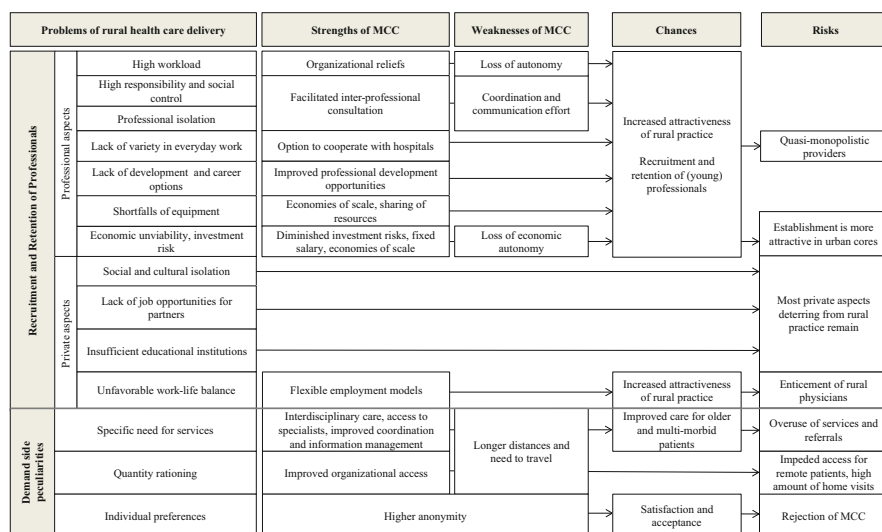


Fig. 1 Strengths and weaknesses of MCC in the context of rural health care delivery

perceived quality improvements (Haas 2011) and reduced waiting times (Gibis et al. 2012) due to the organization of care in MCC.

Summing up, Fig. 1 condenses the strengths and weaknesses of MCC in light of the challenges of rural health care delivery and derives specific chances and risks to rural health care. Considering the physicians' perspective, the strengths and corresponding advantages in the context of rural health care delivery are promising and can diminish several of the professional aspects that deter from rural practice. For patients, advantages seem to prevail and MCC are commonly accepted. However, the discussion reveals, that current MCC cannot be considered the best solution to the challenges rural areas are facing. The most important points concern providers' preferences and economic incentives. Many recruitment barriers to rural practice remain unaddressed and the establishment of MCC is in fact much more attractive in urban cores. Besides, rural MCC consider the burden of demand-side peculiarities (e.g., more chronic and multi-morbid patients) a major challenge (Gibis et al. 2012), that so far has hardly been tackled.

3.3 Medical Care Center Development in Germany

Since its establishment in 2004, the number of MCC in Germany has been growing constantly. A total of 1,750 MCC were founded until 2011, the majority of them by self-employed physicians. The size of MCC increased from an average of 4.5 physicians in 2008 up to 5.5 in 2011. Most of the physicians work as employees in MCC, whereas the most frequent professions are GPs, internists and surgeons

(Association of Statutory Health Insurance Physicians 2011). Thus primary care physicians constitute the most represented profession in MCC. However, there has been a noticeable change regarding MCC operators in recent years. The share of MCC established by physicians decreased from 54.1 % (2008) to 41.9 % (2011), whereas the share of MCC affiliated to hospitals gradually increased within the same time span (Association of Statutory Health Insurance Physicians 2011). The latter is not surprising, as the various legal opportunities to establish MCC provide an option for hospitals to offer ambulatory services and to outsource pre- and post-treatment services, which yields the potential to gain additional revenues as well as reduce costs (Rudolph et al. 2013). The contemporaneous decrease in the share of MCC, which are founded by physicians, is more remarkable. The major reason for this clear drop may be the legal reform concerning physician contracts in 2007 (Gesetz zur Änderung des Vertragsarztrechts und anderer Gesetze, BGBl I 2006). It provides solo- and group practices with substantial opportunities that had previously been limited to MCC, e.g., to employ physicians or to collaborate with non-physician providers. Accordingly, founding an MCC seems to be less attractive for physicians (Farnschläder and Stummer 2012).

The majority of MCC is situated in urban or suburban areas, i.e., 85.4 % in 2011 (Association of Statutory Health Insurance Physicians 2011). However, MCC are still important for rural areas, especially with regard to the different specialties: Rural MCC focus on basic medical care and local availability of services, whereas urban MCC tend to specialize. Besides, cooperation and integration between MCC and other health care providers is more intense in rural areas and the share of MCC with branches is highest, compared to urban MCC.

Conclusion and Needs for Further Innovations

The MCC model fulfills several conditions to counteract the problems of rural health care delivery in Germany. Specifically, professional barriers to rural practice and work-life balance aspects are addressed successfully. Moreover, health care can be delivered aligned to the needs of older patients and/or those who suffer from chronic conditions or multimorbidity. However, providing health care to remote and immobile patients is challenging for MCC as for any other form of health care provider.

The development shows that MCC can only be considered as one piece of a complex puzzle and it underlines the need for additional efforts. However, Germany is still lacking a comprehensive and aligned strategy concept. In fact, several stakeholders (e.g., regional associations of statutory health insurance physicians, health insurances or local governments) take various steps in isolated projects or in parallel actions and without comprehensive evaluation. Altogether, MCC will only constitute a tool to improve health care delivery in rural areas, if some accompanying measures are taken and

(continued)

further innovations are initiated on the personal, operational and health system level.

Additional recruitment incentives need to target private barriers to rural practice, especially regarding family-friendly conditions, e.g., assistance in job search and support in childcare (Gibis et al. 2012). Active community involvement in recruitment processes (Han and Humphreys 2005) and improvements in the status and recognition of rural providers (Hansen et al. 2013) are important facilitators to establish sustainable solutions.

Operational efforts have to be made to exploit the potential of integration and coordination of health care within MCC by appropriate information and communication technologies (ICT) leveraging health care processes. Most MCC use ICT solutions (e.g., standard software) to improve their integration and communication (Gibis et al. 2012). However a lot of unexploited potential remains. Suitable ICT solutions can support MCC providers and patients in time- and data-management and increase efficiency of health care processes and interactions between different stakeholders. The challenge of delivering care to immobile, remote patients can be addressed by the implementation of telemedicine solutions, i.e., telemonitoring systems that focus on remote patient support and self-management, especially in the fields of chronic diseases (Wootton 2012). Nevertheless, accessibility of MCC has to be ensured i.e., in terms of public transportation or organized transport services.

On a system level, recent developments such as the intra-sectoral cooperation of providers and the foundation of branches are promising and should be promoted (Gibis et al. 2012; Advisory Council on the Assessment of Developments in the Health Care System 2012). Furthermore, the current MCC model could be extended by new approaches in rural health care delivery based on international experience, e.g., low-overhead care models and group medical visits (Crane 2011). Eventually, a restructuring in the division of labor including the delegation of tasks to non-physician providers according to international models should be promoted. Particularly an upgrading of the nursing profession is essential in this context, as well as attractive prospects for these providers—otherwise another shortage is yet to come (Advisory Council on the Assessment of Developments in the Health Care System 2012).

Additionally, aligned adjustments in the organization of medical education are necessary. Education currently lacks rural orientation and fosters specialization. Strategies that proved to be effective such as a targeted selection of students with a predisposition for rural practice or programs that enable rural practice experience (Ballance et al. 2009) should be expanded.

The various strategies aiming at the improvement of rural health care delivery imply changes of traditional roles and structures. Continuous

(continued)

communication and cooperation efforts between policy makers, health professionals and health insurance funds (Schlette et al. 2009) as well as the implementation of strategies that consider all stakeholders can enhance acceptance of new approaches in health care delivery and avoid the rejection of changes.

If MCC uphold the potential improvements of the medical care situation in rural areas has yet to be clarified. However, data are still sparse and systematic evaluation is necessary (Schlette et al. 2009; Gibis et al. 2009). Researchers should accompany the implementation of new health care delivery approaches as well as political adjustments to continuously evaluate their effectiveness, especially focusing on access and quality implications.

Meanwhile, the difference between MCC and group practices is hardly noticeable from the patient perspective, as the main differences consider its legal forms and licenses. Thus, it remains to be seen whether physician-founded MCC continue to diffuse or will be replaced gradually by group practices and MCC affiliated to hospitals that purpose to outreach in the outpatient sector.

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Part II

Hospital

Acceptance of Process Innovations in Hospitals: Insights from the German Arthroplasty Register

Jan Sternkopf

Abstract Process innovations in hospitals are of particular relevance because they have the potential to improve quality of care and patient safety, among other aspects. To ensure their success, a high level of employee acceptance of the innovation is required. This study analyzes the factors influencing the acceptance of process innovations in hospitals based on the introduction of the German Arthroplasty Register. The German Arthroplasty Register is an extensive database containing information about a frequently performed surgery in German hospitals—artificial hip and knee joint replacements. The introduction of the register requires process changes within existing hospital structures. Interviewers conducted semi-structured interviews with 47 employees in 20 hospitals, which had recently introduced the German Arthroplasty Register. All interviews were recorded and transcribed, and qualitative content analysis was applied to the systematic text analysis. Results suggest that three major factors influence process-innovation acceptance in hospitals: (1) organizational factors, (2) project-related factors, and (3) people-related factors.

1 Introduction and Information about the German Arthroplasty Register

Research emphasizes the importance of innovations for organizational success (van de Ven 1986; Edmondson et al. 2001; Baregheh et al. 2009). However, the willingness to implement innovations is still limited in many organizations, even if the benefits are demonstrable (Kimberly and Evanisko 1981; Tushman and Anderson 1986). This problem can be of particular relevance in health care since specific innovations have the potential to improve patient safety, quality of care, and may even increase efficiency in the health care system (Vera and Kuntz 2007). Therefore, analyzing and understanding the factors that influence the acceptance of

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innovations (Davis et al. 1989; Verdegem and De Marez 2011) in health care are becoming more important than ever. This chapter focuses on process innovations in hospitals as major consumers of innovations in health care (Kimberly and Evanisko 1981). Based on the introduction of the German Arthroplasty Register (EPRD—Endoprothesenregister Deutschland), this study analyzes the factors influencing the acceptance of process innovations. The recently launched EPRD is an extensive database containing information about one of the most frequent surgeries performed in German hospitals—artificial hip and knee joint replacements. Participation in the register is voluntary for hospitals, and in most cases, senior physicians initiate the participation. Following the successful pilot phase, the EPRD is now in the implementation phase and has documented about 11,000 operations to date. A broad implementation of the EPRD by many hospitals would make it possible to identify reasons for revision surgeries, facilitate product recalls, and thus lead to significant improvements in patient safety and procedure efficiency.¹

The introduction of the EPRD requires process changes within existing hospital structures and routines (Dougherty 1992; Orlikowski 2000). For example, patients need to be informed, software must be set up, and different parts of the artificial joint must be scanned. These new processes modify workflows for different groups of employees (e.g., physicians, nurses) and create additional burden for employees involved.

To gain extensive insights, the author examines the factors that influence the acceptance of employees in regards to the external innovation. The results suggest that factors, which influence acceptance, belong to one of the three categories: (1) organizational factors (ownership, size, specialization), (2) project-related factors (support of decision makers, number of employees involved, responsibility for introduction, lack of resources) and (3) people-related factors (expertise of responsible employees, personal experience from similar projects, high employee expectations). Similar to existing literature (Klein and Sorra 1996), acceptance in this chapter is given if continuous use (e.g., of the software) and all actions which need to be undertaken for the successful implementation of the register (e.g., barcode scanning) are performed by employees. In hospitals with a high degree of acceptance, employees are very satisfied with the continuous use of the register and perform all necessary tasks. Given a low degree of acceptance, employees are not satisfied with the register, do not use it continuously or do not perform all necessary tasks.

¹ Further information on the register are available on the website www.eprd.de

2 Theoretical Background

Innovations in hospitals are not a new phenomena and existing literature is relatively extensive (Djellal and Gallouj 2005, 2007). Process innovations are widely spread in hospitals; typical examples include clinical pathways (Panella et al. 2003), total quality management (Zbaracki 1998) or business process reengineering (Walston et al. 2001). Despite the managerial implications found in literature, many innovation projects in hospitals are not successful (Weiner et al. 2006). As one of the most important reasons for this, research suggests that innovations have not been implemented well (Nembhard et al. 2009) and are not successful because of disrupted routines and employee resistance (Sicotte et al. 1998; McDonald 2007). Therefore, in a complex service organization like a hospital where responsibilities are divided among multiple departments (Tucker et al. 2007), analyzing the factors which influence the acceptance of innovations is crucial to ensure the success of process innovations.

The author used an embedded multiple-case design (Eisenhardt 1989; Yin 2009) to investigate 20 hospitals implementing the EPRD. These hospitals are particularly innovative, and belong to the group of only 37 hospitals participating in the pilot phase of the register in Germany. For this reason, the analysis focuses on process innovations in innovative hospitals. Acceptance in innovative hospitals is of particular importance because potential later adopters of the innovation wait for feedback from early adopters and use this information to decide whether or not they will adopt the innovation. Research reveals that individuals evaluate an innovation through the subjective evaluations of peers who have adopted the innovation (Rogers 1962). For instance, in our sample, one hospital is the pilot hospital for the whole hospital chain it belongs to. If acceptance is given in this hospital, all other hospitals of the chain must adopt the innovation.

3 Data Collection and Data Analysis

The author conducted the analysis by combining primary interview data with secondary data about hospital-specific characteristics including size and ownership. Secondary data were retrieved from hospital quality reports. Primary data were collected in 20 German hospitals which are taking part in the pilot phase of the register. Most of the hospitals examined are non-profit hospitals (12), followed by public hospitals (5), and privately owned, for-profit hospitals (3). On average, these hospitals have 415 beds. Four of the hospitals studied are specialized clinics for orthopedics.

Two interviewers performed semi-structured, guided interviews (Hopf 1995) with 47 employees in these 20 hospitals. Most interviewees were physicians (24), followed by IT staff (12), staff from quality management (2), medical controlling (2), and surgical nursing (2). Furthermore, the interviewers surveyed employees

from surgical management (1), surgical planning (1), business department (1) as well as a commercial clinic director (1) and a secretary (1). The number and diversity of the interviewees' professional backgrounds result from the fact that in many hospitals, only a few employees are involved in the implementation of the register, and, for the most part, physicians are responsible for the introduction of the register.

Altogether the interviewers conducted 27 individual and eight group interviews as well as one telephone interview. They typically lasted for 30–45 min. All interviews were recorded and completely transcribed (Lamnek 1995). Qualitative content analysis (Bryman and Bell 2007; Mayring 2010) using MAXQDA software was applied to the systematic text analysis. Two researchers independently evaluated the degree of acceptance in each of the hospitals. They discussed their results and agreed that four hospitals showed a very pronounced high acceptance. In 11 hospitals, a sufficient level of acceptance was found, and in five hospitals, an adequate level of acceptance was not given among all surveyed employees.

4 Results

Three major factors have been found which influence the acceptance of the process innovation described in this study: (1) organizational factors, (2) project-related factors, and (3) people-related factors.

4.1 *Organizational Factors*

Ownership is the first organizational factor which has an influence on the acceptance of the process innovations within the hospitals studied. The study investigated a total of three hospitals with private carriers. Two of them have a very high degree of acceptance. The third private hospital planned the complete data transmission to the register very carefully and deliberately to avoid uncertainties within the hospital. There was a great acceptance regarding the register among the employees involved at the time of the survey. Thus, the adoption of process innovations in the surveyed private hospitals seems higher than in the non-profit and public hospitals. The author did not observe a difference between non-profit and public hospitals regarding process-innovation acceptance.

In addition to ownership, an influence of hospital size (number of beds) on the acceptance could also be determined. The analyzed hospitals with a high acceptance have fewer beds than hospitals with lower acceptance. The average number of beds amounts 202 beds in the four hospitals with the highest level of acceptance, while the five hospitals with the lowest acceptance level have 514 beds in average. In the hospitals with high acceptance, interviewees repeatedly mentioned the short hierarchical and physical distances within the hospital. The surgical director of a

small hospital, for example, stated that they have only short hierarchical distances and quickly solve possible emerging problems. A doctor from another hospital mentioned something similar and said that small hospitals enable their employees to sit in a hallway, clarify their problems shortly and directly; this is not always the case in large hospitals. Another doctor mentioned that a further possible explanation for higher acceptance in smaller hospitals could be that it is easier to convince people in smaller organizations than in larger ones.

Three of the hospitals with the highest acceptance are specialized joint replacement clinics. In the entire data set, only four clinics specialized in arthroplasty. Due to the focus on orthopedics, specialized hospitals are more likely to view greater values in the introduction of the EPRD and the register has a higher importance than in hospitals that offer many disciplines across the entire organization. For example, participation in the register is easier to communicate to employees, and hospitals with a specialized focus on orthopedics are more willing to provide resources for their main focus. Thus, in conformity with literature (Kimberly and Evanisko 1981), the author notes that a specialization of the hospital on orthopedics positively influences the acceptance.

4.2 Project-Related Factors

Considering project-related factors, significant differences exist between hospitals with high acceptance and hospitals with lower acceptance in the project support of decision makers. A doctor in a hospital with high acceptance, for example, stated that hospital management supports the register 100 % and therefore the project is of utmost importance. The response of a different doctor shows how important the support of top-management can be, especially when difficulties occur at the beginning: “At the beginning, everyone complained saying that’s too much extra burden, we also have to educate the patients—who’s going to pay us? What do we get out of it? That’s the way it was at the beginning—nobody felt like participating, then the boss said the administration wants to implement it, so we’re going to do it, and then we did. And it worked.”

In hospitals with lower acceptance, often just a few employees are involved in the introduction. They have a lot of work associated with the undertaking, which can quickly produce dissatisfaction among them and decrease acceptance. In hospitals with high acceptance, the work was often distributed among several people, and employees with a very positive attitude towards the register were responsible for the introduction. These employees take on key roles, monitor the introduction and, whenever appropriate, remind the other employees of the new processes. Often, these employees volunteer to be responsible for the introduction and are highly intrinsically motivated.

In most hospitals (15 out of 20), doctors are responsible for the introduction. In the surveyed hospitals, the professional background and the hierarchical position of the employees responsible for the introduction do not affect the acceptance of the

process innovation. In two hospitals, for example, two IT staff members were very successful in introducing the register.

During the pilot phase, the introduction of the register required low investment like the acquisition of barcode scanners. Therefore, the resource endowment did not play a decisive role apart from providing temporal resources. However, noticeably striking is that two of the hospitals with the highest level of acceptance stated that money was not an issue, they were not subject to financial restrictions, and that they get everything they need. A hospital with a low level of acceptance, however, suffered from a lack of resources.

4.3 People-Related Factors

Finally, this study suggests that the employees responsible for the introduction in hospitals with a high acceptance level have extensive expertise in introducing similar registers. For example, two doctors have been working for many years with smaller arthroplasty registers; one doctor even changed workplaces because he wanted to be responsible for the introduction of the register.

Personal experience from similar innovative projects in the hospital does not seem absolutely necessary for the successful introduction of the register, although several respondents said that they benefited from the experience of similar projects during the introduction of the register. Many hospitals without prior experience with similar projects also introduced the innovation process successfully and created a high level of acceptance. This may be due to the fact that the software itself is easy to use, and the innovation process usually affects only a limited number of people and therefore experience from similar projects is not absolutely necessary. Another important issue which affects the acceptance is the expectations of the staff involved in the register. In a hospital with low acceptance, it is striking that the employees have had very high expectations concerning the process innovation. Even during the pilot phase, it was assumed that no serious problems would occur. If or when these high expectations were not met, disappointment spread, along with a corresponding negative impact on acceptance. In the hospitals with high acceptance, employees expected to a much greater extent that difficulties would occur and they prepared for them. The employees were aware that in the beginning difficulties like work allocation amongst participants or technical problems could arise and they anticipated them. In one hospital, the expectations were even exceeded, so that there, a particularly high level of acceptance prevailed. Figure 1 provides an overview of the factors which influence acceptance of process innovations in the study.

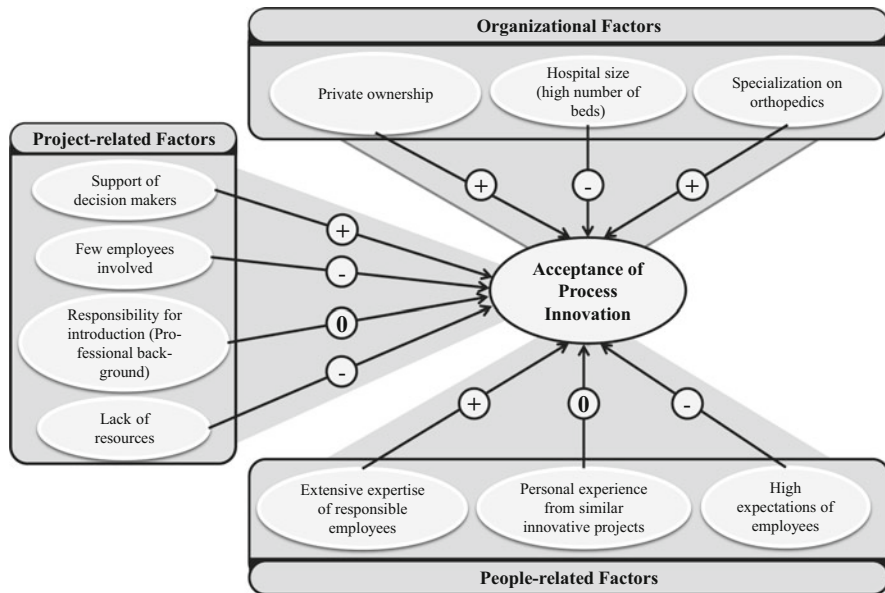


Fig. 1 Factors which influence acceptance of process innovations

5 Managerial Implications

Based on this study, several managerial implications can be derived to increase acceptance of process innovations in hospitals. Taking into account the specific conditions of the hospital, it is important to consider which departments, which employees, and which technical solutions are best suited for the introduction of the process innovation. Considering these aspects, a careful and well thought-out procedure is more important than a rash roll out of the innovation within the organization. Concerning the number of employees involved, management should avoid giving too few employees the additional burden causing them to feel unfairly treated. However, a potential advantage of not involving too many people is that communication remains clear, and if potential problems occur, agitation is limited to a few people and does not affect an unnecessarily large number of employees. If a higher number of employees is involved, it is important that the employee responsible for its introduction has a positive attitude towards the register. This employee takes on key rolls like barcode scanning. Further, this person monitors the introduction, reminds other employees of new processes, and answers all questions concerning the innovation. If possible, involved employees should do their tasks voluntarily, particularly those responsible for the introduction. The hierarchical position, formal power, and professional backgrounds of the responsible employee are less important than his or her attitude and openness towards the innovation.

It is crucial that the top management actively supports the employees. Therefore, if necessary, actions must be undertaken to ensure a high degree of top management

support before rolling out the innovation within the hospital. Communicating the benefits of the innovation purposefully, especially to employees who do not know the innovation very well because of their professional background, is also required. To avoid disappointments, it is significant not to arouse expectations which are too high. Instead, realistic expectations should be communicated and possible problems should be anticipated.

6 Limitations and Future Research

This article focuses on process innovations in innovative hospitals. First, caution needs to be taken when generalizing the results to other industries. Due to special characteristics of the health care market (Berry and Bendapudi 2007), it is possible that the findings are less applicable to firms in other industries. Second, it is possible that in less-innovative hospitals, other factors influence the acceptance than in the most innovative ones. Therefore, future research should focus on acceptance of process innovations in less-innovative hospitals to identify potential differences. Another limitation is given because of the fact that this investigation only studies German hospitals. Due to differing health care systems, for example in terms of the introduction of diagnosis related groups or the dominance of public or privately owned hospitals, other factors can influence acceptance in other countries.

This study analyzed the factors influencing the acceptance of process innovations based on the introduction of the German Arthroplasty Register. Some restrictions are plausible to the generalizability of other process innovations because of the characteristics of the register itself. For example, many employees have a very positive attitude towards the register due to a strong personal conviction that Germany needs such a register. Furthermore, the author's findings refer to a non-profit process innovation and results may not be transferable to commercial innovations. Therefore, future studies should deal with the question whether factors which influence acceptance of non-profit innovations are also relevant for commercial process innovations.

This study is based on interview data collected during or very shortly after the introduction of the process innovation in the hospital. It is possible that the influence of some factors will change over time or that even other factors will become relevant and influence acceptance later on. To ensure acceptance in the long run, it is an important topic for future investigations to analyze the factors which influence acceptance of process innovations over time.

Finally, more research needs to address the issue of employees taking key roles in innovation implementation in hospitals. The relationship between factors determining acceptance may be more complex. For example, this study found out that involving not enough employees in the introduction of the register negatively influence acceptance. Nevertheless, involving too many employees implies higher coordination costs and is likely to have a negative influence on acceptance from a

certain point. Therefore, a more detailed view is required, for instance, on the number of employees taking key roles in innovation implementation.

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Fostering Evidence-Based Design Towards Patient-Oriented and Knowledge-Driven Hospital Design

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Abstract Medical knowledge spans over a large scope (e.g., from the single cell to the whole human body). Hence, finding orientation between science and daily practice in health care is not an easy task. There is a vast amount of literature regarding knowledge and its transfer. The article presents a framework in order to structure methods of knowledge exchange and transfer corresponding to different levels of the healthcare system—societal, organizational, and group level. This framework will support the selection of knowledge management methods, IT support, and architectural means discussed in order to support the transfer of knowledge in hospitals and in the healthcare system.

1 Introduction

Hospitals are to provide medical treatment and care for patients. Yet, Roger Ulrich, Environmental Psychologist and professor at Texas A&M University's College of Architecture, stated: "A visit to a U.S. hospital is dangerous and stressful for patients, families and staff members. Medical errors and hospital-acquired infections are among the leading causes of death in the United States, each killing more Americans than AIDS, breast cancer, or automobile accidents." (Institute of Medicine 2001). The Institute of Medicine (2001) comes to a similar conclusion in its landmark report 'Crossing the Quality Chasm': "The frustration levels of both patients and clinicians have probably never been higher. Yet, the problem remains. Health care today harms too frequently and routinely fails to deliver its potential benefits". Problems in health care do not only negatively influence the patients; they also affect the staff. Registered nurses in the U.S. have a turnover rate averaging 20 % (Joint Commission 2002).

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The U.S. healthcare system faces the need to replace the aging 1970s hospitals. The population shift towards a growing number of older patients and new medical technologies also needs to be accommodated. An estimated \$200 billion will be spent on the design and construction of new hospitals or the renovation and expansion of existing hospitals in the U.S. by the year 2015 (Suttell 2007). Driving forces behind this development are (1) competition for patients, physicians, nurses, and other health care providers; (2) increased space requirements to accommodate newer technologies, and (3) facility improvements to ensure the patients' safety and overall operational efficiency (Stichler 2007). In Germany, the investment in hospital construction reached 3.03 billion euros in 2009 (Deutsches Krankenhaus Institut 2009). Ongoing investments, such as new medical technology and medical devices are not included in this sum. Thus, the healthcare sector and, especially hospital planning, provide an increasing market for architects and engineers.

However, in view of the growing number of beneficiaries of the healthcare system, the available funds spent have to be very goal-oriented. In order to create hospital buildings that meet the requirements of the different stakeholders involved, architects face an increasing need to incorporate scientifically based information into their work. Due to the fast-paced medical and technological development, and the financial and political systems, the design and planning of hospitals is a process of high complexity. Therefore, the added value of the implementation of architectural research has to be made explicit. This way, patient-oriented designs, especially in light of high investment costs for design, planning and construction of hospitals are indispensable.

2 Aims and Method

This paper aims to explore the important role of architectural design in the specific context of hospital environments. It will bring the focus onto patients and the challenges of conducting architectural research joining the discussions held within the different perspectives and disciplines of this book. This chapter introduces a short overview of the existing literature on hospital design. Focusing on the work of Ulrich and his colleagues their results according to design derivations are summarized in Table 1 and, further, research gaps will be identified and discussed. Ultimately, concluding that demands for upcoming patient-oriented designs are derived.

3 Background

3.1 *Complex Requirements in Hospital Planning*

Hospital designs reflect the sociocultural, economic, professional and aesthetic prevalent at a given time. To design and plan a hospital is one of the most complex tasks an architect can face. They need to design a building that addresses many

Table 1 Overview on evidence-based health care design—environmental link to “patient safety issues” and other “patient outcomes” according to the reviews by Ulrich et al. (2004, 2008)

Patient safety issues	Environmental factors	Design measures
Hospital-acquired Infection Rate is affected by three major Transmission routes: – Air and airflow direction – Contact – Water	Malfunction or contamination of ventilation systems Lack of cleaning Lack of maintenance Hospital renovation, dust	• Provide single bedrooms with private toilets • Air quality control measures (during construction + renovation) • Easy to clean surfaces (furniture, floors, doors, etc.) • Install alcohol-based hand rub dispensers in each room door, hand-washing • Install filters, specify ventilation systems and air change rates • Proper cleaning and disinfection
Medical Errors: as a combination of people and environment	Noise Light Patient-transfer-reduce by Acuity-adaptable Single bedrooms	
Falls	<i>Knowledge gaps:</i> No studies have compared different design options (placement of doorways, handrails, or toilets) to determine the impact on incidence of falls	• Design of unit configuration
Other patient outcomes	Environmental factors	Design measures
Pain	Systematic collection of experiences, mistakes, risks, and trends learned in a project and collected with the intention to take them into consideration in future projects	• Large windowed patient room (daylight, nature) • Window views in procedure areas, treatment rooms, and waiting areas • Daylight exposure
Sleep Hospitalized persons need more sleep because of their illness. Quantity and Quality. Age dependency	Noise Light Poor sleep, sleep disruption by roommates, visitors, health care staff <i>Knowledge gaps:</i> Influences of variables as acuity of illness, sedation level, pain, and disruptive patient-care procedures were not taken into account.	• Single bed rooms • Acoustic environment: installation of sound-absorbing materials • Avoiding light pollution (natural lightning) • Flexible light controls (lighting intensities)
Stress	Noise level of medical equipment, staff and other patients Patient stress	• Reduce noise of medical equipment, alarms, paging systems, telephones, pneumatic tubes, trolleys, ...

(continued)

Table 1 (continued)

Patient safety issues	Environmental factors	Design measures
	View of nature, gardens, greenery Art	• Reduce sound-echoes: use sound absorbing materials for floors, ceiling walls • Single bedrooms • Windows with views of nature, gardens • Sensitive use of art: it varies enormously in subject matters, different personal emotions
Depression	Artificial and day lighting	• Site planning according to day light • Dim windows and lighting
Length of Stay	<i>Knowledge gaps:</i> Limited literature links length of stay toward physical environment.	
Spatial orientation Way-finding problems	Light View of nature	• Easily visible and easy to understand signs, door signs and numbers • You-are-here-maps
Privacy	Space partition (hard-wall) <i>Knowledge gaps:</i> Limited research on acoustic performance.	• Single bedrooms • Sound-absorbing materials • Private discussion rooms / areas
Communication/ Social Support	Lounges Day rooms Waiting areas <i>Knowledge gaps:</i> Limited amount of literature.	• Single bedrooms • Movable furniture, flexible grouping
Overall Patient Satisfaction	Comfortable environment Provide window views Adequate lighting, day light and sunlight – Provide information guides	• Single bedrooms • Room environment, furniture, colors • Temperature control • Noise reduction, sound-absorbing material

different stakeholders' requirements, that facilitates logistical processes, is cost-efficient, and, of increasing importance, is ecologically sustainable (Verderber 2010). Aging buildings and outdated designs no longer support contemporary practice or knowledge about the effects of the health care environment on patient health and safety, care efficiency, staff effectiveness, and work experiences (Stichler 2007). Until now, the existing building performance was evaluated in an informal manner and the lessons learned were applied to the next building cycle of a similar facility type. Due to the rather slow evolution of building typologies, knowledge about their performance was passed on from one generation of building specialists to the next (Preiser 1995).

Today, very specialized knowledge in various subfields of the construction industry is necessary. This situation provides challenges since it seems impossible for one person or small group to oversee the complete building delivery process. Rather, major building decisions are made by committees, and an increasing number of technical code and regulatory requirements, such as energy reduction and conservation, hazardous waste disposal, fire safety, occupational health and safety requirements are placed on facilities. Since they all have to be balanced and complied with, the necessity to articulate and document the performance of facilities becomes evident (Preiser 1995). According to the high degree of specialization of medicine and care, hospitals are divided into separated units, following either their function (rehabilitation hospitals, children's hospitals, seniors' (geriatric) hospitals) or their medical specialization such as psychiatric problems, certain disease categories such as cardiac, oncology, or orthopedic problems.

In contradiction to that architects have to act as generalists and all-rounders. Thus, they are facing the challenge to investigate all necessary information according to the design task, understand the details of recent research and translate them into a fitting design solution. Existing studies with relevant information to be implemented in the design process and to address the patients' needs are available. But it is almost impossible for architects during their daily routines to obtain access to this scientific information. The point of time and cost pressure under which architects usually design plays an eminent role as well as the dynamic design process: a finished project is immediately followed by the next project. Of course, each project team is required to document the design process and its outcomes. However, these insights are mostly not accessible for other architects or researchers. This gap could be filled by conducting a Post Occupancy Evaluation (POE), which is a documentation and evaluation method that measures whether the intended design goals are met by the actual building (Preiser 1995). But documentation and evaluation is mostly done by researchers and not by architects themselves. So the results of these POE's need to be transformed into guidelines which can be incorporated into the architectural design process.

3.2 Role of the Hospitals Architecture and Various Stakeholders

Today's hospital buildings are often described as 'efficient machines' and their main task is to manage the social and material work of health care delivery (Cama 2009). Health care providers and administrations want the architect to represent their vision of healing, of health, and of death by the architectural appearance of the hospitals (Risse 1999). At the same time architects interpret hospitals as a public space that orients visitors to a particular vision of charity or social engagement (Stevens 1999). So the hospital has to address the demands of various stakeholders.

3.3 Hospitals Designed as Patient-Oriented and Healing Environments

The concept of hospitals as healing environments was first introduced by Florence Nightingale, a nursing researcher, who espoused the need for light, airy, and clean environments for the wounded soldiers in her care (Nightingale 1969). The vision of building hospitals as healing environments is gaining momentum, but the notion that hospitals have to be ‘hospitable’ is still not completely fulfilled. The overall aesthetics and feelings can be determinants of how patients and their families view the quality of hospitals and can influence decisions as to which hospital facility patients choose for their care (Stichler and Weiss 2001; Stichler 2002). Few slogans in today’s health care environment are as widespread as the focus on patient-centeredness (Mead and Bower 2000). Health care administrators, marketers, and patient groups promote patient-centeredness as the new strategy to improve the patient-provider relationship and to make patients’ intrinsic values visible (Beach et al. 2005; Berwick 2009).

“Get the environment right and the patients will start to heal themselves” mentioned Francis C. Biley, Associate Professor in the School of Health and Social Care at Bournemouth University in 1996. Therefore, it is most important in hospital design to bring the focus onto the patient and relay their needs to the architect’s attention, however, this process may be impeded by the various stakeholders and their interests involved. Thus, developing patient-oriented designs has to be empowered with scientific architectural research.

3.4 Challenges of Architectural Research

Compared to other sciences, there is limited architectural research. One reason for this shortcoming may be caused by the fact that buildings are unique constructions. Each project is different in terms of planning program, funding, legal requirements, location, and aesthetics. Due to the increasing complexity of design parameters and in order to move towards a more patient-oriented healing environment of hospitals, more architectural research is needed. To analyze and to understand the demands of the users is the first step towards a goal-oriented design solution.

However, concerning the quality of the research evidence, there are certain limitations in architectural research. In the medical fields, a randomized controlled trial or an experiment is considered to be the strongest research design for generating sound and credible empirical evidence. In the field of architecture, only very few randomized controlled trials linking specific design features or interventions directly to impacts on health care outcomes exist. The reason for this is that most changes of the physical environment in health care settings alter several environmental factors simultaneously. This creates confounding variables and makes it difficult to disentangle the independent effects. As an example, renovating an

intensive care unit with two-bed patient rooms to create single-bed rooms would likely alter not only the number of patients per room, but also the ratio of hand-washing sinks per bed and possibly the room ventilation or air quality (Ulrich et al. 2008).

Architectural research might be supported via creating experimental spaces and mock-ups, but these constructions and installations require extra effort and high costs. Nevertheless, even if costs for experimental architectural research are funded, the problem of simultaneous occurring phenomena and the cross-influence of different factors persist.

4 Current State of Research

The expected growth of hospital construction in the U.S. and the ‘once-in-a-lifetime’ construction provides the opportunity to rethink hospital design and especially to consider how better designs can improve patient and staff outcomes. Just as medicine has moved towards Evidence-Based Medicine where clinical choices are informed by research, health care design is increasingly guided by careful research linking hospitals’ physical environment to health care outcomes, and it is moving towards Evidence-Based Design (EBD) (Hamilton 2003). In the following paragraph we shortly introduce the main methods referring to hospital design mentioned in the literature:

Evidence-Based Design may also be known as ‘Healing Architecture’. It pursues the proposition that the spatial quality is influenced by a number of various parameters, such as light, color, noise, smell or orientation and has a strong influence on a human being’s psychological and physical health. To enhance the design process with more qualitative and quantitative information Evidence-Based Design became a popular means especially to Health Care Architecture. The goal of Evidence-Based Design is to ensure the systematic transfer of scientific results into the design process (Stichler 2010). Evidence-Based Architecture means that all planning, design and building decisions are to be based on recent and proven scientific findings. Therefore, existing studies are ordered, analyzed, assessed and rated (Rosswurm and Larrabee 1999). It is based on different sources: beside existing literature perspectives and knowledge of different stakeholders as future users, involved occupational groups as well as experts are included and taken into account.

The **Post Occupancy Evaluation** (POE) is a tool which facility managers, architects and researchers can use to continuously improve the quality and performance of the facilities they operate and maintain. POE was defined by Wolfgang Preiser as “the process of systematically comparing actual building performance (i.e., performance measures) with explicitly stated performance criteria. These are typically documented in a facility program, which is a common pre-requisite for the design phases in the building delivery cycle” (Preiser et al. 1988). In the 1960s, performing POEs was introduced in response to significant problems experienced in

building performance with particular emphasis on the building occupant's perspective. This was first noticed in institutional care facilities, such as mental hospitals, nursing homes, and correctional facilities. It was observed that the facilities actually hindered progress towards recuperation or socialization of the residents, or inmates. A common set of problems, even for new buildings, were health and safety issues, security problems, poor signage and way-finding support, poor air circulation and temperature control, insufficient handicapped accessibility, lack of privacy, etc. (Preiser 1995).

In the design process of new hospitals or during major refurbishments the construction of **mock-up** patient rooms is rather common. The mock-ups are used to choose colors, furniture or surface materials and, most importantly, to optimize care processes and workflows. Mock-up designs of patient rooms were first built for the design of intensive care units. Along with their usefulness when striving to design optimal environments, mock-up rooms can serve two additional functions: systems simulation, and advance education and orientation (Reiling 2005). So far, mock-up rooms are mainly used in preparation for and during building operations. Mostly they are not documented systemically and they are rarely used for architectural research.

5 Overview of Design Relevant Parameters

Although health care providers want to deliver the best care possible to patients, the physical environment itself can increase the probability of adverse patient outcomes due to medical errors, hospital-acquired infections or airborne contamination. It is crucial to design hospitals that address specific ways to reduce stress, prevent patient and staff injury, promote healing and support professional practice (Stichler 2007).

For this chapter we focus on the pioneering work of Ulrich and his colleagues (2004, 2008). With over 400 studies, they performed the most recent and comprehensive review on the relationship between healthcare-outcomes and design features. As the most important influences of the physical environment on the patient outcomes they identified: noise, light, stress, and hospital-acquired infection rate. The infection rate served as a good indicator to start investigating in Evidence-Based Design, since it can be measured: either the patient is infected or not.

The results of these extensive reviews are summarized in Table 1. Here we focused on the topics of “patient safety issues” and “patient outcomes”. Within the scope of this paper we skipped the “staff outcomes”, such as injuries, stress, work effectiveness, and work satisfaction.

6 Results and Discussion

The outstanding work of Ulrich and his colleagues has been used in making health care design decisions for several years. However, as the summarized table shows, some areas have not been addressed yet and allow for more research. Even though many factors have been investigated there are only few architectural design recommendations that can be derived. They concern design issues such as the provision of single bedrooms, to install separate transmission routes (water, air), and to choose easy to clean surfaces for walls, floors and furniture.

In hospital design there are other relevant design issues, such as ergonomics, mobility and design of furniture and technical equipment, and the influence of the designed layout or floor plan, which are rarely discussed in the literature. Questions that need to be addressed are, among others, how the building layout influences the user's spatial orientation, the nurse's workflow, as well as the need for communication and knowledge exchange. Further it is not investigated in detail how architecture influences communication, meaning whether design decisions such as color, materials, or surfaces influence the workplace atmosphere and contribute to a healing environment.

Since hospitals are of a complex architecture there are many factors playing important roles. A thorough understanding of the existing influences and their correlation is needed to gain a broader perspective. In order to design goal-oriented and patient-oriented hospitals different factors must be linked and their results have to be examined in order to provide architects and planners with reliable information. The role of the physical environment towards the patients' healing process has to be explained by single factors but also needs overall discussion and wider investigation in order to retranslate the scientific results for architects and planners. Architectural research is still in need to explain the role of healing environments towards policy and decision makers. Therefore, the overall correlation of hospital environment, architecture, and outcomes has to be further investigated.

6.1 *Meta-Knowledge for Architects and Engineers*

A Meta-knowledge of medical research and health care is being discussed among the medical professions and there are some examples of successful implementation. However, concerning the creation of hospital design, the architects are an important stakeholder themselves and they need to be supported with relevant information. Evidence-Based Design recommendations have to be transformed into meta-knowledge. To achieve this goal, systemic reviews of the research literature and the documentation of the relevant expert's knowledge is required. Further, the expert's knowledge has to be transferred, translated and integrated in a useful and understandable manner into the daily practice of hospital architects and planners.

6.2 *Directions for Further Research*

Evidence-Based Design is an important method which provides the link between architectural research and design practice. This way, it is possible to achieve a more patient oriented and knowledge driven approach to the design of hospitals, resulting in the creation of healing environments. However, there are significant gaps in our knowledge. Besides stepping up efforts to fill these gaps, for advances in the field of Evidence-Based Design, further investigations are needed to foster the interdisciplinary knowledge exchange towards developing meta-knowledge. New methodologies to bridge the gap between the multiple professions involved in the design of hospitals are needed. On this basis architectural guidelines that encompass the research findings and views from other disciplines need to be developed and have to be established. This research and knowledge exchange should also enter the education and further training of architects.

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Quality of Care Assessment in Pediatrics: Are Parents the More Challenging Patients?

Tonio Schönfelder, Peter Peschel, and Joachim Kugler

Abstract The study aims to analyze the impact of proxy responses of parents of pediatric patients on quality of care assessments. Data used in this study were obtained from 5,551 randomly selected patients from three medical departments who responded to a mailed survey. The instrument consisted of 37 items and assessed medical and service aspects of the hospitalization, patient demographic data, as well as visit characteristics. Regarding pediatrics, parents acted as a proxy response for their children and filled in the survey. Potential differences in patient assessments were determined by comparing satisfaction ratings of parents and the remaining patients using non-parametric tests. The majority of patients were satisfied with the hospitalization; however, parents of pediatric patients were significantly less satisfied than patients of internal medicine and surgery and were also less likely to choose the same facility in case of another hospitalization. Most of the items measuring medical and service aspects of the hospital stay received significantly lower ratings by parents in comparison to participants of internal medicine and surgery. The perception of length of stay affects satisfaction ratings of patients of all medical departments. Patients who judged the hospital stay as appropriate were significantly more satisfied and more often willing to choose the same facility in case of another hospitalization than patients who perceived the hospital stay as too short or too long. In direct comparison to internal medicine and surgery, the parents of pediatric patients assessed the duration of the hospitalization three times more often as too long. Study findings show that parents acting as a proxy for their children report lower satisfaction ratings in comparison to self-reports of other patient cohorts, and also that the subjective perception of the length of stay influences satisfaction ratings.

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1 Introduction

Patient satisfaction is an important element of the quality of medical care (Crow et al. 2002; Donabedian 2005). Its assessment is being used by many health care providers for internal evaluations of their own performance as well as, on a larger scale, within different health care systems to compare the service quality among health care organizations (Marshall et al. 2003; Geraedts et al. 2007). Studies have evidenced that satisfaction with the received health service quality leads to better treatment adherence which may result in better health outcomes (Doyle et al. 2013). Patient satisfaction is considered as a comparison between the expectations of patients and the noticed health care quality (Ernstmann et al. 2010). It is a multidimensional concept consisting of various aspects such as the technical and interpersonal aspects of care, the outcome of the health intervention, and visit characteristics like the duration of the hospital stay (Mira et al. 2009; Schoenfelder et al. 2010; Rahmqvist and Bara 2010). Further research also indicates that proxy response may affect satisfaction ratings (Quintana et al. 2006).

The majority of studies assessing patient satisfaction among various medical departments reports high levels of satisfaction with the hospitalization (80 % and above) (Quintana et al. 2006; Mira et al. 2009; Schoenfelder et al. 2011a). Conversely, research conducted in pediatrics indicates that parents who are rating the quality of care received as a proxy for their children often report significantly lower satisfaction scores (Seid et al. 2003; Solheim and Garrat 2013). However, due to the different study methods and settings (e.g., survey instruments, health care systems, outpatient versus inpatient), a direct comparison of these findings is limited. Therefore, the intention of this study was to analyze proxy responses of parents of pediatric patients and self-reports of patients of the departments of internal medicine and surgery regarding satisfaction ratings using the identical study method (questionnaire, same geographical area) to reveal potential differences in quality of care assessments.

Since some studies indicate an association between length of stay and patient satisfaction (Tokunaga and Imnaka 2002; Schoenfelder et al. 2010), a potential explanation for the differing ratings might be traced back to the time spent in hospital. Particularly, the patients' subjective perception of the appropriateness of the length of stay appears to have an effect (Schoenfelder et al. 2013). Possibly, due to the physical distance between parents and their child they evaluate the length of the hospital stay exceptionally critical which may yield lower satisfaction scores. Therefore, the conducted analysis additionally focused on the potential impact of perceived length of stay on patient satisfaction.

2 Material and Methods

This investigation was designed as a cross-sectional, secondary analysis of data collected through a regional program. This survey was initiated by the Saxony Hospital Organization, regional physicians' chamber of Saxony and four regional statutory health insurances. The intention was to measure hospital performance in the eastern region of Saxony, aiming at publicly disseminate comparative hospital data for patient satisfaction. Data collection was conducted between January and September 2009.

2.1 *Patients and Setting*

The study population consisted of randomly selected patients from three medical departments (pediatrics, internal medicine, and surgery) discharged from 39 hospitals in the region of Dresden in 2009. The region of Dresden is an administrative district as a part of the Free State of Saxony in Germany. It covers about one third of the area of the Free State of Saxony and is situated in the eastern part of the federal state.

The study data was obtained through a self-administered, previously validated and reliability tested questionnaire consisting of 37 items which was sent after discharge (Schoenfelder et al. 2011b). The instrument covered domains which have been shown to be important components of satisfaction in prior research (Crow et al. 2002). Assessed items dealt with medical and service aspects of the hospitalization such as kindness of nurses and medical practitioners, provision of comprehensible information about different aspects of the treatment, and quality of food. One item collected information concerning the overall satisfaction with the hospital stay in general. Patient satisfaction was assessed on a 6-point ordinal response rating scale (1 = very poor, 6 = excellent). Additional data collected were patients' age (nine age groups), sex, and visit characteristics such as perceived length of stay, as well as the medical department the patients were treated in. Regarding pediatrics, parents acted as a proxy response for their children and were asked to fill in the survey.

Surveys were accompanied by a cover letter informing the participants about the purpose, voluntary nature, and anonymity of the study as well as their consent to participation when sending back the questionnaire. A total number of 19,006 post-paid surveys were distributed; 5,551 were finally completed, resulting in a response rate of approximately 29.2 % (Table 1).

Table 1 Sample structure (N = 5,551)

Medical department	Pediatrics	Internal medicine, surgery
N (%)	551 (100)	5,000 (100)
<i>Age</i>		
<15	518 (94.5)	50 (1.0)
15–20	22 (4.0)	69 (1.4)
21–30	6 (1.1)	193 (3.9)
31–40	2 (0.4)	221 (4.5)
41–50	–	459 (9.2)
51–60	–	758 (15.3)
61–70	–	1,137 (22.9)
71–80	–	1,449 (29.2)
80+	–	628 (12.7)
Missing	3	36
<i>Sex</i>		
Male	211 (52.9)	1,685 (48.2)
Female	188 (47.1)	1,781 (51.8)
Missing	152	1,561
<i>Length of stay</i>		
Appropriate	373 (68.9)	3,383 (69.3)
Too short	22 (4.1)	503 (10.3)
Too long	87 (16.1)	242 (5.0)
Do not know	59 (10.9)	752 (15.4)
Missing	10	120

2.2 Statistical Analysis

The distribution of the satisfaction scores was skewed toward higher satisfaction, which is why non-parametric tests were performed. General associations between overall satisfaction ratings and patient and visit characteristics were investigated with χ^2 -tests, Fisher's exact test in case cell counts were small, and Kruskal-Wallis-tests with Bonferroni-adjustments in case of multiple comparisons. Mann-Whitney-U-tests were used to investigate differences in patients' ratings of the medical departments. In order to investigate the potential effect of the parents' proxy response on patient satisfaction ratings, the analyses were conducted between study participants of pediatrics and the remaining study sample. For this purpose, patients of the departments of internal medicine and surgery were grouped together. All associations were considered to be statistically significant at $\alpha \leq 0.05$ -level. Data was analyzed using SPSS 20.0 for Windows.

3 Results

3.1 Patient Satisfaction Ratings

The majority of parents of pediatric patients were satisfied with the hospital visit. In total, 65 % (n = 356) rated the overall satisfaction related to all performed services either 'excellent' (13.9 %, n = 76) or 'good' (51.1 %, n = 280). Approximately 71.4 % of the parents (n = 387) would choose the same facility again in case of another hospitalization, 8.1 % of them (n = 44) would prefer another hospital, and 20.5 % (n = 111) could not decide (remaining parents (n = 9) did not provide an answer). A comparison with the patient cohort of internal medicine and surgery shows significant differences regarding overall quality assessments (X², p < 0.001). Approximately 80.0 % of the respondents rated the overall satisfaction either 'excellent' or 'good'. About 82.5 % of them would use the facility again in case of another hospitalization, 5.4 % would prefer another clinic, and 12.1 % could not decide. The remaining patients (n = 78) did not provide an answer to that question.

Parents were most satisfied with provided information in the following aspects: anesthesia (grouped median: 5.36) as well as undergoing operations (5.34), cleanliness (5.24), kindness of the nurses (5.17), and medical practitioners (5.18). Quality of food (4.58), organization of procedures and operations (4.61), as well as organization of discharge (4.68) were assessed as the most critical aspects of the hospitalization. There were no statistically significant influences regarding mothers or fathers assessing the different aspects of quality of care (Table 2).

Most aspects assessed in the questionnaire received significantly lower ratings by parents in comparison to participants of the medical departments internal medicine and surgery (Fig. 1). Exceptions concern the provision of clear information about operation, anesthesia, and medication, as well as the organization of discharge and the subjective assessment of the treatment outcome (Table 2).

3.2 Perceived Length of Hospital Stay

Approximately 68.9 % (n = 373) of the parents of pediatric patients assessed the length of stay to be appropriate, about 4.1 % (n = 22) perceived their hospital stay to be too short, 16.1 % (n = 87) to be too long, and 10.9 % (n = 59) could not judge. The remaining patients (n = 10) did not provide data (Table 1).

Parents who perceived the hospital stay of their child appropriate were significantly more satisfied (grouped median 4.92) and more often willing to choose the same facility in case of another hospital stay (82.4 %) (Mann-Whitney-U-tests, p < 0.001) than patients who judged their hospital stay too short (grouped median 4.33/percent willing: 50.0), too long (grouped median 4.21/percent willing: 49.4), or could not judge (grouped median 4.36/percent willing: 46.6) (Table 3).

Table 2 Comparison of satisfaction ratings of pediatrics versus internal medicine and surgery

Satisfaction measures	Grouped median		p-Value ^a
	Pediatrics	Internal medicine, surgery	
Overall satisfaction with hospital stay	4.71	5.05	<0.001
Organization of admitting procedure	5.09	5.26	<0.001
Medical practitioner’s knowledge of patient anamnesis	4.82	5.08	<0.001
Clear reply of inquiries by medical practitioners	5.03	5.14	<0.01
Individualized medical care	4.81	5.09	<0.001
Clear information about undergoing operations	5.34	5.39	n.s.
Clear information about anesthesia	5.36	5.41	n.s.
Clear information about medication	4.76	4.83	n.s.
Organization of procedures and operations	4.61	5.13	<0.001
Directions on what to do at home after discharge	4.68	4.72	n.s.
Kindness of the nurses	5.17	5.37	<0.001
Kindness of the medical practitioners	5.18	5.36	<0.001
Accommodation	4.89	5.16	<0.001
Cleanliness	5.24	5.34	<0.01
Quality of food	4.58	4.99	<0.001
Treatment outcome	5.19	5.18	n.s.

Scale: ‘6’ = excellent, ‘5’ = good, ‘4’ = fair, ‘3’ = acceptable, ‘2’ = poor, ‘1’ = very poor
^aMann-Whitney-U-test

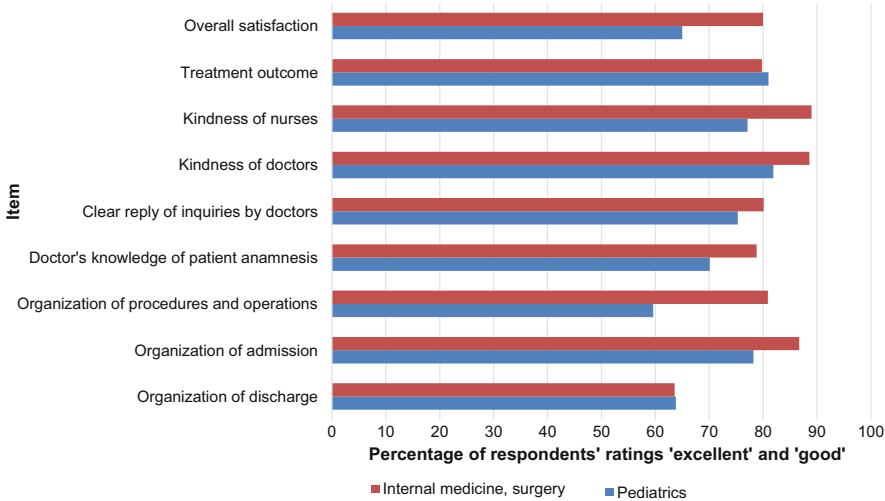


Fig. 1 Respondents being satisfied in % with regard to medical departments

Table 3 Relation between perceived appropriateness of length of stay and overall satisfaction ratings (grouped median) and willingness to return to the provider (%) in relation to medical department

Perceived length of stay	Overall satisfaction rating with hospitalization (grouped median)/willingness to return	
	Pediatrics	Internal medicine, surgery
Appropriate ^{a,b}	4.92/82.4 %	5.21/90.2 %
Too short	4.33/50.0 %	4.65/64.8 %
Too long	4.21/49.4 %	4.38/54.2 %
Do not know ^{a,b}	4.36/46.6 %	4.67/69.2 %

^aDifferences between medical departments regarding overall satisfaction rating were significant; $p < 0.001$ Mann-Whitney-U-test

^bDifferences between medical departments regarding willingness to return were significant; $p < 0.01$ χ^2 -test

The patients of the departments of internal medicine and surgery assessed the length of stay in a similar way; however, the proportions within the assessments differed in that less patients than in pediatrics judged their stay as too long. The vast majority 69.3 % ($n = 3,383$) assessed the length of stay to be appropriate, about 10.3 % ($n = 503$) assessed the length of stay to be too short, 5.0 % ($n = 242$) to be too long, and 15.4 % ($n = 752$) could not judge. In direct comparison to patients of internal medicine and surgery, parents assessed the length of stay of their children nearly three times more often to be too long (χ^2 , $p < 0.001$) (Table 1).

Regarding internal medicine and surgery, patients assessing the length of stay to be appropriate were significantly more satisfied (grouped median: 5.21) and more often willing to choose the same facility again (90.2 %) than patients assessing the length of stay as too short (4.65/64.8 %), too long (4.38/54.2 %) or could not judge (4.67/69.2 %) (Table 3).

4 Discussion

4.1 Implications for Health Professionals

Study findings are consistent with those from research published by other authors and confirm that the majority of parents are satisfied with the treatment of their child (Seid et al. 2003; Solheim and Garrat 2013). However, satisfaction levels were considerably lower than in other studies investigating patient assessments. Often, about 80.0 % of study participants indicate satisfaction with their treatment (Schoenfelder et al. 2010, 2011b; Mira et al. 2009). In the analyzed sample of parents assessing the hospitalization of their child only 65.0 % reported being satisfied (ratings of ‘excellent’ and ‘good’), which is significantly lower than the ratings of patients in internal medicine and surgery. Moreover, regarding most items measuring different aspects of the hospital stay (e.g., organization of

admitting procedure, kindness, quality of food) parents were also significantly less satisfied than the remaining patient cohort. One explanation for the differing results could be that parents are often not present during the whole treatment process. Therefore, it might be more challenging for the medical staff to be attentive to their concerns and to involve them in the treatment of their child; both aspects were found to be important determinants in prior research (Holmboe et al. 2011).

As with the evaluation of perceived length of stay, findings suggest that parents may prefer shorter hospital stays. In comparison to internal medicine and surgery, the parents of pediatric patients were less likely to judge the perceived length of stay as appropriate and assessed the duration of the hospitalization three times more often as too long. This might be explained by the unavailable or inadequate accommodation for parents in the hospitals. The greater physical distance between parents and their child may result in the parents wanting to prepone the discharge. In general, the patients' subjective perceptions of the appropriateness of length of stay seem to be one important factor for patient satisfaction. Study participants of all investigated samples who assessed length of stay as too short or too long were less satisfied.

These study findings might indicate that parents are more demanding when acting as a proxy for their child's treatment and, therefore, may bias the results. From the perspective of health professionals, these findings might be helpful for two reasons: first, results imply that health professionals should be aware that satisfaction ratings do not necessarily depend on their own performance, but also on the person who answers the questionnaire, the patient or someone else; second, there is a need to adjust for this factor for the purpose of benchmarking the quality of hospitals, health professionals, or medical departments.

4.2 Implications for Further Research

Study findings show that parents acting as a proxy for their children report lower satisfaction ratings in comparison to self-reports of other patient cohorts and also that the subjective perception of the length of stay influences satisfaction ratings. However, there are questions that remain. The cross-sectional design of the conducted study is not able to determine the reasons for the different assessments between both groups. Therefore, further research should focus on exploring which aspects yield lower satisfaction ratings specifically on the part of the parents. Maybe parents have a greater need for information or they perceive they are not adequately, comprehensibly, and sufficiently informed about the treatment of their child (Bitzer et al. 2009). For example, previous studies highlighted the importance of providing information to patients and its influence on satisfaction with the hospitalization (Lantz et al. 2005; Mira et al. 2009). Appropriate information is essential to patients in terms of understanding treatment options and to participate in the decision-making process (Crow et al. 2002). Maybe parents have a certain lack of medical knowledge and, therefore, are not able to judge whether the

received information concerning the treatment of their child was appropriate. Therefore, implications for further research might be to develop communication strategies to provide parents with comprehensible information about the different aspects of their child's treatment.

5 Limitations

In interpreting the study findings, some methodic limitations must be acknowledged. The distribution of the satisfaction scores indicate there might be a risk of an acquiescence bias and a social desirability bias that may have resulted in an over-reporting of satisfied patients (Crow et al. 2002).

A weakness of mailed surveys is the difficulty of achieving a representative response rate. To moderate this shortcoming, the survey was accompanied with a cover letter informing the patients about the purpose of the study, and a prepaid envelope was provided to make it easier to reply. Only 29.2 % responded to the study, which might affect validity of the study results. However, Lasek et al. (1997) found that the impact of nonresponse bias on satisfaction surveys of hospitalized patients might be relatively small.

A sample of randomly selected patients from a large number of hospitals of one geographical area was analyzed. However, the generalizability of the findings to other regions or areas outside Germany, particularly those that differ according to hospital characteristics, remains to be established.

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Part III

Teams in Health Care

Collaborative Work Development as a Resource for Innovation and Quality Improvement in Health Care: An Example from a Hospital Surgery

Anu Kajamaa

Abstract This chapter deals with collaborative work development targeted to improve innovativeness and quality in health care. The study unravels contradictions and their solutions within a work development intervention held by medical practitioners, their management and researchers. The framework of the study is activity theory, which views contradictions as drivers for learning and change. During the intervention, the participants co-created and implemented a new activity and management model in a surgical unit. This required breaking organizational boundaries and collectively analyzing historically accumulated contradictions. As a consequence, the unit overcame a near crisis and both significantly increased its efficiency and quality of care and strengthened its community. The study increases our knowledge on innovation creation and the successful management of contradictions to improve quality in health care.

1 Introduction

Public sector health care currently faces pressure from many opposing forces. The management of medical services emphasizes process- and cost-efficiency and the mass production of medical services (e.g. Currie and Harvey 2000; Harders et al. 2006). The activity of health care has become challenging for practitioners and management to explicate and manage. Many health care change efforts are launched in organizations by the management from the top down, but the results do not always satisfy patients, medical practitioners, the health care management and political decision makers (e.g. McNulty and Ferlie 2004; Vartiainen 2008; Kajamaa 2011).

Collective change efforts promoting organizational change and practice development are thus needed (also e.g. Maccoby 2006). This study calls for a change in

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perspectives on healthcare change management and examines the consequences of a collaborative work development intervention in which medical practitioners, researchers and hospital management took part.

2 Description of the Research Site and Data

The research site was a surgical operating unit of a university hospital in Finland. Approximately 200 nurses and 100 medical practitioners worked in the unit, which had 16 operating theaters shared among eight main surgical specialties. The patients were treated post-operatively in a recovery room. The practitioners' work was highly challenging since the unit conducted the most demanding operations in the hospital district.

By 2005, a lack of personnel due to sick leave and employee turnover pushed the unit close to a crisis signaled by the closures of operating theaters and the threat of sanctions due to excessive waiting times for patients. The unit was functioning under increasing pressure to perform more operations and to improve its organizational effectiveness. The unit faced many demands that had become difficult for the management and employees to handle.

The research group carried out a collaborative work development intervention in the unit from August 2006 until February 2008.¹ The project included 20 representatives from the hospital: surgeons and surgical nurses, anesthetists and anesthetist nurses, a secretary, a porter, the top manager of the result unit for surgery and intensive care (a senior surgeon), the operations manager of the surgical unit (a senior anesthetist), a charge nurse (an anesthetist nurse) and two staff nurses (responsible for anesthesia and surgery). During the sessions, the group analyzed the contradictions of situations in the patient care of their unit. These situations were "mirrored" to the participants on videotapes filmed by the researchers.

Eight intervention sessions (six project sessions and two follow-up sessions) took place at the hospital. I will focus on analyzing these sessions. All eight 2-h sessions were videotaped by the researchers, who also conducted extensive ethnographic field research. The other data (in Table 1) supported the creation of this chapter.

3 Theory and Methodology of the Study

Activity theory and its application in developmental work research (see e.g. Engeström 1987, 2005; Sannino et al. 2009) represent a system view on organizational research. Activity theory provides tools for dealing with contradictions and creating system-level changes. The theory aims to explain how

¹The research group consisted of Yrjö Engeström (PI), Hannele Kerosuo, and the author (Anu Kajamaa). The contribution of other two researchers to this project is gratefully acknowledged.

individuals and collectives can expand their scope of action and create innovations. Activity theory views historicity, contradictions, locality, and employee and client participation as significant in organizational development, learning and change.

Activity is always collective and driven by a shared object-related motive (Leont'ev 1978). The sense and meaning of actions are attached to the object of an activity (Vygotsky 1978). Expansive learning is triggered by disturbances, contradictions and concrete innovative actions (Engeström 1987). Local conflicts and dilemmas are connected to larger underlying societal contradictions (Engeström and Sannino 2011).

Discursive manifestations of contradictions can be identified from the intervention sessions with linguistic cues. *Double binds* are processes in which actors constantly face a pressing need to do something and have contradictory alternatives. A *dilemma* is an expression or exchange of incompatible evaluations, either between people or within the discourse of a single person. *Conflicts* take the form of resistance, disagreement, argument and criticism. *Critical conflicts* are situations in which people face inner doubts caused by contradictory motives unsolvable by the individual alone (Engeström and Sannino 2011: 373–374).

In the analysis conducted for this chapter, I traced the discursive manifestations of contradictions during the eight intervention sessions. Then, I depicted solutions for the contradictions collectively created by the employees and management. Innovations are here seen as collectively created solutions to the contradictions promoting organizational change, learning and the reconceptualization of the object of activity (i.e. patient care in the surgical unit). Table 2 summarizes the results.

4 The Creation of a New Activity and Management Model and Its Consequences

The collaborative work development intervention brought representatives of different professional groups of the surgical unit and its management together into a learning environment. The main problems detected in the first session were patients on the waiting list to be operated on, the closures and the lack of efficiency of the operation theaters (due to sick leave), the overbooked recovery room, and problems during emergency duty. The dispersion of the activity of anesthesia around the hospital was a serious problem causing delays in the operations. Other problems mentioned were a lack of responsibility taking, poor information flow and weak collaboration between the anesthetists and the surgeons.

During the first session, double binds emerged as the dominant type of discursive manifestations of systemic contradictions. The double binds were expressed by individual participants of the working group who had repeatedly faced pressing and equally unacceptable alternatives in their activity. The double binds typically triggered collective questioning of the current work practices of the surgical unit. An example of a double bind:

It is a problem that many patients are on the waiting list for operations and there is pressure [from the hospital management] to have them operated on. And we can also see that in the public media. You are caught between a rock and a hard place all the time, and it creates a continuous sense of failure among us who are operating. (Operations manager (senior anesthetist doctor), September 28, 2006)

In the second and third session, the participants continued identifying the problems. In these two sessions, different kinds of dilemmas were expressed as the dominant type of discursive manifestations of contradictions. They were expressed by individual participants or arose in dialogue between people. The dilemmas typically included hesitations and hedges. They were not resolved in the session in which they were raised but were repeated time and again in following sessions. An example of a dilemma:

On one hand I agree with him [with another surgeon about the needed changes], but I have an impression, I can be wrong, but every time these issues [changing the activity of the unit] are discussed, I have encountered a strict no as an answer, there are no resources, no time, or no this and no that. On the top of this, these guys do not have any idea how to handle emergency duties during the day or night time. (Surgeon, November 2, 2006)

In the third session, the participants realized that the unit needed to be simultaneously small and focused and to be able to handle the complex organizational system, as an *ambidextrous* organization. To achieve this, the participants collectively realized that the unit needed a new activity and management model. The operations manager (the senior anesthetist doctor) proposed an idea for a new model which gained collective acceptance and support. She suggested that the unit should be divided into smaller areas according to surgical specialties. The participants also realized that the reorganization of the recovery room was key to organizational change.

A collective decision was made to transcend the detected contradictions by dividing the unit into three *activity areas* based on the surgical specialties with the recovery room as the fourth area. A schedule was made for the transfer from the old activity to the new model. The responsible surgeons and anesthetists were assigned to the activity areas. Certain staff members were designated to work in the recovery room. This proposal (depicted in Fig. 1) formed the basis for a new activity and management model, which later enabled the unit to overcome the crisis and to significantly increase its efficiency and quality of care.

No new discursive manifestations of systemic contradictions emerged in the fourth session. At this point the discussions carried out in the sessions intensified. In the fifth and sixth sessions possible future contradictions were envisioned, for example, whether the designed activity areas would be too small and restrict the flexible transfer of the staff members from one area to another. During the fifth and sixth sessions, conflicts were quite openly expressed as disagreements between the representatives of the different medical professional groups and between the medical practitioners and the management. These conflicts were either solved during the sessions or solutions were collectively negotiated for them. An example of a conflict:

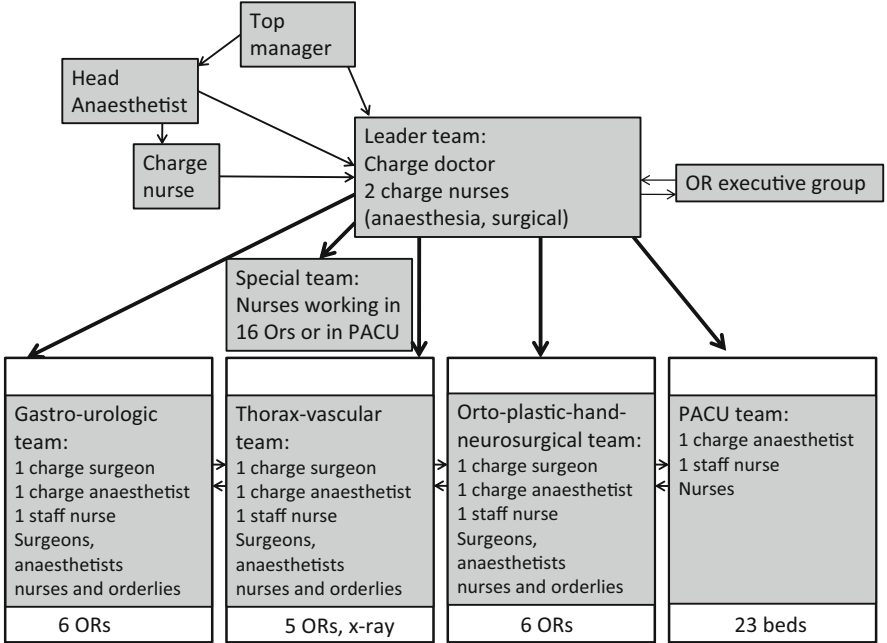


Fig. 1 The new activity and management model of the surgical operating unit (drawn by the operations manager)

It is not the nurse’s task to make the phone call. The nurse must refuse to make the call. This kind of a hassle increases the risk to the patient’s life! The one responsible for the call [a surgeon] needs to make it, not the nurse. It is totally wrong in this system that people, usually nurses, not responsible for certain tasks, try to cover other people’s jobs. One delegates one’s own tasks to others, this seems like a pretty serious crime to me. (The top manager (senior surgeon) of the result unit of the hospital for surgery and intensive care, December 14, 2006)

Our team of researchers then conducted follow-up field visits and depicted the resistance towards the new model. For instance, new coordination skills and new responsibilities were required in the model from the assistant nurses, and they took a large number of sick leave. However, most of the problems the unit faced had already existed before the intervention process. The management and the researchers decided to invite those resisting the model to two follow-up sessions to hear their suggestions for the cultivation of the model.

The first follow-up session was held 3 months after the implementation of the new model. In this session, critical conflicts emerged as some of the experienced nurses showed change resistance. The critical conflicts triggered collective solving efforts, which were put into practice by cultivating the activity model. An example of a critical conflict:

This needs to be admitted that we need people. Seriously, people [skilled nurses] to replace us [assistant nurses] when we are absent, we also have other duties than this [the coordination of the unit]. Or it needs to be rearranged again—the organization! (Assistant nurse, June 7, 2007)

Eight months later, in the second follow-up meeting, the participants reflected on the long-term consequences of the implemented model. A collective analysis of the critical conflicts led to small but important steps in further cultivating the model to better fit the needs of those actors who had felt somewhat neglected and overwhelmed by their new responsibilities. The change resistance was overcome and an important cultivation effort was accomplished by adjusting the division of labor more fairly between the activity areas.

Rare to activity-theoretical studies, I have longitudinally followed the consequences of the intervention project during 2008–2013. Towards the end of the intervention process, the surgical unit strengthened its community and started to show collective ownership over the care processes. The intervention was a very long and intensive process, and developments have continued after it. The implemented model became a device for the reconceptualization and expansion of the object of care activity, and it led to better integration of the patients' care processes. The integration later enhanced the practitioners' experience of meaningfulness and the mastery of their work.

Over the years, the collaboration between anesthesia and surgery and their management has sustained and is flexible. The recovery room, which previously caused major problems, became the most functional of the four activity areas. In 2013, the activity and management model is still in use at the surgical unit. To note, some of the contradictions were not resolved at all in the intervention process as others were considered more crucial.

The intervention promoted not just qualitative changes, but quantitative improvements also took place. Quantitative indicators show major improvements in the unit's functionality, quality and efficiency. By 2008, the unit had overcome its major problems and no operation theaters were closed (versus 100 sudden closings in 2005). During the years 2006–2008 sick leave decreased among anesthetic nurses by 30 %. The utilization rate in 2008 was higher than ever before, both for elective and emergency operations. In 2011 and 2012 the operation theaters still had no closings. During the years 2008 and 2012 the surgical unit led a nationwide comparison of 22 similar kinds of surgical units (hospital specific reference; see also Kajamaa 2011).

Discussion and Conclusions

Collaborative work development interventions involving medical practitioners, the health care management and researchers and focusing on radically transforming collective activity are still relatively alien to public sector health care. In a situation rarely seen in health care, the new activity and management model, the innovation presented in this study, is a collective creation of medical professionals and management. Its creation required breaking boundaries between professional groups. Both the management and the medical practitioners were actively involved in solving contradictions and developing their work in the intervention sessions. This led to overcoming a near crisis at the surgical unit. The qualitative and quantitative consequences demonstrate how the intervention became a resource for innovation and quality improvement.

This study shows that the contradictions paralyzing an organization's activity are often very difficult for the organization to identify. The consequences of organizational change efforts often fade away if contradictions are not resolved. Health care managers who make strategic decisions and direct changes need to realize this. Collaborative and research-assisted interventions can aid the explication and solving of contradictions. To create changes and to prevent crises, management needs to treat contradictions not as harmful, but as driving forces for organizational learning and change and to foster their collective analysis.

The predominant top-down directed reforms and management models have not brought very promising solutions to health care development (e.g. Kajamaa 2011; Vartiainen 2008). This is a great concern and has created acute development needs in public sector health care in Finland where the "free" services are funded through taxation. However, creating and managing organizational change in immediate and high pressure work situations is very challenging. Thus, space outside daily work situations is needed for collective reflection on and multi-voiced analysis of the contradictions of work practices.

Medical practitioners often lack adequate spaces, tools and models for monitoring and improving their activity. Collaborative work development, such as the intervention presented in this study, can be utilized as a platform for the co-design processes of new tools and models useful for both management and practitioners. The new tools and models can help practitioners to prevent crisis situations. To be sustainable, organizational changes need to be anchored into practice-oriented models (also Kajamaa 2010, 2011). The consequences of collaborative work development only become evident after a long period of time, as illustrated in this study (also Engeström et al. 2007). Management needs to secure lengthy time spans for promising new practices to realize.

(continued)

This study illustrates that collaborative work development holds a strong potential for organizational learning and change. It is, however, demanding, time consuming and resource heavy. These problems may inhibit management from trying new kinds of intervention methods when pressured with efficiency requirements in tandem with tightened resources. Yet in many health care organizations such as the surgical unit here, short-term development techniques have not brought the desired changes and this calls for alternative methods.

Collaborative work development provides researchers with rich material for the analysis of the current state and future needs of health care systems. The implementation and consolidation of organizational interventions, however, often remain unstudied (also Engeström et al. 2007). This study contributes to this research gap by analyzing the long-term consequences of a collaborative intervention. The study serves hospital development and the prevention of crisis situations in similar contexts to the hospital under study.

The methods used and lessons learned from the presented intervention have been utilized in Finnish health care by our research team to promote collaboration between primary care, specialized care and home care. To increasingly utilize collaborative work development as a resource for innovation and quality improvement calls for a new expanded vision of health care change from health care managers, researchers, medical education and political decision makers. To create radical change, these parties need to break boundaries and to collectively engage in the development of actual work activities. In the future, patients should also be invited to take part in intervention processes promoting patient-centered care.

Appendix

Table 1 Data collected from the surgical operating unit and its interfaces during the years 2006–2013

Types of data	Amount and contents of the data
Observations	Over 30 days in the surgical wards and its interfaces, such as the wards and the quality unit of the hospital, observing work activities; audio recordings and written field notes
In situ interviews	123 in situ interviews while following work situations of 2–55 min each; audio recordings and written field notes
Planned interviews	23 planned interviews of key informants at the surgical unit and its interfaces of approximately 2 h each; video recorded data
Intervention sessions	Six sessions of 2 h each with around 20 representatives (September–December 2006); video recorded data
Follow-ups of the intervention sessions	Two sessions (June 2007 and February 2008); video recorded data
The focal assessment tool design meeting	One meeting with head nurses, staff nurses and the quality controller (May 2007)
Followed care pathways of patients undergoing different surgeries	Six care pathways (the autumns of 2006 and 2007) in orthopedics, gastroenterology, key-hole surgery, heart surgery and neurosurgery; audio recordings and written field notes
Phone calls and e-mails	Around 230 e-mails and phone calls with the surgical unit and its interfaces (2006–2013)
Documents on the hospital's previous change projects and activities	670 pages of reports and documents related to the activities of the unit; memos, evaluations and audit reports of the result unit (2005–2008); briefs, annual plans, annual reports
Statistical data	Key figures of the surgical operating unit (2006–2008) and 2012
Photographs	362, taken by the researcher during field visits (2006–2008); pictures of people, buildings and work premises
Field notes	480 pages, written by the researcher during the field visits and at the office
Informational meetings	Two preparatory meetings with the hospital management and the researchers One informational meeting with the whole result unit Two activity area meetings One meeting with the operational management
Video conferences	Two between our research team and the surgical unit's management team

(continued)

Table 1 (continued)

Types of data	Amount and contents of the data
Preparatory meeting and board meetings for a second developmental work research project in the surgical unit	One preparatory meeting (2010) Two board meetings (2010) The new project took place during the years 2010–2012
The care pathways of patients undergoing different surgeries	16 care pathways followed in the same hospital by our research team for a new research project (2010–2011); audio recordings and written field notes

Table 2 Intervention sessions, the discursive manifestations of contradictions and the innovative solutions created

Date and main content of the intervention sessions	Content of the discursive manifestations of the contradictions during each session	Innovative solutions created to solve the contradictions during the sessions
Meeting 1, September 28, 2006 (2 h). Explicating the demands and challenges in the current activity of the unit	Double binds emerged: closures of the operation theaters, overload of the recovery room, problems during emergency duty, dispersion of the activity of anesthesia, difficulties in motivating the employees, the large number of sick leave, the lack of anesthetists	Better allocation and use of resources, division of the unit into smaller units or sections, clarification of the identity of the surgical unit, better orientation of the new employees
Meeting 2, October 12, 2006 (2 h). Further explication of the problems in the activity, depicting the underlying reasons for them	Dilemmas were expressed: unit too large to handle, confusion and a feeling of overall chaos, problems in the information flow, the lack of staff, problems in taking responsibility, payment issues, rotas and the working conditions, efficiency problems, the lack of skills among the nurses	Division of the unit into smaller units or sections, recruitment of staff, better planning of the activities, operation teams assigned to certain operation types, charge nurse assigned to the recovery room
Meeting 3, November 2, 2006 (2 h). Explication of the main contradictions within and between the activity systems of the surgical unit	Dilemmas were expressed: the main contradictions within the activity system of surgeons between their object of activity (the patients to be operated on in the waiting list) and the tools (closed operation theaters); within the activity system of anesthesia, the contradictions between the community (dispersion of the activity of the anesthesia) and	The idea of an ambidextrous organization: the complex system as well as the smaller areas need attention; divide the unit into 3–4 smaller units, distribute managerial duties to lower levels. The recovery room needs to take care of immediate post-operative care or just intensive care. The emergency activity should be organized

(continued)

Table 2 (continued)

Date and main content of the intervention sessions	Content of the discursive manifestations of the contradictions during each session	Innovative solutions created to solve the contradictions during the sessions
	the subjects (anesthetists and anesthetist nurses)	according to the types of surgical operations. The operations manager's model: divide the unit into smaller areas and distribute the managerial duties
Meeting 4, November 8, 2006 (2 h). Held outside the surgical unit to cultivate the ideas proposed in the previous meetings	No new discursive manifestations of contradictions were depicted	Negotiation between the activity systems to decide on how many areas the unit needs to be divided into and what their responsibilities are. A decision was made to divide the unit into three activity areas based on the surgical specialties with the recovery room as the fourth area
Meeting 5, November 23, 2006 (2 h). Evaluation and further cultivation of the new activity model, solving contradictions	Conflicts were quite openly expressed. A potential future contradiction: the designed activity areas may be too small and may restrict the flexible transfer of the staff members from one area to another	Ideas on how to reorganize the management of the unit. A schedule was made for the transfer from the old activity to the new activity and management model
Meeting 6, December 14, 2006 (2 h). Plans for the implementation and evaluation of the new activity and management model, solving contradictions	Conflicts were quite openly expressed. Potential future contradictions: the care in the recovery room and the continuity of care in the regular wards and in the intensive care units require special attention and resources, especially from the management	The reorganization of the recovery room is in a key role in the organizational change. The room needs designated staff members committed to working there. Responsible surgeons and anesthetists were assigned to activity areas 1–3. A decision was made to invite the (resisting) assistant nurses to the follow-up meetings
Follow-up meeting 1, June 7, 2007 (2.5 h). Experiences and evaluation of the functionality of the new model, solving contradictions	Critical conflicts emerged: the change resistance among the experienced nurses, the lack of nurses, the lack of skills, the large number of sick leave, problems in the information flow, too few management meetings. Due to the lack of staff, during the summer of	The idea to distribute the emergency duties and the division of labor more fairly between the activity areas

(continued)

Table 2 (continued)

Date and main content of the intervention sessions	Content of the discursive manifestations of the contradictions during each session	Innovative solutions created to solve the contradictions during the sessions
	2007 the unit had to transfer back to the old way of working and temporarily discard the use of the new activity model	
Follow-up meeting 2, February 25, 2008 (2 h). Experiences and evaluation of the functionality of the new model	Further cultivation of the activity and management model. Significant activity improvements. Practitioners' experience of meaningfulness and their mastery of their work	Reflections on the long-term consequences of the implemented model: a functional recovery room, good collaboration between the actors, continued use of the activity and management model

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Mobilizing the Potential of Interprofessional Collaboration

Mariline Comeau-Vallée

Abstract Health care professionals are nowadays called upon to work together. The numerous potential benefits of interprofessional collaboration are widely accepted in the health care sector (e.g., the improvement of care quality and performance, the reduction of costs, etc.). It is less obvious, however, how to induce truly interprofessional work that achieves the goals of high quality and efficient care. Indeed, it is not sufficient to simply bring different disciplines together. On the basis of the relevant literature and an ongoing research with interprofessional teams in the Canadian mental health care sector, I show two complementary and seemingly paradoxical ingredients that need to be understood for the effective implementation of interprofessional collaboration: (a) the establishment of boundaries that enable the different professional groups to function appropriately and (b) the maintenance of gray areas that allow flexibility in day to day adjustments. I argue that professionals need to find the right balance, which varies with the complexity of the specific clinical area of operation. Finally, I discuss the herewith associated implications, including the skills that health care managers must develop in order to support this paradoxical balance of collaboration.

1 Introduction

In the face of the increasing complexity of clinical problems, the spiraling costs of medical care and technology and the rising demand for services particularly among an aging population, today's health care organizations have no choice but to rethink their modes of organization. One approach to reorganizing the delivery of care involves the implementation of interprofessional collaboration that brings together members from different professions to work towards a common goal (Casto and Julia 1994; Leathard 2003; D'Amour et al. 2005). Interprofessional collaboration (e.g., between medical specialties and between doctors, nurses, psychologists, social workers and other professionals) is seen as way to overcome the

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fragmentation of knowledge resulting from specialization and to achieve superior quality care for clients, while reducing duplication (Gaboury et al. 2009). Thus, many organizations are promoting this form of arrangement in the hope of improving their performance (Heinemann 2002; Leathard 2003).

Although interprofessional collaboration is appealing because of its potential to improve quality and efficiency, its implementation is challenging. Research confirms that interprofessional collaboration is a complex activity that requires deft management (Minkman et al. 2009). Often, interprofessional teams do not work as intended; harmony among peers does not always emerge spontaneously. Conversely, the desire to preserve group cohesion at all costs can undermine the potential value offered by the rich diversity of expertise. In addition, the necessary redefinition of professional roles that teamwork demands seems to be a particularly important source of conflict (Jones 2006). In fact, D'Amour et al. (1999) explain that collaboration represents a significant challenge for professionals, because it implies a reversal of their traditional ways of working. Indeed, professions have historically been governed by a principle quite opposite to that of collaboration, i.e., "impermeability." As D'Amour et al. (1999; 70) comment, "Relations between professionals are [traditionally] parallel, cumulative and non-interactive." Thus, collaboration across professional boundaries represents a challenge for professionals, who are socialized into a logic of autonomy, rather than a logic of exchange, sharing and interaction. Professionals may be unsure about how to deal with this.

So how can different professional groups be brought to work productively together to achieve the goals of high quality and efficient care? Although this issue may apply to many sectors and industries, the question is particularly central to the health care sector given its increasing specialization and stratification. The scientific and technological developments of this sector over the last century have led to the rapid accumulation of knowledge, accompanied by an explosion in the number of professions and occupational groups (Brown 1982; Casto and Julia 1994; Baldwin 1996) from new medical specialties and subspecialties to paramedical occupational roles such as social workers, speech therapists, psycho-educators, occupational therapists etc. (Prudhomme 2007). While these developments enable advanced and refined interventions within each field of expertise, the challenge of bringing all this knowledge together for the benefit of the patient to ensure overall consistency in diagnoses and treatments can be quite significant, particularly for complex conditions (Minkman et al. 2009) such as cancer care, geriatrics, and mental health. Indeed no other sector has to deal with quite the complexity and diversity of professional roles as health care.

In this chapter, I show how interprofessional collaboration is based on two complementary and seemingly paradoxical ingredients that need to be understood for its effective management: (a) the establishment of boundaries that enable the different professional groups to function appropriately and (b) the maintenance of gray areas that allow flexibility in day to day adjustments. I argue that team members and managers of interprofessional care need to find the right balance, which varies according to the complexity of the specific clinical area of operations.

2 Two Ingredients for Effective Interprofessional Collaboration

A review of the literature on interprofessional collaboration in the health care sector, enriched by research underway with interprofessional teams in mental health care in Canada, reveals two essential ingredients for effective interprofessional collaboration.

First, to be effective, collaboration requires the establishment of some clear boundaries between the roles of members within the team (Nancarrow et al. 2013). Team members need reference points to organize their interactions with each other. There is a need to specify the role, including tasks and responsibilities, of each professional involved in the diagnosis, treatment and monitoring of patients (MacNaughton et al. 2013). In other words, formal boundary descriptions essentially summarize and clarify “who does what” within the team. Usually, professional qualification provides natural dividing lines for the work (Lamothe 1999; Duner 2013). Nevertheless, the roles of professionals in certain highly technical fields such as surgery or radiology tend to be clearer and more structured than those in less well-defined and more uncertain areas such as general practice, geriatrics and psychiatry. Similarly, paramedical roles can vary in clarity with psychosocial specialists such as social workers having broad but less well-defined roles than, for example psychologists or even nurses. This can partly be explained by the use of particular objects and tools associated with these technical professions such as specific tests and activities whose use is restricted to them (e.g., for diagnosis and prescription). Haldal (2010), for example, shows that radiology pictures guard the radiologists’ role because no one else can interpret them. Qualifications are however not the only source of boundaries. The determination of role boundaries can also be based on individual characteristics, such as demographic and personal variables (e.g., gender, age, and interests, personality, values, etc. respectively) (Casto and Julia 1994). These variables influence the relationship that a professional develops with his or her client. In return, the role that a professional plays within the team is also likely to be determined by the strength of the relationship with the client and not only by the profession.

A clear definition of role boundaries can also assist by establishing members’ status within the team. For example, if personal support workers, such as those who provide assistance in nursing tasks, ambulation and daily living are designated as participating in the decision-making process of developing a care plan, they can acquire valuable recognition within the team (Kontos et al. 2009), despite their relatively lower professional status. Similarly, in mental health, agreeing that paramedical professionals such as psychologists and social workers might conduct initial patient assessments instead of psychiatrists, gives them higher status, motivating them to contribute constructively to the team. In sum, the establishment of role boundaries, and therefore status boundaries, actually clarifies the rules of differentiation accepted within the team (Lingard et al. 2004). In addition to guiding members in their interactions, formal boundaries avoid chaos; they raise the sense

of purpose, in that they give everyone a reason to be part of the group. Collaboration is clearly favored when everyone feels recognized as “special.”

On the other hand, paradoxical as it may seem, interprofessional collaboration also draws its effectiveness from maintaining flexibility and some uncertainty with regard to roles and status. In the words of a health professional I interviewed: “everything is not clear cut, especially in the field of health in which the common object is a human being!” Thus, we see that collaboration also requires the presence of certain “gray areas”. These represent the zones of intersection where professionals’ roles merge and unite—this is where the boundaries fundamentally disappear. These areas favor the integration of team members, leaving ample room for mutual adjustment, compromise and negotiation (Lingard et al. 2004; Axelsson and Axelsson 2009). This may happen for example when it remains unclear which type of professional should do a clinical procedure, or when a professional may undertake a clinical practice that might not be included in his or her job description, but nevertheless agrees to do it to assist his or her colleagues.

Although these two ingredients offer angles for improving the effectiveness of interprofessional collaboration, they nevertheless show that it is not simple. Indeed, we see that interprofessional collaboration is simultaneously based on two opposing forces: differentiation and integration. Differentiation focuses on individuality, building on the notion that members must necessarily intervene in a distinctive way, at the forefront of their knowledge and characteristics, and make the best use of their unique expertise. In contrast, the notion of integration focuses more on the collectivity as a whole, drawing attention to the need for diverse members to intervene in a unified manner amplifying the cohesive strength of the group. So how then can interprofessional teams establish an effective and appropriate balance between these two forces?

3 Striking the Right Balance

There is no predetermined recipe defining the one best way to establish boundaries while providing gray areas for mutual adjustment. Each team is unique and should develop its own approach. However, one key variable emerges as particularly critical and may guide teams in establishing their internal balance. This is the complexity of clinical cases. In general, it seems that the higher the degree of complexity, that depends critically on the uncertainty of the diagnosis (i.e. patients are difficult to categorize)—the more team members need to emphasize integration rather than differentiation, and perceive themselves as a whole (Lamothe 1999; Thylefors et al. 2005). For example, the effectiveness of integrated collaboration is clear in palliative care units (Hall et al. 2007), oncology teams (Gagliardi et al 2011; Clausen et al 2012) and assertive community treatment (ACT) teams that treat patients with severe psychiatric disorders in the community (McGrew and Bond 1995). Understanding and improving the condition of patients with such complex conditions, necessarily requires an immersion of all professionals in all levels of

care. In these complex cases, it is often not the knowledge of the individual professional that matters so much, but the development of a common clinical interpretation of the case and a formula for treatment that is well-adapted to the individual patient. The team jointly develops a care plan which becomes the tool of treatment (Hall et al. 2007). Ultimately, although everyone contributes distinctive knowledge to the process, professionals share this knowledge widely, and may come over time to be relatively interchangeable or generalist. The plan is perceived as shared and owned by everyone; it does not belong to any single professional, neither is it integrated through a transmission of the chart between professionals (Lingard et al. 2004; Clausen et al. 2012). Rather professionals need to work closely together and the integrative dimension (flexibility and fluid but ambiguous relationships that can adapt to specific contingencies) is more important than the differentiating dimension (the establishment of clear roles and boundaries).

Conversely, when clinical cases are more circumscribed and diagnoses are easier to categorize, teams are more likely to organize themselves by focusing on the distinctive strengths of the individual members. In other words, the treatment is based on combining sequentially distinctive specializations rather than their synergistic merger. Some authors associate these cases with the notion of “multidisciplinary” rather than “interdisciplinary” collaboration, arguing that the latter necessarily involves a high degree of mutuality (Thylefors et al. 2005). However, this kind of collaboration is well exploited in very specialized care units, such as surgery, where each member has a highly specific role and maintains very specific technology or knowledge (Lamothe 1999).

Between these two extremes multiple possibilities exist, which balance differentiation and integration by erecting boundaries and determining gray areas, but on a temporary basis. Lamothe (1999) compares this arrangement to project teams—subgroups are created within the interprofessional team on the basis of the cases encountered. She observed this process in particular in rheumatology care. This form of collaboration is also used in pediatrics, where a variety of specialist subgroups are created, more or less ad hoc, around pediatricians (e.g. psychologists, social workers, speech therapists, school counselors) according to the patients’ specific needs (Stans et al. 2013). In general, this balance is ideal for moderately complex clinical cases that require central treatment with occasional interventions by different specialists who relay the case through the medical record.

4 Implications for Management

Interprofessional collaboration is intrinsically paradoxical, “both/and,” rather than “either/or”, embracing both sides of polarized forces, namely those of differentiation and integration. These two opposing forces are simultaneously present and necessary for achieving effective patient care. However, we have seen that balance can be achieved, especially by adjusting patterns of organization to the complexity of the clinical case handled by teams.

This requires managers of interprofessional teams to develop certain skills. These skills can be summarized under three headings. First health care managers should use management practices that are coherent with the paradox. This means that management practices should promote both differentiation *and* integration (Lüscher et al. 2006). Little is gained by depicting interprofessional collaboration in an idealized way, by emphasizing only its mutuality and unity (Lingard et al. 2004). Collaboration is needed precisely because no single profession can provide a complete answer. Yet suppressing variety to facilitate smooth interaction may simply undermine its value. Therefore, one crucial management practice is the organization of clinical interprofessional meetings, where professionals are encouraged to share their distinctive point of view regarding patients. Organized on a regular basis (i.e., daily, weekly or monthly, according to the intensity of the clinical follow-up), these meetings allow professionals to have direct face-to-face contact and develop a good collective understanding of clinical cases. This helps them to allocate roles, based on who might offer the best care and be most interested in the case. Clinical meetings can also enhance the cohesion among professionals as they share their emotional experience vis-à-vis the clients. This is especially true in the context of healthcare work, where professionals are exposed to human tragedy. In addition, managers can also plan internal training activities. For instance, in the mental health care case studied, managers organize formal training sessions in which, each month, a team member is invited to present a practice or a concept associated with his or her expertise to other team members. This is fruitful as it stimulates knowledge exchange among professionals and develops a learning culture (Minkman et al. 2009). Besides the organization of meetings, managers can also influence the team by assigning extra responsibilities, to each individual in the team. These would be in addition to their professional role and be related to their individual interest or personality (e.g. a facilitator role during clinical discussion, the responsibility for a specific clinical group). This accentuates differentiation as well as integration; each team member becomes unique and consequently essential for the team.

Second, managers need to take into account the specificities of each team's client base rather than automatically replicating standard models of collaboration. This implies that upper management (i.e., directors of a health care organization) also accept that there exist a variety of collaboration models in the organization. Health care does not necessarily require a highly integrated form of collaboration in all care units. Indeed, we have seen that the appropriate balance between differentiation and integration varies according to the complexity of clinical cases. Moreover, engagement in collaboration can be enhanced if professionals have the opportunity to participate in its developmental process (Casto and Julia 1994). Managers should thus provide time to brainstorm and collectively reflect on collaborative work (Lowe and Herranen 1978; West and Lyubovnikova 2013). One management practice that we have seen and which was especially effective in this regard is the organization of a special meeting called "staff day." This consists of a one-day meeting where team members are encouraged to have open discussions regarding the types of boundaries they would like to construct and the

areas they would like to leave open, according to the complexity of the clinical cases they serve. Managers can also play a leadership role in these discussions by reinforcing or softening professional boundaries according to the context of the team, requiring more or less formality in client assignments, and more or less flexibility from individual professionals (Chreim et al. 2013). This kind of meeting does not only clarify the functioning of the team, but normally also reinforces the sense of belonging of the team members, as they spend time together and intensively reflect on their collective process (Minkman et al. 2009).

Building on this, managers need to consider the collective process to be one of continuous development. This represents our third heading and means that boundaries and gray areas are subject to change and evolution (Lowe and Herranen 1978). As mentioned, in some cases, teams may need to set temporary boundaries and gray areas based on the idiosyncratic needs of each patient. This type of adaptation is especially important in the current context, i.e. the continued professionalization of health care, the emergence of new specializations (including emergency specialists) and the acquisition of new rights (e.g. the right to prescribe drugs for pharmacists and nurses) (Gheorghiu and Moatty 2005). These contextual changes require teams to be open to renegotiate their boundaries and gray areas. Thus, day long meetings like the one previously described must be organized on a regular basis, for example twice a year, to respect the processual nature of the team boundaries.

In conclusion, managing interprofessional collaboration is comparable to living on the “edge of chaos” (Brown and Eisenhardt 1998; Sull and Eisenhardt 2012). The general underlying insight is that collaborative work requires a certain degree of flexibility. While new boundaries that guide the work of collaboration may be regularly elaborated, space must be left for experimentation and reinvention. This may be seen as counter-cultural in relation to traditional management practices that insist above all that confusion should be avoided by calculating, planning, commanding, controlling, etc. The traditional approach needs to be more nuanced. The success of interprofessional collaboration relies in part on improvisation, adaptability, and a certain amount of organizational slack. Improvisation refers to professionals’ capacity to deal with gray areas that are unpredictable. Adaptability is the capacity to adjust boundaries when problems are encountered. Finally, slack provides needed time and space for non-task based interactions, that might seem unproductive on the surface, but that contribute to the creation of trust among collaborators and build the conditions that enable stronger integration (Brown and Eisenhardt 1998).

Given the continuing trends towards specialization, the health care systems of the future will increasingly need to rely on multiple professionals working together to provide optimal levels of care. As we have shown, this will require leaders and professionals with strong skills in the management of paradox.

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Managing Cross-Functional Collaboration to Improve Innovativeness in Hospitals: An Overview of Hospital-Specific Characteristics and Success Factors

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Abstract Cross-functional collaboration is an opportunity to improve innovativeness in hospitals and, thus, address current challenges in healthcare. To fully benefit from the positive effects of cross-functional collaboration and simultaneously avoid potential negative effects, cross-functional collaboration must be managed actively. However, hospitals have specific characteristics that distinguish them from other industries and that have the potential to impede cross-functional collaboration. Therefore, hospital-specific characteristics must be identified and considered during the implementation and management of cross-functional collaboration. Furthermore, the literature provides numerous success factors for cross-functional collaboration. The aim here is to identify the most relevant and applicable factors. This chapter briefly summarizes the current research on cross-functional collaboration in general, as well as in a hospital-specific context. Furthermore, it describes in detail the most important hospital-specific characteristics and presents a structured overview of applicable success factors of cross-functional collaboration, which can increase the effectiveness of cross-functional collaboration in hospitals.

1 Introduction

Hospitals face a broad spectrum of challenges, including an aging population, new medical and information technologies, higher quality standards, as well as increased requirements for hygiene, expectations for transparency, pressure to reduce costs, shortages of labor, and, particularly, integration of outpatient, rehabilitative and preventive care in hospitals. At the same time, demand for new health care products and services is increasing among patients (Schultz et al. 2013a; Gilmartin and D'Aunno 2007; Ramanujam and Rousseau 2006).

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In an environment as competitive as that of health care, hospitals can address these challenges and simultaneously gain a competitive advantage by adapting to these changing circumstances through innovation (Garman et al. 2006). West and Wallace (1991) define innovation generally as:

[...] the intentional introduction and application within a role, group or organization of ideas, processes, products or procedures, new to the relevant unit of adoption, designed to significantly benefit the individual, the group, organization or wider society.

This definition illustrates the wide range of opportunities for innovation and can be applied to the hospital sector. In the case of hospitals, innovations involve not only introducing new medical and pharmaceutical products, rather designing visible-to-patient, invisible-to-patient and inter-organizational processes and providing new services (Schultz et al. 2011; Salge and Vera 2009).

Hospital innovations often originate from ideas from hospital staff, who have the most knowledge of their organization and work environment (Salge and Vera 2009). Figure 1 shows the results of an own empirical study with the purpose to research the individual innovative work behavior of hospital employees. The survey included 256 hospital employees (physicians, nursing and administrative employees of several hierarchical levels) and was conducted across all departments of three German hospitals. The results of this survey confirm that hospital employees conceive a large proportion of ideas that lead to innovation and communicate these ideas to their supervisors or colleagues.

However, experiences in hospitals reveal that innovations often encounter resistance within hospitals because changes generally affect several departments, employees and familiar processes and thus are not necessarily easy to implement (Garman et al. 2006; Ramanujam and Rousseau 2006). Therefore, the initiation, development and implementation of innovative hospital services and processes require extensive collaboration among hospital staff. However, hospitals are characterized by a rigid hierarchy and strong boundaries between professional groups (especially between physician, nursing staff and administrative staff) as well as

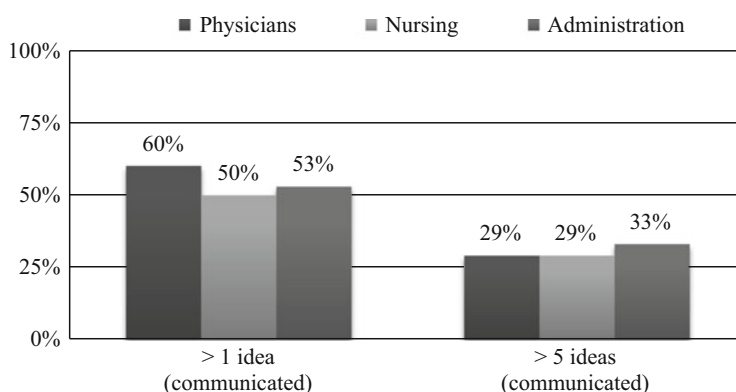


Fig. 1 Proportion of hospital employees with >1 (or >5) communicated ideas in the last 2 years

between departments (Garman et al. 2006). Communicating and designing processes across these group or department boundaries are often difficult. Such difficulties limit the creativity and collective learning processes within hospitals, which are important for increasing interdisciplinary innovations as well as interdepartmental processes. To foster intensive communication and knowledge exchange, which are essential for innovation, it is crucial to break down these rigid structures and to overcome existing barriers. Implementing and managing cross-functional collaboration can support this process (Griffin and Hauser 1996).

This chapter is organized as follows: The introduction presented the current challenges for hospitals and mentioned an opportunity to meet those challenges by improving innovativeness in managing cross-functional collaboration. The next section provides a brief overview of the current research on cross-functional collaboration, in general, as well as in a hospital-specific context. The following section presents hospital-specific characteristics that make managing cross-functional collaboration a special challenge in more detail. Finally, an overview of applicable success factors in cross-functional collaboration, which may increase the effectiveness of cross-functional collaboration in hospitals, is given.

2 Cross-Functional Collaboration

Cross-functional collaboration can help to minimize resistance, improve communication, increase individual knowledge, promote collective learning and thus facilitate innovation (Edmondson and Nembhard 2009; Holland et al. 2000; Griffin and Hauser 1996). Song et al. (1997) describe cross-functional collaboration in general as the interaction and information exchange between different organizational units. Holland et al. (2000) further specify a cross-functional team as:

[...] a group of people who apply different skills, with a high degree of interdependence, to ensure the effective delivery of a common organization objective.

Establishing cross-functional collaboration thus presents a challenge, as such collaboration always involves bringing together individuals with different cultures, perspectives, behaviors, norms and values (de Clercq et al. 2011; Griffin and Hauser 1996).

2.1 *Cross-Functional Collaboration and Innovation*

Research dominated by New Product Development studies provides no consistent results regarding the effect of cross-functional collaboration on innovation performance. In addition to numerous studies reporting positive effects of cross-functional collaboration on innovation performance (e.g., McDonough 2000; Frishammar and Hörte 2005), some studies also report no or a negative effect of

cross-functional collaboration on innovation performance (e.g., Ancona and Caldwell 1992). The literature describes that cross-functional collaboration can have a positive impact on the following outcomes:

- Process and organizational performance (Song et al. 1997)
- Development speed (Griffin 1997)
- Project success (McDonough 2000)
- Organizational innovation (Frishammar and Hörte 2005)
- Innovative behavior (Drach-Zahavy and Somech 2001)

These improvements are attributed to the following characteristics of cross-functional collaboration:

- High quantity and variety of information (Edmondson and Nembhard 2009; Griffin 1997)
- Access to external knowledge through larger and different networks of team members (Keller 2001)
- Wide range of different perspectives (Edmondson and Nembhard 2009)
- Increased ease of coordination and integration (Ford and Randolph 1992)
- Improved opportunities for learning (Edmondson and Nembhard 2009)
- Increased absorption of new knowledge from the existence of a broader knowledge base (Edmondson and Nembhard 2009)
- Increased level of creativity (Fay et al. 2006)

Literature also mentioned a couple of reasons for potential negative consequences of cross-functional collaboration:

- Higher complexity of decision making (e.g., due to a larger number of different ideas and opinions) (Sethi 2000)
- Increased costs of integration (e.g., due to frequent meetings to facilitate information exchange) (Somech 2006)
- Higher number of conflicts (e.g., due to different perspectives) (Ancona and Caldwell 1992)
- Decreased group cohesion and increased stress levels from the greater level of effort required (Keller 2001)

Apparently, cross-functional collaboration does not automatically lead to improved performance or innovation (Somech 2006). The identified potential negative effects indicate that it is not sufficient to just implement cross-functional structures or form functionally heterogeneous work teams. However, especially with the focus on innovation, the positive effects of cross-functional collaboration should not be ignored. Therefore, cross-functional collaboration and necessary conditions for cross-functional collaboration must be managed so that the positive effects exceed any potential negative effects.

2.2 *Cross-Functional Collaboration in the Context of Hospitals*

For hospitals, the central concern is patient treatment and care rather than innovation. Similar to an innovation project, patient treatment is a highly complex task, which often differs for each participant and should be approached with the highest level of creativity and knowledge possible. Thus, the few existing team structures and team activities within a hospital are geared toward fulfilling these tasks. In this context, the literature increasingly discusses the implementation of so-called multidisciplinary teams (e.g., Moroney and Knowles 2006; Fay et al. 2006). Team-based work, in particular cross-functional collaboration, has been shown to improve patient care as well as organizational effectiveness (e.g., Garman et al. 2006). Positive examples of the use of multidisciplinary teams are reported for ward rounds (Moroney and Knowles 2006), wound care teams (Granick et al. 1998) and medical meetings (Molleman et al. 2010). Further, the use of cross-functional teams in emergency departments can reduce the throughput time and time to doctor and increase patient satisfaction (e.g., Larsson et al. 2012). Research shows that the use of cross-functional teams in the hospital sector can have a positive impact on the success of treatment, although studies also report no significant effect of the use of cross-functional teams on treatment success (e.g., Alexander et al. 2005).

Many positive examples demonstrate the usefulness of multidisciplinary teams for patient treatment. Therefore, cross-functional collaboration should also be expected to improve the innovation performance of hospitals, particularly because cross-functional collaboration is used in other industries to facilitate innovation.

However, the literature on hospitals seldom focuses on innovation (Salge and Vera 2009). Moreover, studies on cross-functional collaboration and innovation performance in the context of hospitals are particularly scarce. One such study, however, is that of Pinto and Pinto (1990), who finds a positive effect of cross-functional collaboration on certain innovation project outcomes. In addition, Fay et al. (2006) report a positive effect of multidisciplinary teams on innovation quality, but not on the quantity of innovations. Furthermore, Pinto et al. (1993) examine the antecedents of the relation between cross-functional collaboration and innovation in hospitals.

However, cross-functional collaboration in hospitals does not automatically lead to improved performance or innovation. As already described above, the use of cross-functional collaboration must be actively managed to yield positive benefits and avoid potential negative effects. Therefore, it is also helpful to examine possible frameworks for cross-functional collaboration and to identify the success factors for cross-functional collaboration. Particularly with regard to hospitals, it is important to consider the specific characteristics of these institutions before focusing on the success factors for cross-functional collaboration.

3 Hospital-Specific Characteristics

Hospitals have specific characteristics that distinguish them from other industries. Nembhard et al. (2009) presents several characteristics specific to hospitals that may hinder innovation in hospital. Based on this study, in the following section, the characteristics of hospital that may affect cross-functional collaboration and thus innovation performance in hospitals are described. Four main groups of hospital-specific characteristics are identified: (1) the characteristics of the workforce in hospitals, (2) the nature of the work in hospitals, (3) the performance and control systems and team-specific processes in hospitals and (4) leader-workforce relations in hospitals.

3.1 *Characteristics of the Workforce in Hospitals*

The hospital workforce is usually divided into three professional groups (physicians, nursing staff, administrative staff), which differ in their key identifying principles, field of responsibility, education, skills and abilities, among others (Garman et al. 2006). This tripartite personnel structure is reflected at all hierarchical levels and departments. Such a structure elicits identification at the professional group level while simultaneously preventing identification at the overall organization level and reducing motivation for cooperation between professional groups (van der Vegt and Bunderson 2005).

Compared with staff in other industries, hospital staff have a high level of education, spent a relatively long period of time receiving their education and their socialization occur primarily pre-employment (Garman et al. 2006; Ramanujam and Rousseau 2006). For example, physicians who generally socialize with other physicians may have difficulties relating to other hospital employees, thus intensifying identification at the professional group level and weakening identification at the organizational level (Ramanujam and Rousseau 2006). Further, individuals who strongly identify with their profession generally make smaller contributions to team performance (Fay et al. 2006).

Not only skills and abilities, which are necessary for patient treatment and care, but also the perspective on one's own person as well as on colleagues within and outside of the same professional group, are imparted during education. Deep-rooted hierarchical structures are established which prevail later in hospital work environments (Leape and Berwick 2005).

Medical education often overemphasizes the individual and reduces the importance of teamwork by focusing on providing solutions through qualified individuals rather than encouraging optimized approaches involving teams of individuals. Further, physicians have demanding schedules and avoid administrative work; thus, cross-functional collaborative activities are often considered to be of low importance (Garman et al. 2006).

The health care system is highly specialized and fragmented, because comprehensive and complex medical knowledge is required in the various fields within the industry (Leape and Berwick 2005). In addition to the various existing specializations of physicians, an increasing number of nursing specializations as well as specialized therapists, nutritionists, pharmacists, and so forth are being added to hospitals (Ramanujam and Rousseau 2006). The fragmentation of the health care system based on expertise is also reflected in the variety of departments and clinics within hospitals. An organizational structure based on function and the spatial distance associated with such a structure can intensify interaction barriers between various departments and clinics.

Differences in very specific medical knowledge between professional groups may also increase opportunism in hospitals by undermining the authority of other departments and influencing organizational decisions based on particular interests (Garman et al. 2006). For example, hospital managers often have to manage physicians who still want to influence everyday administrative issues (Gilmartin and D'Aunno 2007).

3.2 Nature of the Work in Hospitals

The primary task of a hospital is to treat and care for patients. This task is highly complex and is associated with high risk. Thus, hospital staff tends to be risk averse, have an increased need for control and approach uncertainties with skepticism (Bohmer 2005). Further, important and well-established norms for patient treatment, such as low fault tolerance or prioritization of loss prevention, increase the risk averseness of hospital staff (Ramanujam and Rousseau 2006; Garman et al. 2006; Nembhard et al. 2009). These norms can affect other matters where uncertainties arise, increase skepticism and the need for control and thus negatively affecting cooperation within heterogeneous teams.

Moreover, hospitals often have a variety of missions and associated tasks (e.g., clinical care, community service and outreach, teaching, research, profit making, and, in some cases, religious values) (Ramanujam and Rousseau 2006). In addition, hospitals are challenged by low staff coverage and cost pressures (Schultz et al. 2011). The workforce is overloaded and operates under constant time and efficiency pressure. Thus, communication and knowledge exchange with other staff or departments often become less important.

3.3 Performance and Control Systems and Team-Specific Processes in Hospitals

Performance and control systems are underrepresented in hospitals (Leape and Berwick 2005). Hospital employees often have negative perceptions of such systems, because they believe that these systems do not accurately reflect their performance and that the data may be used against them (Kurtzman et al. 2011). Accordingly, operational information systems can hardly reflect individual behavior or results and thus complicate cross-functional collaboration. There is little transparency regarding the relevance of collaboration between professional groups, departments or hierarchies in hospitals. Furthermore, the effect of changing working practices on quality and efficiency is difficult to measure and to attribute to an individual group. Thus, employees have little motivation to be active in hospitals beyond performing their responsibilities and supporting projects.

Project-oriented organization structures, which are often present in research-intensive areas of other industries (Griffin and Hauser 1996), as well as tools and processes that encourage communication across departmental, professional and hierarchical levels rarely exist in hospitals. In addition, the use of classic project management is in its infancy in many hospitals. These factors reduce the motivation and ability of employees to work beyond existing boundaries or within heterogeneous teams.

3.4 Leader-Workforce Relations in Hospitals

In hospitals, a transactional approach to leadership is predominantly used for interactions with the workforce (Gilmartin and D'Aunno 2007). Once a transaction is completed, the interaction between the involved parties ends. Similarities of transactions are often not recognized, and thus, employees focus on their own goals and pursue these goals exclusively. Research shows that a relational style of leadership is appropriate when superordinate goals are more important than individual or departmental objectives (Vera and Crossan 2004). Therefore, the transactional approach to leadership is an obstacle to the creation of a working environment and an organizational culture that aim to motivate employees to collaborate across functions.

Further, solidified conflicts between business-oriented management and medical staff impede collaboration. Both groups allow the other party to participate in decision making only to a limited extent, which intensifies the groups' lack of understanding of the other's position and increases the likelihood of groupthink.

In summary, there are substantial difficulties involved in using the heterogeneous attitudes, abilities, skills and mindsets of the different individuals in hospitals to enhance creativity and performance. The specific characteristics of hospitals and the organizational culture within hospitals that hardly prioritizes cooperation hinder the direct collaboration between different departmental, professional or hierarchical levels.

4 Success Factors of Cross-Functional Collaboration in Hospitals

An own empirical study¹ shows that hospital employees are aware of the importance of cross-functional collaboration and that supervisors as well as colleagues expect collaboration across different functions (including different departments, professional groups and hierarchical levels). However, apparently, they do not believe that cross-functional collaboration is beneficial for their careers (see Fig. 2).

It is therefore not surprising that in terms of cross-functional collaboration potential for improvement remains. Figure 3 shows the results of the evaluation of current cross-functional collaboration among hospital employees that support the statement that in terms of cross-functional collaboration potential for improvement remains.

A major purpose of cross-functional collaboration is to break down barriers between different functional areas in hospitals with various organizational measures (e.g., team building, project management) (Edmondson and Nembhard 2009). In addition to cross-departmental barriers, obstacles between various professional groups and different hierarchical levels must be removed to achieve the greatest benefits from cross-functional collaboration. Consequently, cross-functional collaboration in hospitals involves a greater number of levels of employees compared with other industries. For example, in addition to members of various departments, a cross-functional team should include members of different professional groups and of different hierarchical levels.

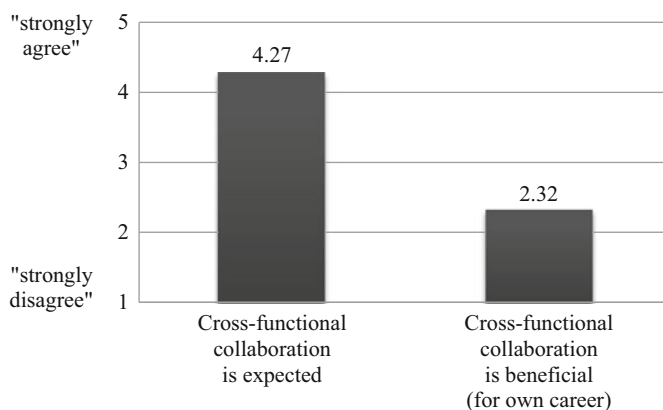


Fig. 2 Expectations regarding cross-functional collaboration

¹ Based on an own empirical study of 256 hospital employees (including physicians, nursing and administrative employees of several hierarchical levels) conducted across all departments of three German hospitals.

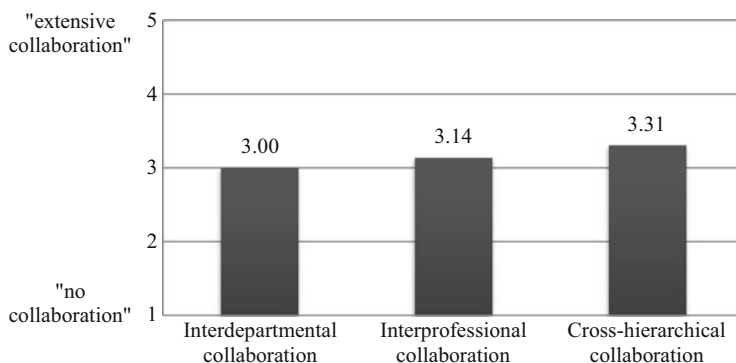


Fig. 3 Evaluation of current cross-functional collaboration

In hospitals, most task fulfillment, namely, that of daily routine tasks, occurs at the individual level. Collaboration outside given (temporary) teamwork structures in hospitals is also important.

Edmondson and Nemhard (2009) describe a positive relationship between the duration of the cross-functional collaboration and performance. Cross-functional collaboration should be encouraged within teams. Beyond that, an organizational environment should be created that enables and supports permanent cross-functional collaboration.

To take advantage of cross-functional collaboration, hospitals should not only implement short-term organizational changes (e.g., team building) but also create a work environment that supports cross-functional collaboration across all levels: departmental, professional and hierarchical. Creating such a work environment requires a new mindset for all hospital employees and the willingness to undergo a continuous process of change.

To successfully support cross-functional collaboration in hospitals and enhance effectiveness and efficiency of cross-functional collaboration, particularly in terms of innovation performance, hospital management should consider the recommendations presented above and take into account the success factors of cross-functional collaboration, as presented below.

Based on the framework of Holland et al. (2000), the following overview presents applicable success factors of cross-functional collaboration, clustered in six groups, which can increase the effectiveness of cross-functional collaboration in hospitals.

4.1 Group Composition

Regarding group composition, it is important to consider the complexity of interaction barriers and to determine the appropriate mix of individuals for the group

(Holland et al. 2000). In addition to the goal of forming a heterogeneous group covering as many different functions as possible, achieving a balanced group size is also important. Too many or too few members can reduce team performance. Research shows that a group size of approximately six members has been proven optimal (Holland et al. 2000).

Furthermore, clear roles and responsibilities should be defined within a group to counteract interaction barriers between hierarchical levels (Ramanujam and Rousseau 2006).

4.2 Task Design

In designing tasks, it should be taken into consideration that tasks are simultaneously important and challenging (Denison et al. 1996). Moreover, tasks should be designed to involve formal yet flexible integrative processes.

Setting clearly defined goals is crucial, because group work can be aligned with these goals and the results of teamwork can be measured. Furthermore, superordinate goals encourage cross-functional collaboration because they are conducive to overcoming social categorization (Fay et al. 2006; Pinto et al. 1993).

4.3 Internal Processes

Internal processes that stimulate communication (Song et al. 1997) and frequent and voluntary interaction (Fay et al. 2006) help to break down interaction barriers and thus promote cross-functional collaboration.

Effective communication structures and project management (e.g., team rules and procedures) are important for the success of cross-functional collaboration (Pinto et al. 1993).

Furthermore, physical proximity is a crucial facilitator of cross-functional collaboration (Pinto et al. 1993), particularly since hospital departments are often spread over several buildings across a large area or at different locations.

4.4 Group Psychosocial Traits

In hospitals, where many very different individuals interact, mutual respect and trust are important and should be supported (Fay et al. 2006; McDonough 2000).

Hospital management should actively encourage flexibility and openness to new ideas as well as the willingness to change (Jassawalla and Sashittal 1998). Promoting these values will have a positive effect on cooperation and create the basis for an innovation-friendly culture.

4.5 *Organizational Context*

The success factors of cross-functional collaboration in the organizational context are very diverse. Because of the large number of different departments and clinics in hospitals, strategic alignment between departments and clinics is required to communicate superordinate goals at the department level (Kahn 1996). Cross-functional initiatives and associated projects should be aligned with these goals.

Initiating cross-functional collaboration requires resources, which should be budgeted for by hospital management, without any further burden on employees (Denison et al. 1996).

Incentive structures to reward cross-functional collaboration should be implemented within the compensation schemes of the different professional groups in hospitals (Griffin and Hauser 1996; Garman et al. 2006)

In particular, to improve innovation performance, well-structured and regulated innovation processes should be implemented. These processes, particularly those for product development, should divide the innovation process in predefined phases. At the end of each phase (usually after a milestone is achieved), it is necessary to make a decision about the further course of the innovation process. Structured processes can facilitate collaboration among cross-functional teams by defining tasks and providing clear decision points (Schultz et al. 2013b).

However, such professional innovation management requires clearly defined institutional responsibility within a hospital. Such an innovation management function would allow relevant knowledge to be acquired, necessary processes to be defined and tracked and employees to receive assistance (Labitzke et al. 2012).

Furthermore, research shows that a participative leadership style can foster the innovation performance of highly cross-functional teams in hospitals (Somech 2006).

4.6 *External Processes*

In addition to the focus on teams, hospital management should also focus on external group processes. Employees need to be encouraged to actively use their networks within and outside the organization to enhance the advantages of using heterogeneous teams (Schultz and Schreyögg 2013).

In addition, a gatekeeper can increase the acceptance of cross-functional collaboration across functional areas and help break down barriers to collaboration (Holland et al. 2000).

Conclusion

These days, hospitals are facing enormous challenges, which can be tackled by increasing their innovativeness. Cross-functional collaboration is one possible approach to increase performance and innovation in hospitals. However, the literature also presents negative effects of cross-functional collaboration. Thus, cross-functional collaboration does not work automatically but must be managed actively.

In summary, the aim of this chapter was to present the potential of cross-functional collaboration for hospitals. Research shows that cross-functional collaboration also can be used successfully in hospitals, especially to increase innovation (Pinto and Pinto 1990; Fay et al. 2006). Particularly through its positive effects on innovation, cross-functional collaboration can provide an approach for meeting the current challenges in healthcare. However, hospitals have specific characteristics that distinguish them from other industries and should be considered. It is essential to recognize the hospital-specific characteristics and take them into account while implementing and managing cross-functional collaboration.

Paying attention to the most common success factors can help to manage cross-functional collaboration and, thus, strengthen the positive effects and avoid potential negative effects. Beyond that, among the numerous success factors, highly relevant factors, especially with regard to the hospital-specific characteristics, should be identified. The overview of success factors presented in this study can stimulate cross-functional collaboration in hospitals, particularly with regard to innovation. It does not claim to be a comprehensive or exhaustive list of success factors of cross-functional collaboration; rather, it indicates the variety of factors that affect cross-functional collaboration, particularly in hospitals.

Future research should continue identifying success factors of cross-functional collaboration in general (e.g., by contributing to the extensive body of research on cross-functional collaboration in new product development) and in hospitals. Furthermore, the applicability of the findings and recommendation to the hospital context should be confirmed by future research.

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From Multi-professional to Trans-professional Healthcare Teams: The Critical Role of Innovation Projects

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Each profession owns a professional jurisdiction or scope of practice, which impacts the delivery of services. This silo-like division of professional responsibilities is rarely naturally nor cohesively integrated in a manner which meets the needs of both the clients and the professionals.
(D'Amour and Oandasan 2005)

Abstract This chapter addresses change and interprofessional collaboration in health care by contrasting two forms of collaborations. The first occurs in ongoing service delivery while the other takes place in project teams that are by definition temporary. Most practitioners and scholars discuss the many challenges of interprofessional collaboration in the context of continuous change efforts. However, collaboration differs when the need for change is more radical and innovative. The chapter explains why, and offers insight on how to manage projects interprofessionally.

1 Introduction

The mood on the unit is far from perfect. All know that they are doing the best they can, but they also feel that they could be doing better. There are glitches that seem to be unfixable, especially since staff turnover has gone up. Everybody involved knows that sometimes urgent cases wait longer than they should. Concerned with improving intake at the maternity ward, the nurse manager comes to the inevitable conclusion: on-off discussions between shifts, hastily conducted briefings, and troubleshooting conversations with other nurses and obstetricians, can no longer suffice to ensure the proper management of ongoing issues (prioritisation) and can no longer help address priorities on the unit. A “new”

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prioritization process is necessary. Obstetricians were asked to lead the way, but there is pushback. They already gave their recommendations; why aren't they followed? Nurses are left wondering what they would change if they were put in charge of fixing how things are done. But how could they implement the changes?

This vignette is an illustration of many change initiatives we witnessed in our work helping healthcare project teams implement change. The key points are similar across situations. First, the vignette shows a shared realisation that change is necessary, but that it can no longer occur through a slow, incremental and continuous process. This shared realisation signals the need for a more radical approach, where some form of innovation must take place and be implemented. This in turn implies that there is a clear “before” and “after” the innovation, and some kind of organized process in between. Second, a common understanding that the usual work roles that define “who does what”, including leadership and management tasks, no longer apply when the goal shifts from caring for patients to fixing “the system”. Finally, a mutual insight that chief clinicians, unit directors, obstetricians, residents, nurses, receptionists, patients and their loved ones all hold valuable experiences and knowledge about “the system” while at the same time realizing that nobody was ever trained in fixing “systems”. Our objective in this chapter is to show how and why healthcare professionals’ roles change when they are involved in a project designed to bring about innovation. Our hope is that this will contribute to better project management and collaboration within healthcare project teams. We start by discussing different forms of collaboration, contrast what collaboration means when one is involved in service work and continuous improvement as opposed to project work and radical change, and conclude with why innovative change projects open the path towards trans-professional collaboration.

All healthcare professionals are trained in the subtleties of continuous improvement in order to provide the best possible care to their patients. It is part of their training and they know it is a role they must play. A work role is “the total set of performance responsibilities associated with one’s employment” (Murphy and Jackson 1999) and is “defined as a set of expectations about behaviour” (Rizzo et al. 1970) within a given context. Obviously, the job of healthcare professionals is to care for people—that is what they expect themselves and each other to do. There is a consensus nowadays that the growing complexity of the population healthcare needs requires more than adding each healthcare team members’ experiences and expertise in the production of the service (Hood 2012; D’Amour et al. 2005). Indeed, a multi-professional perspective is no longer sufficient (see Table 1). The synergy that results from inter-professional collaboration is a better response to patients’ needs. For this synergy to take place, each member of the team must interact more with each other, translate his/her knowledge, expertise, and experiences across disciplinary boundaries and cultures, integrate others’, and finally, the team must share decision-making and accountability (Hall 2005; D’Amour and Oandasan 2005). The shift from multi- to inter-professional collaboration is a challenge of course (San Martin Rodriguez et al. 2005), but a challenge compatible with continuous improvement; that is a challenge compatible with professionals’ go-to modality for change.

There is however a problem entrenched in this view. Continuous improvement and the shift from multi- to inter-professional collaboration as a response to increasingly

Table 1 Key definitions of concepts

Concept	Definition
Multi-professional collaboration	Several different professionals work on the same project but independently or in parallel (juxtaposition of various professionals and competencies), implying some coordination of actions
Inter-professional collaboration	Implies a greater degree of collaboration among members, where themes and schemes become shared and integrated—not solely juxtaposition, but rather a common space, cohesion, and shared ownership. Refers to a more structured entity, with common goals and decision-making processes—integration of knowledge and expertise, solving of more complex problems, more flexibility, more open professional boundaries (interdependent relationships)
Trans-professional collaboration	Consensus-seeking and opening up of professional boundaries is key—boundaries are blurred or vanished. Involves deliberate exchange of knowledge, skills, and expertise that transcends traditional disciplinary boundaries

Note: This table derives from the work of D’Amour et al. (2005)

complex healthcare needs is usually understood from the perspective of immediate patients’ needs. Indeed, inter-professional collaboration is usually seen as an active relationship of structured interactions that stem from joint clinical interests, and aims at problem-solving patients’ needs and delivering effective care (D’Amour 1999; Barr et al. 2008; Hood 2012; San Martin Rodriguez et al. 2005). But what happens when healthcare professionals must work in teams and collaborate on important goals that are *not* immediately related to patient care? The answer to this question requires distinguishing the activities related to providing patient care from other types of systems’ improvement activities which implies a different type of collaboration.

2 One Step Back, Two Steps Forward

At the most basic level, health care is designed to improve individuals’ health. Patients (or users, or beneficiaries) have needs that require addressing and hospitals, clinics, and all other kinds of healthcare organisations provide services to address those needs. Physicians, nurses, social workers, psychologists, nutritionists and many other specialists, including support staff, work interdependently to deliver health services. They are usually grouped in units that specialise in a type of care (e.g., primary, acute, long-term care), specialise in various interventions (e.g., surgery, emergency), perform their work in a physical space (e.g., clinic, community center, hospital), focus on a wide-range of health problems or rather deal specifically with certain health issues (e.g., diabetes, cancer). Depending on the country and healthcare system these components can be combined in a number of ways which often include inter-organisational coordination. What is common though is that healthcare is providing a service to the population’s health care needs.

This type of service work is continuous and involves multiple, relatively short, discreet work episodes (Sundstrom et al. 2000) aimed directly at patients either with

professional-patient interactions (e.g., medical staff caring for critically ill patients) or indirectly through professional-professional interactions (e.g., laboratory professionals providing sample reports to physicians). Although team composition changes regularly (i.e., personnel working on shifts or staff rotations) and each patient is different, service work is ongoing from an organizational perspective because units rely on well-defined roles, clear processes, and streamlined predictable protocols. When service work occurs inter-professionally, the main feature of collaboration is the coordination of services rendered to patients (Sicotte et al. 2002). When healthcare service delivery is optimized, each professional knows how to activate their unique skills and expertise to face the complexity and uniqueness of the patient's needs (Suter et al. 2012). For example, an ICU patient may have a complex, rare, and unique condition, but his/her needs can be addressed because protocols to deliver health care are known, and roles have been negotiated and defined within the boundaries of their professional practices. It is within such complex service delivery settings that—rightfully so—multi-professional collaboration is no longer seen as adequate. In that context inter-professional collaboration offers the promise of better patients' health outcomes through the synergy that emerges from rich inter-professional collaboration.

But service work is not the only form of work healthcare professionals are asked to tackle. Healthcare is an open operational system (Yasin et al. 2002) and system issues are on the rise (Paradis and Reeves 2013). In addition to providing health care, healthcare professionals must also work on projects that aim at fixing the system. Implementing a new form of healthcare service delivery such as Family Health Teams (Goldman et al. 2010b) implies that the system needs adjusting or "fixing". It is only after the system is efficient that healthcare professionals can be effective at attending the health of their patients. It is important to recognise that while healthcare professionals are trained at "fixing"/caring for patients, they are not trained at fixing systems. Fixing systems is not healthcare service delivery. Fixing systems is project work and can be related to a multitude of issues related to work processes, manpower planning or the implementation of new clinical or administrative policies.

Project work is very different from ongoing service work in at least three ways (Hobbs 2014; Chiocchio and Essiembre 2009). First, a project is a temporary and transient organization within the larger organization (Turner and Müller 2003) designed to create something new or sufficiently different to be considered innovative (Schippers et al. 2012). Projects are temporary because from the point of view of how the organization operates, there is a clear "before" and "after". In between the two, a special team is formed and must work towards the projects' goal. Over a relatively long period of time, usually at least a few months, project team members invest all or part of their time away from patients and the delivery of health services knowing that their efforts at fixing the system will eventually benefit patients. Contrary to service work, the tasks that characterize project work are not meant to last. Whatever activities are necessary to produce, say, a completely redesigned maternity ward triage procedure will not exist beyond the launch of the new triage procedure. Project-related work activities such as planning,

consulting, designing, testing, will be terminated once the new triage procedure will have successfully replaced the old one. As such, project work often precedes the launch of new or better ongoing services (Perminova et al. 2008; Davies and Brady 2000). The temporary nature of project work directly impacts decision-making. For example, continuous improvement is based on short work-cycles. Results from mutual integration of each other's perspectives can be implemented fairly rapidly, and its success assessed while the decision and the decision-making process are still fresh. Projects on the other hand have much longer life-cycles. It can take many weeks, even months, before an idea can be tested and feedback to analyse its effectiveness available. This implies that before adjustments to less-than-adequate decisions can be made, much time and energy will have been invested and the project delayed.

The second point of departure between project work and service work is that complexity is addressed differently. We have seen that addressing complexity in healthcare service delivery requires a shift from adding different perspectives to integrating each other's perspectives in order to achieve synergy (e.g., shifting from multi- to inter-professional collaboration). In project work, complexity is handled through progressive elaboration and project risk management (Project Management Institute 2008). That is, at the beginning of the project the innovation and the process leading to the innovation are only broadly circumscribed. But as the project progresses towards completion both become better understood (Øvretveit et al. 2012; Project Management Institute 2008). For example, knowing that an innovative triage procedure needs to address issues of the current one is a necessary starting point. Exactly what that procedure will be becomes clear later in the project. Also, the kind of work necessary to identify and test the new procedure will need to be figured out during the project. Moreover, both the particularities of the innovation and the way to bring it to fruition will impact each other during the course of the project. Management techniques such as project planning, risk management, stakeholder management, (Besner and Hobbs 2008; Besner and Hobbs 2006) help to predict events or issues that will likely impede the success of the project. They also help identify counter measures to prevent these events or issues. For example, recognising mid-project that non-professional staff have a necessary say in the development and implementation of an innovative way of delivering healthcare services (cf. Goldman et al. 2010a) may require integrating their perspective and re-conceptualising the service itself.

The third difference is that while healthcare professionals can rely on their training and expertise to deliver health care, and on defined interactions and protocols to address even the most complex medical case, project work is not taught in medical and health programs (Chiocchio et al. 2013). Given this, our experience has been that healthcare professionals involved in projects have a hard time shifting their mind-set from an "ongoing" to a "temporary" one, because they are unfamiliar with work roles that fit with project work. This very problem is however the cornerstone of how teams of healthcare professionals can move from being inter-professional teams to becoming trans-professional teams.

3 Becoming Trans-professional Teams

Having seen many healthcare project teams struggle and some succeed, we contend that as long as physicians, nurses, social workers, occupational therapists, support staff, etc., apply ongoing/continuous improvement logic to temporary/project work, their projects are likely to fail. That is, projects will not fully achieve their objectives, will be delivered later than they should have, will cost more of professionals' precious time than intended. Worst: a conflation of all these problems will thwart the change effort.

Service delivery's ongoing logic requires inter-professional collaboration. However, when healthcare professionals engage in fixing the system, they are extending their knowledge base from health care to "systemcare". This represents a work-role transition, one that implies an important re-orientation of goals (Ashforth and Saks 1995). Ashforth and Saks add that "work-role transitions constitute a period of discontinuity and flux where individuals and their roles must gravitate towards a new synchronization." (p. 157). This is particularly true when prior skills and knowledge are no longer sufficient to get the job done. In other words, knowing how to care for patients is necessary but is not sufficient to know how to care for the system.

The transition from the patient-focused healthcare professional to one that is also system-focused is a challenge that hinges on decisional latitude to change tasks and methods (Ashforth et al. 2000). While changing tasks and methods is possible in service delivery, it is much more constrained to begin with because it stems from healthcare professionals' specialized training. For example, (although counterexamples are not unheard of; see Kristof and WuDunn 2009), only surgeons can perform surgery. Complex healthcare needs call for specialization. Specialization will always foster role-specific tasks, the downside of which can only be solved by increased sharing and integrating, and shared accountability at the team level (i.e., inter-professional collaboration). This is why we believe that although ideal service delivery can and should shift from multi- to inter-professional collaboration, it cannot become trans-professional. Trans-professional collaboration is said to occur when translation is no longer necessary between disciplines as each team member has fully integrated others' unique contribution (D'Amour et al. 2005). We add that the only way to really know if full integration has taken place is if healthcare team members can fulfill each other's roles. This of course is not possible.

What makes project work unique however, is that it hinges *by definition* on team members' great decisional latitude over tasks and methods; that is "what" to do and "how" do to it (Turner and Cochrane 1993). The high novelty and change in decisional latitude that accompanies major changes in the principal objectives of the work such as attending the system's "health" rather than the patients' health triggers role exploration and role transition (Ashforth and Saks 1995). In other words, the transition from the patient-focused healthcare professional in a service team to one that is also system-focused in a project team implies that any team member can undertake the role of project manager, team leader, project

coordinator, knowledge integrator, liaison officer, or any role that the project requires. None of these roles hinge on prior boundary-forged expertise.

Viewed more broadly than through healthcare service delivery alone, collaboration is an interactive, constructive, and knowledge-based process, involving multiple autonomous and voluntary participants employing complementary skills and assets, with a collective objective of achieving an outcome beyond what the participants' capacity and willingness would allow them to accomplish individually (Hartono 2004). Collaboration can occur between people, teams, or organizations (Bedwell et al. 2012). Within a team, collaborative processes include communicating, coordinating and synchronizing activities between teammates (Chiocchio et al. 2012). This broader view—one that does not focus exclusively on patient health—helps apply the concept of collaboration differentially whether work is organised as service work or project work. From that, we contend that inter-professional work occurs when the focus is on patient welfare and trans-professional collaboration occurs when the focus is on system welfare.

Concluding Remarks

As the quote at the beginning of the chapter implies, different forms of collaboration in health care are seen exclusively in terms of patients' needs. There remains many difficulties in defining collaboration and the people that collaborate (Hood 2012). Multi-, inter- and trans- prefixes are often used randomly and their meaning remain imprecise (McCallin 2001). One way to untangle the vocabulary and the concepts they represent is to examine different ways healthcare professionals are asked to address complexity; namely service and project work.

In both forms of work, complexity fosters the need to assemble individuals across functions, disciplines, professions, even organizations. However, while service and project work are both complex and carry their share of challenges, what professionals need to do to respond to this complexity differs markedly whether they are engaging in ongoing service work or project work. This differential view of collaboration underscore that a shift from multi- to inter-professional collaboration is necessary in providing services, but that a shift from inter- to trans-professional collaboration is only possible if healthcare professionals are engaged in project work.

Innovation projects—where an organisation and its stakeholders see the need to make radical rather than incremental improvements to its processes—contribute to adding new roles that physicians, nurses, nutritionists, and patients and their families must play to see their project through. These new roles are challenging, but they offer the real possibility of trans-professional collaboration. Finally, keeping in mind that the values of quality and safety of patient care are at the core of health care team's preoccupations, introducing these new ways of collaboration represents an added value to reaching these objectives.

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Part IV

Patients Perspective

Patient Choice and Consumerism in Healthcare: Only a Mirage of Wishful Thinking?

An Essay on Theoretical and Empirical Aspects

Sophia Fischer

Abstract In many industrialized countries, healthcare systems are becoming increasingly competitive and patient-centered. Along with this development, the debate if, how and why patients act as sovereign consumers of healthcare services continues with sustained scholarly and societal interest. Regarding these aspects, the present essay summarizes essential aspects on the issue of patient choice for healthcare policy and research. First, the article elucidates the societal developments and political presumptions on which the concept of patient choice is built. These theoretical underpinnings are supplemented by an excursus covering the idiosyncrasies of the healthcare service encounter and lead to the introduction of a conceptual framework that illustrates relevant impact factors on patient's ability to perform healthcare choices. Second, a brief summary of empirical findings provides current insights into evidence on patient choice. Here, the essay pays special attention to evidence on system-related outcomes, such as efficiency, and findings on the patient's self-reflexion. Lastly, the essay closes with selected recommendations for health policy and academia.

Can patients be considered as consumers of healthcare services? Does this designation and the therewith associated responsibility in clinical decision-making live up to the patient's role and identity? Are sick people indeed able to sovereignly choose among different healthcare offerings? Or is "patient choice" just a fashionable buzzword used by health politicians? Although these and many more questions about the sovereignty, autonomy and accountability of patients have been discussed extensively and for a considerable amount of time, scholars across many disciplines, such as sociology, politics, economics and medical science,¹ do

¹ For detailed sociological, philosophic, and ethical disputes on the role of patients as healthcare consumers, please refer for instance to Heubel (2000) or Newman and Vidler (2006).

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1. Theoretical Perspective	2. Empirical Perspective
1.1 Societal developments and political assumptions underlying patient choice 1.2 Idiosyncrasies of the healthcare encounter affecting patient choice 1.3. Conceptual framework of key determinants on patient's ability to perform choice	2.1 Evidence on efficiency, equity and quality improvements through patient choice 2.2 Self-reflection of patients on their role as healthcare consumers 2.3 Interplay of provider, patient, and system characteristics
3. Conclusion and Recommendations for Healthcare Policy and Research	

Fig. 1 Outline of the essay

not provide comprehensive answers to them. With the implementation of consumer-driven healthcare systems only starting less than 20 years ago, the debate on patient choice still continues today (Robinson and Ginsburg 2009). As in every discussion, there are arguments and counter-arguments for each perspective. Yet, the scientific evidence to confirm or refute single propositions on patient choice is only now beginning to emerge. Therefore, this essay balances current insights on patient choice from a health policy perspective. The first part summarizes existing theoretical assumptions on patient choice in order to develop a conceptual framework of its key determinants. Afterwards, the second section discusses empirically evidence on patient choice. Finally, the third part of this essay derives conclusions for healthcare policy (see Fig. 1).

1 Theoretical Perspective

1.1 Societal Developments and Political Assumptions Underlying Patient Choice

Within this essay, *patient choice* is defined as the transfer of consumer denominations and characteristics to the group of healthcare recipients, particularly involving the individual freedom to select time, location and type of healthcare treatments as well as the service provider performing it (Greener 2007). Within this understanding, patient choice is growing in importance for all players on international healthcare markets.

Besides, the significance of patient choice is decisively fuelled by global societal trends. First, the ever ongoing ascent of *consumerism* has been the most influential development as it impacts many aspects of people’s daily private and public lives, e.g., education, welfare, and health (Lupton 1997). The notion of consumerism implies that people independently gather and rationally evaluate information in order to make optimal decisions. The term “consumer” entails that individuals

focus rather on personal advantages than on collective thinking and equality (McDonald et al. 2007; Robinson and Ginsburg 2009). This thought is in line with neo-classical microeconomic and rational choice theories presuming that individuals, including patients, have complete and stable preferences, seek for maximization of utility, act independently and within a state of perfect information (McGuire et al. 1988). Second, modern *information and communication technologies* facilitate the patient's process of gaining autonomy through easier knowledge accumulation (Calvillo et al. 2013). Especially the internet yields great possibilities for patients to deepen their distinctive health-related competencies, e.g., through health promotion websites or online support groups (Cline and Haynes 2001).

Therefore, *information provision* across multiple media channels represents a key plank in policy actions in order to support patient choice. Thereby, improved access to information is said to increase individual *health literacy* and foster *patient empowerment* (Schulz and Nakamoto 2013). The underlying assumptions appear rather simple: if patients are well informed about treatments and providers, they are supposedly enabled to make a choice among them. Other stakeholders are likely to respond to the patients' newly gained consumer power through tailoring healthcare services to their needs. When this mechanism sets in, competitive pressure supposedly grows and triggers efficiency, quality and responsiveness of the entire healthcare system (Fotaki et al. 2008).

Remaining faithful to these assumptions, the term "patient choice" has become a mantra in *government policy* in some countries, for example in the UK (Bryant et al. 2007). There, politicians advocate that citizens perform active choices in healthcare settings and take responsibility for their own wellbeing (McDonald et al. 2007). Considering the psychological effect of this demand, behavioural science shows that humans are lured by the cognitive rule of thumb that having a choice is always better than not having a choice (Bown et al. 2003). Research proves that framing a decision as a choice is likely to enhance the perceived value of a particular option and may also lead to biased, suboptimal outcomes (Szrek and Baron 2007). Moreover, it is commonly known that people only possess limited information processing capability which forces them to use intuitive decision heuristics to do well given their limitations (Bettman et al. 1991). Contrary to rational choice theory, the bounded rationality approach (Simon 1959), the biases and heuristics program (Tversky and Kahneman 1974) and the adaptive decision making framework (Bettman et al. 1991) challenge many political assumptions in the medical context, such as to regard patients as utility maximizers. Taking this into account, political encouragement of patient choice appears more as battle for votes that takes advantage of implicit human behavior patterns rather than good governance. Therefore, the next paragraph critically reflects on idiosyncratic patient characteristics and reconsiders the basic assumptions of patient choice in respect of the healthcare encounter.

1.2 *Idiosyncrasies of the Healthcare Encounter Affecting Patient Choice*

Scientists agree that the delivery of medical care and the associated choice processes are only partially comparable with the delivery of other services (Greener 2007; Berry and Bendapudi 2007). What both have in common are the core aspects applicable to every provision of services: intangibility, heterogeneity, inseparability and perishability (Rust and Tuck Siong 2006). Medical care is performed by people for people and requires the presence of both actors: provider and receiver. As healthcare services are highly labour- and skill-intensive, they are also potentially variable in performance (Berry and Bendapudi 2007). However, the *principle-agent-constellation* between the patient and the physician implies a knowledge imbalance that puts patients at a disadvantage (Greener 2007). Patients have to trust in the physicians' medical skills as they are not able to judge the quality of the services they receive for themselves (Kay 2007). A constant situation of information asymmetry prevails. This imbalance decisively shapes the patient-physician relationship and makes healthcare services credence goods.

Besides these similarities, many specific conditions that are mainly caused by the fact of patient's poor health or illness distinguish healthcare services. Generally, healthcare consumers are sick. Unlike going to the hair-dresser or getting insurance consulting, medical care is a service that almost nobody actively seeks to require. Once the need arises, people have to cope with it although they do not want to. Nevertheless, they are highly involved, because health is "men's most valuable asset". Times of illness are usually unplanned, infrequent and paired with situations of high risk and emotional vulnerability (McCullough and Dodge 2002). Moreover, when being hospitalized or treated, many people experience feelings of fear, lack of privacy or lack of control (Berry and Bendapudi 2007). Overall, these inherent traits of the medical encounter limit patient's ability to act as a sovereign consumer.

Therefore, personal communication with the physician is of particular importance to overcome patient's insecurities (Dutta-Bergman 2005). Not long ago, this communicative exchange was mainly dominated by a nimbus of authority and wisdom surrounding the physicians. The patient's role was rather passive (Lupton 1997). Today, a shift of power within the *patient-physician relationship* takes places, which balances the inherent information asymmetry in the medical encounter (Rapley 2008). Patients become more active in decision-making, because they are more confident regarding their health knowledge, self-determined in their lifestyles and able to access a wealth of information (Lo and Parham 2010). More and more, patients and physicians meet each other as equal partners with the same intentions: to restore and create health. This approach, based on cooperation and mutual negotiation instead of strict guidance, is referred to as *shared decision-making* (Charles et al. 1997). However, the results of shared decision-making are highly viable to individual patient preferences and physician's attitudes towards patient involvement in medical decisions (Flynn et al. 2006; Levinson et al. 2005).

1.3 Framework of Key Determinants on Patient’s Ability to Perform Choice

In sum, the healthcare encounter is determined by a multitude of interacting and interrelated determinants on the patient, physician and policy level. Figure 2 provides an overview of the most important theoretical aspects discussed in this essay.² Although, the scheme is not complete, it highlights the essential parameters to support patients’ ability to perform choices.

In order to give a concluding example, theory predicts that *personal traits and abilities* of the patient impact the performance of choice. For instance, individual *health literacy*, which is the cognitive ability to process, retain and interpret information, positively affects the individual ability to build up health-related knowledge (Jordan et al. 2010). Depending on a person’s current *health status*, health literacy levels vary, e.g., persons with chronic diseases tend to have great knowledge about their illness (Gazmararian et al. 2003). Likewise people, who are highly health literate and feel psychologically *empowered*, are supposed to become effective self-managers of their health through being capable of making reasoned choices. As a prerequisite for this to happen, health professionals should educate, persuade and motivate patients during care processes and support them through *shared decision-making* (Schulz and Nakamoto 2013). One potential support mechanism for professionals is to provide access to reliable and appropriate *information* (Lubalin and Harris-Kojetin 1999; Hibbard et al. 1997). Parallel to the physician’s advice, information can be retrieved from other sources, e.g., governmental health promotion campaigns. The interaction of these constructs can be retraced in Fig. 2.

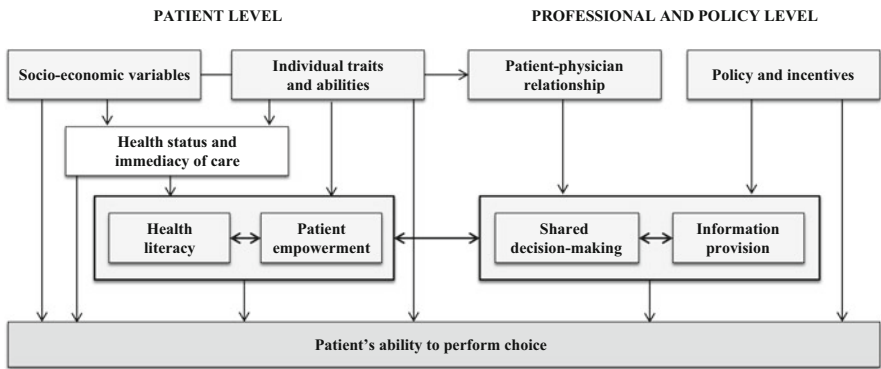


Fig. 2 Conceptual framework for key determinants on patient’s ability to perform choice

²The constructs appearing in Fig. 2 are highlighted in italic print within this essay.

2 Empirical Perspective

2.1 *Evidence on Efficiency, Equity and Quality Improvements Through Patient Choice*

The degree to which patient choice is promoted by health policy differs from country to country. The British National Health System (NHS) has taken a pioneering position in implementing a patient-centred, choice-oriented national healthcare system. Since its market-oriented reforms in the 1990s, the NHS has been subject to extensive research. Therefore, most evidence about the verifiable benefits and risks of patient choice originates from the UK. Regarding *efficiency gains* and *quality improvements* within the NHS, an extensive literature review by Fotaki et al. (2008) reports that there is only a small amount of evidence supporting that patient choice has a positive effect on these measures. Similarly, scholars are also inconclusive if increased patient choice in the UK leads to enhanced *equity* for lower socioeconomic groups. Dixon and La Grand (2006) argue that health policies need to be properly designed to realize this ambitious goal, especially with regard to several support mechanisms, such as patient care advisers or transport grants. Likewise, Robertson and Burge (2011), who conducted a patient survey in parts of England, note that there might be a social gradient in the execution of choice. Although no social group proved to be more likely to be offered a choice, the researchers found that higher educated patients tended to bypass the nearest hospital as they were more willing to travel. Recent empirical evidence from Russia comes to similar results. Choice is said to be of general value for patients, but inefficiencies in resource allocations prevail (Sheiman et al. 2014). As this empirical evidence appears rather scattered, more international research on the outcomes of patient choice in various healthcare settings is encouraged.

2.2 *Self-Reflection of Patients on Their Role as Healthcare Consumers*

The buzzword “patient-centeredness” is spinning the globe in healthcare research. Therefore, numerous studies put considerable effort into the examination of the patient’s perspective onto provider or treatment choice. Several studies investigate how patients identify themselves in their role as “healthcare consumers” and if they like to be called that way. Except for one sample (Lloyd et al. 2001), all other respondents from international settings indicated that they preferred to be addressed as “patient” instead of any other designation such as “consumer” or “client” (Loudon et al. 2012; Hutton et al. 2011; Deber et al. 2005). The reasons for these evidences are rarely described. Being the only research team to employ qualitative research on this matter, Hutton et al. (2011) used ten focus group interviews in five countries to illuminate the main arguments people hold regarding the customer metaphor (see Table 1). Generally, their participants thought of rather objectionable

Table 1 Key arguments for or against the appropriateness of the customer metaphor in the medical context

Economic arguments	Responsibility arguments
+ Payment (monetary exchange) makes it a customer relationship + Having a choice makes it a customer relationship + Accountability and incentive are increased by the customer metaphor – Profit is not the goal of medical services	– Public responsibility and moral make the customer metaphor inappropriate in medical contexts – Those who cannot determine what they need should not be treated as customers – Professional responsibility and/or legitimate authority make the customer metaphor inappropriate
Relationship arguments	Purpose arguments
± Trust and respect are helped or hurt by treating patients as customers ± “Customer” is not the right metaphor – Personal relationships are preferred to “customer” relationships – Treating people as customers encourages inappropriate pandering to patients	– People seeking help for fundamental needs, such as health, should not be treated as customers – Customer terminology contradicts the basic purpose of some social institutions, e.g., community hospitals

Adapted from Hutton et al. (2011). “+”: argument for usage of customer metaphor; “–”: argument against usage of customer metaphor; “±”: argument with both positive and negative interpretations with regard to customer metaphor

associations when called “customer” in public sector contexts, e.g., social responsibility concerns (Hutton et al. 2011).

However, not wanting to be called “customer” does not necessarily indicate that patients do not want to be treated like one. Levinson and colleagues’ study (2005) on preferences in medical decision-making reveals that 96 % of their respondents want to be at least offered a choice and wish to be actively involved in the decision-making process through voicing their opinion. However, the individual extent of involvement varies considerably among patients (Levinson et al. 2005). Patients’ preferences regarding decision-making in the medical encounter range from non-deliberate delegators to deliberate autonomists (Flynn et al. 2006). Frequently, physicians’ advice plays a decisive role even if patients hold an active share in decision-making (Levinson et al. 2005). Combining interview techniques and discrete choice experiments to find out more about the patient identity, McDonald et al. (2007, p. 448) mention that the participants of their study “*oscillated at times between [being] empowered consumer and dependent patient, although the former involved a desire to assert oneself in the consultation [with the general practitioner] rather than taking responsibility for making healthy lifestyle choices.*” Overall, patients are in favor of having a choice before they are ill, but once a situation of uncertainty, vulnerability and distress arises, they rather tend to delegate the choice to a trusted health practitioner (Fotaki et al. 2008). There seems to be a large divergence between the extent to which patients wish to make a choice and the extent to which they are able to do so (Greener 2007). In sum, the literature indicates that the fact of having a choice provides intrinsic value to patients, although they might neither stand by it nor execute it (Coulter 2010).

2.3 Interplay of Provider, Patient and System Characteristics

Based on their extensive literature review, Victoor et al. (2012) provide a summary of empirical evidence on the determinants of patient choice of healthcare providers. As a result, they state that a complex interplay between *patient and provider characteristics* influences if, how and whom patients choose. Table 2 depicts the broad range of mutually interacting factors determining patient choice on the individual, provider and system level.

Contrary to political assumptions, most patients turn out to be incapable of behaving in a rational, consumerist fashion as far as their health is concerned (Victoor et al. 2012; Marshall and McLoughlin 2010). Victoor et al. (2012) report that patients often base their choice on a limited set of provider characteristics and/or irrelevant factors such as personal mood. Whether people prefer structure-, process- or outcome-related provider characteristics is dependent on each patient's *socio-demographic* and *disease characteristics* as well as on *individual attitudes, knowledge and beliefs* (Victoor et al. 2012). For example, older patients tend to place more importance on interpersonal factors, such as interpersonal communication style and travel times, whereas the importance of these factor declines with a rising level of education (Dijks-Elsinga et al. 2010). Moreover, not all provider

Table 2 Overview of empirically evaluated factors for patient choice

Patient characteristics	Provider characteristics	System characteristics
<i>Socio-economic factors</i> • Gender • Age • Education • Income etc.	<i>Structural factors</i> • Availability • Accessibility • Provider type and size • Availability, experience and quality of staff • Organizational aspects (e.g., opening hours) • Cost of treatment • Socio-demographic factors of doctors	<i>Regulatory factors</i> • Degree of choice offered • Freedom to exercise choice • Restrictions imposed by health insurers
<i>Disease characteristics</i> • State of health • Immediacy of care etc.		<i>Availability, accessibility and quality of public information</i> • Reliability • Comprehensibility • Relevance
<i>Attitudes, knowledge and beliefs</i> • Current mood and emotional condition • Willingness and ability to travel • Health literacy and numeracy • Activation level and perceived empowerment • Religion and cultural beliefs	<i>Process factors</i> • Interpersonal factors (e.g., communication style) • Availability of provider information • Continuity of treatment • Waiting time • Quality of treatment	
<i>Previous experience and existing relationship towards the provider</i>	<i>Outcome factors</i> • Mortality rates, pressure sore rate etc.	

Adapted from Victoor et al. (2012)

characteristics are equally important to patients. For example, outcome measures, such as mortality rates, are less relevant than referrals by other health professionals or distance assessments (Fotaki et al. 2008). Thus, not all factors displayed in Table 2 impact the choice situation at all times.

Moreover, the information available to and processed by the patient plays a crucial role in decision-making. Overall, patients are more likely to rely on informal rather than formal sources of information. Many studies underpin that previous experiences and existing personal interactions with the provider (Dijks-Elsinga et al. 2010; Leister and Stausberg 2007) as well as recommendations from the social environment, i.e., general reputation and opinions of family and friends, serve as main information sources (de Groot et al. 2012). Scientific evidence on the use of formal, comparative information shows that only few patients are aware of its existence, use it and understand it (Damman et al. 2009). Again, the usage of information sources differs depending on patient characteristics such as age and education (Faber et al. 2009). However, research shows that patients use simplification strategies to process the information they have acquired by overrating precise variables, such as costs or location, and underrating fuzzy variables, such as quality (Hibbard et al. 1997).

Conclusion and Recommendations for Healthcare Policy and Research

Summing up from the theoretical and empirical perspectives on patient choice, it remains to be noticed that there may be “*no such thing as a typical patient: different patients make different choices in different situations.*” (Victoor et al. 2012, p. 15). Therefore, policy makers should not base their initiatives on the belief that all patients carry the same needs (Greener 2007). For example, more health literate people with chronic diseases need different support in choice programs than patients with acute conditions as the former are more likely to possess expert health knowledge.

Public societies should develop a common understanding that the idiosyncrasies of the healthcare encounter, especially the prevailing information advantage of providers, restricts the patient’s ability to make rational choices. Therefore, future policy initiatives should focus on the patient-physician relationship which proves to be the essential nucleus for the execution of empowered and informed patient choice. Based on the experiences made in the NHS, Greener (2007) proposes that particularly primary care services should be re-oriented to give patients time, education and space to understand information and make sound choices together with general practitioners. Thus, patients will not be able to execute choice, if the medical profession is not willing to engage in decision-making with them, for example through pointing out reliable information materials (Coulter 2010). Another policy action for the improvement of patient choice is the implementation of other support mechanisms, such as recruitment of patient care advisers, to ensure

(continued)

that lower socio-economic groups are not subject to inequity (Dixon and Le Grand 2006). Anyhow, political rhetoric about patient choice should be limited unless it is supported by carefully designed and managed programs that create meaningful options (Sheiman et al. 2014; Robinson and Ginsburg 2009).

Regarding research on patient choice, significant progress has been made within recent years. Although studies on the influence of single patient and provider characteristics on patient choice behaviour evolved, an integrated and comprehensive picture on the interactions of the multitude of patient-related factors is still missing. Particularly, the constructs of patient empowerment and health literacy as well as their effects need to be untangled in scholarly research (Schulz and Nakamoto 2013). Future studies should therefore investigate which individual differences impact decision-making styles in healthcare and which information is needed to support patient choice. Notably, healthcare researchers should pursue to get more insights into the psychological aspects behind patient choice in order to increase decision-making and system efficiency (Bryant et al. 2007). In parallel, attitudes and beliefs of the medical profession as counterpart to the patient perspective should be included on the research agenda.

Overall, more thorough, long-term and interdisciplinary efforts are required to comprehensively address the questions posed in the beginning of this essay. Yet, this article has provided some initial summarizing ideas on the complex topic of patient choice and consumerism in healthcare.

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From Shared Decision Making to Patient Engagement in Health Care Processes: The Role of Digital Technologies

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Abstract In the past patients have mainly been passive recipients of health care services and clinicians' advice. However, within today's healthcare environments constellations have changed. Patients have access to a tremendous amount of information and are more confident in managing their own health and care independently. Shared decision making and patient engagement are increasingly popular approaches to respect patient sovereignty and enhance participation. The following article summarizes the influence of these developments on health care processes and outlines the crucial role of digital technologies as levers to support shared decision making and patient engagement. Despite potential benefits and widespread political commitment, empirical evidence demonstrates that supportive digital solutions only slowly diffuse into the health sector.

1 The Changing Role of Patients and its Consequences for the Medical Encounter

Historically, the role of patients has always been rather passive due to the generally accepted view that physicians knew best what treatment was good for their health. Patients were commonly required to do nothing “*but seek competent help, and cooperate with the physician in order to get well*” (Brody 1980, p. 718). This imbalance of power subsisted for a long time, and was amplified by clinicians' knowledge advantage as well as by a social gap between professionals and their patients (Brody 1980). However, the conventional understanding of a patient's role

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has considerably changed in the last years. As patients become better educated and empowered, they become more confident in questioning physicians' authority (Brody 1980). As a result, medical care is shifting from physician- towards patient-centeredness, and the consideration of patient's perspective is gaining increasing importance from both a theoretical and an empirical viewpoint (Laine and Davidoff 1996). A major attribute of this patient-centeredness is the active engagement of patients in the processes of their health care.

In the following paragraph we introduce the concept of shared decision making and outline its important role in enhancing patient engagement in health care processes. Afterwards, the second section summarizes topical evidence concerning the potential benefits and main facilitators of shared decision making and patient engagement. Drawing upon these insights, we will: (i) discuss important digital levers to engage patients; and (ii) present empirical evidence about the diffusion of digital solutions within the health sector. Finally, we outline the main future avenues that research and practice should focus on.

1.1 Shared Decision Making and Patient Engagement

In order to actively engage in their own care, patients need to understand the cause of diseases, to recognize symptoms and treatment effects, and to learn how to manage their treatments and/or chronic conditions (Coulter et al. 2008). Thus, the key elements on which health care systems have to focus prospectively are: (i) to increase patients' **health literacy**; (ii) to improve the support for **better self-management** of care; and (iii) to foster easily-understandable and well-structured processes of shared decision making in the medical encounter (Coulter 2006; Coulter et al. 2008).

These processes are particularly critical since international evidence suggests that patients want to participate actively in their health care—especially when different effective treatment options exist and when alternative pathways may cause different combinations of therapeutic side effects (Guadagnoli and Ward 1998). In fact, these pathways are preference sensitive and the best choice depends on the patients' evaluation of benefits and harms associated to each alternative (Elwyn et al. 2010b). For example, preventive screenings or alternative treatments options (e.g. for different forms of cancer) often include complex trade-offs between risks and benefits, without any warranty for a preferred medical outcome. Different levels of participation exist that depend on demographic factors, prior experience, the relationship between physician and patient, the type of disease, the health status and the type of decision that has to be made (Say et al. 2006). In light of the uncertainty inherent to many treatment alternatives, the approach of making shared decisions allows sharing responsibility and respecting patient autonomy (Frosch and Kaplan 1999). Leveraging on these benefits, shared decision making has progressively become both a philosophy and a leading practice in the last two

decades to support patient engagement in health care processes (Edwards and Elwyn 2009; Da Silva 2012).

There are various conceptualizations of shared decision making and a lack of coherence in the use of the term (Makoul and Clayman 2006). The definition of Charles et al. (1997), which is the most cited one (Makoul and Clayman 2006), defines shared decision making as a model of decision-making characterized by four main attributes:

- It requires at least two participants—usually a physician and a patient—who are actively involved in the decision-making process;
- These participants conjointly evaluate the opportunities of treatment available and express treatment preferences in order to achieve a consensus regarding the question which one to follow;
- During this process, the participants share information regarding treatment options, potential consequences as well as individual knowledge and values;
- Finally, a treatment decision on which all participants agree is made collectively.

In order to successfully accomplish a shared decision making process, it is essential to improve health literacy and support patients in the deliberation and expression of their preferences and opinions. Accordingly, information has to be adequately shared (Elwyn et al. 2012), and patients should be enabled to develop not only informed preferences but also accurate expectations of the relative health care outcomes (Frosch and Kaplan 1999). From this viewpoint the implementation of strategies to establish effective shared decision making processes and enhancing patient engagement is fostered not only by adequate health policies (Elwyn et al. 2010a; Coulter 2006), but especially through the diffusion of supportive digital solutions (Fichman et al. 2011). Particularly, the Internet-based applications have increased patients' access to a vast amount of health care information considerably and enabled the extensive exchange of knowledge with peers (Frosch and Kaplan 1999) and health professionals (Locatelli et al. 2012). As a result, it is important to study the role that digital technologies play in fostering shared decision making and thus, in increasing patient engagement.

1.2 Benefits and Facilitators of Shared Decision Making and Patient Engagement

The strategies used to improve patient engagement are supported on the political level in many European countries (Coulter et al. 2008). This promotion might be justified by the ethical imperative of self-determination and autonomy. Besides, a growing amount of evidence suggests that shared decision making has beneficial results on patient experience and medical outcomes (Da Silva 2012). Effective patient-physician communication—including sharing of information and involvement in treatment decisions—can dramatically improve health outcomes. In fact,

research shows that psychosocial measures like emotional health, the level of anxiety/depression, and patients' well-being are influenced positively by patient engagement (Stewart 1995; Griffin et al. 2004), and many studies found a positive impact of shared decision making practices on patient satisfaction with care and adherence to treatment (Da Silva 2012).

Most evidence on the influence of outcomes comes from studies in the area of chronic diseases—including diabetes, cardiovascular diseases, epilepsy, depression, or breast/prostate cancer (Griffin et al. 2004). The principal outcome measures that tend to be affected positively by shared decision making include the subjective experience of illness (e.g., reduction of symptoms and better functional status) (Griffin et al. 2004), behavioral changes, and objective parameters such as improved blood pressure control and blood values (Da Silva 2012). However, the majority of those studies is purely observational and focuses on small samples (Griffin et al. 2004). Moreover, the results regarding the improvements of long-term physical health are still ambiguous (Coulter et al. 2008) and necessitate more rigorous evaluation (Da Silva 2012). Besides promising psychosocial and physical aspects, the involvement of patients in shared decision making improves their competences and health literacy with regard to their conditions, and enhances their engagement in health care processes (Da Silva 2012).

Strategies to implement shared decision making and those to increase patient engagement are considerably overlapping (Da Silva 2012), and the overall objective of making patients more engaged and better informed requires strategic action on the political, organizational and individual level. Health professionals seem to be the most important facilitators of this development. Patient engagement and effective shared decision making largely depend on physicians' communication competences and specific professional capabilities—including the ones related to building a rapport with patients and to properly structure the consultation (Elwyn et al. 2012). Besides, personal attitude is a key factor. The motivation of professionals in encouraging shared decision making and patient engagement is essential as well as their perception that this in turn will lead to improved health care processes and outcomes (Légaré et al. 2008). On the other side, patients' desire of engaging in health care processes is highly moderated by personal and demographic characteristics. In light of the dynamics of these processes, the interaction and especially the compliance between patients' willingness of participation and the professionals' corresponding behavior are decisive (Da Silva 2012).

As mentioned, keys to more engagement are a higher health literacy, which is pre-conditional, and an easily understandable and well-structured shared decision making process, accompanied by support for a better self-management (Coulter 2006; Coulter et al. 2008). An additional facilitator is a higher activation level resulting from these strategies, as it implies increased self-efficacy and patients' self-perception as managers of their own health (Hibbard and Mahoney 2010). Thus, health care providers aiming to increase the levels of shared decision making and patient engagement need to: (i) support the health education of their patients; (ii) consider patients' preferences; (iii) progressively guide them towards an effective usage of health information sources; and (iv) provide them with support for

self-care and self-management. As these requirements are substantially facilitated by supportive digital solutions, providers have to be able to use innovative digital technologies, and contemporaneously manage their time effectively in order to not negatively impact everyday work (Coulter et al. 2008).

2 Digital Technologies as Levers to Support Shared Decision Making and Patient Engagement

Contrary to the great effort regarding the conceptual development of shared decision making and the political commitment to patient engagement, their realization considerably lags behind (Stiggelbout et al. 2012) and is more an issue of discussion than a consolidated reality (Da Silva 2012). Related services to foster shared decision making and patient engagement are mainly directed at (i) increasing patients' deliberation, (ii) increasing patients' self-responsibility or/and (iii) increasing patients' interactions with the rest of the health care system. Comprehensively, the services with these orientations tend to diffuse models of shared decision making and patient engagement. Practical strategies tend to focus on technological levers—with an emphasis on digital solutions fostering interactions within the health care system, and primarily supporting health care providers in better using their resources (Gastaldi et al. 2012). Among these solutions it is possible to consider:

- *The solutions increasing patient deliberation:* the online corporate magazines, the multimedia newsletters, the issues cards, the option grids, and, more generally, any digital tool shared by health care providers with patients/caregivers giving available information on health prevention and life style;
- *The solutions increasing patients' self-responsibility:* the digital solutions providing information and sending notifications on the availability of clinical exams and reports, allowing patients/caregivers to directly access or download clinical data, to achieve preliminary/complimentary diagnoses, to book/pay/cancel exams and visits, or to monitor the waiting times associated to any health care service;
- *The solutions increasing patient's interactions with the rest of the health care system:* the online surveys used by health care providers to collect information on patients and their behaviors, and the online tools made available to patients to exchange knowledge on their health status (social networks, online communities, forums, blogs, wikis and chats);

In order to better understand the relationship between these solutions and the results that are achievable in terms of patient engagement, we suggest considering two complementary dimensions: the *domains* and the *manners* of patient engagement.

Concerning the first dimension (*domains of patient engagement*), empirical evidence (Observatories 2013) suggests distinguishing three different spheres of activities that are related to (i) knowledge management, (ii) data management, and (iii) organization and time management. Among the services and underlying digital solutions to increase patient engagement in the different domains (Table 1), some are supporting shared decision making directly (e.g. decision aids or social networks) while others are indirectly leveraging shared decision making (e.g. by increasing patients' awareness of self-responsibility/-determination and considerably improving the efficiency of health care processes¹). As time pressure is the main barrier to implement shared decision making (Légaré et al. 2008), improvements in the domain of time-management are key factors to enhance physicians motivation to encourage shared decision making and increase the amount of quality time available in the medical encounter. However, the services and strategies through which shared decision making is fostered in each one of these domains of patient engagement tend to be highly different and connected to the specific orientation. Coherently, the digital solutions supporting both shared decision making and patient engagement tend to be highly heterogeneous (even if complementary²).

With regard to the second dimension (*manners of patient engagement*), it is possible to range from a direct engagement, fostered through face-to-face meeting between patients and health professionals, to more indirect manners of engagement, which can assume the form of both a distance interaction mediated by digital means (e.g. through the use of social networks) as well as a self-management of care autonomously accomplished by patients (e.g., online solutions to digitally book for visits, hospitalizations and pre-admissions).

3 Diffusion of Digital Solutions Within the Health Sector

All the empirical evidence concerning the diffusion of digital solutions in this chapter is based on a broader and continuative research initiative promoted since 2007 by the Politecnico di Milano (Italy), i.e., the ICT in Healthcare Observatory (IHO). IHO is 1 of the 37 Observatories activated to study the impact of digital technologies on different Italian industries (Gastaldi and Corso 2013). Every year the IHO creates and delivers an electronic survey to a sample of more than 500 Italian health care Chief Information Officers (CIOs) from representative organizations of varying types and sizes, as well as in different geographical areas. A response rate higher than 15 % has always been achieved. With the support of pilot respondents, the IHO advisory board adjusts the design for every year's

¹ Especially interaction and utilization aspects.

² For example the services of auto-diagnosing or consultation of personal data provide patients with a degree of autonomy that might even hamper shared decision making processes.

Table 1 Classification of services fostering shared decision making and the underlying digital solutions according to the domain of patient engagement

Domains of engagement	Orientation of the services used to foster shared decision making				Underlying digital solutions
	Increasing deliberation	Increasing self-responsibility	Increasing interaction		
Knowledge management	Diffusing a culture of health care and well being Increasing patient activation level Increasing the reflection of patients regarding their health conditions	Providing a basis for autonomous and shared decision-making Fostering health education Increasing health literacy	Increasing the knowledge exchange among patients and between physicians Making treatment alternatives visible and support weighting of preferences Providing guidance in the decision process		Corporate magazines, multimedia newsletters and tools providing information on health prevention and life style Social networks, online communities, forums, blogs, wikis and chats Online surveys to collect information on patients and their behaviors Shared decision making process guides for physicians Patient decision aids (e.g., issue cards, option grids)
Data management	Consulting personal health data Auto-diagnosing the socio-clinical conditions associated to a patient	Providing patients with personal health information Increasing the awareness of patients regarding privacy issues	Increasing the exchange of health data within health care systems Reducing the perceived anxiety associated to shared decision making Supporting an adequate use of health data		Solutions to directly access or download clinical data Online tools for preliminary/complex preliminary diagnosis Solutions increasing the interoperability of health care data
Organization and time management	Supporting patients in an adequate use of health resources Diffusing an unbiased perception of the services available to patients	Providing information on specific services and options Facilitating autonomous coordination of care	Increasing the efficiency and the effectiveness of the interactions within the health care system Increasing the quantity and the quality of the interactions among patients and professionals		Online solutions to digitally book for visits, hospitalizations, pre-admissions Online payment of health care services Notification of the availability of clinical reports (usually through SMS reminders) Solutions providing information on clinical exams and on the waiting times associated to health care services

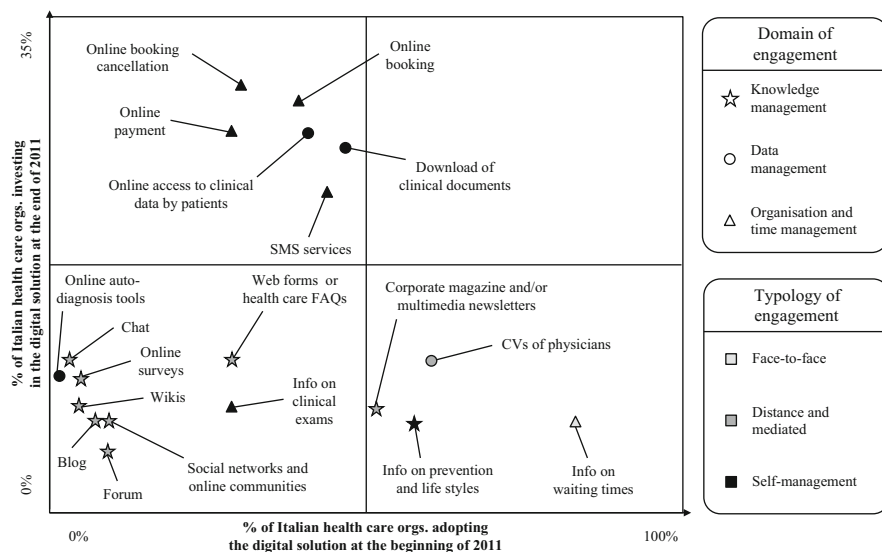


Fig. 1 Presence and expected diffusion of the digital solutions offered to Italian patients in 2011 in order to increase shared decision making and patient engagement

wave of the survey. In previous years, the scope ranged from 29 to 58 semi-closed questions. These dynamic features lead to higher response rates. From a researcher viewpoint, the delivery of the survey through an electronic platform enables IHO to analyse closed questions throughout data collection. The research team is thus able to identify anchors to guide future data gathering and detect connections between data for further theory generation. In order to ensure high reliability of the results and cross-validate given responses, the IHO delivers a second set of surveys to the strategic board—Chief Executive Officer (CEO), Chief Financial Officer (CFO), and Chief Medical Officer (CMO)—of the same health care organizations of responding CIOs. Since 2012, the IHO additionally runs two yearly surveys on statistically significant samples of general physicians (637 respondents in 2012) and citizens (1,001 respondents in 2012).

As the results of the 2011 health care organization survey indicate (Fig. 1), most digital solutions have currently only general communication/outreach purposes—with almost-always unidirectional streams of general-purpose information from the organizations to patients. These streams develop only weak forms of shared decision making and patient engagement in all the three domains depicted in Table 1. Most of the investments in shared decision making and patient engagement are accomplished in the self-management tools with the aim to improve the empowerment and self-responsibility of patients (see Table 1) on the one hand, and to increase efficiency in the usage of health care resources on the other hand. Unfortunately, the digital solutions that directly support a shared decision making process—i.e. the solutions allowing the exchange of knowledge without the necessity of a direct co-presence of patients and health professionals (blogs, chats, forums,

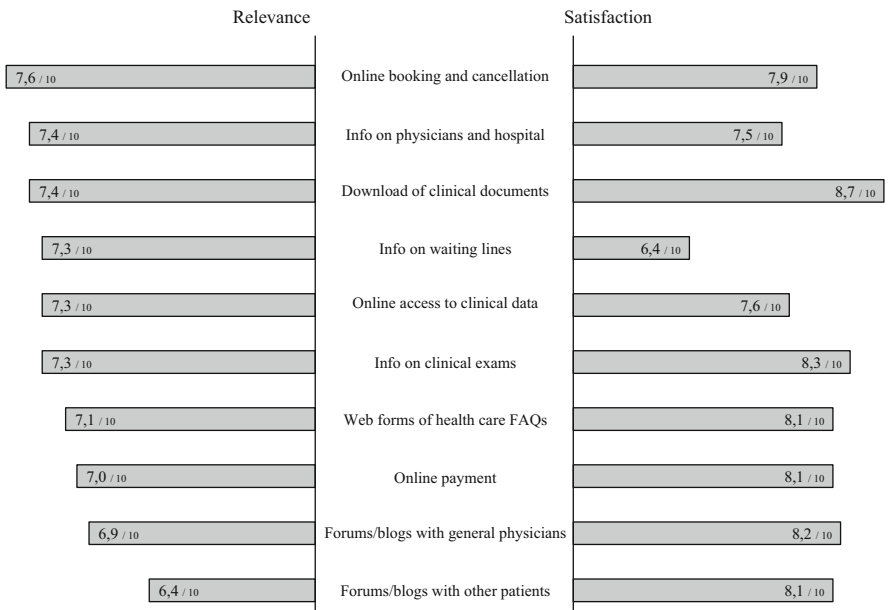


Fig. 2 Relevance of and satisfaction with the main digital solutions offered to Italians in 2013 in order to increase shared decision making and patient engagement (sample: 1.001 Citizens) (Corso et al. 2013)

wikis, etc.)—are not only the less prevalent, but also the ones in which health care organizations tend to invest less.

In fact, these “2.0 tools” are still not perceived as relevant by most patients, as it is shown in Fig. 2. This lack of interest can only partially be explained with a lack of professional solutions tailored to the requirements of patients and health care professionals (Anderson and Agarwal 2011). Actually, most citizens do not have an adequate awareness of the actual and potential offers that could increase their participation within decision making processes regarding their treatments (Locatelli et al. 2012). This fact is underlined by recent data,³ showing that only 35 % of Italians have utilised at least one of the digital solutions presented in Fig. 1, and only 6 % of them have utilised three of these solutions (Observatories 2013; Corso et al. 2013).

If these facts are related to a population that is on average 44 years old, it is interesting to note that the cohort of individuals born between 1980 and 2000 considers the self-services supporting them in the use of health care resources as more important than the services supporting pure shared decision making and effective interactions with health professionals. Only the individuals born after 2000 value true collaborative tools such as forums, blogs and wikis (Observatories

³The data has been collected during May 2013. For more information, see Observatories (2013).

2013). However, they are the ones who will interact less frequently with the health care industry during the next 20 years.

Conclusions and Further Developments

Comprehensively, the empirical evidence presented in the previous paragraphs outlines an overall immaturity of the practices and the levers used to improve both shared decision making and patient engagement, which however opens up several avenues of improvement for the near future. The most promising ones on which researchers and practitioners should focus their attention are presented in the following core aspects.

Sharing decisions with patients and engaging them in their care should doubtlessly be a responsibility of health care providers. However, the change in traditional roles concerning the physician-patient relationship is a slow process. Acceptance can be achieved if stakeholders constantly point out benefits from research, policy and practice. Strategies for the implementation of shared decision making and engagement approaches need to target all participants. For physicians, the implementation needs to be as easy as possible. Organizational support can be provided by training sessions on how to implement shared decision making in clinical practice, as well as how to improve communication skills, e.g. to learn how to talk to patients in a way that creates trust and understanding. Easy-to-use guidelines or process models for physicians need to be developed and evaluated. Additionally, efforts need to be taken to alleviate patients' fears to take responsibility for their care and adopt new technologies, especially with regard to people who are less used to them.

Despite its potential benefits, little is known on how the different digital solutions actually influence patients' decision making processes. Existing solutions are highly heterogeneous: some are mutually beneficial while others might even cancel each other out, e.g. by providing patients with so much autonomy that making shared decisions might even be hampered. It is unknown, what works most effectively, alone or in combination. This interaction is a field of further research and it has to be taken into account by practitioners before services will be completely implemented.

Thus, from a managerial perspective, it is necessary to increase patients' deliberation, self-responsibility and interaction comprehensively. Every development over-concentrated in only one of these orientations tends to produce sub-optimal results. As the domains and the manners of patient engagement are highly interrelated, they require both an extensive exploration of all the synergies present among them as well as a dynamic focus on the most efficient and effective steps to be made in order to improve shared decision making and patient engagement.

(continued)

It is important to emphasize that digital technologies are “only” levers, which have always to be planned, acquired, managed, and evolved from a strategic perspective, and coherently with the socio-technical system surrounding them. From this viewpoint, a continuous development of a set of capabilities for the effective and efficient management of digital technologies along the entire health care system is critical while still missing in practice. Further studies and applications will have to address this point in all its aspects, possibly trying to connect it to the development of solid governance models linking the digital solutions to shared decision making and patient engagement.

Overall, health care organizations and policy makers should increase the awareness of citizens regarding the actual and the potential benefits associated with the digital solutions and the governance models that could effectively increase patients’ engagement in the decisions regarding their treatments. The barriers hindering the relevance and the satisfaction associated to the different digital solutions have to be investigated from different stakeholder perspectives together with potential strategies to overcome them.

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Trick or Treat: Assessing Health 2.0 and Its Prospects for Patients, Providers and Society

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Abstract Recent advancements in information and communication technologies do not stop at the borders of the healthcare sector. Therefore, this essay portrays the emergence of the topical phenomenon of Health 2.0. This concept combines latest Web 2.0 technologies with healthcare-related content. After introducing a common definition of Health 2.0, the essay elevates its core characteristics of social networking, participation, apomediation, openness and collaboration. These key features help to illustrate the prominent role of Health 2.0 applications in today's societies with two striking case examples. First, the social networking platform *PatientsLikeMe.Com* shows how shared patient experiences contribute to improved health self-management and support clinical knowledge. Second, *Microsoft HealthVault* demonstrates the potentials and limitations of web-based personal health record systems. Ultimately, this essay closes by transparently assessing the benefits and risks of Health 2.0 on the patient level, provider level and system level. Taking a societal perspective, levers for healthcare policy to encourage Health 2.0 adaption are suggested.

1 Where Information and Communication Technology and Healthcare Meet

The rapid advancement of information and communication technologies, especially the world-shaking divulgence of the internet, has changed many aspects of people's lives (e.g., education, shopping, healthcare). The relationship between patients and medical professionals is one of its spheres of influence. The internet offers a convenient, quick and private way to access an extensive amount of health-related information and interactive medical services. Thus, patients become more

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empowered in healthcare decision-making (AlGhamdi and Moussa 2012). Physicians face much more health literate and sovereign patients, who have already informed themselves online about potential diagnosis and treatment options before entering the doctor's office (Kivits 2006). Through the emergence of more interactive, collaborative, and participatory online technologies, commonly known as Web 2.0 applications, the physician-patient relationship is severely affected by a shift of power, responsibilities and communication patterns (Chretien et al. 2011).

Whenever Web 2.0 technologies are applied within the healthcare context, the term *Health 2.0* is commonly used (Van de Belt et al. 2010). The aim of this essay is to define the topical phenomenon of Health 2.0 and illustrate its dissemination by means of two case examples, which show the application of digital health information technologies in practice. Finally, this essay assesses the benefits and risks emerging with Health 2.0, both for patients and medical professionals, and concludes with general recommendations to increase the societal value of Health 2.0.

2 Health 2.0 and Its Characteristics

In the early stage of the internet, static online websites primarily focused on uni-directional communication of content towards the reader. Today, internet users do not only consume web-available information and resources but rather generate information and content themselves (Van de Belt et al. 2010). Technologies that foster this development are called Web 2.0. For those Web 2.0 technologies used in the healthcare sector, the term Health 2.0 or Medicine 2.0 is applied. Eysenbach (2008) defines Health 2.0 as “*web-based services for healthcare consumers, caregivers, patients, health professionals, and biomedical researchers, that use Web 2.0 technologies and/or semantic web and virtual reality approaches to enable and facilitate specifically social networking, participation, apomediation, openness, and collaboration, within and between these user groups.*” This definition particularly fosters the idea of stakeholder integration in healthcare via technological innovations and therefore appears most suitable for further explanations.

Given this description, *social networking* is a key component for patients to use Health 2.0 tools in order to increase their personal health knowledge, exchange advice and receive social support (Antheunis et al. 2013). For professionals, social networking within the Health 2.0 landscape offers similar fields of application. Care providers are able to interact with both scientific peers and patients, the latter primarily with marketing-oriented reasoning in mind (Hamm et al. 2013). The first case example covering the social networking platform *PatientsLikeMe.Com* will highlight the current dissemination and prospects of health-related social networking.

The second core attribute of Health 2.0, which is closely connected to social networking, is *participation*. Today's patients and also health care professionals are increasingly engaging in participatory, shared decision-making, partially fostered through online information seeking. In this context, *personal health records*

constitute a feasible path to digitalized care management involving multiple stakeholders (Randeree 2009). Personal health records are electronic applications to access, manage and share personal medical data and that of others in an authorized, private, confidential and secure manner. The second case example on *Microsoft® HealthVault™* further explains the participatory approach of such a personal health record tool.

Closely related to the attribute participation is the idea of *collaboration*. Illustratively, wikis underline both aspects of Health 2.0 as all users are able to collaboratively edit content in knowledge repositories (Eysenbach 2008). By now, health-related wikis are applied in various fields, for example within the clinical education environment or in more efficient service delivery for mental health practices (Kamel Boulos et al. 2006). A recent study from Switzerland shows that health wikis are highly endorsed compared to other Health 2.0 applications. Muhdi and Boutellier (2010) argue that wikis are already well-established in other industries, for example within the finance and banking sector, and thus highly accepted among user groups. Considered across sectors, this fact shows that healthcare has been among the slowest to embrace information and communication technologies (Hawn 2009).

To fully understand the picture of Health 2.0, Eysenbach (2008) introduced the socio-technological term *apomediation*. This attribute refers to disintermediation, which is the removal of intermediaries within health information access and seeking processes. Intermediaries, such as physicians necessary to filter relevant information for patients, are replaced or supplemented by apomediators, such as tools and peers standing by to guide patients to trustworthy information or to add credibility to information. To name an example, a “cloud of patients” contributes their experiences in online ranking portals in order to assess the quality of health care providers without further professional assessment (Greaves et al. 2013).

The last but not less important attribute assigned to Health 2.0 is *openness*. It refers both to the technical perspective, for example to the ability of a personal health record system to connect with other third-party databases, and to the transparency of freely accessible online health information per se. The thought of sharing information constitutes a central component of Health 2.0 activities to achieve collective intelligence in an open communication environment (Moorhead et al. 2013). Figure 1 summarizes characteristics, applications and stakeholders of the Health 2.0 landscape.¹

¹ For a more detailed overview on practical examples for Health 2.0 application see Kamel Boulos and Wheeler (2007).

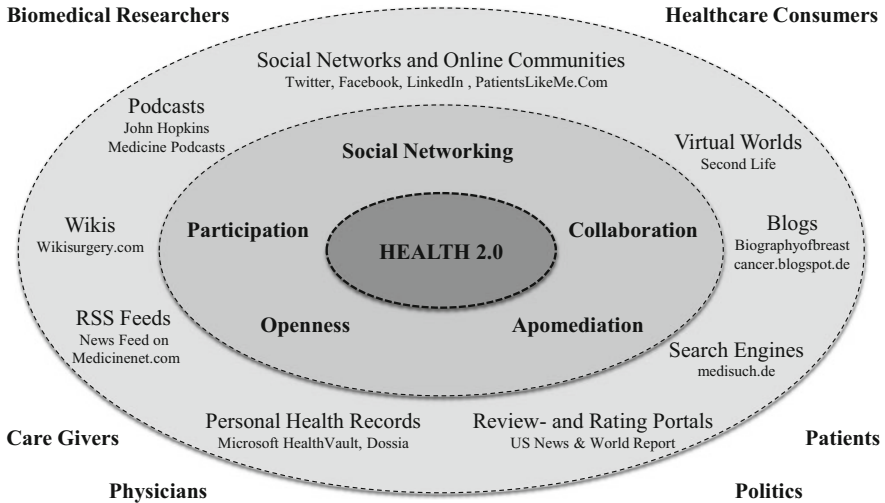


Fig. 1 Characteristics, applications with respective examples and key stakeholders of Health 2.0 (from inside to outside)

3 Divulgence of Health 2.0 Among Patients and Providers

Recent studies from multiple international settings that investigate the diffusion of Health 2.0 technologies yield remarkable results. Online health information behavior is increasing and the usage of Health 2.0 by patients is on the rise (AlGhamdi and Moussa 2012). While some years ago Eysenbach and Kohler (2003) reported that 4.5 % of all searches on the web between 2001 and 2003 were health-related, more recent numbers show that now roughly 50–60 % of people from various countries look for health information online (Chou et al. 2009). Those who are using the internet extensively for health-related purposes tend to be younger, female and more likely to be affected by chronic diseases (Kummervold et al. 2008). Patients particularly embrace interactive social media tools like Facebook or Twitter.

While the acceptance of Health 2.0 among the public is not questioned, healthcare providers have long missed the opportunity to meet their patients online (Aase and Timimi 2013). Only recently, usage of Health 2.0 tools, especially social media, by hospitals and healthcare professionals has accelerated significantly. A multinational, longitudinal study in 12 Western European countries conducted by Van de Belt et al. (2012) showed that the usage of social media by hospitals increased significantly from 2009 to 2011. Although social media usage differs significantly between countries due to country-specific media landscapes, hospitals' usage of YouTube (from 2 % to 20 %) and Facebook (from 10 % to 67 %) increased notably. Even public health departments in the USA are beginning to use social media, albeit still rather focusing on information distribution rather than interaction (Thackeray et al. 2012). Moreover, the dominant application of social media in

healthcare education across multiple disciplines is noteworthy. However, the current usage of Health 2.0 does not yet exploit its potential to overcome the boundaries of multiple stakeholder groups, e.g., between patients and educators.

4 The Role of Health 2.0 Today: Two Case Examples

In the following, two prominent examples of Health 2.0 applications are described: the social network platform *PatientsLikeMe.Com* and the web-based personal health record *Microsoft HealthVault*. After briefly introducing their main mechanisms, major advantages are highlighted and their attributes as Health 2.0 technology are reflected in Tables 1 and 2.

4.1 *PatientsLikeMe.Com*

One of the essential characteristics of the Health 2.0 definition is social networking. Since social media tools are on the rise in many other areas of life, it is no surprise that this trend finally meets the healthcare sector. Especially, for an industry where the information asymmetry is as distinct as in medicine, it is a ground breaking approach. A recent article in *BusinessWeek* hit the mark by asking “what would happen if critically ill patients joined together, obtained their personal information, and made it public” (Arnst 2008, p. 1). That is the idea behind the social networking platform *PatientsLikeMe.Com* (see www.patientslikeme.com). The founders of

Table 1 Attributes of Health 2.0 using the example of *PatientsLikeMe.Com*

Attribute of Health 2.0	<i>PatientsLikeMe.Com</i>
Social networking	<i>PatientsLikeMe.Com</i> is a social networking platform, which allows self-expression and data sharing. Exchange about personal experience and giving advice are essential benefits.
Participation	Patients, physicians and care givers can register freely under specification of the disease with which they are confronted or dealing with. Patients feel engaged in the medical and personal history of their peers.
Collaboration	Registered patients seek and give advice. Additionally, patients share not only information, but can also participate in low-level clinical studies (e.g., lithium therapy for ALS patients, which turned out to be not successful).
Apomediation	Intermediaries are removed. Peers share and provide information about specific conditions and diseases. Patients actively give and seek advice from peers without consultation of general practitioners.
Openness	The network is open for all patients independent of their disease. If a disease is yet unknown to the network, new users can submit a request to add the disease to the list.

Table 2 Attributes of Health 2.0 using the example of Microsoft HealthVault

Attribute of Health 2.0	Microsoft HealthVault
Social networking	Microsoft HealthVault allows sharing of personal health data between patients and providers (e.g., physicians or emergency departments), but also among friends, family members, insurance companies or other third parties. Communication with people with similar health problems is facilitated.
Participation	If authorized by patients, health information can be shared and is accessible by general physicians, hospitals etc. Microsoft HealthVault also supports patients to find clinical trials they would like to participate in.
Collaboration	An open application programming interface allows the interconnection of websites. Integration of a wide partner network in the area of medical and fitness devices is possible. Collaboration with regard to software development is enforced.
Apomediation	Patients can download their data directly from the practice, laboratories or insurance-claims databases. Applications and connections to other medical devices enable patient access at all times.
Openness	Free for every interested consumer. However, sharing and forwarding of personal data requires consumer agreement. Also, the HealthVault Development Center is open to computer programmers or app developers.

PatientsLikeMe.Com originally fundraised millions of dollars for research on ALS (amyotrophic lateral sclerosis) and ended up creating the data-sharing social network. Since its foundation in 2004, more than 200,000 patients covering more than 1,800 diseases have registered. While in the traditional physician-patient relationship most of the information about the patient are locked and the gate keeper physician only gives away what s/he thinks is necessary, within PatientLikeMe.Com more information about a specific disease is shared on a voluntarily basis.

The benefits of sharing information on personal health are manifold. There is evidence that social networking platforms foster the decision regarding the appropriate treatment as well as symptom management by means of sharing experiences and exchanging health information among patients with the same health condition (Antheunis et al. 2013). A qualitative content analysis on comments within the ALS group on PatientsLikeMe.Com showed that there are three groups of comments: asking for advice, offering advice and fostering relationships with other affected patients (Frost and Massagli 2008). The results of a cross-sectional study of over 1,300 registered patients by Wicks et al. (2010) showed that respondents felt an improved understanding of their condition in general and its treatment in particular. Furthermore, they reported to be more involved in the decision-making process. Moreover, engaging in a Health 2.0 based online community decreases psychological problems and thus enhances quality of life. Having the opportunity to reach like-minded people on a daily basis is invaluable for patients, especially with chronic or rare diseases. By choosing an associative brand name (i.e., “there are others like me”) users gain the feeling of being equal among equals right away. For

researchers the platform allows to quickly approach a group of patients with a specific disease. Although patient trials via PatientsLikeMe.Com do not fulfill the conditions of real clinical trials, information on social media platforms can capture emerging trends before official data are available (McKee 2013).

4.2 *Microsoft HealthVault*

While PatientsLikeMe.Com is based on the principle of sharing content in an online community, *Microsoft HealthVault* is a web-based personal health record repository (see www.healthvault.com). As such, personal health records go beyond what general electronic health records have to offer. While electronic health records only enable providers to process patient data paperlessly and save it to local electronic devices, web-based personal health records allow multiple users to access, store, retrieve, manage and share health data over the internet and among multiple players, such as providers, insurance companies or employers (Steinbrook 2008).

Microsoft HealthVault was launched in 2007 and is currently available in the USA, Canada, the UK and Germany. It comprises two central features: (1) an electronic repository for health data and (2) a specialized search engine for health information. Microsoft HealthVault is able to connect with other applications and devices (e.g., heart rate watches, blood pressure monitors) and also supports standardized medical data formats such as DICOM. However, Microsoft HealthVault is not the only platform of its kind. Main competitors are the US-based *Dossia* (see www.dossia.org) and the Norwegian *World Medical Card* (see www.wmc-card.com). The former is a consortium of several large American employers, such as AT&T, BP or Walmart, that attempt to empower their employees to make smarter healthcare decisions through the use of *Dossia*. Until 2012, Google's product *Google Health* had been likewise present on the market but was discontinued because it did not fulfill the company's expectations. Google announced that it was not able to translate its benefits into a "widespread adoption in the daily health routines of millions of people" (Google 2011). Instead, users were encouraged to join Microsoft HealthVault. All presented tools have in common that the patient's need for self-control and thus self-improvement is supposed to be the main driver for success.

Moving beyond telemedicine and interactive websites, the push toward personal health records has emerged as a new option for patients to take control of their own medical data and become active participants in digitized health care (Randeree 2009). Theoretically, web-based personal health records empower patients to control their information and thus facilitate decision-making concerning health conditions. Personal health records have the potential to improve personal fitness levels, patient-provider communication and coordination of care (Steinbrook 2008). By tracking personal health data, medical errors can be avoided and patients' safety may be enhanced (Randeree 2009). Altogether, healthcare costs could be decreased. However, more empirical research is needed to confirm these propositions (Steinbrook 2008).

As a matter of fact, healthcare providers already struggle to adopt electronic health records (Jha et al. 2009). Presumably, providers tend to underestimate the potential upheaval web-based personal health records will bring along. Providers using electronic health records would need to decide if they allow patients to receive their data and potentially share them with competing third parties. Physicians and patients, dealing with chronic conditions or need for intensive care, will probably be the first to understand the benefits of web-based personal health record systems such as Microsoft HealthVault. Ultimately, success of web-based personal health records will only be achieved if users do not perceive them as a doubtful business model, but rather as added value for their personal healthcare management.

4.3 Assessing Health 2.0: Can We Realize Its Potential?

In order to provide an unbiased picture of Health 2.0's potential, benefits and risks need to be thoroughly counterbalanced. Table 3 provides an overview of key aspects related to the debate on Health 2.0. Although Health 2.0 involves multiple stakeholders, this assessment focuses on the three main perspectives, patients as healthcare consumers, medical professionals as healthcare providers, and society as system environment.

From the *patients' perspective*, the main benefits of Health 2.0 are exchange with other people affected by the same disease and the access to shared knowledge that goes beyond the scope of the individual. Making personal health data transparent to others and receiving external feedback on the individual health status or treatment decision encourages further health-conscious behavior. Health 2.0 plays a key role to facilitate and motivate self-disease management and health promotion (Frost and Massagli 2008). However, the danger of patients overestimating their health literacy is imminent. Moreover, patients remain vulnerable to privacy concerns, data security issues and misleading information which is also the main barrier against Health 2.0 usage (Antheunis et al. 2013).

Taking the *provider perspective*, the greatest risk for medical professionals is not to respond to innovative communication trends online (Aase and Timimi 2013; Hawn 2009). Physicians and other practitioners often do not acknowledge or welcome these new developments and miss the chance to open up to new opportunities (Ahmad et al. 2006). Antheunis et al. (2013) elucidate the main motifs of medical professionals not to use social media: perceived inefficiencies such as additional time and resources as well as lack of skills for proper use proved to be the main obstacles. At least the first concern is refuted by efficiency improvements through improved communications, increased self-management and better quality of care via Health 2.0 (Van de Belt et al. 2012). Further positive effects such as facilitated professional exchange among scientific peers or open patient dialogue are not less prevalent.

Table 3 Benefit and risk assessment of Health 2.0

	Patient perspective	Provider perspective	Societal perspective
Benefits of Heath 2.0	• Generation of health-related knowledge^a • Exchange of experiences, advice and social support^{a,b,g} • Immediate access to personal health information^{b,e} • Facilitated self-monitoring and self-care/disease-management^{c,f} • Usage of collective intelligence to detect poor healthcare quality services^h • Overall promoted patient autonomy and increased ability to make informed healthcare choices^{b,i}	• Communication with peers about scientific advancements^a • Usage as marketing tool to promote health services, even in restricted regulatory environments^a • Facilitated clinical education and communication^d • Efficiency improvements in organizational processes and reduced costs, for example through online communication with patients^{a,f}	• Improved access of patients to health servicesⁱ • Increased health promotion and thus decreased burden on healthcare systems^g • Shared decision-making with a collaborative teamwork approach^{b,i} • More efficient use of clinical time^b • Multi-stakeholder access to medical health data^b • Generally improved quality of careⁱ
Risks of Heath 2.0	• Data security and privacy concerns^{a,f,i} • Unreliability of information and highly variable information quality, potentially misleading^{a,b,i,j} • Danger of disempowerment and inequity for people with lower socio-economic status, limited health literacy and missing internet accessⁱ	• Fear of law suits on legal grounds due to violation of patient privacy^{a,f} • Shift of conventional notions of the medical authority^{b,j}, patients acting as “scientists”ⁱ • Missed opportunities to promote and improve service quality as well as to engage in patient dialogue^j	• Possible exacerbation of socio-economic health disparities as usage of Health 2.0 is dependent on infrastructure and age^{b,i} • Ambiguous shift in patient-physician relationships as patients vary in their role as empowered medical decision makerⁱ

^aAntheunis et al. (2013); ^bWald et al. (2007); ^cFrost and Massagli (2008); ^dHamm et al. (2013);

^eRanderee (2009); ^fHawn (2009); ^gWicks et al. (2010); ^hLagu et al. (2010); ⁱLo and Parham (2010);

^jAhmad et al. (2006)

To make the best possible use of Health 2.0, all stakeholders should consider several recommendations. Patients need to carefully evaluate the obtained health information with regard to quality and reliability and further discuss it diligently in the physician encounter. Physicians are encouraged to promote patients' informed decision-making, for example by participating in online ratings and recommending reliable online information sources. Emotional and counterproductive reactions to patients' commitment should be avoided (Lo and Parham 2010). Providers can also distinguish themselves in terms of medical knowledge through correction of untrustworthy or unreliable information on the web.

5 Implications for Healthcare Stakeholders

Following Rogers (1962) typology of innovators, Health 2.0 is in a stage of *early adoption*. At the moment, existing user groups of Health 2.0 pursue different goals when engaging in new health information technologies. Both patients and providers rarely communicate across their peer groups and therefore do not lever the potential of Health 2.0 technologies to its fullest extent (Antheunis et al. 2013). Patients seem to be more open towards Health 2.0 than medical professionals. Potentially, physicians are threatened by additional financial burdens or legal risks when adopting new technologies. This would explain why larger corporate organizations such as clinics or hospitals are at the forefront to refine Health 2.0 (Steinbrook 2008).

Taking a *societal perspective*, policy makers need to avoid that patients exploit Health 2.0 to “e-scape” from the confines of the medical profession (Nettleton and Burrows 2003). Incentive systems and reimbursement mechanisms for providers are currently missing and might offer a path for increased provider motivation to make greater use of Health 2.0 (Antheunis et al. 2013; Lo and Parham 2010). In parallel, detailed evaluations of single Health 2.0 applications should be initiated. As they are relatively recent phenomena, their impact cannot yet be determined. This applies to all tools ranging from web-based personal health records to social networking platforms (Steinbrook 2008). Finally, society should not lose sight on ethical concerns and challenges emerging with Health 2.0, especially the difference between private and public space and the right to anonymity (McKee 2013; Lo and Parham 2010). Therefore, possible policy actions could also concern improved privacy and data security legislations to reduce risks and burden on all stakeholders (Lo and Parham 2010). In the end, politicians are also obliged to provide more equitable access to Health 2.0 technologies, especially to socio-economically disadvantaged people.

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Part V
Technology and Innovation

Adoption and Diffusion of Innovations in Health Care

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Abstract This chapter discusses the theory and practice of adoption and diffusion of innovation. It has a healthcare sector emphasis and is aimed for readers who are new to the field of innovation. The chapter offers a broad overview of the literature on the adoption of complex organizational and technological innovations in health systems. In doing so, it summarizes the most commonly used perspectives that explain the factors that determine the fate of the innovation process, namely the characteristics of the innovation, the adopter characteristics and health care system and innovation context characteristics. The strategic importance of these perspectives in determining successful diffusion of innovation is discussed in detail. A framework is constructed that offers guidance and support to those responsible for managing innovation projects.

1 Introduction

Innovation is the driving force of progress in societies and national economies. The abandonment of previous structures, practices and technologies clears the way for new economic developments and moves society forward. This phenomenon known as ‘creative destruction’ describes the continuous generation of innovations (Schumpeter 1943). Accelerating the uptake of promising innovations and rejecting less beneficial ones are keys for efficient systems and societies. Innovation systems and structures (Freeman 1995) that do not foster innovation risk the underuse of promising innovations. Unfortunately, embracing change and innovation is complex.

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Innovations in health care serve the noble purpose of providing better care for patients. The health care sector creates a variety of innovations such as new drugs, medical devices, business models, assistive technologies or models of care. Nowadays, innovations in health care are of crucial importance to address a variety of challenges in health care systems all over the world. The health care sector requires innovative solutions to adequately deal with increasing health care costs, an aging population, and more demanding consumers (Herzlinger 2006; Varkey et al. 2008). However, research and experience demonstrate that diffusion of innovations in health care is particularly cumbersome (Herzlinger 2006; Lämsäalmi et al. 2006). For example, only about 50 % of all evidence based practices are effectively implemented in health care systems (Alexander and Hearld 2011). The characteristics of most health care systems and its actors as well as innovation resistance impede the sustainable uptake and scale up of innovations. For example, social and ethical risks of treatments, restrictive governmental laws and perhaps conflicting national policy reforms, the complexity of health care organizations or change inertia of clinicians and organizations impose barriers on innovation (Lämsäalmi et al. 2006). Innovation in health care is hard and systematic approaches are needed to tackle the problem of slowly spreading innovations. These approaches need to focus on the innovation, on potential adopters as well as on system and context variables. For example, health care innovations need strong evidence of relative advantage that must be promoted to a multitude of innovation stakeholders.

The following examples illustrate the difficulties, which innovation diffusion encounters in health care. Particularities of the health care system can lead to inadequate implementation of promising innovations and adoption of inefficient ones. In a study with 12,000 children, 30 % received unhelpful and expensive antibiotics despite solid evidence that these antibiotics were inappropriate. In addition, the harmful treatments cost \$200,000 more per year than appropriate treatments (Berman et al. 1997; Berwick 2003). The example of safety checklists for surgeons further illustrates the problem of change inertia. There is overwhelming evidence that surgeon safety checklists reduce mortality and other postoperative complications (Haynes et al. 2009). However, although many surgeons completed the checklists, they were often inaccurate and superficial, rendering the checklists useless (Sparks et al. 2013). Whereas in other industries ineffective implementation of innovations may only cause inefficiencies, an ineffective implementation of innovations in the health care sectors affects the life of patients.

The aim of this chapter is to apply innovation theories to identify factors that influence adoption and diffusion of innovations in health care. Existing literature in this research field frequently focuses on a single perspective such as the innovation, the adopter or the system perspective. For example, innovation research in health care has primarily focused on individual doctors and rather neglected large health care organizations (Fleuren et al. 2004). However, determinants that affect innovation diffusion do not only include the adopter perspective, but also compromises the innovation perspective as well as context variables (Fleuren et al. 2004). Only few articles integrate both promoting and impeding factors as well as distinguish various perspectives (Atun et al. 2010). Therefore, this chapter provides a broad

overview using three perspectives that influence innovation adoption and diffusion. We are well aware that this chapter is not able to provide an exhaustive list of all relevant factors that influence innovation adoption and diffusion. The chapter seeks a balance between displaying a comprehensive set of factors that determine innovation diffusion and describing certain enabling or inhibiting factors in detail. In this way, we discuss the theory and practice of adoption and diffusion of innovation with a health sector emphasis. Hence, this chapter provides a first overview and guidance to readers who are new to the field of innovations in health care. For this purpose, this chapter adjusts innovation theory to health care—or rather explores to what extent statements of traditional innovation theory also fit to health care, which undeniably is one of most complex sectors of our economy. The chapter concludes with a summary model that actors in the health care system may use to foster innovation adoption and diffusion.

2 The Theory of Innovation Adoption and Diffusion

A health care innovation refers to “the intentional introduction and application within a role, group, or organization, of ideas, processes, products or procedures, new to the relevant unit of adoption, designed to significantly benefit the individual, the group, or wider society” (West 1990). In line with this broadly accepted definition, innovations in health care are, for example, new organizational technologies, innovative treatment practices or novel drugs for patients (Lämsäsaalmi et al. 2006). This chapter uses examples of product innovation, process innovation as well as organizational innovation in health care to explain the factors and processes that determine whether a social system embraces and quickly adopts a novelty or whether the social system inhibits and rejects a novelty.

The process of innovation splits into two processes: adoption, that is the decision of an individual or an organization to use an innovation, and diffusion, that is “the process in which an innovation is communicated through certain channels over time among members of the social system” (Rogers 2003, p. 5). While adoption research is concerned with the decision of a single unit, diffusion research looks at the entire system and analyzes how innovations spread.

The diffusion process begins with the dissemination of the innovation (i.e., a targeted approach to increase awareness of an innovation such as a pharmaceutical firm introduces a new drug to the market), followed by the actual adoption decision of an individual or organization (e.g., physicians decide to use the new drug for treating patients or a hospital purchases a new medical device). However, the complete process of adoption not only requires a purchase but also incorporates the implementation as well as actual and continued use of the innovation (Fleuren et al. 2004).

A major drawback of the current view on innovation adoption is that most actors view adoption as a discrete event (Robert et al. 2010). The view that an organization or an individual either uses or does not use an innovation is too simplistic. As the

surgeon safety checklist example shows, a mere superficial usage is not sufficient. The uptake of innovations needs to be sustained in a way that creates benefits. Therefore, extending the process of adoption to implementation and sustainability paints a more complete and realistic picture. Distinguishing these two different end points (i.e., adoption decision and implementation) is necessary to understand the complete innovation process. For instance, although the adoption (i.e., purchase) of electronic medical health records has spurred, 80 % of U.S. hospitals were still in the adoption phase rather than in the implementation (i.e., use) phase by 2010 (Angst et al. 2010). In addition, hospitals may adopt (i.e., decide to purchase) a certain innovation successfully in one clinic, but it may spread slowly or not at all to other parts of the organization and therefore wide spread implementation fails (Berwick 2003). In conclusion, adoption should be viewed as a process rather than a specific point in time (Robert et al. 2010). Continuing to use the innovation at the desired level is the final stage of the innovation process. During any stage individuals or organizations may decide to stop the adoption process because the innovation does not align with desired goals.

While the process described above considers adoption and diffusion from a linear stage-like perspective, other scholars suggest non-linear models and ‘messy’ processes. Innovation pathways involve various interactions between actors and changing conditions during the process. Coalition building across groups or boundaries between professionals are examples for factors in non-linear models that are critical to innovation success (Ferlie et al. 2005; Fitzgerald et al. 2003). However, we believe that the stage model described here offers an analytical tool to help actors realize the complexity in the sustainable uptake of innovations across organizational and professional silos.

3 What Fosters and What Inhibits Adoption and Diffusion? An Overview of Three Perspectives

Three perspectives are necessary to understand why some innovations are rapidly accepted and diffused while others are scarcely adopted. The innovation adoption process in health care is influenced by (1) innovation characteristics, (2) adopter characteristics and (3) health care system and innovation context characteristics. Each perspective contains unique factors that foster or impede adoption and diffusion processes.

3.1 The Innovation Perspective

Innovation adoption research found that one of the major drivers of adoption decisions are features inherent in the innovation. These innovation characteristics

are perceived attributes of innovations, which determine the consumer's product evaluation (Arts et al. 2011; Rogers 2003). Extant literature on innovation diffusion in health care and other sectors is heavily influenced by Roger's (2003) theory of innovation diffusion. His influential summary of existing work on innovation diffusion distinguishes between five main characteristics, namely relative advantage, compatibility, complexity, trialability and observability (Rogers 2003). A recent meta-analysis confirmed most of these assumptions and found that relative advantage, compatibility and complexity have substantial influence on adoption and diffusion processes (Arts et al. 2011).

First, and most important, innovations need a relative advantage compared to existing practice. In contrast to other industries, healthcare has an established system (although certainly not without flaws) that tries to produce evidence-based information about the relative advantage through randomized controlled trials. The results are often publicly available. However, if the relative advantage is not clearly expressed or controversial, the dissemination of an innovation could be hindered. An example is the diffusion of mammography. Due to conflicting recommendations on the appropriate age for screening, public and health insurances were confused and impeded the diffusion (Berwick 2003). Since clinicians form a major group of health care adopters, evidence of advantage is best provided in quantitative form (Barnett et al. 2011). Professionals in health care are used to "hard" numbers and "p-values" and these should accompany innovations when discussing the relative advantage. In addition, because adoption decisions in healthcare are strongly influenced by a variety of stakeholders such as physicians, providers, patients, insurances and policy-makers, the relative advantage must also be observable from different perspectives.

Second, innovations need to be compatible with current practices and behaviors. For instance, the user interface and operating concept of new imaging technologies (e.g., computer tomography) builds on prior experience of existing technologies (e.g., x-ray) (Cain and Mittman 2002). For such innovations, organizational impact (i.e., changes in current practices and routines) and budget impact are the most important reasons for innovation adoption (Gurtner 2014). If the objective is wide adoption and diffusion, innovations should only alter existing routines or the status quo when absolutely necessary. Every change required that is not the core of the intervention needs to be analyzed and eliminated, if possible. For instance, physicians adopted and used electronic patient records on tablet PCs, because the software could be used just as traditional paper records. Users were able to receive the benefits without needing to change their behavior.

Third, complexity, and its counterpart ease of use, is an important but often overlooked component of the innovation. A long history of research on different types of technologies such as information systems shows that ease of use is an essential driver of actual use. Complexity concerns the user. In the case of health care, the users can be different actors such as physicians, nurses, administrative staff or patients. For instance, shifting the point of care from physicians to nurses and from nurses to patients, is only possible when devices and procedures become less complex and easier to use. An example is the miniature blood glucose meters,

which shifted the point of care from physicians and nurses to patients. The complex procedure of drawing a blood sample was simplified into a device patients can easily use to test blood sugar wherever they are (Christensen et al. 2000). Since many industrialized countries are facing an aging population, developing less complex products becomes even more important.

Fourth, the easier it is to try an innovation before making the decision to finally adopt it, the better the innovation diffuses. Trialability enables potential adopters to reduce uncertainty and risks that hinder adoption. All else being equal, stand-alone medical devices such as syringes or surgical staples will diffuse faster than new combinations of medical devices and surgical techniques such as keyhole surgery on a beating heart (Cain and Mittman 2002). Not just because the latter innovation is more complex but also because the trialability of heart surgery with new devices is very limited. Therefore, innovators need to find ways to make some parts of the innovation trialable, for instance, by carving out component pieces which could be tried separately (Cain and Mittman 2002).

Observability, the fifth attribute, does not refer to the question of whether adopters can physically see the innovation and how it works (e.g., x-rays are invisible), but to the question whether the innovation and its outcomes are visible to a large number of potential adopters (e.g., x-ray images attracted quite an audience). Some medical innovations produce long-term results, but fail to show immediate outcomes (e.g., cholesterol-reducing drugs for preventing arteriosclerosis) and thus, are not very observable (Cain and Mittman 2002). Ideally, the use of the innovation and its outcomes should be exposed to other users. This increases awareness and—even more importantly—decreases perceived risks by potential adopters. For innovations that are hardly observable, best practice cases, promotional workshops, seminars or research studies might help to communicate the innovation among stakeholders and potential adopters. These communication tools should demonstrate the success and cost reduction parameters to key stakeholders. When success information is observable to other stakeholders, fewer barriers will impede diffusion.

The importance of certain innovation characteristics differs between the stages of the adoption process. A recent meta-analysis points out that compatibility strongly affects adoption intention (Arts et al. 2011). In contrast, relative advantage affects actual adoption behavior. Complexity fosters intention to adopt, but inhibits adoption behavior (Arts et al. 2011). Thus, complex healthcare devices may signal advancement and are therefore attractive to clinicians, but they may also become a barrier when implementing them in practice.

3.2 The Adopter Perspective

Diffusion theory assumes that the population of potential adopters can be segmented in those that adopt relatively early in time (e.g., innovators and early adopters) and those that adopt relatively late in time (Rogers 2003). Adopters in

health care are either individuals (e.g., patients) or organizations (e.g., hospitals). Both types of adopting units play a substantial role for innovation diffusion and therefore, should be considered. For example, organizational units of hospitals make the decision to purchase medical devices, but physicians decide to what extent they use the device. For example, health care information technologies may be purchased by the hospital but may not be used by physicians because they fear they might lose control over their work procedures (Bhattacharjee and Hikmet 2007). Depending on the type of adopter or the stage in the adoption process, different theoretical models should be used to identify innovators and early adopters.

Only few people are innovative in many product categories. The strongest predictor for early adopters in consumer settings is therefore domain-specific innovativeness (DSI). DSI refers to the tendency of whether individuals are willing to learn about and adopt in a certain product category (Goldsmith and Hofacker 1991). Depending on the type of innovation, consumers that adopt relatively early are more involved or more knowledgeable in the product category. A challenge in health care is that innovations often include multiple categories. For example, the adoption of new health apps for smartphones and tablets requires potential adopters to be innovative in both consumer electronics and health provision.

In contrast to individuals, organizations are motivated to adopt innovations for two reasons: technical efficiency (“wanting to do better”) or social legitimacy (“wanting to look good”). In addition, organizations are either motivated to achieve gains or to avoid losses. Hence, organizations try to avoid economic losses or achieve economic gains and try to avoid social losses or achieve social gains (Kennedy and Fiss 2009). In a study on total quality management (TQM) implementation, early adopters (hospitals) were primarily motivated by social gains (e.g., being perceived as market leader or innovative hospital). In contrast, economic threats (e.g., loss of market share) and the perceived threat of social losses (e.g., not receiving an accreditation) motivated later adopters (Kennedy and Fiss 2009).

In addition to driving characteristics of adopters, actors in the health care sector should also be aware of the dark side of innovativeness: innovation resistance. Resistance to innovations either emerges in the organizational context of technology implementation (e.g., health care information technologies in hospitals) or in the context of consumer behavior (e.g., patients rejecting treatments). In an organizational setting, individuals resist change when they feel threatened by loss of status quo, power or control (Bhattacharjee and Hikmet 2007). However, resistance could also be beneficial in organizational change, when drawing attention to poorly thought out aspects within the implementation process. When managed carefully, resistance could be a constructive tool for introducing healthcare technologies (Lapointe and Rivard 2005; Waddell and Sohal 1998). For instance, physicians’ resistance to use information technology in health care can be a trigger to improve this information technology’s usability.

In addition to resistance inside organizations, analyzing resistance from an end-user perspective (i.e., in a non-organizational context) is just as important. Patients become more engaged consumers of healthcare, inform themselves and

may disregard medical advice. Thus, physicians have to leverage consumer's growing empowerment to enhance adoption (Herzlinger 2006). Recent studies also reveal that usage barriers, missing superior performance-to-price ratios, traditions as well as economic or functional risks impede adoption of technologies and lead to resistance (Kleijnen et al. 2009). For patients, however, other barriers such as physical risks (e.g., side effects of drugs) may play a more prominent role. In addition, certain medical technologies and drugs like addictive tranquillizers, test-tube babies or hear transplantation surgery rise public criticism. They are opponent to moral values of different individuals and skepticism may hinder their successful diffusion (Calnan et al. 2005).

3.3 The System and Context Perspective

The system perspective compromises specific structures of the health care system that are important to innovation adoption and diffusion. For instance, policy makers evaluate safety and efficiency of technologies and set regulating laws. Thus, they determine structures of the health care system. Pharmaceutical companies develop and sell drugs while physicians prescribe drugs. Both physicians and pharmaceutical firms influence innovation decisions of patients due to their role as change agents that directly or indirectly try to influence patients' adoption decisions (Cain and Mittman 2002). Such pluralism suggests that one of the greatest challenges for health care entrepreneurs lies in convincing key stakeholders of their new product. For instance, convincing patients and physicians of a new intervention is pointless when public health insurance won't reimburse the innovation. The patient certainly is a key stakeholder but often is less powerful than other interest groups (Denis et al. 2002). The network of relevant stakeholders in health care is more complex than in other industries and varies in different countries.

To make matters worse, even within stakeholder groups different professions exist that may impede the spread of innovations (Ferlie et al. 2005; Robert et al. 2010). The reason is social and cognitive boundaries. For instance, while the use of heparin to prevent blood clots was adopted by vascular and general surgeons, orthopedic surgeons were resilient. They viewed orthopedics as something different and worried about other problems than vascular surgeons (Ferlie et al. 2005). Therefore, evidence and adoption in a single profession is not sufficient. A possible solution is collaboration projects between different professions and stakeholders. Collaboration stimulates interpersonal networking and open communication and, hence, is a means to overcome innovation barriers (Varkey et al. 2008).

Successful diffusion depends on the distribution of benefits and risks in the stakeholder system (Denis et al. 2002). Innovations that diffuse rapidly possess characteristics that are valued by the most powerful stakeholders (e.g., public insurance, hospital buying centers, physicians). For instance, a new intervention could help save hospital beds but at the same time reduce income for physicians and

require extensive training for nurses. In a case like this, innovators should find ways to compensate physicians and reward nurses to achieve adoption and implementation success.

In addition, innovations and entrepreneurs need formal or informal ties and links to other organizations in healthcare (Barnett et al. 2011). Especially with the risky task of introducing innovations, mutual trust and support between the partners are essential. For example, the densely connected professional networks in hospitals can influence their respective members' (e.g. physicians, nurses) behavior. If a few members become convinced of certain medical procedures or the efficacy of a drug, other members will more likely follow suit (West et al. 1999).

Ties and relations can be used to find champions inside and outside organizations that promote the innovation. Pharmaceutical and medical device companies, for example, should identify opinion leaders among stakeholder groups and pay special attention to them. Opinion leaders influence different phases of the adoption process and are particularly important when innovation projects advance to practical implementation. However, companies should also be aware of resistant opinion leaders (Lämsäsalmi et al. 2006; Locock et al. 2001). In addition, organizations that attract public attention and that stakeholders view favorably have significant influence on other hospitals. These so-called "celebrity" hospitals influence the adoption of new technologies in other hospitals (Angst et al. 2010). Hence, stakeholders that are interested in spreading a new technology should pay attention to social contagion effects and select influential organizations as early adopters. This is especially important for complex technologies such as electronic medical records. With such innovations, managers seek information to reduce the risk of adoption (Angst et al. 2010). Conversely, there are few champions for IT systems for small practices and therefore the diffusion of new IT systems in small practices has been tremendously slow (Cain and Mittman 2002).

4 Recommendation Summary for Innovation in Health Care

To ensure successful adoption and diffusion of healthcare innovations, researchers and practitioners should mind certain drivers and inhibitors. Innovation theory distinguishes three perspectives. This chapter summarizes research on all three perspectives while taking into account the specific characteristics of the complex healthcare sector. Resulting from the discussion of influencing factors in the former sections, Fig. 1 presents a framework with helpful guidelines to properly introduce healthcare innovations. If managers of innovation projects become aware of the multitude of influences on innovations, a higher rate of adoption, implementation and continuation is more likely. As the case of surgeon safety checklists illustrates, considering adoption as a process with different phases rather than as a discrete choice could even save lives.

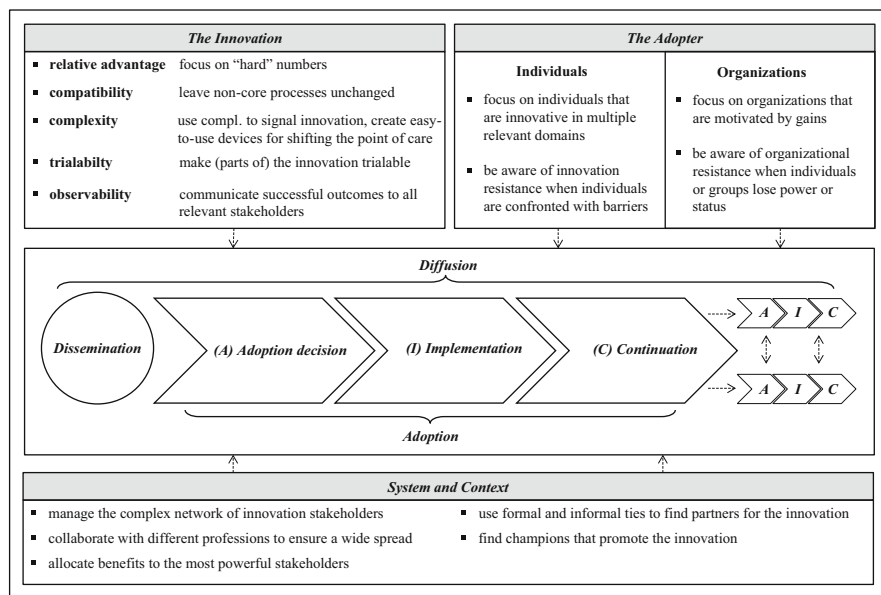


Fig. 1 Innovation adoption and diffusion framework

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Usability Assessment of Medical Devices from a User Perspective: Results of a Focus Group Discussion

Daniel Schubert, Jens Mühlstedt, and Angelika C. Bullinger

Abstract Due to poor usability of medical devices adverse events occur. To lay foundations to prevent such occurrences we present and discuss usability evaluation methods for medical devices from a theoretical perspective. Additionally, results from a focus group discussion are elaborated which targeted the identification of appropriate usability methods. Combining literature and empirical data, we suggest an assembling of heuristic evaluation and a supplementary usability questionnaire to evaluate medical devices. Applying this combined instrument, we expect a reduction of adverse events in medical treatment.

1 Introduction

In healthcare the number of adverse events, in terms of medical devices, increases every year. In 2012 there were 8,211 adverse events recorded in Germany (Bundesinstitut für Arzneimittel und Medizinprodukte 2013a). In the USA and in Great Britain the development of recorded adverse events is comparable (FDA 2013; MHRA 2011). The detailed results of the study of the BfArM (2013a) also show the link between adverse events and insufficient usability of medical devices. In a scientific review potential causes of errors are identified (e.g. insufficient usability, functionality problems, anthropometric design flaws) (Bundesinstitut für Arzneimittel und Medizinprodukte 2013b).

A further study shows that nearly half of the associated avoidable adverse events are caused by poor usability (Backhaus 2010). This proves that poor usability is a reason for the emergence of adverse events.

Therefore, it is surprising that on the one hand, there is a wide body of literature about the usability in terms of medical devices and different kinds of regulations, and yet on the other hand there are increasing adverse events in connection with usability. It seems that the usability of medical devices has not been considered

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sufficiently as there are additional benefits. For example, users can benefit from increased productivity, reduced errors, and a reduced need of training. The benefits for manufacturers are decreasing user support and improved product marketability acceptance by the users (Donahue 2001; Jaspers 2009; Maguire 2001; Shaver and Braun 2008). Additionally, usability has an impact on several other aspects, which can influence financial factors in a positive manner. Manufacturers and also users must take these financial impacts into account. But the link between costs and benefits of usability is not clear for organizations (Leiber et al. 2013). One reason might be that exploration of usability is difficult because these benefits are often intangible. Most of them are indirectly observable and only after a long period of usage (Beevis and Slade 1970).

Hence, this article aims to lay a foundation on the usability evaluations of medical devices in hospitals. Especially the possibilities to evaluate medical devices from the user perspective are discussed. In this chapter medical devices refer to equipment that can be used for diagnosis and treatment. The focus group discussion was centered around equipment which is operated by a digital human-computer interface (e.g., infusion pumps, digital blood pressure measurement devices, monitoring devices).

The chapter starts with a presentation of usability, translates the concept to medical devices and then presents methods. Said methods have been discussed in a focus group and the results of the focus group are presented subsequently. In the discussion suitable methods for usability evaluations for medical devices are presented while implications are shown at the end of the chapter.

2 The Concept of Usability

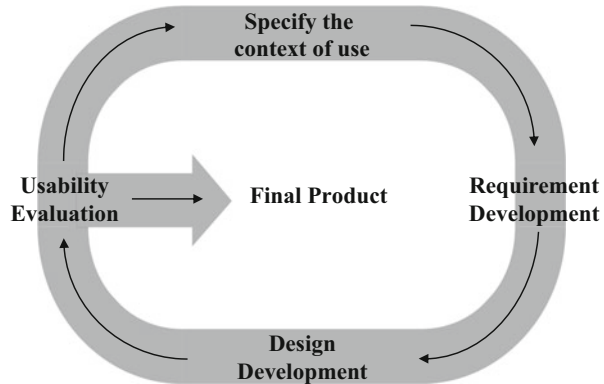
Usability is defined as “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use” (ISO 9241-11 1998).

Figure 1 illustrates the three factors of usability. *Effectiveness* describes the completeness and accuracy with which users reach desired goals in specific environments. *Efficiency* refers to the ratio between accuracy and completeness and the assigned efforts. *Satisfaction* describes the convenience and acceptability of the work system to its users and other people affected by its use (ISO 9241-11 1998).



Fig. 1 Factors of usability (Leiber 2010)

Fig. 2 Iterative usability engineering process (ISO 9241-210 2010)



Effectiveness, efficiency and satisfaction are essential measurable factors that determine the usability of a product. Furthermore, the context of use also builds up specific requirements for usability. This context includes the *specified users* and *goals* and *particular environments* where the product is used in. This means that not only effectiveness, efficiency and satisfaction are important criteria which influence the usability of a product but also the context of use has to be considered precisely (Liljgren 2006).

To archive the goals of effectiveness, efficiency and satisfaction and consider the whole context of use, the human-centered design process should be conducted. This process is described in ISO 9241-210 as well. The human-centered design process consists of four general steps (Fig. 2).

In the first step, the basis of any usability development is represented in the analysis of the context of use. In the next step, the plurality of determined information concerning the context of use needs to be condensed. So it is possible to deduce more concrete requirements for the product that will be developed. Based on the defined requirements, usability design guidelines have to be elaborated in generating product designs. These will be verified in the last step of the evaluation process with regard to the fulfillment of the previously defined requirements. The process is iterative. This means that the process must be repeated again, if the evaluation step induces that the requirements were not met. Therefore, it is advisable to carry out the design and evaluation of maturity levels and already evaluate early product designs (ISO 9241-210 2010).

The definitions as well as practical experiences make it clear that usability is a relevant factor in terms of quality of use. In literature a lot of examples show how insufficient usability leads to errors in all kinds of industry (Han et al. 2001, Air Accident Investigation & Aviation Safety Board 2006). For example, in terms of consumer products (e.g., home/consumer electronics) insufficient usability is primarily dissatisfying and annoying. In the engineering and automobile industry, poorly designed machine tools and human-machine interfaces can result in property damage and serious personal injuries (see Fig. 3).



Fig. 3 Possible impacts due to operation errors caused by poor usability

3 Usability of Medical Devices in Hospitals

In hospitals, the concept of usability is also of crucial importance. The three factors effectiveness, efficiency and satisfaction can be transferred to medical devices. The treatment process of patients has to be *effective*. This means that the used medical device has to lead to successful treatment of a patient. *Efficiency* can be described as the ratio between the applied medical devices and treatment duration, compared to the treatment success. *Satisfaction* is also an important aspect. Satisfaction can be seen as a crucial factor for both patient and physician. The satisfaction of medical device users can be a crucial factor against accidents, illness and staff absence. If employees can do their work with highly usable medical devices, the likelihood of errors decreases. Also the cognitive workload for the operation of medical devices decreases. Therefore, the satisfaction of physicians and hospital staff increases. This can have a positive effect on absence rates (Hendrick 1996). Satisfaction can also be a criteria for patients. Patients who were treated effectively and efficiently are more satisfied and the probability that they choose the hospital again increases (Kessler and Mylod 2011).

Along with effectiveness, efficiency and satisfaction, *safety* is an important aspect in hospitals (Gosbee 2002). As previously described, the usability of medical devices has a strong impact of the occurrence of errors. Therefore, it is essential that medical devices can be used intuitively because design flaws in the human-machine interface of medical devices lead to a high risk of serious harm (shown in Fig. 3). For example, errors in infusion pumps or devices for anesthesia often lead to serious consequences for patients (Bleyer 1992; Reason 2005).

Failure in design also has a crucial financial impact, short- and long-term, on hospitals and subsequently on the whole healthcare system. First, there are costs of additional training and maintenance, and second, there are direct and indirect costs of adverse events. If patients suffer from adverse events due to poorly designed medical devices, an after-treatment is usually necessary (Kohn et al. 2000). After-treatments cause additional costs because more staff are bounded to treatment and the time of hospitalization increases. This leads to higher health care costs. These costs can have a negative effect on the premiums of health insurances in consumer-

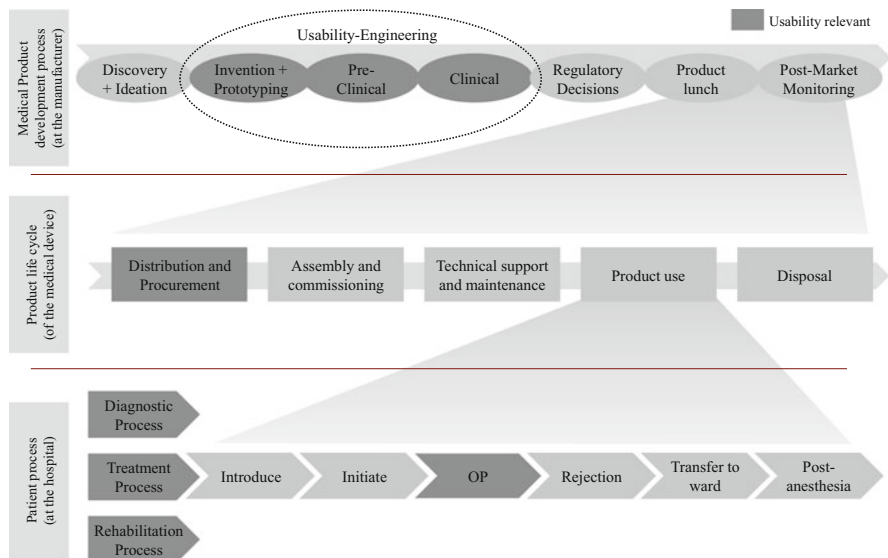


Fig. 4 Stages where the usability evaluation of medical devices plays a crucial role within medicine (ISO 9004-1 1994; Bartel and Spanner-Ulmer 2011; Center for Devices and Radiological Health and U.S. Food and Drug Administration 2011)

funded systems or on taxation. In socialized systems it can influence the quality of service (Bridger and Poluta 1998).

To decrease operation errors and the negative financial effects of the insufficient usability of medical devices, usability has to be evaluated more closely. The evaluation of usability can be done at different stages of the product life cycle:

- There is the possibility that manufacturers can integrate and evaluate usability in the product development process. In reality however, sometimes this possibility is used insufficiently.
- Or hospitals can evaluate the usability themselves. But at present this option is not widely used due to the lack of methods for assessing usability. Additionally there is a lack of transferring bad usability into costs. This means that bad usability has not been examined in terms of costs and thus information on the cost of bad usability is scarce. Nowadays, the evaluation of devices is mostly subjective (Schubert et al. 2012).

Figure 4 illustrates the foregoing possibilities of usability evaluation at different stages of the product life cycle of medical devices in detail. The first bar shows the development process of medical devices. It depicts, that the usability engineering process has to start early and prototypes and designs have to be checked continuously during the whole development process. In the middle, the second bar is an extract from the product life cycle (ISO 9004-1 1994) and illustrates the phases of “use” of medical devices in hospitals. In the first phase of the life cycle the procurement department can consider the usability of the medical devices in the

procurement process to find the device with the best usability. For this purpose usability evaluation methods can be used because after being sold, physicians and nurses will have to work with the device. Therefore, it is essential to check the usability exactly at this stage. After this the patient process bar below shows at which phase usability of medical devices can influence the treatment process of patients (e.g. usability influences the patient care process during an operation).

To explain these issues more exactly, usability methods in general are discussed. After that suitable usability evaluation methods for medical devices are presented.

4 Usability Evaluation Methods

Usability evaluation methods are methods which support manufacturers and customers/users (e.g. designer, consumer, physician etc.) to assess the usability of an interface or product. These methods can be applied at different stages of the product life cycle. There are several kinds of methods available. Considering the topic of this paper, only usability evaluation methods (and not the design methods) are reviewed. Evaluation methods can be distinguished between expert- and user-based methods.

Expert-based usability evaluation methods are conducted by usability experts. They evaluate a design with the help of guidelines, heuristics or checklists to discover breaches of design principles. Experts are able to detect general problems of a design with appropriate evaluation methods quickly, but also to determine problems relating to cognitive processes of the user (e.g. cognitive overloads) and offer solutions immediately (Jaspers 2009). Heuristic evaluation, guideline review and cognitive walkthrough are methods which belong to the expert-based evaluation methods.

User-based methods involve the actual user in the evaluation process (Blandford et al. 2004). Thereby, either the user experiences will be considered or the user will be observed while operating the product. The advantage of these methods lies in the existing user knowledge of the operator. Hence, serious problems affecting the product development are mostly determined (Jaspers 2009). User-based methods such as the usability-test, thinking aloud method or field test help to assess an interface or a product.

Table 1 shows usability evaluation methods which can be used for assessing the usability. The following usability evaluation methods are rated by five criteria which refer to the requirements and properties of the methods. Two experts conducted the evaluation of the methods. The first criterion “Requirements of the evaluator” assesses the required knowledge of the evaluator about usability and the methods. The second criterion “Number of evaluators/users” shows off how many evaluators or users are necessary/required to get/obtain meaningful results. “Required resources” are the third criterion. Time effort and required materials which are necessary to use this method are rated. “Standardization”, the comparability of the results, and “Output” form the fourth and fifth criterion. Especially the

Table 1 Usability evaluation methods (● high, ◐ medium, ○ low)

Evaluation methods	Requirements of the evaluator	Number of evaluators/users	Required resources	Standardization	Output
Expert-based methods					
Heuristic evaluation	◐	3+	○	●	Quantitative
Checklists/guidelines	○	1+	○	●	Qualitative
Expert-interviews	○	5+	●	◐	Qualitative
Cognitive walkthrough	◐	3+	○	○	Qualitative/quantitative
Pluralistic walkthrough	●	1+	●	○	Qualitative
User-based methods					
Thinking aloud	●	3+	●	○	Qualitative
User-interviews	◐	5+	◐	◐	Qualitative
Questionnaires	●	15+	◐	●	Quantitative
Laboratory usability test	●	10+	●	◐	Qualitative/quantitative
Remote usability test	●	15+	◐	◐	Qualitative
Focus group	●	5+	●	○	Qualitative
Observation	◐	20+	◐	◐	Qualitative

criterion “Output” which describes the interpretability of the results is important. Qualitative results are more difficult to interpret for non-experts than quantitative ones because quantitative results are mostly numeric values which rate a property of a device.

The presented evaluation methods are only a small part of the existing methods which can be used for evaluation in general (Stanton and Young 1999, 2003; Wang and Caldwell 2002).

5 Suitability of Evaluation Methods for Medical Devices

In health care, there are some special characteristics which hinder the adoption of usability evaluation methods. Particularly, the characteristics of the context of use play a crucial role. In hospitals, medical devices are used

- by numerous user groups (e.g. physicians, nurses, etc.),
- for several tasks (e.g. multi-functional medical devices), and
- in varying environmental conditions (e.g. different departments in a hospital use mobile devices under different lighting conditions) (Martin et al. 2008).

Another fact which complicates the application of usability evaluation methods is the knowledge about usability (Scandurra et al. 2007). The employees in hospitals and especially the actual users (e.g. physicians, nurses, etc.) are not well-trained evaluators in terms of usability. Consequently, it is difficult for them to assess the usability of medical devices without any guidance.

All these factors make it difficult to use common usability methods. Therefore, not all existing usability evaluation methods are appropriate for the evaluation of medical devices. Nevertheless, to support the usability evaluation in hospitals, a set of adapted methods would be useful to make an assessment of the usability of medical devices in hospitals more objectively.

Therefore, in July 2013 a focus group was initiated to discuss the insufficiently used possibilities to assess the usability of medical devices in hospitals. Five usability experts discussed the issues for 2 h, with the aim of finding appropriate strategies for assessing the usability of medical devices in hospitals. All participants were usability experts in a variety of domains (software, medical device, automobile design). First of all, the problem of assessing usability in hospitals was illustrated. In hospitals, especially at the procurement process, usability is not considered sufficient (Schubert et al. 2012). After the delimitation of the problem the experts discussed the problem on the basis of two questions:

1. Which requirements an appropriate method must fulfill?
2. Which usability evaluation methods are appropriate for medical devices?

Question 1: The results of the focus group discussion show that an easy and transparent tool which supports the evaluation of the usability of medical devices would be helpful. The methods have to fulfill some essential properties. Possible evaluation methods should be easily understandable and usable because the employees at the procurement department are not necessarily trained in usability. Additionally, the methods should consider the special characteristics of hospitals. Therefore, a small and guided set of evaluation methods is needed to assess the usability of medical devices efficiently. A combination of expert-based and user-based methods should be used to benefit from both perspectives.

Question 2: After clarifying the first question the experts focused on the second question to find methods which fulfill the required properties. As a further result of the focus group a suitable approach to evaluate the usability of medical devices is presented. Firstly, the evaluation of the usability of the selectable medical devices should be done by the employees of the procurement department. With the help of usability inspection methods (e.g. heuristics, checklists, walkthroughs and/or guidelines) the evaluation should start. To use a usability inspection method by a non-expert it is necessary to design these methods in a clear and easily understandable way. Additionally, it is useful that the employees complete a small training session in terms of usability. Only with background knowledge the use of usability

inspection methods is effective and leads to the desired goals. Secondly, a usability test (e.g. questionnaires) with the actual users should be conducted. The application of questionnaires provides some advantages. Questionnaires are mostly standardized. This has the advantage that the results of questionnaires are comparable. For example, the software usability scale (SUS) can be used with minor adaptation to evaluate the usability of a medical device. Additionally, it takes only a few minutes to complete the questionnaire by the actual users of the medical devices (Backhaus 2010; Brooke 1996). By using a questionnaire the opinions of the users can be collected and included in the assessment process. The collection of information can be conducted in the form of a “supplementary usability questionnaire” for each medical device. The participation of the actual users could have a positive impact on their satisfaction.

6 Discussion

Based on Table 1 and on the results of the focus group discussion some conceivable methods are discussed in detail. Especially in focus are the appropriateness and applicability of usability inspection methods (e.g. heuristics, checklists, walkthroughs or guidelines) and usability tests (e.g. questionnaires, interviews, thinking aloud) for the assessment of the usability of medical devices.

6.1 *Expert-Methods for Novices*

Usability inspection methods are methods which are used by experts to evaluate an interface. The aim of the methods is to find usability problems in a design (Mack and Montaniz 1994). Heuristics, walkthroughs, checklists and guidelines are some methods which can be used for evaluation (Nielsen 1994).

Heuristics such as *Heuristic Evaluation* is an informal evaluation method. Experts look at an interface and compare the interface in terms of usability principles, checklists and guidelines (Chew et al. 1990). Hence, the heuristic evaluation is *appropriate* for the usability evaluation of medical devices. This method can be adapted to an understandable and “easy to use” guideline. Evaluators in hospitals should be trained so that they are common with the usability principles in general. To conduct a heuristic evaluation only few resources are required. With an understandable guideline and general knowledge about usability, the heuristic evaluation can act as a well standardized supporting tool for evaluating medical devices.

Cognitive Walkthrough is a usability inspection method which follows a theoretically structured process of evaluating an interface. While conducting these methods experts evaluate an interface from the perspective of users based on specific work items. The evaluators use a list of questions which focuses the

attention on the learning process (Lewis et al. 1990). The method is *therefore, rather inappropriate* for the usability evaluation of medical devices in hospitals. The effort of preparation and implementation is tedious and the procedure is less standardized. Therefore, it is difficult to interpret the results of the cognitive walkthrough. Additionally, the evaluators' lack of knowledge about the task on where and how the medical device will be used can be problematic.

6.2 User-Based Methods

Usability testing or also called *user testing* is preamble of evaluation methods used to assess a user's interaction with an interface or product. The methods provide information about user experience (ISO 9241-210 2010). Additionally, the method can also be used to identify misunderstood use scenarios resulting in hazards.

Usability testing can be conducted in different ways but always the actual user is in focus. Thinking aloud, field observation, and questionnaires are the most common methods (CDRH 2000). Usability testing methods in general seem to be an appropriate way for the usability evaluation of medical devices. The usability test offers the advantages that the medical device can be used in a realistic environment by the actual users. In a small usability test first indications about the usability of the medical device can be found. In a structured and objective way the following usability tests present suitable methods for evaluation.

Questionnaires are a useful evaluation method to capture how actual users interact with the product and what their opinions and preferred features are. The advantages of questionnaires are the ease of use, low time requirements and no training of the users is required. The expenditure and benefit depends on the questionnaire and whether it is a standardized, existing tool or a new developed item. The sample should cover at least 15–25 users to get valid results (Holzinger 2005). Therefore, questionnaires are *generally appropriate* for the usability evaluation of medical devices. On the one hand, a set of questions asking the opinions of users about the usability can help to assess medical devices. On the other hand, standardized questionnaires can be used for several evaluations. It can be a cheap and effective supporting instrument for different usability evaluations of different medical devices. Additionally, the results of questionnaires are mostly quantitative and therefore easily interpretable.

Thinking aloud is another kind of evaluation method where users work with an interface. The difference to the other methods is how users conduct this method. Users verbalize ideas and expectations spontaneously that come to their mind while working with an interface. The method is appropriate for non-experts to uncover cognitive processes during the use of an interface. Furthermore, a small number of test users is required (Jørgensen 1990; Nielsen 1993). Despite a lot of benefits, thinking aloud seems *rather inappropriate* for the usability evaluation of medical devices in hospitals because the requirements of the evaluators are high and the

method is very time consuming. Furthermore, the approach is not standardized and the qualitative results are difficult to interpret.

Conclusion and Implications

The chapter shows that the consideration of usability is highly relevant, especially in health care. Medical devices which meet usability principals offer a lot of benefits for hospitals, users and patients. The reduction of operation errors as a result of well-designed medical devices is one main positive effect for hospitals. Thereby costs can be avoided and saved. Therefore, usability is a source for competitive advantage.

Practitioners, especially hospitals and their management have to consider usability more. In particular, procurement departments in hospitals can and should use appropriate usability evaluation methods to assess the usability of medical devices. Some existing usability evaluation methods are applicable in the procurement process of medical devices with less adaptation effort. For example, a combination of heuristics and user-questionnaires can be used for assessing the usability of a medical device. It would be conceivable to prepare a “supplementary usability questionnaire” for any medical device which is evaluated. After each use, the user has to fill out a short questionnaire. Then, after a short period of use the questionnaires can be analyzed. A decision about the usability can be made on a comparative basis. The analyzed questionnaires of each medical device and the results of heuristic evaluation can support a decision about the usability.

Scientists should further assess appropriate methods and conduct studies to show the effectiveness of their methods and the benefits of usability in health care. They should focus on refining general usability evaluation methods for medical device evaluation. Furthermore it is necessary to develop easy-to-use usability evaluation methods which can be carried out by users.

Finally, it is recommended that practitioners and researchers work together to decrease the occurrence of operator errors. Therefore, the research should jointly work with the employees of the procurement department to evaluate the usability of medical devices.

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Open Innovation in Health Care

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Abstract Traditionally, the dominant form of innovation required that firms generate ideas internally and subsequently develop and market resulting products themselves. Yet, this mode of innovation is not always the best solution, because a single firm might not possess all relevant knowledge or capabilities. The open innovation concept, therefore, postulates that ideas and knowledge should be used as both inputs and outputs for the innovation process. In contrast to other industries, the health care industry holds peculiarities that influence and restrict the open innovation concept. This chapter analyses existing literature to describe the current state of research for open innovation in general and to specifically analyze health care industry characteristics. We discuss differences in organizations, norms, regulations and data protection, intellectual property (IP) protection culture as well as innovation complexity and information asymmetry. In addition, we present solutions for each of these peculiarities to develop a comprehensive understanding of open innovation in health care.

1 Introduction

Even expert actors in health care do not possess total knowledge of all relevant and related topics that affect the success of new products. Small medical device companies may need to incorporate specialized knowledge (e.g., electronics) or health care professionals may need to create a comprehensive understanding of patients. The search for this knowledge has traditionally been focused on internal sources. With the open innovation model, however, various actors began to seek

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knowledge outside the organizational and technological boundaries of their institutions. The open innovation concept has dramatically transformed innovation processes in various industries. In health care, pharmaceutical companies in particular increasingly rely on open innovation. Other actors such as government agencies, medical device companies and patients have begun slowly to get more involved in open innovation processes in health care.

However, the health care industry contains structural and cultural particularities that influence open innovation projects. A highly regulated and complex innovation process with different influential stakeholders creates barriers (and opportunities) for open innovation.

A unique culture in intellectual property protection as well as different norms and backgrounds of project members create additional challenges for open innovation initiatives. Initiators and managers of open innovation projects need an understanding of factors influencing open innovation as well as novel approaches to solutions for these challenges.

This chapter summarizes the open innovation concept while shortly touching the important questions of ‘What are (potential) benefits of open innovation in health care?’ and ‘How much openness is enough openness?’. Subsequently, the chapter highlights important differences of the health care sector and how these particularities influence open innovation. For each health care-specific challenge, we present possible solutions from theory and practice. These recommendations empower the actors within the health care sector to shift from closed to open innovation.

2 Open Innovation in a Nutshell

To understand the emergence of open innovation, it is important to understand its intellectual counterpart, the closed innovation concept. Closed innovation describes the process of generating ideas inside an organization and developing these ideas into products that the organization can introduce to the market. Open innovation positions itself as counterpart and complementary to the closed innovation process. In addition to internal ideas, open innovation proposes the integration of external ideas, technologies and knowledge into the product development process (Chesbrough 2003). Moreover, open innovation calls for exploiting commercialization opportunities outside the boundaries of the organization. Consequently, open innovation is defined as “the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and to expand the markets for external use of innovation, respectively” (Chesbrough et al. 2006, p. 1).

According to Dahlander and Gann (2010), open innovation processes can be classified into four categories, two for inbound innovation (sourcing and acquiring) and two for outbound innovation (revealing and selling). The inbound process sourcing refers to how firms can harvest freely available, external ideas. For example, ideas could come from patients with rare diseases who are willing to share problems or solutions irrespective of expected returns. Acquiring, conversely,

describes the pecuniary process of licensing in and incorporating expertise from outside. In drug development, this inbound process typically occurs in the first stages (i.e., target and lead identification and pre-clinical tests) to access specialized knowledge (Bianchi et al. 2011). The outbound process revealing describes the process of disclosing internal resources to the external environment without expectations of immediate financial returns. This process can often be observed in open source software projects. In contrast, selling is tied to achieving financial returns through licensing out or selling inventions. In drug development, selling usually occurs in later stages of the development process (i.e., during clinical tests and post-approval activities) to ensure a quick and wide market access (Bianchi et al. 2011). Coupled processes describe cooperation between different organizations that include both inbound and outbound processes. The joint development of drugs or medical devices by an alliance of different firms is an example for the coupled process.

Inbound, outbound and coupled processes describe how open innovation functions but not why firms should apply the concept. The question, what makes open innovation attractive for firms, can be answered threefold. (1) There are many creative people and organizations with novel ideas outside the firm, who are willing to provide input; (2) there are many potential applications for ideas and technologies that are better commercialized by other organizations; and (3) using open inbound, outbound and coupled processes can lead to significant commercial value (Laursen and Salter 2006; Lilien et al. 2002; Tomlinson 2010). However, an open innovation strategy may not always be beneficial (Salge et al. 2013) and medical device firms, for example, have a rather hesitant view on open innovation projects because they fear to give up core competencies (Pullen et al. 2012).

Therefore, firms may choose a strategy from the continuum between open innovation and closed innovation. This leads to the important question: What is the best level of openness? For the inbound processes, search openness (i.e., the number of different sources) has an inverted U-shaped relationship on new product creativity and success (Salge et al. 2013). Hence searching either too widely or too narrowly may be detrimental to the success of new product development activities. However, more explorative projects (e.g., more basic research projects) can choose more open approaches than exploitative projects (e.g., incremental improvements of an established technology) (Salge et al. 2013). Organizations need to open their innovation processes, but depending on the context, organizations must find the appropriate level of openness.

3 Open Innovation in Health Care: Challenges and Solutions

To use the open innovation concept in the health care industry, managers need to be aware of certain features specific to the industry. The health care sector has substantial structural and cultural differences that affect open innovation processes. The following section discusses the five areas organizations, innovation complexity and information asymmetry, regulation and data protection, intellectual property protection as well as divergences in backgrounds, goals and norms of open innovation participants. For each area, we present possible solutions and opportunities that result from different structures and cultures in health care (see also Fig. 1).

3.1 Organizations

The health care system consists of very diverse organizations. There are small biotech start-ups, large pharmaceutical companies, university hospitals, approval authorities, patient and physician organizations and numerous others. This heterogeneity is also reflected in their level of open innovation experience. For example, whereas biotechnology and pharmaceutical companies are forerunners of open innovation (Melese et al. 2009), even innovative governments are still in the very early phase of adoption and implementation of open innovation strategies (Lee

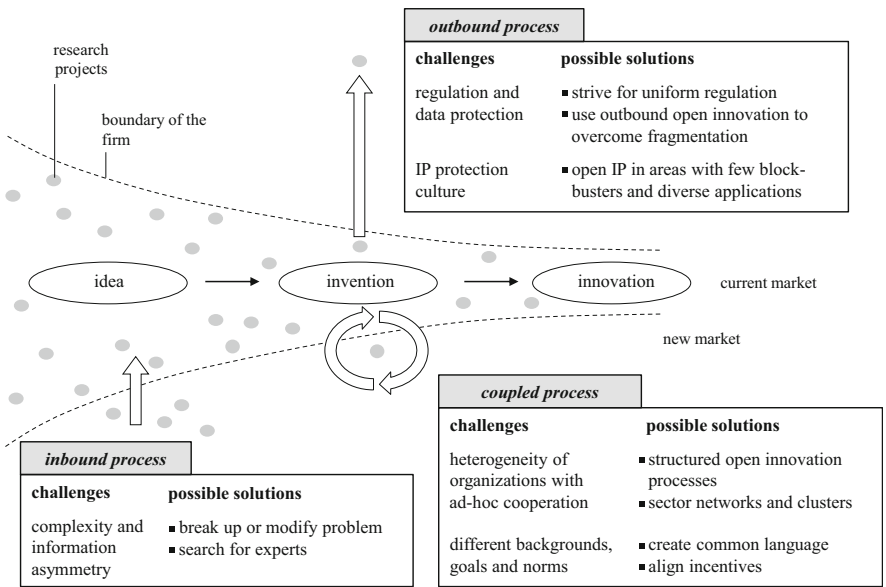


Fig. 1 Overview of open innovation processes and health care particularities

et al. 2012). Most health care organizations still lack a systematic approach to open innovation projects. Collaboration often occurs on an ad-hoc basis (Melese et al. 2009).

Firms need a structured process that searches broadly for solutions. Stabilizing and reinforcing existing cooperation and open innovation projects is a key to commercial success (Juanola-Feliu et al. 2012). Since governmental entities such as research institutions or approval authorities play an important role for health care innovation, these entities, too, need a structured approach to open innovation. For instance, the freely accessible online database for chemical molecules PubChem shows how the open innovation process “revealing” contributes to drug discovery (Ekins and Williams 2010). These open innovation catalysts should also be fostered by other stakeholders. For example, journals could require to make the data published in articles available in free databases (Ekins and Williams 2010).

Another approach to establish a structured approach is to open the traditionally closed process of innovation in academia. To overcome the limitation of the closed innovation process which builds strongly on a set of (peer) experts to select future topics, Harvard Medical School has disaggregated and opened the different stages of the academic process to outside input with remarkable success (Guinan et al. 2013).

In addition, the heterogeneity of the health care system requires networks between different types of actors. Sector networks and clusters are an important basis for open innovation projects. For example, GlaxoSmithKline (GSK) announced to create a science park based on the open innovation model; companies located in the park will be able to have access to experts and equipment (Hunter and Stephens 2010). The interaction of different firms and individuals creates opportunities for inbound, outbound and coupled open innovation processes.

Finally, the importance of health 2.0 platforms has to be addressed, online meeting points where patients and other health care stakeholders convene (Kuenne et al. 2013). These health 2.0 platforms can fulfill the role of an open innovation accelerator if designed a) with an *explicit enquiry towards the users* and b) with *structured knowledge exploitation*.

3.2 Innovation Complexity and Information Asymmetry

The health care industry is one of the most complex sectors in the economy (Begun et al. 2003), making innovation in health care a complex process. The fragmented and sometimes contradictory nature of the actors form the basis of the complex system. Furthermore, these different actors have different information and knowledge about various areas in health care. For instance, most patients lack extensive medical knowledge and producers of medical devices have only limited awareness of user perceptions of their products. Complexity and information asymmetry is detrimental to open innovation (Almirall and Casadesus-Masanell 2010). However, there are various strategies on how to cope with the issue of complexity and

information asymmetry. (1) Break up or modify the problem to enable outsiders to be part of the solution or (2) search for experts that have or will overcome the knowledge barrier.

Breaking up a problem into digestible pieces should be a first approach to overcoming information barriers. TopCoder, an online competition platform for software development systematically breaks down large software projects into independent modules. Cooperating with open innovation scholars, a large (medical) project for the U.S. Department of Health and Human Services and the state of Minnesota has thus been divided into 123 (computable) problems (King and Lakhani 2013). Prize-based contests are a means to solving those problems. Contests are likely to create optimal solutions, because the search does not merely focus on pre-selected experts but allows individuals from different fields and with a diverse set of skills and knowledge to self-select themselves into the contest (Lakhani et al. 2013). In addition to breaking the problem into smaller pieces, modifying is a second strategy for coping with information barriers. Modifying the problem may also mean taking the problem out of context. For example, researchers from the University of Washington created the online platform Foldit, where computer gamers compete against each other in designing proteins (Cooper et al. 2010). These designs will later be evaluated to see if the designs are applicable in drug use.

Although many actors face information asymmetries, there are individuals and groups that have overcome knowledge barriers and are valuable for open innovation projects. For instance, the engineer Ted Golesworthy designed his own heart-repair kit. This invention has successfully been implanted with 30 patients (Treasure and Pepper 2013). Users that develop medical equipment technologies have a high motivation to find new solutions, process a wide range of competencies and are embedded in a supportive context (Lettl et al. 2006). Using these expert individuals for the inbound open innovation process acquiring generates a chance for radically new solutions. Furthermore, a person translating between the different knowledge sectors and coordinating knowledge resources, such as a process promoter can help to resolve barriers (Gurtner and Dörner 2009).

In addition to innovative lead users, chronically sick patients or patients with rare diseases develop valuable knowledge. These patients freely reveal their knowledge and ideas. For example, in the field of rare diseases, an open innovation platform established in 2011, *Gemeinsam für die Seltenen* (together for the rare), has illustrated a public interest to be involved in health research and demonstrated the innovative potential which results from the integration of the public in health care research. 803 Participants generated 144 innovative challenges and 53 solutions (Bullinger et al. 2012). Solutions encompass a range of elaborations from vague product ideas to elaborate hybrid product-service bundles, for instance a rare disease passport with related emergency service. Similarly, the platform *PatientsLikeMe* has established an online community for patients with rare diseases. At *PatientsLikeMe*, physicians are not directly involved in the interactions taking place on the site. However, medical expertise is visible. Industry or nonprofit partners are able to create subpages on the site and, thus, can reach out to patients

for trial recruitment, education purposes, or sentiment analysis. In addition, patient platforms can be a valuable source of data that is useful for accelerating the process of evaluating the effectiveness of drugs (Wicks et al. 2011). For instance, Wicks et al. (2011) were able to come to the same conclusion concerning the effectiveness of lithium for patients with amyotrophic lateral sclerosis (ALS) as randomized controlled trials.

3.3 Regulation and Data Protection

The health care industry and the health care innovation processes are highly regulated. In addition, strong regulations on data protection contrast the concept of openness in open innovation. However, other industries such as the airline or automotive industry face similar regulations. The core difference between those industries and health care are uniform standards. Global industries require global and uniform standards. Health care, in contrast, often remains a local or regional industry with regulations varying from country to country or even within countries. This fragmentation of regulations impedes inbound open innovation processes because a solution to a problem may only work in a specific environment. For example, genome sequencing and predictive medicine may not be allowed in all countries. On the other hand, the fragmentation of regulations may be a chance for outbound open innovation processes. Different institutions that develop novel solutions could license their ideas to regions with similar problems and regulatory regimes. For example, the East Meets West Foundation successfully introduced neonatal intensive care equipment for low-resource regions in Vietnam. Encouraged by the initial success, the IP was licensed to General Electric Health Care to bring the solution to other low-resource countries (WHO 2012).

3.4 Intellectual Property Protection

Intellectual Property (IP) protection has a long tradition in the health care industry. Large pharmaceutical companies used to favor the closed innovation model hoping to generate the next blockbuster drug and being the predominant source for developing therapeutics (Ekins and Williams 2010). Accordingly, IP in health care is often licensed exclusively, limiting the application or further development by others (Frangioni 2012). This, in turn, leads to an underutilization of existing knowledge. For instance, Siemens reported that they only actively use 10 % of their patents (Alexy et al. 2009).

In addition, open innovation faces a barrier as being wrongly conceived as open access (Hunter and Stephens 2010). Open access, however, is only one strategy in the open innovation strategy family. Equating open access and open innovation undermines the concept of intellectual property for open innovation. For the

revealing process (i.e., waving IP rights or publishing ideas without immediate returns) to become a substantial innovation mode, an industry needs a certain trigger (e.g., Linux in the software industry) that in turn kicks off a self-reinforcing process between customers and producers (Henkel et al. 2013).

As the closed innovation model is becoming increasingly less successful in developing radical innovations, firms need to overcome old habits. Firms should open their innovation process in areas where there is a low probability of blockbuster drugs and a high probability of diverse applications. For example, GSK announced the creation of a patent pool with 800 patents to remove IP barriers for neglected tropical diseases (Hunter and Stephens 2010).

3.5 *Backgrounds, Goals and Norms*

The most important characteristic of successful open innovation projects is goal complementarity (Almirall and Casadesus-Masanell 2010; Pullen et al. 2012). However, diverse backgrounds and motivations strongly influence goals in open innovation projects. When conducting open innovation projects with physicians, research institutions, pharmaceutical companies and patients, perfect goal complementarity often remains a pipe dream. For example, physicians are often not interested in the details of medical devices and engineers are not necessarily interested in in-depth medical knowledge (Arntzen-Bechina and Leguy 2007).

An essential step for successful open innovation projects with diverse participants is generating a common vocabulary and understanding to facilitate communication and exchange of ideas (Arntzen-Bechina and Leguy 2007). The key then lies in aligning incentives for each party to the goals of the project. This can either be achieved indirectly through reward systems or directly through a moderator. For example, university hospitals may need to reward research physicians for helping to commercialize innovative new treatments or devices. In addition, each party may need suitable tools to measure the success of open innovation (Brau et al. 2013).

Summary and Conclusion

Unique structures and cultures in health care generate challenges for open innovation. These challenges affect all three types of open innovation processes. Complexity and information asymmetry create barriers for incorporating new knowledge from outside the organization. The fragmented nature of regulations hinders inbound processes, but—perhaps more importantly—creates opportunities for outbound open innovation processes. In contrast, the rigid intellectual property protection culture impedes the external commercialization of ideas and knowledge. The joint development of new technologies using coupled processes faces problems because of heterogeneous firms

(continued)

and people with heterogonous backgrounds, norms and goals. Although the fact that there are challenges for all types of open innovation processes may be interpreted as an incompatibility between health care and open innovation, the possible solutions in this chapter suggest that all challenges can be overcome. When managers and regulators address the particularities of health care, the industry will be able to reap the benefits of the open innovation concept as other industries have demonstrated.

However, more research regarding interdependencies between industry characteristics and open innovation methods is needed. Gathering comprehensive knowledge in this area requires a multi-stage process. First, research needs to validate industry particularities with regard to open innovation methods. Interested scholars could use the framework presented in this chapter to survey informed individuals, such as consultants who have implemented open innovation projects in different industries. Second, these validated industry particularities should then be contrasted to existing solutions. Studies could, for example, analyze the problem of complexity and investigate whether breaking up the problem or searching for experts is the best solution and which contextual factors determine whether the approach is appropriate. Third, using qualitative or quantitative systematic review methodologies, these individual results should be aggregated to support a comprehensive understanding of open innovation in health care.

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Stakeholder Variety in Healthcare and Their Integration in the Medical Device Development Process

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Abstract The innovation process of medical devices is not easily manageable and already the early stages of the innovation process decide on the duration and costs of product development. A great challenge for medical device developers is the variety of stakeholders that are included in the development process. In order to ensure that all stakeholders accept the new medical devices, developers have to consider their specific needs and have to overcome a few challenges: first, the stakeholder identification including their needs, opportunities and challenges of working together and second, the stakeholder integration focusing on the stages of the medical device development process (MDDP) and methods for user integration.

1 Relevance of Medical Device Development in Healthcare

The term ‘healthcare’ is often related to the action of diagnosing, treating, and preventing diseases, illnesses and injuries. It represents a large sector within countries’ economic systems that provide goods and services to treat patients with curative, preventive, rehabilitative and palliative care. But the term goes beyond the pure treatment of individual patients. The healthcare sector does not only include the altruistic side of helping people with complaints; a lot of companies earn money with healthcare provision (i.e., providing medical devices for healthcare). Current economic data emphasizes the relevance of the healthcare industry, or medical industry, for European economies. The medical industry is one of the world’s largest and fastest-growing industries. It is a more dynamic economic sector than other industries and with more than 10,000 patent applications one of the most innovative technical fields (MedTech Europe 2013). In most developed countries, the healthcare industry, including all sub-sectors, earns ten percent of the gross domestic product (GDP). As part of the healthcare industry, the medical device industry is a dynamic innovation-driven and highly competitive industry with more than 10,000 different types of products. The European market

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for medical devices generated about 72 billion euro in 2007 with an annual increase of 6 %. It represents the second biggest market worldwide with 33 % of the world market share, after the US (37 %) and before Japan (15 %). Over 11,000 businesses, 80 % of them are small and medium sized enterprises (SME's), employed 529,000 people in 2007 (MedTech Europe 2013).

To understand, analyze and optimize the medical device development process (MDDP), a clear definition of medical devices is necessary. However, a definition of this term is challenging, due to the multiplicity and diversity of existing devices. A comprehensive definition was made by the Global Harmonization Task Force (GHTF) and is commonly used by the World Health Organization (WHO). In their understanding medical devices are essential for delivering successful healthcare in form of effective prevention, diagnosis, treatment and rehabilitation of illness and disease. Healthcare workers, patients and other individuals can use them in a variety of settings including hospitals, clinics and even at home. Medical devices save and prolong lives and improve the quality of life.

2 Identifying and Managing Stakeholders

2.1 *Identifying Stakeholders*

Already, the size of the healthcare industry is an indicator for multiple stakeholders that contribute to the economic relevance of this sector. Current scientific literature examines the various stakeholders, their needs and relationships among each other. Freeman (1984) described the fundamentals of identifying and managing stakeholders as key part of a company's strategy. The stakeholder theory was born and soon transferred in specific contexts and industries. Fottler et al. (1989) were one of the first authors who adopted the approach to healthcare, specifically to the management of hospitals. The authors categorize hospital stakeholders into three groups—internal, interface and external stakeholders (Table 1). Internal stakeholders are described as operating entirely within the boundaries of the organization (Fottler et al. 1989). The second group of stakeholders, the interface stakeholders, have internal and external functions and link the organization to its environment. For example, medical staff belongs to the interface stakeholders and include people who regularly use medical devices in their daily work in a hospital or other clinical settings (Biemans 1991). Fottler et al. (1989) entrust the most power to the interface stakeholders. External stakeholders can be differentiated into three groups: those who provide input, those who compete with the organization and finally, those who have special interests in the work of the organization. Whereas the last group of stakeholder is generally neutral, hostile or non-supportive, internal or interface stakeholders are partly supportive (Fottler et al. 1989).

A very important group of healthcare stakeholders are obviously the *patients* as target group of most healthcare activities. Some patients use smaller devices at

Table 1 Key hospital stakeholders (based on Biemans 1991; Fottler et al. 1989; Shah and Robinson 2006)

Stakeholder category	Internal	Interface	External			Have special interests
			Provide input to organization	Compete with organization		
Stakeholder	• Management • Professional staff • Non-professional staff	• Medical staff (e.g., clinicians, physicians, medical students, nurses, therapists, carers) • Hospital board of trustees • Corporate office of parent company • Stockholder • Taxpayer • Other contributors	• Supplier • Patient • Third party payers • Financial community • Universities • Scientific foundations and research institutes	• Other hospitals (for patients) • Related health organization (for skilled personnel)	• Government • Regulatory agencies • Private accrediting associations • Professional associations • Labor unions • Media • Local community • Political-action groups • Right-to-life groups	
Relationship to organization	Partly supportive	Partly supportive	Symbiotic, mutual interdependence	Competition	Conflict, compromise as a solution	

home, for example a mobile blood pressure monitor, but most of the healthcare activities are carried out by *physicians and clinicians*. *Non-physicians* like nurses, radiologists or labor staff, support physicians with the patient care. Medical staff has a functional view on medical devices. They focus intensively on the usability of the devices and rather less on other factors like costs or development time. Besides the management of healthcare institutions as key decision makers for healthcare technologies, payers and insurers are important stakeholders to consider. External stakeholders are also individuals or organizations who support the MDDP directly or indirectly with strategic knowledge or by setting the framework. The identification and interpretation of needs and goals of all of these stakeholder groups is quite complex, but nevertheless necessary to create successful products.

This chapter gives a focused introduction on the topics that need to be understood to manage stakeholders within the medical device development process. After an approach to structure the conflicting aims of stakeholder groups, we discuss opportunities and challenges of stakeholder integration. The chapter concludes with a systematic overview of the product development process and possible methods for the integration of stakeholders.

2.2 *Managing Stakeholders*

2.2.1 Needs and Conflicting Aims of Stakeholders

Individual stakeholders have specific wants and needs toward different aspects of healthcare services. In some cases stakeholder preferences might be aligned; but often they display confronting opinions, discrepancies and different needs. Kumar and Subramanian (1998) examine the needs of five stakeholder groups: The *medical staff* is interested in clinical quality that is achieved through new and technologically advanced services and facilities. *Non-physician professional staff* keeps an eye on clinical quality and the availability of adequate services and facilities. The *patients* assign great importance to clinical and service quality. Whereas the *hospital management* longs for cost containment, profitability and institutional leadership, the *board of trustees* concentrates only on profitability, the effective utilization of resources and the steady stream of revenue and cash flow.

Quality of patient care, which becomes increasingly relevant as we face increased competition, depends on the provision of well-designed medical devices. The term ‘well designed’ implies the clinical effectiveness and safety of devices as well as the way the devices meet the needs of patients and users (Martin et al. 2012). A major challenge for the development and implementation of medical devices lies in the diversity of needs and aims of involved stakeholders. Shah et al. (2009) differ between three often competing perspectives: the regulators’, the manufacturers’ and the users’ perspective. This chapter offers a slightly modified distinction based on the work of Shah et al. (2009), which is illustrated in Fig. 1.

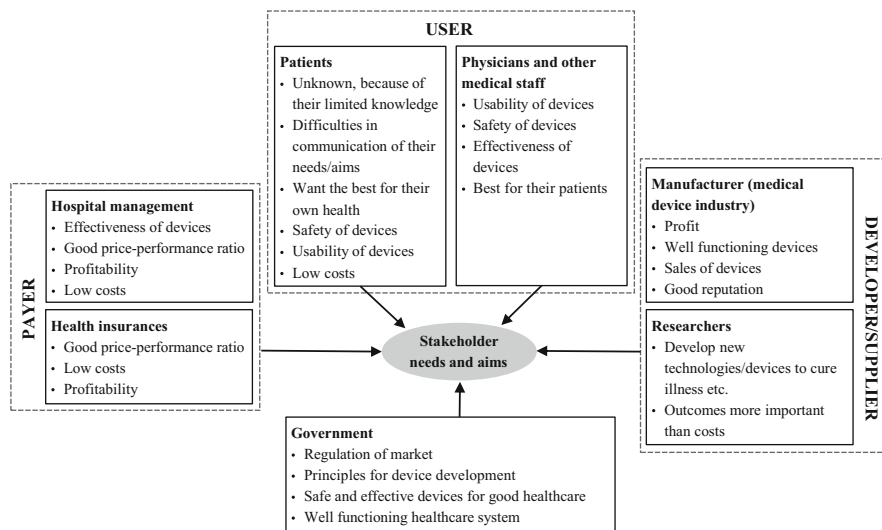


Fig. 1 Needs and aims of Involved Stakeholders in the MDDP (based on Shah et al. 2009)

The regulators' perspective is similar to the *governments' perspective*. It assumes a legislative role and is responsible for guidelines, regulations and policies to ensure that safe and effective medical devices contribute to a well-functioning healthcare system of a country. The *perspective of researchers* that also influence the MDDP complements the *manufacturer perspective*. Both have in common the major aim to develop new innovative and efficient devices. Whereas manufacturers are interested in the sales of their devices and the respective profit, researchers often put the outcomes first and neglect the financial and economic perspective. The model also contains the *users' perspective* that is subdivided into two parts: first, patients who use medical devices themselves, and second, physicians or other medical staff who use medical devices to help patients. Shah et al. (2009) describe users of medical devices as a very heterogeneous group. Professional users are properly qualified and skilled to use medical device, whereas end users (patients) possess no or less formal qualification and training. The patient's lack of knowledge often raises difficulties in communicating their needs and aims. In general, users are interested in the effectiveness, the safety and the usability of a device. But the relative importance of these aspects differs between patients and medical staff. The variety of potential users and applications makes it difficult to generalize needs and aims of stakeholders. Realizing the important role of users in the MDDP and respecting their diversity will result in more appropriately designed medical devices.

An additional perspective also bears potential—the *payers' perspective* containing hospital management and health insurers. Profitability and a good price-performance ratio are the focus of these stakeholders. Both are interested in lower costs while achieving an effective treatment of patients.

2.2.2 Opportunities and Challenges of Stakeholder Integration

According to Biemans (1991), three main arguments justify why companies should integrate potential stakeholders in the innovation process of medical devices. First, by integrating stakeholders the company is able to *meet user needs*. Improved usability, higher product quality or more security for users may lead to a competitive advantage. Besides, users who are satisfied with new devices may act as *reference customers* spreading positive word of mouth. Second, the duration of the innovation process is likely to be shortened. Time savings until the product is launched on the market may lead to competitive advantage—the so-called *first mover advantage*. Moreover, companies have the chance to reduce costs due to fewer mistakes or adjustment steps in the innovation process. Third, the integration of stakeholders may foster market acceptance and may later contribute to increased *customer loyalty*. In an empirical study, Shaw (1985) showed the dominance of users in the product development process as all of the investigated successful innovations were demand orientated. Moreover, operating close to the market allows a timely reaction to market changes. Co-operations with companies in the same or adjacent economic sectors help to overcome barriers of a single market and to strengthen *interdisciplinary development* results. Recent studies confirm positive effects of integrating the stakeholder's perspective. For example, users were shown to be able to *indicate problems* in the functionality of existing and future technologies as well as suggest appropriate solutions (Shah and Robinson 2007; Lettl et al. 2006). Garmer et al. (2002) emphasize the importance of a suitable human-machine interface to better fit the user requirements and to *minimize accidents* with medical devices. Stakeholders often become co-developers as they evaluate concepts or prototypes of technologies before companies start the next step of the innovation process (Lettl et al. 2006).

In spite of the many opportunities that come along with integrating stakeholders, the management has to find a way to handle simultaneously arising challenges. On the one hand, the company has to overcome the obstacle of *providing all resources* needed to successfully involve stakeholders in the product development process (Shah and Robinson 2007; Rochford and Rudelius 1997). Thus, the crucial factor is not the integration itself, but rather its implementation. The management should know the *internal capabilities* in order to decide which external knowledge is promising to integrate. The integration of already existing knowledge would lead to costs without additional benefits. On the other hand, stakeholder involvement is a *mutual process* in which it is not sufficient that only one part (the company or the stakeholder) is active while other partners of the network remain passive (Ritter and Walter 2003). Skeptics often argue that companies do not analyze whether stakeholders are open to innovative technologies or whether they are satisfied with *conventional technologies* (Lettl et al. 2006). An additional internal obstacle is the *not invented here-syndrome*. This phenomenon describes the internal resistance against new technologies among employees if these technologies originate from external knowledge (Hussinger and Wastyn 2012). In this case the input of

stakeholders is not integrated in the innovation process because it is argued to be unnecessary or less valuable (Shah and Robinson 2007). Besides these mainly organizational issues, companies need to keep in mind financial and strategic challenges of stakeholder involvement. For example, protecting *intellectual property* is one of the most important challenges when exchanging knowledge beyond company boundaries (Fowles and Clark 2005). Integrating stakeholders in the company's innovation process results in a knowledge transfer from the company to the stakeholder and vice-versa. From a negative point of view, this can lead to an imbalance of know-how exchange (Shah and Robinson 2007; Lettl et al. 2006). Stakeholders often do not have the required *technological competencies* to assess the feasibility of their ideas. Furthermore, it is possible that stakeholders interact in an opportunistic way, which may lead to a *knowledge drain* or a loss of undisclosed information.

The possible opportunities of involving stakeholders have to be weighed against the challenges of co-operation. Whether collaborative inventions will be successful depends on the harmonization of all factors mentioned above.

3 Stages and Methods of Stakeholder Integration in the Medical Device Development Process

3.1 Stages and Key Drivers of Stakeholder Integration

Whether a medical device innovation is successful on the market or not, depends on its adoption by institutions and individuals. Therefore, potential stakeholders as well as other important sources of knowledge have to be included in the product development process to increase customer value and reduce barriers. The integration of stakeholders in the product development process of a company is part of the open innovation approach (Gassmann 2006; Chesbrough 2006). This special paradigm encourages new ways of thinking and helps companies to develop useful products, which have the potential to be established permanently and effectively in the market. Constructive stakeholder involvement can only be achieved by understanding the MDDP and by identifying suitable stages and methods to integrate stakeholders.

Literature reports a variety of different product development processes. Cooper and Kleinschmidt (1986) describe thirteen stages of the new product development process, later this research results were modified into a twelve-stage model by Rochford and Rudelius (1997). The WHO (2003) identifies a seven-stage model for the new product development process. Based on these models Shah and Robinson (2006) analyzed the stages of the medical device lifecycle and identified five key phases (Table 2).

In addition, Shah and Robinson (2006) describe four of the five stages (except production) as relevant and feasible for user involvement. In a later publication,

Table 2 Key stages of MDDP (based on Shah and Robinson 2006; Koen et al. 2002)

1. Concept	Fuzzy front end (FFE)	Starts with idea generation and includes technical, financial and commercial assessment
2. Design		Involves product development process from (re)design to prototype development
3. Testing/trials		Starts with prototype testing in house and includes trials in the real world
4. Production		Includes large-scale production, supported by business and commercial rationale
5. Deployment/ commercialization		Includes product marketing, launch and use in the real world

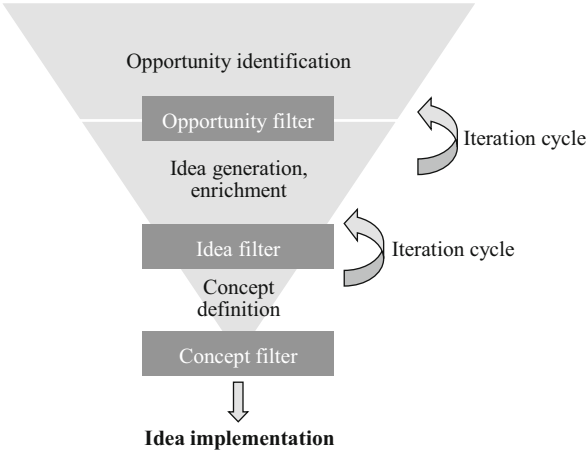


Fig. 2 Structure of the FFE

they claim that it is crucial to involve users in the early stages of the product lifecycle (Shah and Robinson 2007). The early stages of an innovation process, also called the fuzzy front end-phase (FFE), are the preliminary steps before product development and commercialization of the final product (Koen et al. 2002). The focus of ideas is undefined and information for decision-making is qualitative and informal. In this phase, ideas are rejected, new ideas are developed, changed and finally accepted (Jongbae and Wilemon 2002). Although the FFE appears intransparent and difficult to manage, empirical studies demonstrate the importance of FFE for companies in different economic sectors, particularly for manufacturers of medical devices in the USA (Khurana and Rosenthal 1998). In order to derive guidelines for management, it is crucial to structure the FFE from a theoretical point of view. In accordance to Koen et al. (2002), the FFE is divided into three steps: the *opportunity identification*, the *idea generation and enrichment* as well as the *concept definition* (Fig. 2).

The aim of the *opportunity identification* is to identify interesting and promising trends in the medical technology market. This involves regular monitoring of

stakeholder needs and of the economic and regulative environment. For example, a surgeon could face the challenge of an enormous blood loss of a patient while operating. Knowing about this challenge, a medical device company would have the chance to develop products that help the surgeon to minimize the blood loss and increase the quality of the intervention. This early product development stage is the right moment to reveal undisclosed or intangible knowledge, through an intensive stakeholder interaction (Braun et al. 2012).

After passing the opportunity filter, possible fields of action are examined in more detail. *Idea generation* is evolutionary and deals with developing, structuring, rejecting, combining or modifying ideas (Koen et al. 2002). Bridgelal Ram et al. (2008) give an example of how stakeholders provide essential information for the design and specifications of a wound care product. Stakeholders should get feedback about the progress and use of developed ideas (Koen et al. 2002). Thus, they feel valuable and encouraged to be involved repeatedly in the FFE of the company in the near future.

The result of the *concept definition* is a business plan for a new product concept (Koen et al. 2002). To ensure that the product meets the requirements of the stakeholders in terms of usability and efficiency, users should be integrated in the validation process by testing a prototype of the product. Finally, a detailed project plan, including the complete product life cycle from the FFE to the deployment and commercialization, is the basis for successfully entering the healthcare market.

3.2 *Methods of Stakeholder Integration*

Literature suggests a variety of methods to integrate stakeholders in each stage of the MDDP. A structured literature review of 24 studies by Shah and Robinson (2006) investigates user involvement practice in the development and assessment of medical devices. Most common is user involvement in the concept stage (Table 2). In most studies user's perspectives are captured through usability tests (33 %), interviews (25 %) and questionnaire surveys (21 %). Another method that helps to gain access to user perspectives and ideas, improve the design and functionality of medical devices is to work together with so-called "lead users" (Shah and Robinson 2007). The term lead user describes people or groups with high intellectual abilities and a strong intention to find solutions for occurring problems. Lead users are ahead of the market and usually possess very specific solution knowledge (Von Hippel 1986). Lead users contribute significantly to the development and evaluation process of medical devices (Shah and Robinson 2007). In lead user workshops and site visits they provide information about user needs towards new products as well as develop solutions to those needs at an early stage.

The National Health Service (NHS) established a model in 2010 that summarizes methods to involve stakeholders in the MDDP. For each stage, different methods are recommended to involve users (see Fig. 3). The model offers practical guidelines and recommendations for the medical device industry.

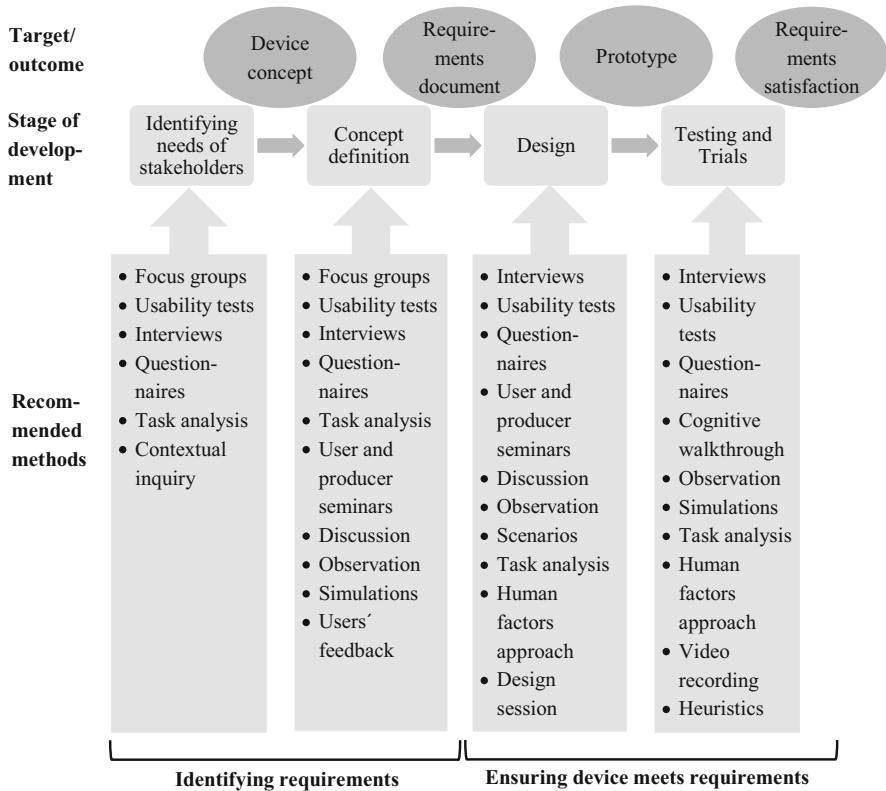


Fig. 3 Methods for stakeholder integration in the MDDP (based on Martin et al. 2012; NHS 2010; Shah et al. 2009; Shah and Robinson 2006)

Conclusions and Implications for Research and Management

This chapter has shown that integrating stakeholders in the MDDP is associated with substantial opportunities for both parties—the company and the stakeholder. Through involvement, stakeholders can contribute to the development of medical devices that better fit their needs. Companies are more likely to react timely to market changes and improve functionality, quality and usability of medical devices resulting in financial gains by increased sales.

From a *research perspective*, the recommendations put forward in this chapter provide insights about who are the most important stakeholders in the MDDP and which factors contribute to a successful co-operation with these stakeholders. However, especially in the healthcare industry, stakeholder involvement has not received extensive attention in previous research. This

(continued)

could be due to a lack of awareness of stakeholder importance. The next step on the research agenda is to develop reliable and valid measures in order to examine the effectiveness and efficiency of key drivers for integration success. Although nowadays multiple information and communication channels exist, for example internet-platforms, further research effort is necessary to get a deeper understanding of the role of media in knowledge exchange processes.

In terms of *practical relevance*, the paper deals with the relevance of early integration of stakeholders in the MDDP. Managers need to understand that involving stakeholders may have a positive effect on the speed and quality of the MDDP and resulting technologies. However, the intensity of the interaction between company and stakeholder will vary depending on for example the company's size or the willingness of stakeholders to take part in the innovation process. The management should integrate stakeholders by carefully selecting them in order to reach full benefits. Therefore, the chapter underlines that stakeholders need to be actively integrated in the FFE of the innovation process. That means that they should have the chance to raise criticism or suggest improvements out of their practical experiences. The chapter gives an overview of methods and relevant stages for stakeholder integration and therefore provides a solid basis for manager's consideration of involving stakeholders in the MDDP.

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Disruptive Prescription for the German Health Care System?

Feasibility and Impact of Disruptive Innovations in the German Context

Stefanie Steinhauser, Philipp Ramin, and Stefan Hüsig

Abstract As with many health care systems of developed countries, the German system is in dire need of reforms in order to be able to ensure the provision of health care in the future. In this paper, we examine the potential feasibility and impact of the theory of disruptive innovation in the context of the German health care system. For this purpose, we conduct a review based on the concept for the disruption of the American health care system by Christensen et al. (The innovator's prescription—a disruptive solution for health care. McGraw-Hill, 2009) and then analyze the German context accordingly. Our results indicate that the disruption of the German health care system could present considerable opportunities as well as diverse risks. Furthermore, its implementation would face some significant barriers due to the divergent structure and the prevailing culture and values of key stakeholders in the German system.

1 Introduction

The health care systems of developed countries such as the USA or Germany are facing dramatic problems that could endanger these systems. First, demographic change is leading to an aging population and an increase in the number of multimorbid patients (Statistisches Bundesamt 2009, 2012b; United States Census Bureau 2011, 2012a, b; Bodner 2013). Second, continually rising costs will no longer be tenable in the foreseeable future (Schölkopf 2010; OECD 2012a, b). Therefore, cost reduction is a central objective for both the American and the German health care systems. Despite intensive efforts, this goal could not yet be accomplished (Christensen et al. 2009; Shi and Singh 2010; Porter and Guth 2012).

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Thus, new approaches have to be considered. One possible avenue is the theory of disruptive innovation coined by Christensen (1997), which is a major concept in innovation research. It explains how disruption substantially changes industries and makes their products and services cheaper and more accessible. Disruptive innovations result in products and services whose performance is initially inferior compared to that of established ones. However, disruptive products and services are simpler, cheaper, and more convenient (Christensen 1997; Christensen and Raynor 2003). The health care systems of developed countries seem to have been barely affected by disruptive innovations yet (Christensen et al. 2009). Against this backdrop, Christensen et al. (2009) proposed a concept to solve the problems of mature health care systems by applying the theory of disruptive innovation. Since the authors focus their illustrations primarily on the free-market system of the United States and build their concept on its existing structures, the question arises as to what extent the concept can be transferred to the German social security system. Therefore, our objective is to apply their approach to the German health care system and identify its potential feasibility and impact in this context. In order to achieve this objective, we conduct a literature review on the concepts by Christensen (1997) and Christensen et al. (2009) and then transfer it to the German context using current statistical data.

This paper proceeds as follows: First, we describe the theoretical framework of disruptive innovation and its application to the US health care system. Next, we apply the concept to the German health care system. The final section summarizes conclusions and future research needs.

2 Theoretical Framework

2.1 *Basics of the Theory of Disruptive Innovation*

Every market is characterized by a certain rate of innovation, i.e., an improvement in performance that poses additional value to the customers. However, technological advancement can progress faster than the demand for performance of the customers (see Fig. 1). This can lead to an excess supply of product or service quality that customers do not actually need. This kind of innovation can be described as sustaining innovation. It constantly improves the performance of established products and services. They are often introduced by established companies that target profitable high-end customers. In contrast, disruptive innovations are products and services that underperform in traditional performance dimensions compared to established products. However, disruptive products and services offer a different value proposition. They are typically simpler, more convenient, and cheaper. Therefore, they are valued in niche markets either at the low end of the mainstream market (low-end disruption) or in a new market by previous noncustomers (new-market disruption). In the beginning, established companies ignore

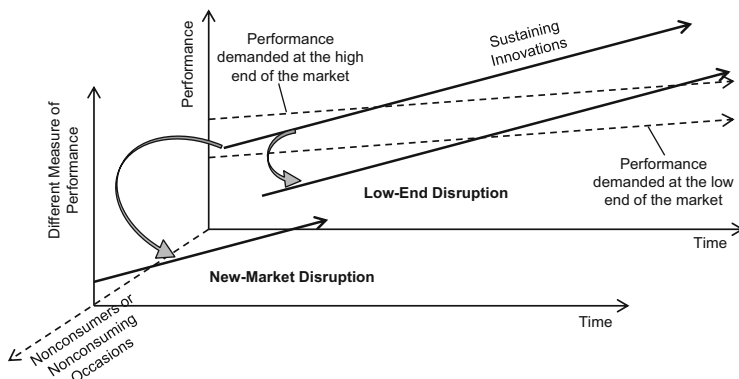


Fig. 1 The model of disruptive innovation (own illustration based on Christensen (1997) and Christensen and Raynor (2003))

disruptive innovations introduced by new entrants because these customers are not attractive to them. Instead, they will move up-market in order to serve high-end customers. But once disruptive innovations gain a foothold in the market, these products and services improve performance too. Since the technological improvements progress faster than customers' needs, disruptive innovations will eventually meet the needs of customers in the main market. At this stage, established companies finally react and try to bring similar products to market. However, new entrants have already been able to gain valuable cost-advantages and experience. That way, most established companies are either pushed back into niches or have to leave the market altogether (Christensen 1997; Christensen and Raynor 2003).

2.2 *The Theory of Disruptive Innovation Applied to the US Health Care System*

In their publication, Christensen et al. (2009) identified three components of disruptive innovations in health care: technological enablers, business model innovations, and a coherent value network.

Technological Enablers Technological enablers are new technologies that can lead to disruption (in combination with the other two components). In the context of health care, these are technologies such as molecular diagnostics, diagnostic imaging, and omnipresent information and communication technologies that can improve both the understanding and the treatment of diseases and their causes. The role of information and communication technology is threefold. First, it is the basis for facilitated network business models (see below). Second, electronic health records that store all of a patient's medical data serve as a coordination instrument in the disruptive value network and additionally help to save costs. Finally,

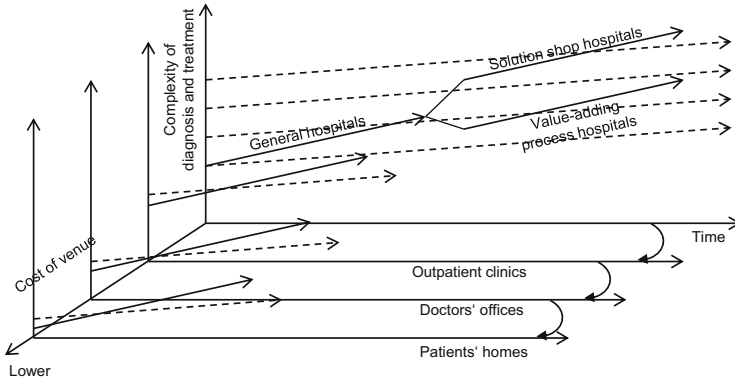


Fig. 2 The continuous cascade of disruption in health care. This cascade is characterized by the separation of business models as well as by the decentralization of care towards less expensive venues (own illustration based on Christensen et al. (2009))

applications for telemedicine (or eHealth) can promote the decentralization of care (see Fig. 2). Some other technological enablers that facilitate this decentralization are disruptive medical devices and diagnostic equipment (e.g., home blood glucose monitoring devices or portable ultrasound scanners). Their decentralized application possibilities allow a shift of treatment of less complex conditions to lower cost venues of care. This is achieved by embedding expert knowledge into devices so they can be used by less qualified personnel or the patients themselves.

Business Model Innovations A business model describes how an organization creates, delivers, and captures value (Osterwalder and Pigneur 2010). Christensen et al. (2009) advocate splitting the mingled business models of hospitals and practices into three distinct types: solution shops, value-adding process businesses, and facilitated networks. Solution shops (e.g., the Mayo Clinic or specialist practices) should work in the realm of intuitive medicine since they are aligned to diagnose and solve unstructured problems. They would conduct the diagnosis of complex diseases with the help of their expertise. Value-adding process businesses can only be operated in the realms of empiric or precision medicine where diseases are better understood. This type of business model transforms resource inputs into output of higher value. Value-adding process hospitals (e.g., surgical centers) should concentrate on the treatment of previously diagnosed ailments. Clear-cut treatments allow for an effective and economic execution. Retail clinics are another type of value-adding process business models and are recommended for illnesses in the realm of precision medicine previously treated in physicians' offices. In retail clinics, medical assistance personnel such as nurses conduct a certain range of treatments (e.g., strep throat tests, vaccinations) in convenient locations such as shopping centers. Finally, facilitated network business models can improve the care of chronic diseases (e.g., diabetes or asthma). They give their members a platform to exchange their experiences with a particular ailment. Thus, patient networks

could make a great contribution towards the improvement of both treatment quality and compliance. In contrast to the other business models, facilitated networks can make a profit by preserving health instead of treating illnesses.

Value Network The value network defines the context in which an organization identifies and responds to customers' needs, solves problems, procures input, reacts to competitors, and strives for profit (Christensen 1997). A coherent value network in the health care system should be established by powerful integrators such as integrated providers or large employers (Christensen et al. 2009). Similar to Health Maintenance Organizations (HMOs), integrated providers should incorporate their own insurance, employed physicians, and self-operated hospitals. Within their integrated network, reimbursement should only be executed by capitation (i.e., there is a fixed payment per patient per year no matter how much care is actually delivered). This way, providers have the incentive as well as the power to establish cheaper disruptive innovations within their organizations. Large self-insured employers, on the other hand, should provide disruptive medical care either through employed medical personnel or by contracting with health management organizations. In this context, the authors recommend high-deductible insurances combined with health savings accounts that enable patients to manage the payment for their care themselves. By doing so, employers would also stimulate the health-conscious behavior of their employees.

In order to facilitate the introduced disruptive changes, the infrastructure of the health care system has to be adapted as well. Changes within the reimbursement system and the medical devices industry were already mentioned above. Furthermore, regulations and standards have to be modified. Licensing and certification of personnel and venues, admission of drugs and medical devices as well as reimbursement for disruptive products and services are important examples of regulations in need of change.

2.3 Contradictions and Limitations of the Approach

However, the concept contains some important deviations from the basic theory of Christensen (1997). The absence of low-end disruptions is one noticeable difference for which Christensen et al. (2009) do not provide any explanation. Although new-market disruptions can play an important role in health care, this does not justify the complete absence of low-end disruptions. Not only the provision of care under capitation in the context of Managed Care but also ambulatory surgery centers are examples for disruptive innovations that were initially designed to appeal to customers at the low end of the market (i.e., healthier patients) (Curtis and Schulman 2006; Hansen and Bozic 2009). The fact that many disruptive innovations are hybrids anyway (Christensen and Raynor 2003) further questions this exclusion. The role of quality and performance also differs significantly from the initial theory where disruptive innovations were defined as cheaper and simpler

(Christensen 1997; Christensen and Raynor 2003). In the context of health care, disruptive innovations are not only described as being cheaper but also as being of higher quality and efficacy (Pauly 2008; Christensen et al. 2009). Since the importance of quality in health care is evident, advocating lower quality care is often avoided (Smith 2007; Pauly 2008). Nevertheless, the authors are mostly able to justify their claim in their argumentation but they fail to integrate this deviation in the theory of disruptive innovation. The authors further recommend that physicians move up-market. They justify this suggestion with the disruption of specialists (Christensen et al. 2009). However, the parallels with industries where incumbents were eventually forced out of the market by continuous up-market movement are obvious. Furthermore, the examples of successful disruptive innovations mentioned (e.g., home blood glucose monitoring, angioplasty, treatment by nurse practitioners) relate only to isolated subdomains of the health care system whereas the proposed concept aims at the disruption of the whole system (Curtis and Schulman 2006). In addition, the health care system does not consist of one single industry but rather of multiple different ones. It remains unclear whether the concept can actually be applied to the complete system. Christensen admits that the potential of disruptive innovations in health care is by far higher when the following premises are met: conditions that can be precisely diagnosed and for which there are rule-based treatments, and optional treatments for which the patients pay themselves and which therefore behave in a similar way to consumer products (Smith 2007). Thus, the most expensive and difficult ailments are the most resistant to disruptive innovations.

3 Application to the German Health Care System

In the following, the concept for the disruption of the American health care system is applied to the German system. First, we shortly examine the main differences between the American and the German health care system. Second, we highlight some important opportunities and risks that can result from disruptive innovations in this context. Finally, some major barriers to their implementation are presented.

3.1 *Differences Between the US and the German Health Care Systems*

The US health care system is mainly a free market economy where the private sector plays a major role. It is not managed by the government and there is no general health insurance coverage (D'Angelo 2008; Christensen et al. 2009). In the US, private health insurances are the main form of insurance. Additionally, there are state programs for people like pensioners or the income-poor (Schölkopf 2010;

Shi and Singh 2010; Wetzel 2011). Nevertheless, there is a high percentage (about 15.7 %) of uninsured citizens (Wetzel and Parsa-Parsi 2011; United States Department of Health and Human Services 2012). In contrast, Germany possesses a social security system. Therefore, the state plays a dominant role and the public sector is of vital importance (Simon 2010; Schölkopf 2010). About 90 % of the German population is covered by the statutory health insurance, while the rest possess private insurances. Only less than 0.2 % of the citizens are uninsured (Simon 2010; Bundesministerium für Gesundheit 2012a; Statistisches Bundesamt 2012a; Bannenberg 2013b; GKV-Spitzenverband 2013). In addition, insurance instruments are not congruent. Beyond that, the basic structure of the two health care systems is very different with respect to providers, care-concepts, and major players (Jonas et al. 2007; Shi and Singh 2010; Simon 2010). Forms of health care like the Managed Care concept (to which HMOs belong) do not exist in Germany. Furthermore, in the US employers play an active role with respect to health insurances whereas in Germany they traditionally act passively (Porter and Guth 2012).

3.2 Opportunities Induced by Disruptive Innovations

The integration of care in Germany is far less developed than in the USA (Neumann 2007; Simon 2010; Porter and Guth 2012). Although there are no integrated providers comparable to HMOs, the impact of integration in Germany can be analyzed by investigating the pre-existing schemes for the integration of health care (*Integrierte Versorgung*). In the German context, *Integrierte Versorgung* describes the provision of care either across disciplines or cross-sectorally (ambulatory, stationary, and rehabilitative) (Simon 2010; Volk and Wohlgemuth 2013). Several studies came to the conclusion that there is a potential for reducing costs through integration. A comparative study with parallelized data at the Kiel Pain Center (*Schmerzlinik Kiel*) indicated that the direct costs 2 years after treatment could be significantly reduced by integrating care (ambulatory sector: −31.5 %, stationary: −21.5 %, rehabilitative: −50.6 %). In contrast, sectoral care hardly reduced costs; it led, instead, to rising costs in some sectors (ambulatory sector: −6.0 %, stationary: +19.9 %, rehabilitative: +34.6 %) (Göbel et al. 2009). Furthermore, a project for the integrated care of patients with knee and hip endoprosthesis in Münster confirmed the potential for cost reduction. The average dwell time in hospital as well as in stationary and ambulatory rehabilitation could be reduced. This resulted in an average reduction of the overall treatment costs of more than 10 % per patient (Dolderer et al. 2007). The potential for cost reduction could be further exploited by the implementation of disruptive business models in the context of integrated care and the profuse application of standardized electronic health records.

Technological enablers that allow the decentralization of care pose the opportunity to improve health care in Germany by making it cheaper, more accessible, and more convenient (PricewaterhouseCoopers/Economist Intelligence Unit 2012; PricewaterhouseCoopers 2013). The Federal Ministry of Health (*Bundesministerium für Gesundheit*) has already established an eHealth initiative to promote

the implementation of telemedicine applications. Furthermore, the program aims to find solutions for interoperability issues and to screen the reimbursement codes (*Einheitlicher Bewertungsmaßstab*) for their compatibility with these applications (Bundesministerium für Gesundheit 2012b, c). The large number of mobile phones in Germany would allow the use of mobile health technologies (mHealth). Mobile phones could be employed for the provision of care and medical information (World Health Organization 2011; International Telecommunication Union, 2012; PricewaterhouseCoopers/Economist Intelligence Unit 2012). In particular, this could improve the care and monitoring of chronic diseases that are continually on the increase. The home monitoring of blood glucose levels by means of mobile phones is an example that shows the potential positive effects of these applications on chronic diseases (Kollmann et al. 2007; Istepanian et al. 2009; PricewaterhouseCoopers/Economist Intelligence Unit 2012; WellDoc 2012).

3.3 *Risks Induced by Disruptive Innovations*

Parallel to the above mentioned opportunities, there are some significant risks for the stakeholders of the health care system. Disruptive innovations can also deteriorate the quality of health care as well as its accessibility. Several authors, such as Newhouse (1996), Jacobs and Schulze (2004), Porter and Guth (2012), and Volk and Wohlgemuth (2013), express their concern over integrated providers and capitation. Capitation generally carries with it the danger of patient and risk selection. Patient selection can result from marketing activities that are targeted towards less riskier patients. Even worse, insurance contracts and the personnel structure of providers can be specifically designed to appear unattractive to high risk patients. This means that the access to care for high-risk groups can be significantly impeded (e.g., the chronically ill or cancer patients). Furthermore, capitation can lead to an under-supply of care since the reimbursement is independent of the performance. Therefore, the provider can improve profits by minimalizing care. Consequently, these incentives have to be reduced by the implementation of a risk adjustment system. However, a complete elimination of these incentives is impossible despite risk adjustment (Newhouse 1996; Newhouse et al. 1997; Jacobs and Schulze 2004; Porter and Guth 2012; Volk and Wohlgemuth 2013). Physician associations in Germany (*Kassenärztliche Bundesvereinigung*) are concerned that capitation for primary care (*Hausarztmodell*) and integrated care imposes high incentives for patient selection. IT systems in the offices of physicians may even facilitate this selection (Gramsch and von Stillfried 2003). The diagnosis-related groups (DRGs) for stationary care constitute a form of capitation that can result in under-supply as a result of both the withholding of services and the drastic reduction of dwell time. Furthermore, cost pressure can result in staff reduction, which in turn has a negative impact on the quality of care (von Schroeders and Köbberling 2002; Buhr and Klink 2006; Simon 2007; Bauer 2012; Porter and Guth 2012; Bannenberg 2013a). Quality can, in addition, be

reduced by financially motivated over-supply. In this case, patients are exposed to unnecessary health risks (von Schroeders and Köbberling 2002). The expansion of specialized clinics (such as value-adding process clinics proposed by Christensen et al. (2009)) may promote this issue, as was observed in the USA (Lynk and Longley 2002; Iglehart 2005; Nallamothu et al. 2007; Hollingsworth et al. 2010). In Germany, a rise in the number of unnecessary operations has already been observed in the recent past, especially in operations suitable for specialized surgery centers (Bartholomäus 2010; Bauer 2012; Betriebskrankenkassen Landesverband Bayern 2012).

Furthermore, disruptive innovations can lead to rising costs. New forms of care as well as new technologies can lead to a disproportionately increased use of health care, which results from higher quality, higher efficiency, more convenience, or better accessibility (Cutler and Huckman 2003; Pauly 2008; Christensen et al. 2009; Hollingsworth et al. 2010).

3.4 *Barriers to the Implementation of Disruptive Innovations*

The concept of Christensen et al. (2009) clearly builds on the pre-existing structures of the health care system of the USA. Since the German system is very different from the American, tremendous changes would be necessary to transform the system into the proposed value network. Both the divergent structure and the prevailing culture and values of the German system can pose significant barriers for the implementation of a disruptive value network.

Despite its potential for cost reduction mentioned above, integrated care has not yet been able to establish itself on a broader basis (see Fig. 3). Supported by initial funding by the legislator, health plans with integrated care constantly grew from 2004 to 2008. However, the overall impact of integrated care was still insignificant. Following the end of government funding, the number of contracts for integrated care dropped and there were no new projects by the health insurances (*Krankenkassen*) (Volk and Wohlgemuth 2013). Given the attitude of the players towards integrated care, an expansion of this concept in the near future seems unlikely. This might be caused, to a large extent, by the resistance of both patients and providers. On the one hand, patients object to any restrictions to their choice of providers. On the other hand, they doubt the motives of the *Krankenkassen* for establishing integrated care (Porter and Guth 2012). The interests of providers are mostly influenced by their own profit orientation rather than by a system-wide optimization approach. In addition, there is a substantial investment risk for cross-sectoral projects (Volk and Wohlgemuth 2013). Physicians often see integration as a threat and a commercialization of their profession. They want to remain independent (Coordes 2010; Porter and Guth 2012).

It is not only the implementation of new concepts of care that is facing difficulties in Germany but also the implementation of technological enablers such as electronic health records (EHRs). Diverse authors emphasize the importance of

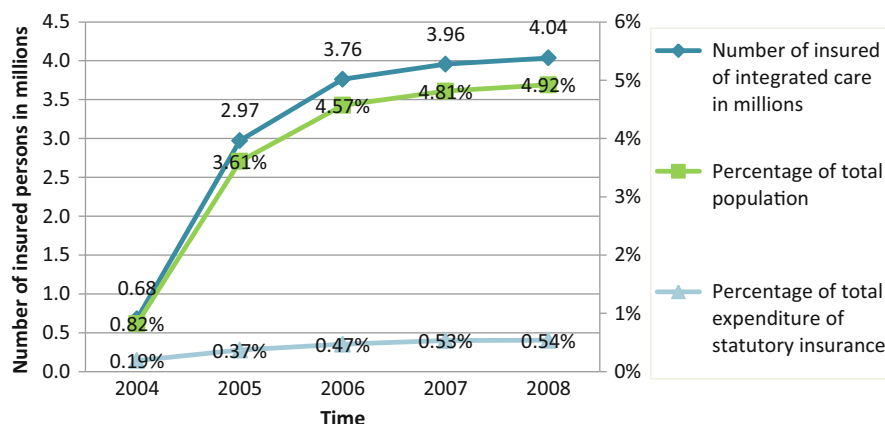


Fig. 3 Development of the number of patients and the volume of reimbursement of integrated care in Germany (own illustration based on data of the Bundesgeschäftsstelle Qualitätssicherung (2009) and the Statistisches Bundesamt (2012b))

EHRs as a coordination instrument as well as for the treatment of chronic diseases (Herzlinger 2004, 2007; Porter and Teisberg 2006; Schoen et al. 2006; Christensen et al. 2009; Deloitte 2010; Porter and Guth 2012). Despite government efforts, the electronic health card (*Elektronische Gesundheitskarte* (eGK)) is yet to be established as a complete EHR and the introduction of the eGK started in 2011 instead of 2006 (as planned). Technical problems as well as the concerns of data protectionists, patients, and physicians delayed the launch. Instead of all relevant health care details, the current version of the eGK only includes administrative patient data, gender details, and a photo (European Commission 2005; Bales 2006; Wächter 2011; Oppong 2012; Porter and Guth 2012; Baumann 2013; Bundesministerium für Gesundheit 2013). While the majority of patients had a cautiously positive attitude towards the eGK, they were reluctant to store any data on it that was more comprehensive than emergency information. Beyond that, they were concerned about data security (Amhof 2006; Forsa Gesellschaft für Sozialforschung und statistische Analysen 2008). This concern was shared by many physicians. Furthermore, physicians worried about the financial expenditure, disruption of their workflow, and the monitoring of their activities. Therefore, the acceptance of the eGK among physicians is overall low (Amhof 2006; Göres 2009; Wirtz et al. 2011; Porter and Guth 2012). Only if all parties involved saw an apparent benefit from the eGK, would it be more widely accepted and could be successfully implemented as an EHR.

Finally, the German health care system constitutes a highly regulated market. This regulation poses two kinds of entry barriers. First, high minimum requirements for performance often prevent disruptive innovations from entering the market. Second, regulation originally intended to protect patients from inferior products and providers is used by incumbents to secure the status quo and to keep disruptive competitors from entering the market (Curtis and Schulman 2006; Havighurst and

Richman 2006; Lee and Lansky 2008; Robinson and Smith 2008; Christensen et al. 2009; Hansen and Bozic 2009). In addition, the present reimbursement system poses another entry barrier for disruptive innovations. For example, the absence of reimbursement options for telemedicine applications and protracted examinations prior to their inclusion in the compensation categories will effectively impede the implementation of these innovations (Curtis and Schulman 2006; Kraft 2009). Furthermore, the German health care system (especially the statutory health insurance) shields the patients from the costs of care since they are largely excluded from the reimbursement process (Simon 2010; Baumann et al. 2013). Therefore, patients are unlikely to use cheaper but less sophisticated care providers such as retail clinics (Christensen et al. 2009) as long as the *Krankenkassen* pay for the treatment by established providers.

Conclusions and Further Research Needs

In summary, disruptive innovations can pose significant opportunities as well as risks that are not negligible. Furthermore, the disruption of the German health care system may face considerable barriers. Figure 4 presents a short overview of the most important results of our research.

In order to facilitate the disruption of the German health care system, the legislator would have to enforce a comprehensive reorganization of the current regulations as well as the reimbursement system. Since disruptive innovations cannot be fully determined *ex ante*, as emphasized by Danneels (2004) or Keller and Hüsiger (2009), the creation of a regulatory environment that would promote disruptive innovations becomes even more complicated. Nevertheless, the governmental bodies should try to assess surrounding circumstances that have a positive or negative impact on disruptive innovations (Curtis and Schulman 2006). Further research could analyze feasible policy options regarding enabling conditions for disruptive innovations using frameworks such as the Motivation-Ability framework by Christensen et al. (2004). The Motivation-Ability framework consists of a two-by-two matrix with continuums of motivation and ability along the axes. In this framework, motivation and ability are not only affected by market factors but also by nonmarket factors. The matrix helps to assess the impact of any regulation, policy, or other initiative on innovation.

Patients would only have an incentive to use disruptive products and providers if they were at least partially exposed to the actual costs of health care. They would then be more interested in saving costs. Furthermore, the perception of entitlement of patients would have to be changed in order to prepare them for a disrupted health care system.

On the part of the physicians, a profound change of culture and values is necessary before they would accept disruptive care concepts on a broad scale. They have to be included in the reorganization of the regulations. That way,

(continued)

Opportunities	Risks	Barriers
Cost reduction through the integration of care , especially in combination with disruptive business models and standardized electronic health records.	Deterioration of the access to health care due to integrated providers and capitation, which can foster patient and risk selection.	Divergent structure of the German health care system impedes the implementation of disruptive care concepts and technological innovations.
Decentralization of care through mHealth applications that have the potential to make care cheaper, more accessible, and more convenient, especially with regard to monitoring and care of chronic diseases.	Deterioration of the quality of health care due to both cost-related under-supply and financially motivated over-supply.	The prevailing culture and values can lead to resistance of important stakeholders like physicians who see disruptive care concepts as a threat of their profession and who want to remain independent.
	Rising costs because of disproportionately increased use of health care, which results from higher quality, higher efficiency, more convenience, or better accessibility.	Entry barriers due to high regulation and the prevailing reimbursement system .

Fig. 4 Overview of the most important opportunities, risks, and barriers

the government can both benefit from their practical experience and increase their acceptance. Finally, the problem of potential loss of income for physicians due to disruptive care concepts has to be approached in future studies.

According to the concept of Christensen et al. (2009), the disruption of the German health care system would necessitate significant changes in culture, regulation, and reimbursement structures. These changes would very likely face strong opposition from various stakeholders. Moreover, the groups of players are not homogenous, which will further complicate matters. Although the concept poses a potential guideline for the restructuring of the German system with considerable opportunities, its implementation would also present diverse risks and would face some significant barriers, as previously elaborated. Furthermore, the concept was proposed for the American health care system, which is a free-market system. Its transferability to a social security system such as that found in Germany may be limited and requires a discussion of liberalization and deregulation. Therefore, the concept would probably have to be adapted in order for it to be more suitable for the German health care system. In addition, there is a major lack of data concerning potential disruptive innovations in the German health care system. Hence the findings need to be further studied with better data support.

In spite of these limitations, this paper provides initial main findings concerning opportunities, risks, and barriers for the disruption of the German health care system that could establish an agenda for further more detailed

(continued)

research initiatives. In order to include all of the interdependencies within the system as well as the conflicting interests of all stakeholders, further broad-based and detailed studies would be necessary.

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Part VI
Toolkit for Organizing Health Care

A Review of Scientific Evidence for Public Perspectives on Online Rating Websites of Healthcare Providers

Sophia Fischer and Martin Emmert

Abstract The importance of consumer-driven quality reporting initiatives, such as provider rating websites, is on the rise in many industrialized countries like the USA, the UK and Germany. Therefore, this essay covers the issue of online rating websites of healthcare providers as internet-based social networking platforms that facilitate peer-to-peer information exchange and subjective patient experience assessments. Since research on these information tools is in its infancy, this essay uses an explorative approach to outline the five most common views on provider rating websites that appear in the scholarly and public debate. Based on an in-depth literature review of the international evidence, the essay reveals that provider rating websites prove to become a major performance indicator for healthcare managers and a useful tool for individual decision-making in provider choice. Besides a thorough reflection on the most common public misconceptions, the value of this essay lies in the provision of significant recommendations for all stakeholders for the future enhancement of provider rating websites.

1 The Emergence of Consumer-Driven Quality Reporting Initiatives in Healthcare

Fuelled by liberalization efforts and legal initiatives to enhance the patient-centeredness of healthcare systems, politics in many countries support the mandatory quality reporting of healthcare providers. The aim of those public quality reporting initiatives is to increase the measurability of treatment outcomes and to indirectly improve healthcare quality (Marshall et al. 2000). In the USA, for example, patients have open access to the results of the national “Hospital Consumer Assessment of Healthcare Providers and Systems” Survey. This survey

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consists of a standardized, experienced-based questionnaire to measure patients' perception of care and is supposed to support patients' medical decision-making (Huppertz and Carlson 2010). However, patients' usage of such policy-driven performance data remains limited. Frequently, such surveys do not provide patients with relevant, understandable and easy to interpret data (Hibbard and Peters 2003) and other sources of information, such as family or friends, play a more vital role when choosing a healthcare provider (de Groot et al. 2012). Overall, patients remain rather unfamiliar with *policy-driven* public quality ratings (Faber et al. 2009).

However, a large proportion of people in industrialized countries are more health-conscious and knowledgeable than ever before. Their need for transparent, comparable and reliable information rises. As patients are asked to make more sovereign choices related to their personal health, their search behavior now goes beyond the counsel of primary physicians. Today's healthcare consumers focus on peer-to-peer exchange about personal experiences, perceptions and impressions in the digital world. On the internet, information is easily accessible and appears trustworthy (Fox 2009). Therefore, a more *consumer-driven* initiative originated parallel to policy-driven quality reporting: *provider rating websites*.

Therefore, the aim of this essay is to portray the contemporary societal phenomenon of provider rating websites and to outline its relevance for healthcare management. For this purpose, this essay discusses five topical statements about the most controversial issues regarding these tools. As research on provider rating websites is still in its infancy and theoretical grounding is lacking, these debatable propositions are mainly derived from the scholarly and public debate. As shown in Fig. 1, the propositions cover various issues, such as the nature of published content within provider rating websites. Based on a thorough literature review, the scientific findings presented in this article considers both patient and provider perspective. Admittedly, the scientific evidence is dominated by German and American research settings. However, recommendations to improve the overall utility of provider rating websites for all stakeholder groups as well as implications for future healthcare management are provided in the last sections of this essay.

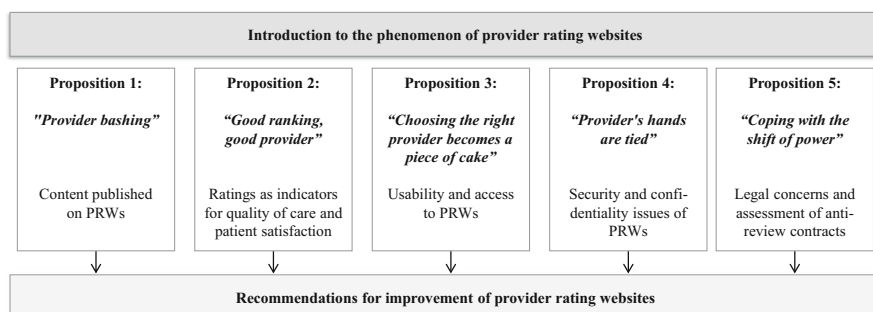


Fig. 1 Outline of this essay (PRW = provider rating websites)

2 Online Rating Websites of Healthcare Providers: New Tools to Facilitate Provider Choice

Within this essay, provider rating websites are understood as internet-based social networking platforms that allow patients to discuss peer-to-peer information and to give evaluations based on personal experiences. Although these websites likewise contain factual information, such as directions or opening hours, they particularly yield the possibility to rate healthcare providers according to the patient's individual treatment satisfaction level and performance assessment (Reimann and Strech 2010; Lagu et al. 2010). Thus, provider rating websites are very similar to online user rating websites from other industry sectors, e.g., tourism or finance, that proliferate in many societies in response to the common demand for accountability and transparency (Espeland and Sauder 2007).

The term provider rating website comprises both hospital rating websites and physician rating websites. However, hospital rating websites are often based on a combination of objective data from quality reports, such as mortality rates, and subjective components, such as peer reputation measures (Sehgal 2010). This distinguishes them crucially from physician rating websites which are not built upon publically available quality data but on subjective patient experience assessments. Compared to the literature on physician rating websites, the scientific evidence on hospital rating websites is rather limited. Thus, the following discussion addresses mostly physician rating websites.

Overall, the emergence of provider rating websites is mainly supported by technological advancements. The great spread of the internet facilitates more active search behaviour for health-related information all over the world (AlGhamdi and Moussa 2012). To give an example, in 2008 61 % of all American adults looked online for information about health topics such as disease conditions or treatment options (increasing from 25 % in 2000). 24 % of these so-called "e-patients" have consulted rankings or reviews of doctors, hospitals or other providers. Although less than 10 % of them are publishing information themselves, the general search for user-generated health information, such as posts on personal health experiences or reviews on health facilities, is on the rise (Fox 2009). The figures are similar regarding Germany. A representative survey conducted on behalf of the German National Association of Statutory Health Insurance Physicians (NASHIP, German abbreviation "KBV") revealed that only 7 % of all respondents used physician rating websites to inform themselves in 2010 (KBV 2010). More recent numbers indicate that approximately 32 % of all participants within a cross-sectional German survey had heard of physician rating websites, 25 % used a rating website when looking for a physician and 11 % submitted a rating themselves (Emmert et al. 2013a). Therefore, the relevance of provider rating websites cannot be underestimated and is reflected in the way modern technology shapes health-consciousness and patient empowerment (Calvillo et al. 2013).

3 Challenging Common Misconceptions on Online Rating Websites of Healthcare Providers

As recent news and media reports show, the phenomenon of online rating websites of health providers is not without interest to consumers and professionals (Jain 2010; Lieber 2012). However, comprehensive analyses and rational discourse about provider rating websites are scarce. Therefore, the following core statements about positive and negative aspects of provider rating websites are based on a thorough desktop study. This literature review revealed that the following five issues on provider rating websites gain most public and scholarly attention: (1) the nature of the content published on the websites, (2) the appropriateness of online provider rankings as indicators for quality of care, (3) usability of and access to provider rating websites, (4) respective security and confidentiality issues, and (5) legal concerns in terms of anti-review contracts. Therefore, those issues are contemplated from a state-of-the-art perspective in an explorative manner.

Proposition 1: Content Published on Provider Rating Websites

“Provider Bashing”: *Patients and competitors use provider rating websites mainly as platform for complaints and spread negative publicity about healthcare providers.*

The medical profession is rather sceptic towards provider rating websites. The main argument among professionals is that these tools are defamatory, flawed and biased by patients with negative experiences. Many doctors are fearing the loss of their reputation (Pasternak and Scherger 2009). In reality, scientific evidence shows that the majority of review comments posted on provider rating websites are positive. Several recent studies in international settings did not observe the dreaded “bashing” of healthcare providers (Lagu et al. 2010; Emmert et al. 2013b; Ellimoottil et al. 2013).

For example, López et al. (2012) conducted a qualitative content analysis of patient reviews about primary care physicians in urban regions of the USA and discovered that most reviews expressed positive notions. Besides overall assessments, patients discussed interpersonal manners (e.g., time pressure during appointment), doctor’s technical competence (e.g., knowledge and clinical skills) and organization-related issues (e.g., friendliness of staff). The theme of empathy was mentioned most often, highlighting the importance patients place on the face-to-face encounter with the physician (López et al. 2012). Likewise, a recent German study that analyzes all comments published in 2012 on *jameda*, which is the largest German physician rating website in terms of total evaluations, found that two-thirds of all evaluations are “very good” assessments of medical providers (Emmert and Meier 2013). The same ratio is confirmed by a meta-study of ten English provider rating websites: two out of three patient reviews are said to be favorable (Kadry et al. 2011). Moreover, Emmert and Meier (2013) show that female physicians are significantly better rated than their male counterparts. Their study also found differences between medical specialties with neurologists/psychiatrists,

ophthalmologists, orthopedists and dermatologists scoring lowest in overall ratings. Also, the authors demonstrate that within their data a correlation between the number of ratings per provider and the overall performance evaluation exists. Providers with a high number of ratings were ranked significantly better. Potentially, some providers already use provider rating websites as marketing tools and deliberately encourage patients with positive experiences to rank them after treatment (Emmert and Meier 2013).

Proposition 2: Ratings as Indicators for Quality of Care and Patient Satisfaction

“Good Ranking, Good Provider”: *Provider rating websites are reliable indicators for medical outcome measures such as quality of care and patient satisfaction.*

The provider rating websites assessed in scientific literature prove to be very heterogeneous as they all use other conceptual models to determine quality of care and patient satisfaction (Thielscher et al. 2013; Reimann and Strech 2010). When analysing German physician rating websites, Emmert et al. (2012) note that none of their evaluated ranking websites uses a scientifically validated questionnaire. Additionally, as the questionnaires of various physician rating websites decisively differed from each other, their outcomes lack comparability. The authors elucidate that the websites mostly cover structural quality information (e.g., on location data) and neglected information on process and outcome dimensions. Process quality is only partially covered by items related to waiting times and patient education programs. Outcomes are very poorly represented in terms of recommendation by colleagues or patient organisations. Furthermore, the websites' outcome results are not risk-adjusted to patient and illness characteristics. Thus, these indicators do not appropriately represent a provider's quality of care as they might only reflect the severity of cases treated (Emmert et al. 2012). According to this train of thought, providers treating healthier people would always be rated more positively.

Just like quality of care, the construct of patient satisfaction is multi-layered too (Sitzia and Wood 1997). Again, current patient reviews do not refer to all dimensions of patient satisfaction and only reflect a subset of opinions, particularly from younger, more internet-savvy generations (López et al. 2012). Additionally, the numbers of providers effectively ranked and the number of reviews given determine the reliability of provider ratings as quality indicators. Emmert and Meier (2013) state that in 2012 already 37 % of all German physicians were rated on *jameda*. Nearly half of those doctors were rated only once. On average, only 2.37 ratings per provider were posted in 2012. In another study, Lagu and colleagues (2010) analyse 33 American provider rating websites and discover similar results. The amount of ratings and reviews across all websites has been fairly low. Therefore, it can be assumed that overall scores on physician rating websites are highly volatile due to small sample sizes.

Regarding hospital rating websites, German and American studies report low correlations between the results of different hospital rankings and imply that a hospital scoring high in quality of care on one online platform is often not recommended by another (Thielscher et al. 2013; Halasyamani and Davis 2007). This means that different hospital rating websites apply different understandings of quality of care. Moreover, patients looking for an optimal hospital choice are likely to get confused by contradictory or false results. Overall, it remains unclear whether provider rating websites are accurately reflecting medical outcome measures. This is due to their methodological shortcomings and a lack of dissemination among the totality of patients.

Proposition 3: Usability and Access to Provider Rating Websites

“Choosing the Right Provider Becomes a Piece of Cake”: Provider rating websites are easy-to-access, easy-to-use and easy-to-understand tools for every patient and facilitate personal health-related decision-making.

Statistics show that the opinions on physician rating websites greatly vary among all Germans using such tools. Roughly half of them think that the use of provider rating websites is rather unhelpful, whereas the other half claim the opposite (KBV 2013). One possible explanation for this observation might be the fact that the first obstacle for patients is not finding the best provider, but rather finding a reliable online portal (Thielscher et al. 2013). In Germany, medical associations have recognized the patients’ need for reliable criteria to differentiate between the various provider rating websites available. Therefore, the Agency for Quality in Medicine¹ elaborated a catalogue of criteria that is supposed to help patients assess rating portals by including benchmarks (e.g., compliance to legal requirements, transparency, data security or user friendliness). The catalogue also requires that provider rating websites disclose their financing models (Schaefer and Schwarz 2010).

Additionally, provider rating websites are said to lack centeredness to patient needs and usability (Lagu et al. 2010). To interpret the website’s data correctly, users need a high degree of health literacy. Even if data is provided comprehensively and accurately, users’ ability to apply these assessment tools depends on their ability to locate and understand the provided materials (Damman et al. 2009). Moreover, patients have to critically evaluate the information and match it with their own needs and preferences (Schaefer and Schwarz 2010). This potentially constitutes a barrier for sick and emotionally vulnerable people. Emmert and Meier’s (2013) finding, that hardly any user of German provider rating website provides more than one review, might indicate that patients are deterred by the portal’s functionality or design after providing their first feedback. An American

¹The German Agency for Quality in Medicine is a joined institution of the German Medical Association and the German National Association of Statutory Health Insurance Physicians.

study evaluating hospital rating websites comes to similar conclusions. Rothberg et al. (2008, p. 1686) conclude that “providing more measures may actually obscure comparisons, because consumers may be overwhelmed by confusing and conflicting information”.

Proposition 4: Security and Confidentiality Issues of Provider Rating Websites
“Provider’s Hands Are Tied”: *Security and confidentiality issues hamper providers to use provider rating websites and react appropriately to negative comments.*

Another whisper circulating among medical professionals is that there is no refutation against negative comments without the violation of privacy laws or breach of medical confidentiality (Jain 2010). However, evidence from the USA shows that if providers needed to respond to negative patient reviews, they could mostly react without crossing confidentiality lines (Lagu et al. 2010). Still, it has to be recognized that regulations differ on national levels. Respectively, several guidelines for physician rating websites constitute that serious, reputable websites should meet a couple of requirements to prevent infringement against providers. Essential prerequisites for operators to avoid abusive criticism and discrimination are that (1) providers have the right to publish counterstatements, (2) personal rights of physicians are not violated, and (3) reviews are constantly monitored by portal staff (Schaefer and Schwarz 2010).

Instead of being forced into defence, experts suggest that providers should take their own appropriate measures against dispersed, unstructured and unregulated comments. Bacon (2009) argues that the medical profession is well-advised to take a leading role in developing and supporting quality physician rating websites that benefit all stakeholders in order to prevent themselves from security and confidentiality issues. However, as generally anyone can give an anonymous review or rating, abuse cannot be entirely ruled out (Emmert et al. 2012).

A look on the fairly regulated hospital quality reporting initiatives shows that the key to provide protection might lie within the standardization of measurement instruments. Besides positive impacts on quality improvements, hospitals using rating websites develop better reputations in the long-run (Hibbard et al. 2005). However, hospital rating websites only reflect patients’ subjective views on the physician’s reputation, which is not necessarily an objective measure of hospital quality (Sehgal 2010).

Proposition 5: Legal Concerns and Assessment of Anti-Review Contracts

“Coping with the Shift of Power”: *Provider rating websites are changing the ways provider and patients interact with each other and ultimately disadvantage providers by weakening their position of trust and responsibility. To avoid this, providers should have their patients sign anti-review contracts.*

Although its exact manner remains an open point for scientific evaluations, the idea that online reviews are radically changing the patient-provider relationship is not questioned. However, providers should not look at this phenomenon from the wrong angle and rather see it as an opportunity, not as a threat. Providers forcing patients to sign mutual privacy agreements (López et al. 2012), so called “anti-review contracts”, might be protected from negative word-of-mouth in the short-run. In the long term, this measure is more a throwback to medical paternalism and likely to fuel patients’ mistrust and suspicion. Constituting a case example, a private American company called *Medical Justice* (Segal 2009) constructed parts of its business model around anti-review contracts, but had to discontinue this service after intensive public debate. Recently, two renowned American universities² created a new website called *DoctoredReviews.com* to expose the legal and ethical risks of restricting patients’ right to free speech (Gluss and Lohse 2011). Following their reasoning, the erroneous premise that most published reviews are negative has devastating consequences: if physicians avoid getting rated in general, patients will either look for more information elsewhere and tap sources that are even less credible or they are more likely to visit providers who are at least ranked by a few peers. To avoid both scenarios, providers should embrace provider rating websites as means to come closer to their target group and gather patient feedback for quality improvement (Fung et al. 2008). In sum, provider rating websites have the potential to contribute to improved quality management within practices and clinics, if providers are able to self-reflect critically about their ratings and reviews (Bacon 2009).

4 Amendments Before Provider Rating Websites Can Become Reliable Guides to Individual Decision-Making

As the discussion within this essay has shown, great room for further conceptual and operational enhancement of provider rating websites remains. Figure 2 summarizes the main recommendations provided by the academic community for future research and highlights practical implementation advice. Only by considering these necessary amendments, can provider rating websites become useful tools in patients’ individual decision-making and facilitate quality management of healthcare providers.

²Precisely the Santa Clara University High Tech Law Institute and The Samuelson Law, Technology & Public Policy Clinic at the University of California Berkeley School of Law, USA.

Research	
Future directions	• in-depth assessment to see if provider rating websites are a suitable tool to reflect provider's quality of care^{3), 4), 5)} • elucidate characteristics of provider rating website users and assess the patient's motivation to why and how to use these tools³⁾ • provide more evidence on dissemination and conceptualization of provider rating websites from international settings beyond Germany and the USA, lever from best practices
Practice	
General	• incorporate guidelines developed by national health associations and interest groups into overall portal structure and processes including legal, textual and technical aspects (e.g., guidelines by German National Association of Statutory Health Insurance Physicians)^{2), 6)} • develop common "rules of play" that are accepted among all stakeholders²⁾ (i.e., insurances, providers, patients, politics etc.) and discuss the potential of third-party certifications for quality improvements⁵⁾ • provide transparency on the business models and revenue sources behind provider rating websites
Survey instruments	• include more information items on all dimensions of quality of care, especially structure, outcome and patient satisfaction measures as well as disease specific information^{1), 6)} • match evaluation measurement with dimensions of patient satisfaction construct
Evaluation process	• ensure a minimum amount of ratings or reviews before online publication to increase validity^{1), 3)} • risk-adjustment: consider provider case-mix to avoid bias through severe cases in overall assessment^{1), 6)} • eliminate biases: rule out the bias of high numbers of reviews leading to high provider performance ratings³⁾

Fig. 2 Recommendations for improvements of online provider rating websites. *Note:* ¹⁾ Emmert et al. (2012); ²⁾ Schaefer and Schwarz (2010); ³⁾ Emmert and Meier (2013); ⁴⁾ Emmert et al. (2013a); ⁵⁾ Reimann and Strech (2010); ⁶⁾ Rothberg et al. (2008)

5 Implications for Future Healthcare Management

Although all presented propositions could be largely refuted by evidence, one major point of criticism has to be addressed once again. Due to anonymity and lack of structure, patient opinions published within provider rating websites lack comparability. Studies substantiate the poor quality of most existing provider rating websites and advise both patients and physicians not to entirely rely on those tools in medical decision-making yet (Emmert et al. 2012).

Albeit, provider rating websites exist within today’s information societies and all players within the healthcare sector should extract the most out of them. In the future, provider rating websites might become a more powerful tool to assess

qualitative data on patient satisfaction, needs and preferences within local environments (Emmert et al. 2013a; Jain 2010). Thus, they can become a valuable performance indicator for healthcare managers. Therefore, providers should talk with patients about the impact they can make when using provider rating websites. Health policy should transparently inform about provider rating websites and encourage their usage among the mass of patients to enhance the overall measurement quality. However, this development should be accompanied by purposeful research that carefully counterbalances provider rating websites' benefits and risks for individual medical decision-making (Schaefer and Schwarz 2010; McCartney 2009). If online rating systems are properly designed, for example by considering the suggestions in Figure 2, they can potentially induce a "reputation society", motivate truth-telling, protect personal privacy, and discourage digital vigilantism (Masum and Tovey 2011).

In sum, online ratings have the potential to empower patients and to offer a new route for providing physicians with constructive feedback at the same time. At large, provider rating websites need to be seen as a gateway to unfiltered patient opinions. Although the comments need to be interpreted, some doctors are already recognizing their real value. When googling herself, Shaili Jain, MD (2010, p. 6–7) recognized the following: *"I'm discovering what patients think makes a good doctor, what they value and deem essential to high-quality care, and what gets them really riled. These patients don't hold back, and their tales make for refreshing reading, a sea of patients' voices telling me how it really is."*

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Applying Tool-Kit-Based Modeling and Serious Play: A Japanese Case Study on Developing a Future Vision of a Regional Health Care System

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Abstract To ensure sustainable development in health care systems and to bring about workable ideas which are widely accepted, there must be dialogue and collaboration between highly diverse stakeholder groups, such as medical practitioners, managers and administrators as well as health care policy makers and patients and their families. However, diversity between these actors requires methodologies that enable the participants working on change and development processes together. It is important to understand each other's work situations, demands and constraints to collaborate on future ideas. Therefore, we suggest a so-called serious play methodology which combines tool-kit based modelling using LEGO® building blocks and story-telling to foster the development of shared understandings between different stakeholders. In an empirical example of a system development process between health care practitioners in Japan, we describe and discuss the application of this methodology.

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1 Demands for Change Processes in Health Care and the Integration of Different Stakeholder Perspectives

In the last several years health care systems and institutions in most countries have faced major challenges (e.g. Prybill 2003; Griffith and White 2005; Ginn 2006; Bandyopadhyay and Hayes 2009). In particular, they are confronted by having to balance tensions between quality of service and costs (e.g. Khatri et al. 2006). Therefore, learning, system improvement and innovations are seen as fundamental for healthcare organizations to cope with changed framework conditions (Savitz and Kaluzny 2000). Thereby inter-functional and interdisciplinary interaction between the main actors—general practitioners, specialized physicians, nurses, therapists and health care administrators as well as health care policy makers—are crucial for the efficiency and enhancement of a health system. The heterogeneous knowledge, experience and motivation of the diverse actors as well as their ability to overcome institutional boundaries (Kerosuo 2006) significantly influence the performance of health care processes and institutions (Rondeau and Wagar 2002). Particularly, healthcare organizations are characterized by their incorporating various stakeholder and interest groups that influence structures, rules and practices. Organizations often exploit any creative potential by encouraging various stakeholder groups to take on change and development activity (Sanoff 2000; Reed et al. 2012). In these contexts new ideas are likely to emerge out of mutual reflecting and practicing (West and Farr 1990; Amabile 1996; West 2002; Sannino and Ellis 2014). However, despite the creative potential of such activity, participants are confronted with diverse perspectives and understandings. At the same time, it is the diversity of the participants combined with their ability to share meaning and understanding which provides creative potential (Cromptley 2006; West 2002). Moreover, this exchange and collaboration bring into question power relations between these actors. Therefore, these subtle power struggles and the personal concerns of different stakeholder groups need to be taken into account. Such aspects are relatively strong in health care practices since e.g. nurses and doctors are often deeply personally engaged in their profession (Larson 1977; Abbott 1988; Mintzberg 1989; Chambliss 1996).

Consequently the question arises as to how changes in system development and learning processes in health care can be facilitated, countering this diversity of stakeholders. A major aspect of this is how a collectively shared understanding and language about the object of consideration can develop among the participants, which is an essential prerequisite in learning processes where different disciplines and professional cultures meet (Jacobs and Heracleous 2006; Schulz 2008). From our point of view haptic models, mock-ups and stories play an important role as metaphors for understanding and sense-making within development and innovation processes (e.g. Buur and Matthews 2008).

Therefore, we will introduce a *tool-kit-based modeling and serious play methodology* which actively integrate all stakeholders into learning and development processes, allowing them to gain awareness, exchange knowledge as well as to

develop and discuss ideas within a group. The method is characterized in the following. As an empirical case study we refer to a development workshop applying the serious play methodology with diverse health care practitioners in leadership positions (e.g. head nurses, therapists, doctors, hospital managers, social workers, paramedics) of an urban region in Japan. They gathered to discuss problem areas of their current care processes and to construct a shared vision of future health care essentials in the region. We explore how such a heterogeneous group of health care practitioners apply the serious play method to expose ideas and concepts of change. Finally we discuss in what fields and stages of change and development processes in health care such methodology can be successfully applied.

2 Serious Play and Tool-Kit Based Modeling: The LEGO[®] Serious Play[®] Method

Originating mainly in graphical and industrial design, idea creation by *manual modeling* has been a common practice for some time (Cross 1999, 2011; Best 2006). Sketching, cardboard modeling or sculpturing are frequently applied methods. Within a discipline whose members are experienced in applying a certain method, using idea creation can be easy and very efficient. Within a heterogeneous group originating from different professions, and with participants of different skills and experiences, applying such methods can, however, prove to be time-consuming and produce an imbalance in the quality of solutions (Lee 2008). This problem has become more obvious since manual modeling was transferred from design to more abstract fields of application such as strategy or organizational change, which means non-designers apply mental processes in designing for creative and development processes in their contexts (Brown 2009). Non-design experienced practitioners are asked to contribute to the development and change process. Therefore methods used for modeling should be easy to handle and suited to providing high informative value. Accordingly building bricks, cardboard, geometrical shapes or icons are appropriate tool-kits, since they are simple to use and meaning is generated easily (Sanders and Stappers 2008).

Based on a conceptual formulation, the tool-kits are used to build physical models which are subsequently verbally explained by the creator, by way of *storytelling*. Stories are important parts in the production, reproduction, transformation and deconstruction of beliefs, understandings and assumptions (Boje 1991). The model building and its explanation can be individual or collective, and adapted to the task, whether of abstract or concrete character. The physical building is therefore only a “metaphor for meaning” (Heracleous and Jacobs 2011), which story is told by the creator (Roos et al. 2004; see also Orr 1996, 2006). Hence, meanings are created and expressed through a manifest representation, the physical model created with a tool-kit, and the volatile one which is the story about the

model. The entire meaning of the model requires both steps: a process of building and verbal explanation.

When the tool-kit is used for intuitive modeling the processes set in motion may be described as ‘playful interaction’. The creator is applying the given tools to build a model. Since this playful action has an objective and is goal oriented, it is referred to as ‘*serious play*’ (Roos et al. 2004; Statler et al. 2009). The basic assumption of serious play is that possible answers are already present in the minds of the creators without them being conscious. The answers first come through after an intense and intuitive interaction between tool-kit and creator. Such intuitive practice is characterized by its unawareness and improvisation while carrying out the given task.

When considering play related to the workplace and organizational development, the term ‘serious’ should be emphasized, since this activity serves a purpose and necessarily follows rules and agreements among the participants. However, the term ‘serious’ also exposes a paradox, since the playfulness is accompanied by a general motive: the intention provided (Statler et al. 2011; Heracleous and Jacobs 2011). Serious play when used for idea creation requires a physical tool-kit (e.g. LEGO® building blocks) since the interaction or communication with an object of creation needs to be set up. Without the reification of ideas in a physical model the outcomes of the playful improvisation might not be retained and may be lost before reflection and further discussion.

We especially refer to *LEGO® Serious Play®* which was first conceived in the mid-1990s as a tool in a specific in-company executive education programme in the LEGO Company (Roos et al. 2004). It comprises the elements of tool-kit based modeling and the principle of serious play: Metaphors and models are manually built with LEGO® bricks and verbally explained afterwards. The LEGO® Serious Play® benefits from the building part of playing. Knowledge is gained through building something and learning is enabled when participants actively construct brick models (Papert and Harel 1991). Through the ‘think through the hands’ principle (Roos and Victor 1999) based on the relationship between hand and brain coordination (Jensen 2005) spontaneous creative acting occurs and models show different aspects than results from a merely cognitive process. The characteristics of LEGO® building blocks enable an easy modeling process without requiring specific craft capabilities. Furthermore playful interaction is facilitated through the quick connection, release and reconnection of the material.

Applying LEGO® Serious Play® in a workshop includes the following steps (Schulz and Geithner 2014):

1. *Posing the question*: The participants are challenged by a question which should have no obvious or easy solution.
2. *Designing a model*: The participants make sense of what they know and what they can imagine by constructing a model using LEGO® bricks and materials.
3. *Explication and Sharing*: The participants conceive a story covering the meaning in the model. The stories are shared between the participants.
4. *Reflecting*: As a way of internalizing and grounding the story, reflection upon what was heard or seen in the model, is encouraged.

After an introduction on how to become familiar with the tool-kit, concrete model building based on a workshop task follows: Each participant builds a complex model representing a process or an abstract concept and tells the story behind it. Subsequently the participants consolidate or negotiate their individual mock-ups into one shared model which must represent the diverse perspectives of all participants. Contradictions are to be solved collectively. In the last stage, the participants explain the collective model.

The serious play method using LEGO[®] can prove to be a powerful methodology facilitating improvement awareness, developing new ideas and creating a shared understanding among diverse stakeholders (Schulz and Geithner 2014). In the following exploratory case study we describe how a LEGO[®] Serious Play[®] could be applied in order to develop a common shared understanding about the future development of health care in an urban region of Japan.

3 Case Study: Applying LEGO[®] Serious Play[®] to Develop Visions of Future Health Care Practice in Osaka

3.1 Background of the Case Study

As in most industrialized nations, the health care sector in Japan faces major challenges. There has been a growing concern for change management among Japanese health/social care organizations, which are all stipulated to be not-for-profit, either government supported or private corporations. Since the end of WWII, the health care system in Japan has developed mainly in the form of institutional care at larger hospitals for acute diseases and injuries of a relatively younger population. They are now required to meet increasing and complicating health/social care needs of a rapidly-ageing population of 130 million, whose average life expectancy is over 80 years-old, and about one fourth of them are over 65 years old.

At the same time, Japanese health/social care organizations are facing an unparalleled management challenge of providing a massive amount of finely-customized, reliable, and low-cost residential care for the elderly with complicating multiple chronic illnesses and disabilities (including dementia). Visiting physicians, nurses, therapists, and rapidly-trained nursing care workers with limited medical knowledge at smaller health/nursing care stations are expected to create urgently various new professional and managerial practices in close collaboration with medical professionals and therapists at larger public hospitals (Ministry of Health, Labour and Welfare in Japan 2013, 2014; Nishihara 2012). In the provision of residential care for the elderly in Osaka region, where our case study of development workshop was conducted, we have already seen tensions rapidly arising especially around the medical and nursing care for the elderly by their families, medical professionals and paramedics at different types of medical institutions, and non-medical nursing care workers. Osaka region was the economic and

industrial center of Japan until the 1960s, and is now inhabited by about 9 million people, currently 22 % of whom are aged over 65 years-old excluding baby-boomers. There is an urgent need to find new ways to solve contradictions and conflicts among above stakeholders of regional care with different professional backgrounds, knowledge, experiences, aims, and views before the baby-boomers reach the age of a 75 year-old. Therefore, a development workshop was conducted as part of an intended change process.

3.2 The Development Workshop Using LEGO® Serious Play®

In the development workshop of our case study health care practitioners in leadership positions at public and private health care institutions in Osaka participated. All participants had more than 15 years of experiences in respective fields, and were studying at Osaka City University MBA program exclusively for health care professionals and managers, which is coordinated by one of the authors. The group consisted of 24 people, namely 9 head nurses, 5 social workers, 4 administrative managers, 2 clinical engineers, 2 physicians, 1 dietitian, and 1 physical therapist. They agreed to participate voluntarily in the experimental workshop in advance, and gathered together to discuss problem areas of their current care processes and to come up with a shared vision of future health care principles in the region, which the participants had been discussing for some time in the MBA classes before the workshop. Hence the workshop was at an early stage of the process with the goal to discuss and share basic principles of future health care in Osaka. LEGO® Serious Play® was chosen as a main method. Other representational tools such as narrative scenarios were used at the beginning of the workshop. With such technique, profiles or characters of major clients, e.g. patients and other stakeholders are described on paper at the beginning of the workshop. The main procedure remained the same regardless of the tool used: working on a model in an intuitive and playful mood; explaining the model to the other group members (story-telling); collectively reflecting on the model.

As empirical methods, participatory observation and videotaping were used considering the exploratory, cross-cultural, and multi-lingual (English, and Japanese) nature of the study. Two of the authors participated in the workshop as a facilitator, who explained the tasks, raised questions during the model building and model presentations, and time-keeping, and as a translator/observer, who interpreted the facilitator's instructions and questions in English and participants' answers and explanations in Japanese. The following analyses are primarily based on videotaped data, which was shared by the authors after the workshop, and have been reflected upon to explore more appropriate interpretations in the discussions among the authors.

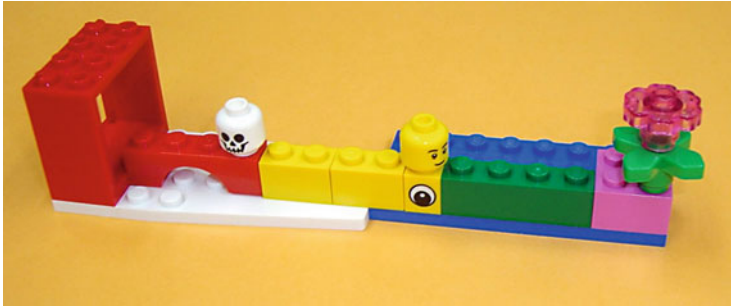


Fig. 1 Description of an ideal workplace

At first, the participants were divided into three groups of eight people. Each group was instructed to design and discuss the models of the future vision of health care in Osaka on their own by the end of the development workshop for 3 h. It was also explained that the final results of the respective group would be exchanged between the groups. According to the above principles of playful modeling and explaining the models to others, the workshop was designed around the specific tasks to be carried out and divided into three sessions: (1) warm-up and ideal workplace; (2) individual model of ideal health care organization; (3) collective model of the future vision of health care.

(1) Warm-Up and Ideal Workplace

At the beginning, the participants needed to become familiar with the topic. Therefore prior to using the LEGO® tool-kit, they were asked to describe on paper one typical system user or client they had in mind when thinking about their work (narrative scenario). At the second step they started to use the LEGO® tool-kit. The professional identity of the participants was discussed, namely they modelled their individual understanding of work and subsequently their ideal workplace. Through such, other participants got understandings of the individuals' views, constraints and understandings, and to some extent, of their convictions.

For example, a head liaison nurse working for a university hospital expressed her professional identity and 'ideal workplace' with the model shown in Fig. 1. She explained that her primary mission as a liaison nurse was to facilitate seamless transitions of patients with highly complicated medical problems from life-threatening conditions at hospital (signified with red bricks and a white skull) via carefully observed and attended processes of recovery (signified with yellow bricks and an eye of liaison nurse) to the safe (a green brick) and blooming (a pink brick and a flower) lives at homes. A white underlying brick stands for intensive medical care at the university hospital and a blue brick stands for residential care, which includes regular medical care and nursing care. She also talked about her mission as a head nurse to realize this model of 'ideal workplace' referring to some challenges such as skills development of staff nurses and better communication with smaller clinics and nursing care providers that provide residential cares.

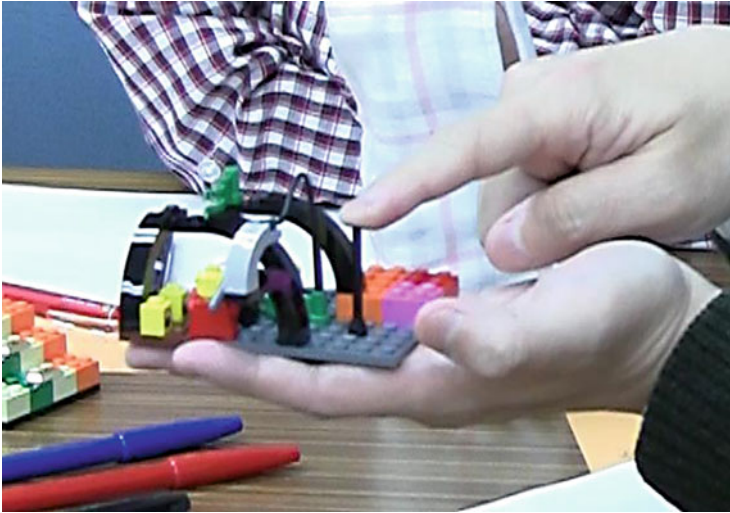


Fig. 2 Explaining an individual model of ideal health care organization

As leading health care professionals who were expected to be excellent problem-solvers and educators at respective health care organizations and fields, participants seemed to be embarrassed at the beginning of this session by the task of conceiving the ‘ideal workplace of their own’. These reactions could be explained by the ‘standardizing’ culture of professionalism (Abbott 1988) and highly more uncertainty-avoiding culture of the Japanese (Hofstede 1991). The resulted models and explanations tended to describe some ‘utopian’ situations where all problems and troubles that frequently annoy them are solved and removed. Some of them were classical examples of ‘professional dominance’ (Freidson 1970) over very obedient ‘old-fashioned’ patients who were willing to accept ‘correct’ standardized treatment suggested by health care professionals following the slightly less individualistic and slightly more authoritarian cultural tradition (Hofstede 1991). Very few were innovative ‘dreams’ such as creating new ways of customized treatments in collaboration with younger patients, who are becoming more individualistic and egalitarian than their parents are willing to obtain more information and knowledge, from the Internet.

(2) Individual Model of Ideal Healthcare Organization

Based on this identity building and establishing a shared understanding of diverse views, the central task was then dealt with: Each participant was asked to design a model of ideal health care organization for the region. The participants were aware that the given task was on a metaphorical level to outline any basic principles or visions of the ideal organization. For example, a physician and CEO of a small (200 beds) private hospital at a residential district of factory

workers explained his future vision of hospital, which should be operated by divergent professionals (pink, red, orange, and black bricks on the right-centre) and 'reach out' (black bricks) to local patients (red and yellow bricks on the left) suffering from chronicle diseases, who should be simultaneously watched warmly by the eyes of neighbors (yellow bricks with an eye) (Fig. 2). It showed that the physical model itself was not meaningful without a story about its sense. Hence each participant explained his/her model which led to intensive discussions. We note here that exchange and reflection was focused on the models and not on the persons who created them. Although the participants had known each other well in the MBA classes for more than a half year, asking such questions as 'why?', 'on what grounds?', or 'how?' were carefully avoided, and this could be partially explained by the autonomous culture of professionalism (Freidson 1970; Abbott 1988). We might also explain this partly with the general tendency of the Japanese to show respect and discretion and to avoid offending others as long as possible, which can be attributed to the slightly less individualistic and highly more uncertainty-avoiding culture (Hofstede 1991).

It was a particularity of this group that the LEGO[®] models were rather minimalistic. The models also differed in terms of building block types used and complexity. Through the combination of physical models with story-telling, the overall meaning of the metaphors was a combination of both and did not only depend on the LEGO[®] mock-up. Furthermore the storytelling provided additional dynamics in the modelling process, since the final meaning of the models arose through the explanation. Such effect could be realized through asking the participants about the meaning of their model during building, and then comparing the answer with the story told by the creator afterwards. Further the storytelling itself often had a flexible, meandering character, participants started at one point and added aspects and interpretations. Especially when others asked about specific features in the model, interpretations were added. Only a few participants came about with a more or less entirely prepared story. The overall structures and types of the models (physical model and story) did not significantly differ even between different professional backgrounds of the participants. However different aspects were focused on by the participants depending on their individual professional concerns.

(3) Collective Model of the Future Vision of Health Care

After exchanging the visions, the individual models of ideal healthcare organization were connected to a shared model of the future health care system. The connected model incorporated the individual views but also modified the existing models. Therefore the participants were allowed to modify the single models before or after connection. However only the creator was allowed to modify, or had to give his/her agreement. Further all different views presented before needed to be present in the collectively shared model. Hence the connection and modification was an intense mutual discussion process (Fig. 3). In fact the discursive process could be seen to be a stimulus and



Fig. 3 Connecting individual models to create a shared model of the future health care for the region

inspiration for further idea generation, since participants intensively discussed specific parts of the models in pairs or they discussed aspects beyond the model and the initial task. It should be noted, however, that the discussions tended to focus on exploring wider possibilities of connecting. Potential conflicts related to the modifications of individual models, which had to be creatively solved in actual specific connection, were seldom discussed. It could be partially due to the limitation of time and to the Japanese custom of starting group discussions with ambiguous agreements in order to learn and deal properly with emerging possibilities and risks in the process itself. We need to watch carefully if the same tendency can be observed even with longer time allocation to this aspect in future workshops.

Once everyone was satisfied with the model the group subsumed the meaning of their model. Subsequently it was presented to the facilitators and the other groups. The group reflected carefully on the meaning of the model, therefore the explanation given was less spontaneous than the ones before. The presentation was, however, a mutual action since one participant started and others joined in the conversation freely. Hence the meaning emerged naturally during building, discussing and explaining. At this final stage of presentation, some critical questions such as ‘why?’, ‘on what grounds?’, or ‘how?’ were raised from the other groups. Most questioners tended to be satisfied with the ‘right’ answers that correctly followed the latest policy discussions on the new roles of hospitals in the scheme of residential care. This might be partly explained by the highly more uncertainty-avoiding and slightly more collective nature of Japanese culture (Hofstede 1991), which tends to allow and make Japanese participants protect the group to which they belong. In the meantime, some

questions such as how to motivate nurses and nursing care-givers who tend to be under-paid while their jobs are becoming tougher both physically and mentally actually facilitated reflective and more innovative.

Discussion and Conclusions

Combining serious play with the tool-kit based modeling was considered to be one of the key aspects in the search process for ideas on the future development of regional health care in our exploratory case study. A common basic idea emerged and found in the three visions of future health care in Osaka might be phrased as ‘crossing boundaries’ among diverse professionals and organizations, and between citizens/patients and providers of health care services. One group came up with a vision that focused on the expansive functions of larger hospitals with advanced medical facilities, equipment, and specialists to support more the activities of smaller health and nursing care institutions that were expected to play larger roles in residential care. Another group came up with a vision that focused on the reaching-out activities of health care providers in general to support and facilitate self-help and mutual-help activities of local citizens to maintain and promote health and quality of lives on their own. And the third group proposed a vision to integrate the medical care services of hospitals and the nursing/social care services of nursing homes and social welfare institutions at residential care settings with narratives and stories that reflected upon the death-denying nature of modern health care and the subsequent clear distinctions between medical and nursing/social care.

Both the common basic idea and three visions generated in the workshop accorded the current governmental policy to establish ‘integrated community care’ urgently (Ministry of Health, Labour and Welfare in Japan 2013), and the participants playfully developed detailed operational models of the policy in the settings of the Osaka region. The intuitive playfulness that might have contributed to the above results could, however, not be recognized right from the beginning of the workshop. The first steps in using the tool-kit to fulfill the given task were rule-based and with awareness of a procedure and structure. Playful behavior of the participants emerged out of the process as the participants gained experience on how to apply the method. Therefore simple rigid warming up tasks are necessary to make the participants familiar with the tool. Although participants came mainly from senior positions at health care organizations, they were all open to working with the tool-kit and the method. After the initial phase of embarrassment, participants were gradually motivated through the challenging nature of the task itself. The modeling process however was not restricted to the manual building step, but also included the explanation of the model which evolved by way of intuitive and spontaneous developmental action (see also Orr 1996). The LEGO®

(continued)

Serious Play[®] principle also included a methodological switch. Whilst individual model creation was characterized by its intuitive and 'playful' modus (Roos et al. 2004), the assembling of a shared model followed a conscious process of negotiating and solving of contradictions (Engeström 2008).

The tool-kit based serious play workshop as a whole is an example of mutual development. The design and explanation of the individual models inspires the other participants to reflect and discuss. Most particularly the step from the individual model to a shared one is a collective process characterized by merging different positions to a comprehensive picture. The goal can only be reached through adaption, modification and integration of the single models. Specific value in the tool-kit based serious play process lies in the fact that each participant is involved in almost the same way. Artistic skills may improve the sophistication of the brick model, but they do not influence the explanatory value of the model-story combination. Consequently using brick-based serious play is a method in overcoming hierarchical and skill differences. Therefore each person's potential ideas are taken into account (Schulz and Geithner 2014). In hierarchical and physician-dominating healthcare organizations, this aspect is of specific value since no profession is dominating the process of tool-kit based serious play. Furthermore, as was found in the final results of our case study, the professional and organizational distances and knowledge diversities of participants can be overcome easily since meaning needs to be carefully explained. Most of the models designed in the workshop represented the same degree of abstraction and mean little without explanation. Consequently the methodology shows its main benefits at early stages of ideation or conceptualization processes where meanings are symbolic and abstract. The method is particularly appropriate where diverse perspectives are confronted with each other. Such can happen in various contexts, business, public and non-profit or in combination of those.

Difficulties emerge when concrete models are designed. In such cases the tool-kit LEGO[®] limits too much and the focus of the model-builder would not lie on the playful creation of a solution, but rather on how the task can be fulfilled with the given tool. In our exploratory case study, this limitation seemed to be felt by the participants in the initial phase of the first session to build the model of an 'ideal workplace of their own'. For 'standardizing' health care professionals at leading and educating positions, who were also strongly expected to take the role of 'enlightening' applied scientists in a more uncertainty-avoiding country, such a task seemed to be a fundamentally surprising, and therefore culturally embarrassing, task in the beginning. Since the different methods of manual construction and verbal expression are used, different skills are brought into play. Hence the stimulation takes place both through the dialogue with the tool-kit (serious play), and the succeeding explication. Collectively the shared story-telling and the model reflection

(continued)

stimulates further building action. This is, however, only successful if participants engage fully with the method and the tool-kit, and also if they indeed consider the model to be a real representation of their understandings. As mentioned above, the application of the method inspires the participants to think further. Hence it is not only the choreography that leads to an intended result of the workshop (only achieving a result is the goal, there is no intention about the result itself) but also side activities of the participants: They start discussions about related issues, in parallel build models, and make personal connections and arrangements. Modeling with LEGO[®] provides the advantage that one can always come back to the brick model; you just need to reconstruct the story each time. Such bringing back is important where there should be diffusion of ideas to people not present in the development process. However the anchor of the model helps participants make ideas easily understandable to others. Non participants can easily be connected to the process too, e.g. through letting them modify the model or enhance aspects. We add that it is important in change processes to maintain the spirit and inspiration of the modeling process. A serious play workshop can only be a starting point which requires subsequent actions that build on the experience. In daily health care such an approach needs to be actively pursued, since operational pressure frequently blocks consideration of, and the motivation for, change.

As mentioned above the serious play methodology represents methods that combine physical building with narration. It does not necessarily have to be LEGO[®], it can also be done by any design medium such as drawing, clay or wood. The LEGO[®] bricks do provide some advantages. Most of the people know them; they can easily be applied regardless of crafting capabilities. Further they provide a reasonable balance between concretion and abstraction. Features such as awareness and connectability can easily be realized with LEGO[®] Serious Play[®]. Another advantage is the disconnectability of the bricks. Models can be modified and changed. Therefore the models provide some dynamics other shaping techniques do not.

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Telemonitoring: Criteria for a Sustainable Implementation

Ines Weinhold, Luca Gastaldi, and Dennis Häckl

Abstract The use of information and communication technologies appears to be a main lever to ensure effectiveness and efficiency of modern health care systems. In particular, telemonitoring is one of the most promising concepts in enabling patients' self-management, relocating medical services and improving equity in access to high quality care. However, a large-scale adoption of telemonitoring solutions across Europe has still barely been accomplished. Considering the several dimensions of a system's implementation, this chapter provides insight on the reasons for the slow diffusion of these innovations in the health sector. Subsequently it illustrates how to take advantage of these systems and outlines what the different stakeholders need to contribute in order to bridge the gap between pilot projects and the diffusion of telemonitoring solutions.

1 Introduction

During the last three decades health care expenditures have grown faster than GDP in all OECD countries (Pammolli et al. 2012) putting the sustainability of health systems at the core of any political agenda. Although the provision of high quality health care and the reduction of inequalities remain fundamentals, actions to

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achieve these objectives have to be combined with an equitable access to health care services among different socio-economic groups (Goddard and Smith 2001). This balance is particularly critical in rural and structurally weak areas (Rygh and Hjortdahl 2007), where sufficient health care provision is endangered by provider shortfalls (Simoens 2004), social deprivation (Haynes and Gale 2000) and impeded access to specialty care—particularly for patients with specific diagnoses, e.g. cardiovascular diseases (Chan et al. 2006).

In light of these challenges, Telemedicine is a promising concept for both industrialized and developing countries, because it uses various types of information and communication technologies for delivering health care services and medical education over distances, with the objectives of providing clinical support and improving health outcomes (WHO 2010).

Considering the potential benefits associated to Telemedicine (Hailey et al. 2002), the topic is highly debated in both research and policy settings. However, large-scale adoptions are still mostly unrealized (Zanaboni et al. 2013). This chapter will focus on Telemonitoring as a specific typology of Telemedicine service and will analyze the reasons explaining its slow diffusion in the healthcare domain. In order to achieve this result, the chapter applies a two-tier approach. First, we illustrate the different dimensions that have to be considered during the implementation of Telemonitoring solutions. We summarize topical evidence in each of these dimensions and discuss reasons that hamper the large-scale diffusion of solutions. Based on this insight, we demonstrate how to gain leverage effectively using Telemonitoring solutions. Subsequently we outline what health care managers, policymakers and researchers should accomplish in order to bridge the gap between pilot projects in Telemonitoring and large-scale adoption of this telemedicine solution.

2 Sustainable Implementation of Telemonitoring Systems

Telemonitoring is a form of Telemedicine that focuses on remote patient support and self-management by using telecommunication and information processing technologies to monitor a patient's clinical parameters at a distance (WHO 2010, Paré et al. 2007). Interventions are either automatic or involve patients to transmit data via different technologies (Wootton 2012)—especially in the fields of chronic diseases such as cardiac or respiratory conditions, diabetes and hypertension. Data are transferred to primary care professionals or to specialized professionals, who are alerted when critical values exceed.

Coherently with other Telemedicine solutions, the main challenge associated to Telemonitoring is moving away from the isolated pilot projects characterising the current health care landscape to large-scale deployments, fully integrated with other digital solutions scattered in the health care systems. More specifically, despite the available evidence on effectiveness, efficiency and social impacts of Telemonitoring solutions, most of the initiatives fail in taking the different aspects

into account that have to be considered during implementation and diffusion (WHO 2010). From this viewpoint, literature (Masella and Zanaboni 2008; Zanaboni 2010) proposes seven dimensions that need to be considered during the deployment of Telemonitoring solutions in order to make them widely adopted:

1. Clinical effectiveness
2. Efficiency of interventions
3. Technical feasibility
4. Social aspects of interventions
5. Equity of access
6. Organizational impact
7. Legal and ethical issues

In order to get an overview of the state of research concerning the different dimensions, we summarize findings from the existing body of scholarly knowledge. The search for literature relating to Telemonitoring covered databases in the fields of medical and social sciences (above all PubMed, ScienceDirect and Google Scholar). Both empirical and conceptual papers have been considered. Systematic reviews in the field of Telemedicine were included as well, since they comprise Telemonitoring applications. Supplementary, we included relevant articles through a backward search. We continued considering papers since additional ones failed to dispute existing, or reveal new, categories or relationships—that is, until theoretical saturation (Strauss and Corbin 1990) was achieved. The next paragraphs will report the main considerations that we have raised throughout the analysis of the literature.

2.1 Clinical Effectiveness

Currently, most robust evidence is collected on the clinical effectiveness of applications (Ekeland et al. 2010). Telemonitoring proves itself as an effective strategy to enhance control of disease parameters and reduction of symptoms in chronic diseases like diabetes, asthma and hypertension (Paré et al. 2010). In the treatment of cardiovascular and respiratory conditions, Telemonitoring is assessed to be effective by reducing hospitalization, length-of-stay, complications and exacerbations (Clark et al. 2007; Paré et al. 2007; Jaana et al. 2009; Häckl 2010). Especially for chronic conditions, these monitoring applications facilitate self-management and patient autonomy. Several positive behavioral and psychological effects—such as a sense of higher security and increased health-competence—are demonstrated (Jaana et al. 2009).

However, other research applying more rigorous designs ends with less positive conclusions (e.g., Chaudhry et al. 2010), and even after two decades of research and innumerable systematic reviews conducted in the field, evidence is still ambiguous (Ekeland et al. 2010; Wootton 2012). For instance little is known regarding: (i) the effectiveness of Telemonitoring in comparison to other forms of care, and (ii) the long-term-sustainability of these solutions (Chaudhry et al. 2007, 2010). Systematic

reviews come to conclusions ranging from “Telemonitoring is effective” or “Telemonitoring is promising” to “evidence is limited and inconsistent” (Ekeland et al. 2010). Despite the high data quality of many studies, more randomized, controlled evidence is claimed (Jaana et al. 2009). Due to the heterogeneity of studies, it is difficult to condense knowledge and derive universally valid results. In order to gain generalizable results and reliable conclusions, reviewers should try to agree on a set of widely applicable outcome measures to enable the assessment of interventions by means of meta-analysis (Wootton 2012).

2.2 *Efficiency of Interventions*

Although the amount of articles in the field of Telemonitoring has grown enormously during the previous decade, there is little evidence concerning the cost-effectiveness of Telemonitoring interventions (Wootton 2012; Dávalos et al. 2009). Studies hardly come to an unequivocally positive conclusion (Ekeland et al. 2010), and tend to indicate not more than “fair evidence” (Rojas and Gagnon 2008). For instance, the support of remote monitoring applications reduces direct costs for treatments, e.g., for cardiovascular conditions (Seto 2008)—due to reduced hospitalizations, readmissions or emergency-department visits and decreased times spent by health professionals in visiting patients and/or traveling (Rojas and Gagnon 2008). However, studies are too heterogeneous and economic efficiency also depends on the severity of illness. As a consequence, study results lack universal validity.

Similarly, indirect savings linked to the reduction of productivity loss and travel times for both patients and their relatives (Rojas and Gagnon 2008) are associated to Telemonitoring solutions, which however generate higher costs for equipment, software and system support (Rojas and Gagnon 2008; Seto 2008). Comprehensively, there is insufficient evidence regarding cost-effectiveness of Telemonitoring, and uncertainty remains regarding its funding and reimbursement (Dávalos et al. 2009; Häckl 2010). Cost-effectiveness needs to be assessed in a long-run, multi-center and multi-country cost-benefit-evaluation considering different perspectives (Dávalos et al. 2009). To overcome methodological deficiencies researchers suggest applying common indicators and standardized approaches for economic evaluation (Rojas and Gagnon 2008; Dávalos et al. 2009).

2.3 *Technical Feasibility*

Telemonitoring systems comprise the techniques for measuring, acquiring, integrating, transmitting and storing health care data (Nangalia et al. 2010). Measurements by the use of sensors work properly for many physiological parameters. Regarding the transmission of data, Telemonitoring systems proved to be able to

transfer data reliably and accurately in various project studies (Paré et al. 2007). However, highly advanced Telemonitoring systems put high demands on the capacity of Information and Communication Technology (ICT), which is not comprehensively available everywhere (Häckl 2010). The technologies used for transferring data are the most crucial as they determine if other components of the system can be used according to their capabilities (Nangalia et al. 2010).

Subsequently, data analysis and response are determined by additional technical requirements and organizational issues. The ease of access to technologies for health professionals as well as the timeliness of responses to queries are decisive and imply the need for considerable investments in sophisticated ICT infrastructure (Nicolini 2006). However, occurring interface problems hamper the implementation of systems. Sustainable solutions should focus on interoperability and thus need to be facilitated by common ICT formats and standards accompanied by the expansion of efficient infrastructure (Häckl 2010).

2.4 Social Aspects of Interventions

The social view reveals what is required to make the technology usable and if it corresponds to the needs of users—whether these are health professionals or patients (Nicolini 2006). Considering the patients' perspective, positive impacts of Telemonitoring solutions prevail. Telemonitoring systems enhance patients' self-management and participation in health care. Studies consistently demonstrate that patients are receptive for monitoring applications (Paré et al. 2007), and indicate improvements in the quality of life of chronic patients. The levels of acceptance for and satisfaction with Telemonitoring systems are prevalently high (Clark et al. 2007; Jaana et al. 2009; Rojas and Gagnon 2008). However, it is occasionally challenging to maintain patients' compliance over time (Paré et al. 2007)—especially if technologies for data transfer are not easily usable (Jaana et al. 2009). Furthermore, the commonly reported high levels of acceptance and satisfaction should be considered with caution. In fact, the results may be subject to a sampling bias since most of the evidence comes from volunteer project participants (Currell et al. 2010).

The social aspect related to Telemonitoring introduction that has to be deepened in empirical studies concerns the changes in the relationship between patient and medical professionals associated to Telemonitoring. Literature prevalently covers conceptual work or interpretative-based case studies, focusing on the potential loss of informality and cordialness (Nicolini 2006) or the proceeding depersonalization of care (Miller 2003). In contrast, it is unclear in which empirical settings patients may prefer remote monitoring to face-to-face encounters.

2.5 *Equity of Access*

In order to increase access to health services (especially in rural regions), Telemonitoring is often considered a lever usable to improve (Bower et al. 2011): (i) the equity in the distribution of available services for remote patients, (ii) the lead-time associated to service delivery (e.g., diagnostics), and (iii) the affordability of specialized services for underserved or vulnerable subgroups.

From this viewpoint, even though most of the programs adopted to reach remote regions or special populations (where time and cost for transport are critical) proved to be successful (Dávalos et al. 2009), evidence is still not overwhelming. This shortcoming may be explained by the fact that impacts on access are most reasonably assessed in the stage of large-scale diffusion that is however hardly reached for many technologies so far (Zanaboni 2010). Actually, some researchers question the presence of a straightforward link between an investment in Telemonitoring and increased equity of access to health care services (Zanaboni et al. 2013). In fact, the widespread use of Telemonitoring services tends to increase the tendency to centralize services. This eventually leads to an even higher disempowerment of rural or structurally weak regions and reduced investments in local infrastructures respectively (Nicolini 2006). The more intense supervision of patients might also lead to an increasing demand for visits to general practitioners or specialists (Häckl 2010), which poses a structural problem to regions that already lack a sufficient supply of providers. Besides, there is a strong need for better data and further research if and how indirect effects of improved access (e.g., a decrease of inefficient utilization of services) actually entail health improvements (Dávalos et al. 2009). To reliably evaluate the Telemonitoring systems influence on access, it is necessary to collect data systematically on a large scale and beyond pilot projects and clinical studies.

2.6 *Organizational Impact*

Few published papers have been written on either the organizational impacts of Telemonitoring, or on health professionals' acceptance of the relative solutions (Tudiver et al. 2007). The implementation of Telemonitoring is often accompanied by a re-distribution of tasks in the form of work delegation to non-physician-providers or technologies. These change processes are hardly seamless transitions, and may involve unforeseen cuts in established team work and/or interaction patterns (Nicolini 2006). In some contexts Telemonitoring has been associated with a higher workload due to additional tasks (mostly related to documentation requirements) and the necessity of professionals' up-skilling. Especially nurses need to handle an increased amount of information, more complex tasks and frequently vicarious roles (Nicolini 2006).

Gagnon et al. (2012) identify health professionals' perception of adequate organizational infrastructure, training, and support as the most important facilitators of successful Telemonitoring implementation. Frequently the implementation of systems ends in failure due to the lack of integration in the organizational environment (Yellowlees 2005). Besides, the importance of professionals as taking a pioneering role has recently been emphasized in literature (e.g., Yellowlees 2005). If the embodied requirements of use of a system lack compatibility with health care providers, the technology will likely be rejected (Nicolini 2006). From this viewpoint it is important to underline that the greatest barriers to professional commitment in Telemonitoring arise from a widespread fear of changes in work processes/habits (Yellowlees 2005).

2.7 Legal and Ethical Issues

Detractors of Telemonitoring often address legal and ethical problems such as misuse of data, missing confidentiality and a lack of standards. Indeed, these issues have to be taken into account for a successful, large scale diffusion of Telemonitoring services. Otherwise, there will be a high degree of uncertainty within patients, physicians and insurance companies. These problems are closely linked to social aspects of Telemonitoring. In the European Union directives regarding the use and storage of data (such as the Data Protection Directive 95/46/EC) exist. A binding legal framework is important to create acceptance for Telemonitoring services and to address problems of liability (Häckl 2010). In fact (and as discussed above), Telemonitoring increases the division of labor between various physician groups and/or hospitals. So, it is hardly possible to identify the source of a mistake straightforward. For instance, complications might occur, if one of the involved parties had a wrong diagnosis, which may result from wrong human decisions as well as from wrong data transmission. By now, there are many different legal frameworks in the context of Telemonitoring (Häckl 2010): specific medical product laws, data protection laws, laws regarding the treatment of patients via distance, etc. Future research has to address these issues and reach a consensus between all actors in the health care system.

3 Effectively Leveraging on Telemonitoring Solutions

Besides considering the main assessment dimensions, it is necessary to focus on the implementation process—the sequence of activities necessary to make Telemonitoring services widely adopted. From this viewpoint, it is possible to leverage on the multidisciplinary literature studying the diffusion of innovations (Rogers 2005). Latest developments in the field (e.g., Tidd 2010) suggest maintaining a permanent focus on the conditions allowing to gain a 'momentum',

i.e., a critical mass of applications able to promote further adoptions. In this spirit, we first consider the four phases of diffusion of Telemonitoring solutions.

- *Pre-pilot studies*: a first test of technical feasibility of new a Telemonitoring solution, often conducted in pre-experimental settings in which patients are not involved; this phase becomes critical when the digital technologies and/or the business models characterizing the Telemonitoring solution are quite innovative;
- *Pilot studies*: studies conducted not only to test the feasibility of a Telemonitoring solution in a real setting, but also to define the best way of fostering its' adoption within this setting; the main focus has to be on technical, legal and ethical issues, and three scenarios are possible: the drop-out, the re-assessment or the adoption of the Telemonitoring solution;
- *Clinical studies*: studies involving a number of patients (in one or more clinical settings) allowing to test the effectiveness of the Telemonitoring solution systematically—especially regarding its capability to improve the quality of the treatment process (clinical domain);
- *Large scale diffusion*: a key phase to strengthen the routine use of Telemonitoring services, which are used at a regional or national level and are recognized/reimbursed by the health care system.

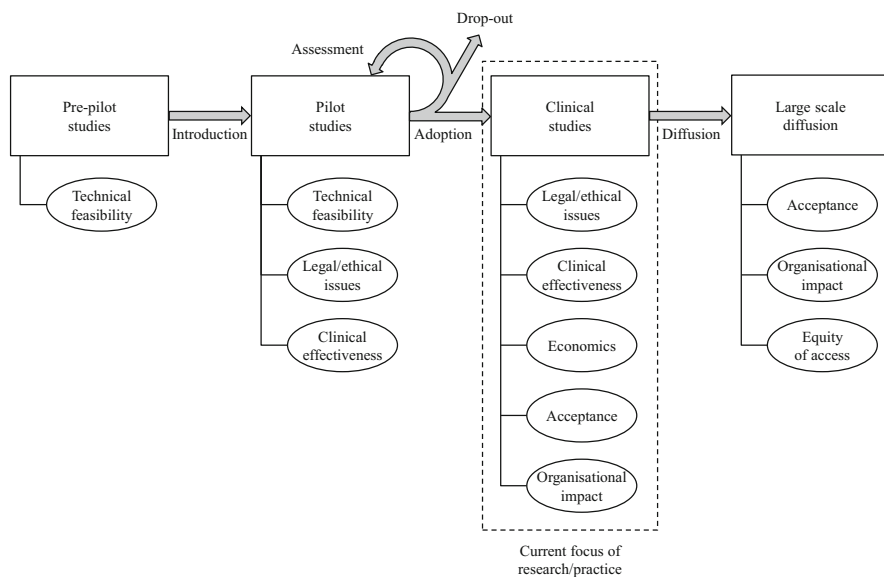


Fig. 1 Process to effectively implement Telemonitoring solutions

For each phase, drawing on Zanaboni (2010), we propose the main assessment dimensions that have to be considered in order to not constrain the diffusion of Telemonitoring solutions. Figure 1 outlines these dimensions and emphasizes the prominence of clinical studies. It is important to underline that the results achieved during the deployment of a Telemonitoring project cannot always be generalized to any setting. In fact, recent studies (e.g., Zanaboni et al. 2013) show that the comprehension of the context in which the Telemonitoring services are implemented—as well as the related policies—are key factors that could facilitate the diffusion of Telemonitoring solutions and also their integration with the other ICT-based solutions adopted within the health care domain (Gastaldi et al. 2012).

4 Implications and Outlook

Telemonitoring needs to find acceptance by all actors in a health care system. In order to accomplish sustainable solutions and to enable its widespread diffusion, the main pillars are (i) a long-term policy commitment, (ii) a clarification regarding reimbursement aspects and (iii) the health care providers' understanding of the key facilitators to successful implementation.

Policy makers have to understand the implementation process and must make decisions about how a progressive institutionalization of Telemonitoring and, more generally of Telemedicine solutions, can be fostered. The main policy contributions to draw from the analysis of the literature and of the empirical evidence considered in this chapter are as follows:

- Focus not only on pilot or clinical studies but on introducing policies and guidelines also for the preliminary phases in which the supportive technology is introduced;
- Consider a multi-stakeholder perspective and base decision-making activities on a comprehensive set of dimensions;
- Base the extension of Telemonitoring solutions to large-scale settings on a periodic monitoring process, in order to verify: (i) the correct implementation and level of use of health care providers, (ii) the achievement of objectives (clinical outcomes, cost, access, etc.) and (iii) to modify the clinical protocol and eventually interrupt the service, if necessary.

While the policies' task is to set up an appropriate framework, the successful implementation and sustainability of Telemonitoring is basically determined by the users' intentions and capabilities to utilize the solutions. Thus, the main implications for health care providers intending to implement Telemonitoring are as follows:

- Base the introduction of new systems on clinical relevance, derived from patients' needs;
- Identify target groups and their problems and provide suitable solutions;

- Endeavor to collaborate with the actual users as early as possible within the implementation process;
- Identify supportive “drivers” in the organization of the leveraging;
- Verify the integration with other provided health services as well as with other digital solutions in use;
- Implement consistent quality assessments to ensure that Telemonitoring solutions are superior to conventional service delivery;
- Promote the collaboration of participants within the network and the establishment of a common base of knowledge and understanding;
- Demonstrate a positive cost-benefit ratio of Telemonitoring solutions in order to get acceptance by payers.

Finally, research has an over-arching role in the development and implementation of Telemonitoring solutions. In order to verify the achievement of objectives, systematic evaluation and scientific support has to be ensured in every phase of the diffusion process. Above all, there is a strong need for conclusive evidence, derived from large studies, to assess the effectiveness of Telemonitoring solutions according to each of the criteria discussed in this chapter. Moreover, further research should:

- Develop comprehensive, consistent, and scientifically-acknowledged assessment frameworks considering all criteria raised in this chapter and others that will emerge as relevant in the future;
- Ensure high-quality assessment studies, exploiting advanced methodologies, extensive data, randomized and controlled research designs, and context-appropriate outcome measures;
- Foster the standardization of outcome measures: to enable universal validity for all stakeholders, comparison of different results and, thus, a generalization of research findings;
- Orient toward providing robust and longitudinal empirical evidence: concerning the social, the organizational and the environmental impact of Telemonitoring implementations.

Telemonitoring, as well as Telemedicine and ICT-based solutions in general will continue to change accustomed forms of health care delivery. The framework proposed in this chapter strengthens the processes of evaluation designs, and promotes comparable evaluations with the aim of building a stronger knowledge base on Telemonitoring as well as on Telemedicine in general. Summing up, this proves to be the basic prerequisite for the successful and sustainable implementation of these services.

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Empowering Knowledge Transfer in Healthcare: A Framework of Knowledge Transfer Methods

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Abstract Medical knowledge spans over a large scope—e.g. from the single cell to the whole human body. Hence, finding orientation between science and daily practice in healthcare is not an easy task. There is a vast amount of literature regarding knowledge and its transfer. The article presents a framework in order to structure methods of knowledge exchange and transfer corresponding to different levels of the healthcare system—societal, organizational, and group level. This framework will guide the selection of knowledge management methods, IT support, and architectural means in order to support the transfer of knowledge in hospitals and in the healthcare system.

1 Introduction

After the age of industrialization, the age of knowledge emerged. Knowledge itself, its accessibility and its transferability are identified as the main success factors. Knowledge will be the key resource of the knowledge society, and knowledge workers will be the dominant group in its workforce (Drucker 2001). In the vast body of knowledge management literature three main disciplines are predominant: (1) information sciences, (2) business and management, and (3) medical and allied health sciences (Nicolini et al. 2008). The healthcare sector has become one of the most important economic sectors and a primary source of employment in all the industrialized economies, generating an average 9 % of the gross domestic product

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(GDP) in the European Union and Canada, and a staggering 15 % in the US (Watson 2006). This contribution focuses on the application of knowledge management in the healthcare sector, as it has—both as a concept and as practice—influenced the structure of organizational and managerial processes in healthcare.

The greatest obstacle to effective knowledge management in healthcare is arguably the hierarchical culture of healthcare. Entrenched attitudes about scope of practice, professional “turf” and historical power structures can sabotage the essence of this. Healthcare providers need to address their personal issues, adopt common goals, break down hierarchies and then educate patients how each medical team member contributes to their care (Clements et al. 2007). The complex, multi-professional and multi-level nature of the healthcare sector is reflected in the fragmented and distributed healthcare knowledge. The major issue is the overabundance of information and knowledge (Nicolini et al. 2008).

Due to healthcare and hospital structures, many stakeholders are involved in the processes. Beside the patients three other groups can be assigned: medical researchers, decision makers and healthcare workers. The group of decision makers contains for example managers, policy makers, clinicians, as well as administrative staff and healthcare professionals like physicians, nursing staff, lab technicians, medical assistants, etc.

In this constellation the most critical task is making people work together in order to create, share and use all forms of evidence, including methods, tools and techniques of knowledge transfer and implementation. Ultimately, the behavior of the stakeholders and the features of context are interlocked.

In order to facilitate knowledge transfer in healthcare between stakeholders on different hierarchical levels, this contribution provides an overview on methodological approaches to support knowledge transfer. Therefore, a classification framework that supports the decision making processes of selecting adequate methods for knowledge transfer is provided (see Sect. 2). In the remainder of this chapter, the context of healthcare is explored from a managerial, architectural, and technological perspective. Each of these perspectives is illustrated by examples that outline how specific interventions facilitate knowledge transfer with regard to the given context (see Sect. 3).

2 Knowledge Transfer Matrix

Within communities, such as medicine, scientific evidence is widely held up as a privileged form of knowledge (Fitzgerald et al. 2002). In healthcare especially, using evidence to support policy and practice has become a shibboleth of highest order. Knowledge transfer has infused the academic literature, infiltrated the policy discourse, raised the aspiration of funding bodies and entered the lexicon of universities’ strategic visions (Davies and Marshall 2000).

In healthcare, as in all other sectors, the discourse of knowledge management is bounded by a range of interrelated terms which are often used interchangeably and

over which there is still an ongoing debate (Abidi 2001). Knowledge transfer has become shorthand for a wide variety of activities linking the production of academic knowledge to the potential use of such in non-academic environments. Some other commonly used terms are: knowledge translation, knowledge exchange, knowledge sharing, research utilization, implementation, dissemination, diffusion, continuing education, or continuing professional development (Graham et al. 2006). In the case of healthcare the term knowledge transfer is preferred because it indicates that the value of knowledge management lies in its application and its ability to impact organizational performance in a positive way.

The main goal of managerial knowledge transfer interventions is to offer and support a successful interprofessional coordination. Guided by this notion, we developed a matrix, which facilitates the selection of suitable knowledge transfer methods in a specific healthcare environment and provides a holistic view on knowledge transfer in and around hospitals.

Based on arguing and deductive reasoning, we identified suitable methods to support knowledge transfer. In order to distinguish situations in which such exchange activities take place or need support, we introduced three basic dimensions:

1. Managerial interventions for knowledge transfer and method classes,
2. IT support of knowledge transfer, and
3. Architectural support of knowledge transfer.

Figures 1 and 2 illustrate how these dimensions form a matrix that not only maps supporting information technology and architectural means to a variety of knowledge transfer methods, but also puts them into a context referring to the perspective and organizational level of the healthcare sector. Hence, our matrix suggests which knowledge transfer methods could be used in a certain context/situation and how this method or the situation itself may be supported by technological or architectural means.

We selected knowledge transfer methods based on a framework introduced by Wildner and Scholz (2006) in which the authors refer to knowledge transfer methods that we consider as means of managerial interventions. Therefore, Wildner and Scholz (2006) classify knowledge management methods according to their applicability for solving knowledge management tasks (Probst et al. 2000). This framework originally incorporates five classes of methods: planning, representation, promotion, organization and evaluation. Due to our focus on the directly manageable level of knowledge transfer, we concentrate on three classes: representation, promotion, and organization.

Following an integrated approach, the managerial perspective is accompanied by a technological and an architectural perspective that represent starting points for a holistic knowledge management.

In addition to the knowledge transfer method classes derived from Wildner and Scholz (2006), we differentiate four levels of organizational influence which allows us to distinguish use case scenarios for our knowledge transfer methods. These levels are: (1) the individual level, which comprises knowledge transfer activities

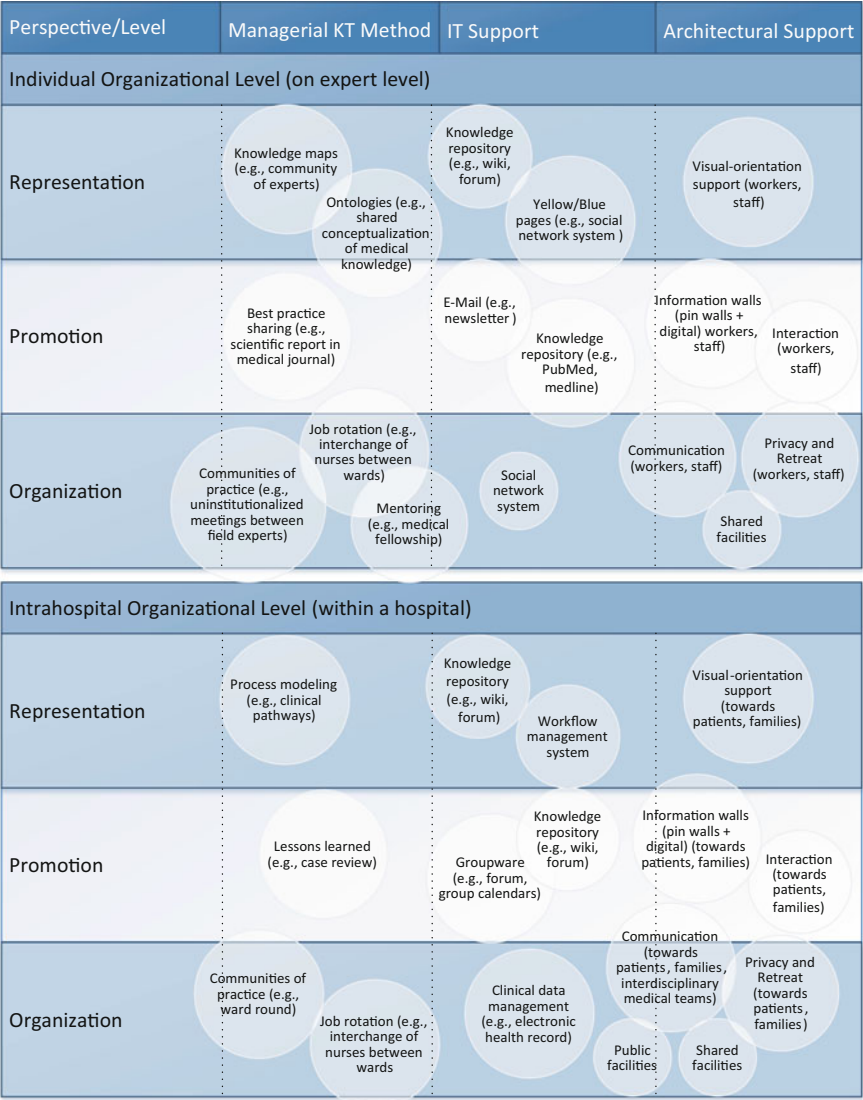


Fig. 1 Internal perspective of the knowledge transfer matrix

between experts, nurses, patients, etc. (2) the intrahospital level, which has a broader focus but only summarizes knowledge transfer activities *within* a hospital (Fig. 1), such as those between administrative personnel, managers, or procurement,—(3) the interhospital perspective and (4) the societal level covering interorganizational exchange with stakeholders like insurance companies, medical associations, or policy makers (Fig. 2).

Perspective/Level	Managerial KT Method	IT Support	Architectural Support
Interhospital Organizational Level (between hospitals)			
Representation	Ontologies (e.g., shared conceptualization of medical knowledge) Knowledge maps (e.g., map of specialized hospitals)	Knowledge repository (e.g., wiki, forum) Blue pages (e.g., directory of experts)	Virtual orientation
Promotion	Storytelling (e.g., medical surgeons interchange) Best practice sharing (e.g., workshops)	Extranet	Communication
Organization	Communities of practice	Electronic health records	Shared facilities
Societal Organizational Level			
Representation		Medical guidelines	
Promotion	Best practice sharing (e.g., medical conferences or publications)	Websites (e.g., homepage), SNS (e.g., Facebook page, Twitter)	
Organization			

Fig. 2 External perspective of the knowledge transfer matrix

3 A Toolbox for Empowering Knowledge Transfer in Healthcare

To cope with the complexity of knowledge transfer in healthcare we decided to concentrate on three dimensions, as mentioned in Chap. 2. Hence, we believe that the use of our knowledge matrix should begin with focusing on one dimension first and then taking into consideration one dimension after another.

The following chapter summarizes the dimensions we introduced to develop the Knowledge Transfer Matrix. First, we shed light on the methodological background of knowledge transfer and provide a short explanation for each approach mentioned in Sect. 2. After that, we highlight the importance of technology, i.e. IT, and again illustrate the role of architecture in the healthcare sector. Finally, we conclude with a short description of the origin and meaning of the (organizational) levels of the healthcare sector.

3.1 *Managerial Knowledge Transfer Methods*

Because healthcare and hospitals are highly complex systems with different stakeholders and levels of operation, knowledge transfer plays an important role. In general, hospitals are of high complexity according to their organizational and architectural structures. Due to the importance of individual knowledge within the medical decision making (Nicolini et al. 2008) as well as the cost pressure in and the professionalization of the healthcare sector a systematic knowledge transfer is needed.

Table 1 illustrates a broad range of knowledge transfer methods. In addition to the methods introduced by Wildner and Scholz (2006), we added two new approaches in the organization section: job rotation and mentoring. Thus, the table presents different approaches for each perspective of knowledge transfer. We do not claim to offer an exhaustive overview, but a glimpse on a set of methods that are easy to manage and comprehensible.

3.2 *IT Support for Knowledge Transfer*

Traditional information technology offers various ways to support communicative and collaborative processes. On a personal level, IT can support virtual communities and thus collaboration, community building and learning between clinicians (Falkmann et al. 2005). From a rather data-centered point of view, the healthcare sector benefits from current developments. Beside traditional storage and data management tools, such as knowledge repositories (e.g., PubMed, medline),

Table 1 Selected knowledge transfer methods

	Description	Source/author
<i>Representation</i>		
Knowledge maps	Navigation aid to knowledge portraying knowledge sources, flows, constraints and sinks of knowledge within an organization	Vail (1999)
Ontologies	Formal representation of knowledge as a set of concepts within a domain using a predefined vocabulary to describe different types, properties and relationships between concepts	Fensel (2002)
Process modeling	Formal representation of processes connecting organizational workflows with people, information, and information technology	Dumas et al. (2005)
<i>Promotion</i>		
Lessons learned	Systematic collection of experiences, mistakes, risks, and trends learned in a project and collected with the intention to take them into consideration in future projects	Schindler and Eppler (2003)
Best practice sharing	Documentation of best practices with the goal to replicated those practices	Szulanski (1996)
Story telling	A method for constructing methods about one's experiences within an organizational setting with the goal to transfer his/her experiences by telling a story	Swap et al. (2001)
<i>Organization</i>		
Communities of practice	Group of people who share a set of problems and who deepen their knowledge by interacting on an ongoing basis	Wenger et al. (2002)
Job rotation	Rotating employees throughout parts of the company to grant them insight into knowledge necessary to perform tasks which are not necessarily part of their job	Wickert and Herschel (2001)
Mentoring	Refers to the concept that an experienced person teaches and guides an inexperienced person	Swap et al. (2001)

yellow/blue pages, etc. the emergence of Web 2.0 technologies opens new possibilities to share and transfer knowledge.

Following these directions, IT supports a variety of purposes regarding knowledge transfer. IT can be used (1) to store knowledge. Here, traditional document or data management systems are of most use. In addition to that, directories, e.g. electronic health records allow hospitals to store and access crucial data across all organizational levels. In order to share knowledge and data related to that knowledge, IT systems also help to (2) transfer knowledge from one expert to another. These systems include social network systems, wikis, forums, websites as well as intra- and extranets. A third perspective on knowledge transfer comes with (3) the (re)presentation of existing knowledge. Yellow/Blue pages or websites support such activities. Even higher demands on IT support claim (4) collaborative processes, where experts or groups work together to achieve a common goal. Such projects require even more sophisticated tools and functionalities that go beyond the basic features of SNS, wikis or forums (e.g., parallel editing, interfaces between systems, synchronous communication). Another important support function lies

within (5) the organization of knowledge transfer. In this case, workflow systems, groupware tools and calendar systems facilitate scheduling and coordinative activities.

3.3 Architectural Qualities to Support Knowledge Transfer

To design complex systems like hospitals, architects have to consider a lot of perspectives and demands. In this chapter we depict some architectural qualities implemented by architectural means that focus on the facilitation of the knowledge transfer. The appearance and the design of the physical environment are influencing people's behavior, their interaction and communication rate, their well-being and ultimately their performance.

Reflecting the aforementioned organizational levels, we identified a variety of architectural qualities and some of their means that are easy to manage, to comprehend and to be implemented not only while designing a hospital but also during operation. Our examples range from minor changes in architecture or adding new facilities to re-thinking whole concept of architectural support in hospitals.

First, there are architectural qualities, which focus on (1) visual-orientation. This group of interventions comprises, e.g., guidance systems for individuals, such as door labels or colored floor plans and architectural models or you-are-here-maps on higher organizational levels. To architecturally support (2) information exchange, information walls, such as highly visible digital pinwalls allow displaying and transferring knowledge on recent publications, news etc. For architectural interventions focusing on (3) interaction and communication, we suggest considering additional meeting rooms (e.g., coffee corners, open workspaces, showrooms) or even physical events, such as regular evening receptions, which may also support knowledge transfer not only on a formal but also on a rather informal level. From a (4) privacy and retreat perspective we believe that knowledge transfer may benefit from concentration places, such as break lounges, greenery, etc., which improve the focus of individuals as well as groups. Well-designed (5) shared facilities for technical or administrative staff or facilities, such as kitchens, gardens, etc. may also (indirectly) support knowledge transfer. Even sharing whole diagnostic systems (e.g., MRT system) between healthcare institutions may influence the exchange of knowledge. Finally, (6) public facilities and (7) the general hospital atmosphere may add a significant contribution to the suggested managerial interventions for knowledge transfer. Here, the placement of a new cafeteria, a playground, etc. supports knowledge transfer that is not performed directly on the job. In addition to that, the coloring, the composition of surfaces, or the appearances of hospital facades are other architectural means that should not be neglected.

Conclusion

The landscape of methods for transferring knowledge in or from a specific context is broad and has attracted a lot of attention in past and current research. Within this article we provided a classification framework that incorporates a managerial, technological, and architectural perspective on knowledge management with the aim to identify starting points to facilitate knowledge transfer in healthcare.

By incorporating the healthcare perspective into the method framework introduced by Wildner and Scholz (2006) our research provides a valuable overview on existing approaches and strategies to transfer knowledge within as well as outside the borders of a hospital. In addition to that, the assessment of the applicability and suitability of those methods allows practitioners to prepare a better decision when it comes to knowledge sharing and selecting one of the alternatives.

The Knowledge Transfer Matrix enables practitioners to support the process of finding a suitable knowledge transfer approach by following five steps:

1. Select the organizational level depending on the scope and range of the knowledge transfer project, e.g., intrahospital organizational level,
2. Choose the perspective of knowledge transfer according to knowledge transfer project's objectives, e.g., representation of knowledge,
3. Enable and involve employees in knowledge transfer activities in order to decide upon the initial area of application for knowledge transfer means, e.g., choosing a managerial knowledge transfer method, i.e. using process modeling to describe clinical pathways,
4. Support initial activities by covering the other means of knowledge transfer, i.e. IT support and architectural support, e.g., implementing a knowledge repository to store and share the process models as well as supporting the knowledge transfer by introducing visual orientation that reflects the hospital's processes, and finally
5. Review initial activities and evaluate additional actions covering other cells of the Knowledge Transfer Matrix.

From a researcher's perspective our contribution may serve as a starting point for in-depth case studies (e.g., implementation of one or more knowledge transfer methods) or further quantitative research (e.g., on the distribution and utilization of the identified methods in healthcare environments and hospitals). Given the identified methods, future research can also shed light on measuring their influence on knowledge sharing/transfer in a hospital regarding cost reduction, time saving (e.g., in terms of patients' therapy), increase of efficiency (e.g., distribution of crucial knowledge).

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Part VII

Case Studies

“Was hab’ ich?” Makes Medical Specialist Language Understandable for Patients

Anja Bittner, Johannes Bittner, and Ansgar Jonietz

Abstract Health literacy and participative decision-making are central challenges of health care systems in the twenty-first century. To meet these challenges we need to give patients individualized and well-founded health information. The Internet portal “Was hab’ ich?” (“What’s my diagnosis?”) provides this type of information: at the Internet portal medical students translate medical reports free-of-charge into a language that laypeople can readily understand. The aim in the work of “Was hab’ ich?” is to make medicine understandable for everyone, and to place doctor and patient onto an equal footing. For this purpose “Was hab’ ich?” uses the synergy between patients and medical students: it gives support to patients in their health awareness while providing further training to medical students and doctors in their communicative behavior.

1 Introduction

Who hasn’t experienced this? You go to see the doctor, you get the medical report and can barely understand what the results mean. The Internet portal “Was hab’ ich?” (“What’s my diagnosis?”) provides assistance: this is where medical reports are “translated” free-of-charge into a language that laypeople can readily understand.

For this purpose, users upload their medical reports anonymously at <https://washabich.de> (see Fig. 1) or submit them by fax. The translation is produced within a few days by a team of medical students at an advanced stage in their training. In the case of complex medical reports, the students have a team of doctors and two psychologists available to them in a consulting capacity. The patient can then call off the translation online on a password-protected basis. Thus patients are better able to assess the medical reports and the possible consequences arising from them. The doctors work for “Was hab’ ich?” voluntarily, thereby preparing themselves for their careers in a way that shows commitment and is close to actual

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„Was hab' ich?“ sucht Menschen, die gute Arzt-Patient-Kommunikation fördern wollen. Dazu gibt es ab sofort die Möglichkeit, unsere Initiative durch eine Dauerspende regelmäßig zu unterstützen. Wir sind auf diese Hilfe angewiesen, um unser Projekt dauerhaft fortzuführen.

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Zu Gast bei Markus Lanz

Was brachte uns der Talkshowauftritt bei Markus Lanz im ZDF? Hielt der Server durch, wurden wir mit Mails oder Spenden überhäuft? Ein Fazit.

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Fig. 1 The Internet portal washabich.de (05.03.2014)

everyday practice. The processing of patients' real-life cases results in the students constantly acquiring new specialist medical knowledge; simultaneously the students learn how to explain complex medicine in a way that suits patients' needs. In this way the doctors-to-be become competent communicators.

The concept of "Was hab' ich?" is straightforward and yet it works. Within 3 years, patients and their loved ones were able to be helped on more than 20,000 occasions, by producing medical reports formulated in a language that laypeople can understand. So far more than 1,000 helpers from Germany, Austria and Switzerland have committed their efforts to "Was hab' ich?" in the team of voluntary medical students and doctors, thereby further training their

communicative abilities. In their everyday professional lives, these volunteers become multipliers in terms of good doctor-patient communication.

2 Patients with Good Health-Awareness: A New Challenge in the Health System

2.1 Patients with Good Health-Awareness Need Health Information

Around 60 % of patients wish to have detailed explanations by their doctor and would like to be involved in decisions regarding treatment (Bertelsmann Stiftung 2005). These patients with good health-awareness demand comprehensive individual health information and doctor-patient communication on an equal footing. But the doctor’s time is in short supply; thus, apart from the examination there remains little scope for health knowledge to be put across in an understandable way or for patients’ questions. In addition, up to 80 % of the information conveyed in the discussion with the doctor is forgotten as soon as the patient leaves the treatment room (Edison et al. 2012).

The Internet is a source of knowledge frequently used in such cases. Yet how can patients assess which information is correct in subject-specialist terms and is relevant to them individually? They cannot—and thus it is other criteria, such as the level of comprehensibility, possibilities for rapid follow-up queries and maybe a word from a neighbor that decide which information ultimately “registers itself” in the patient’s mind. This frequently leads to misunderstandings and mistaken conclusions by the patient and, not least, can influence the patient’s degree of commitment to the therapy decided upon and the course that the respective illness takes.

2.2 Health Is Dependent on Education

Studies in the USA and Great Britain show the extent to which good health-related information has a decisive role concerning risks of contracting given illnesses and also the course of an illness. The research examined possible links between the level of health literacy (i.e., knowledge regarding medical processes and also how to deal with one’s own body) and the emergence of illnesses. What the studies revealed is less surprising than it is frightening: lack of health literacy is correlated with a higher rate of chronic ailments and even with an increased mortality rate (Joint Committee on National Health Education Standards 1995; Berkman et al. 2011). Consequently a good flow of information between doctor and patient could raise the patient’s life expectancy by improving the patient’s health literacy.

2.3 Communication Is Still Given Low Priority in Medicine

Nevertheless, up to now the complex of issues surrounding “communication between doctor and patient” has only been given a low priority. Granted, efforts are being made to attain improvement (e.g., by practicing difficult discussions, with actors taking on the role of patients). Yet the present status reveals no preparation that is sustainable or has broad-based effectiveness, with regard to medical students conducting doctor’s discussions that match patients’ needs.

In practice the existing structures are also not sufficient at present for offering a comprehensive medical consultation with patients, on an across-the-board basis. In this regard, limited time resources play an important role (among other factors).

3 The Approach for Attaining a Solution: “Was Hab’ Ich?” Places Doctors and Patients onto an Equal Footing

The aim in the work of “Was hab’ ich?” is to make medicine understandable for everyone, and to place doctor and patient onto an equal footing—for a doctor-patient relationship based on trust and a healthier way for patients to take care of their own bodies.

The concept is simple, linking up patients that seek help with those training to be doctors, in a unique synergy process.

3.1 How It Works

Patients can upload their medical reports anonymously and free of charge at the Internet platform <https://washabich.de>, or submit them by fax. To do this, all that they need to state is their year of birth, their gender and their e-mail address. The users are also requested to remove all personal data from the medical reports.

After the data are sent in, the reports reach the internal network of medical students and doctors at “Was hab’ ich?”. Here medical students who are either in or beyond their 8th semester of studies in their respective specialism, in addition to (fully-qualified) doctors, are voluntarily working on “translating” medical reports. To do this, the volunteers are individually trained in a structured way that corresponds with their abilities.

Online, one of these doctors translates the submitted report into easily-understandable language. As part of this, the interconnected elements of the individual’s medical situation are explained, and basic knowledge is also put across—for example, with regard to the area of the body that is being examined. However, no interpretation of the reports is given; the process neither deduces diagnoses based on suspicion of what may be the case, nor deduces therapy

recommendations from the reports—this remains the task of the doctor treating the patient.

During the translation, the medical-team member can submit subject-specialist questions to the team of doctors and students at any time, in an internal “Questions and Answers” forum. Beyond this, it is primarily an individual supervision of the translator that contributes to quality assurance. This process of improvement takes place both at the language level and also at the level of content.

When the translation is complete, the patient is informed by e-mail. The latter receives an access link and also a password, so that the translation can be called-off on an encrypted basis and, if required, printed off. The patient is also requested to assess the translation. This feedback, which patients do indeed provide in around two-thirds of cases, serves the purpose of assisting the ongoing quality-checking process, but is also given to the translator and to the whole medical team, for whom it has a motivating and positive effect.

3.2 The Synergy: Giving Support to Patients in Their Health Awareness and Providing Further Training to Medical Students and Doctors in Their Communicative Behavior

To enable patients to reach a decision regarding their treatment, jointly with the doctor, the patients need an individualized basis of well-founded information. “Was hab’ ich?” makes this available by means of free-of-charge translation of the medical reports. Patients can take receipt of their health information and go through it in their familiar home surroundings. That way, in advance of the visit to the doctor, the patient can give consideration to specific and targeted questions and draw the answers into the decision-making process, based on the patient’s knowledge.

Through “Was hab’ ich?” the medical students and doctors acting as voluntary translators gain further training in their communicative competences. Through the extensive process of initiation into the translation activity, as well as the constant individual supervision, the medical students and doctors are trained in formulating even complicated medical subject matter in a way that patients can understand.

The medical students and doctors also acquire specialist knowledge relevant to actual practice, by means of translating the medical reports. This process is promoted by the lively exchange of thoughts and opinions within the team.

The teamwork also brings about a loosening-up of hierarchical structures in the everyday practical work of medical personnel. At “Was hab’ ich?” medical students and doctors work with one another on the basis of equality of rights. The concept of training in communication, which is a prerequisite for translating independently at “Was hab’ ich?” does not make a distinction between doctors and students. Each new team member receives his/her individual training and supervision from an experienced student. Thereby, the content and duration of the training take the

translation guidelines set by “Was hab’ ich?” as the only point of orientation. The exchange of thoughts and views among subject specialists is also invigorated by placing the doctors’ experience-based knowledge and the medical students’ fresh university-based knowledge opposite one another on the basis of equality. Getting to know one another within this open opportunity for exchanging thoughts and ideas, independent of hierarchies, is also helpful in everyday professional life, in overcoming hierarchy-based hurdles for the sake of quality in the provision of medical care.

4 “Was hab’ ich?” Really Has an Impact

Three years after being set up, “Was hab’ ich?” can point to a successful and established system. The concept has its effect in an all-embracing way, on patients, medical students and doctors and on the German health system.

4.1 20,000 Translations of Medical Reports in 3 Years

By now, more than 20,000 documents produced by doctors have been “translated” into easily-understandable language without charge. At an average time investment of 5 h per translation, this corresponds to a work output of more than 100,000 person-hours, provided voluntarily—this alone is to be equated with the work of 16 full-time employees over this time period. In addition, roughly a quarter of these translations were supervised by an experienced translator.

In a survey, among more than 500 users of “Was hab’ ich?”, 84.6 % of those asked agreed that the translation of the medical reports had given them encouragement in facing the challenge of their illness with determination. Beyond this, the following advantages of translating the medical reports were stated: comprehensibility and exactness; certainty about one’s own illness; the possibility to use the translation of the medical reports as the basis for considering how to proceed from that stage; and the fact that the information is provided in writing and can be read again whenever one wishes.

4.2 Equality of Opportunity in Obtaining Information

The same survey showed that almost 60 % of the users surveyed have educational qualifications at Realschule level (roughly equating to secondary school in Britain) or lower. Unlike many other medical-information portals, the product offering of “Was hab’ ich?” thus primarily reaches people with low levels of educational

qualification—a target group with a particularly high level of demand for easily-understandable health information.

4.3 Medical Students and Doctors Learn to Communicate

A survey was conducted among the “Was hab’ ich?” team of medical students and doctors: it showed that the team’s members are certain that, through the translations, they learn how to communicate in a way that laypeople can understand: 98.7 % of the medical students and 93.6 % of the translating doctors stated that, through working with “Was hab’ ich?”, they were able to improve their ability to explain subject matter in a way that laypeople could understand. In this way, a total of around 1,000 medical students and doctors have already been trained to be better communicators at “Was hab’ ich?”

The team’s assessment is that their specialist knowledge also increases as a result of translating medical reports. 94.7 % of the team members who are students and 77.4 % of those who are doctors are convinced that they are able to improve their medical specialist knowledge at “Was hab’ ich?” based on cases relevant in practice.

The patients’ feedback also helped in the learning process. Around two thirds of the patients assess the translations, (among other aspects) with regard to how well they can be understood—that way, the patients contribute to patient-centred further training in communicative abilities.

4.4 Attention Given to Doctor-Patient Communication

In recent years, more than 200 media reports in periodicals and on radio and television have been spreading the idea of “Was hab’ ich?” among patients, medical students and doctors, and more broadly in the health-care sector. Among the patients, the demand for understandable health information from “Was hab’ ich?” is enormous: only a short time after the project was founded, a virtual waiting room had to be set up because the strong level of demand could not be serviced. To this day, the waiting places that are available daily are taken within a few hours after the “virtual waiting-room” opens.

Young medical students and doctors are committing their efforts to patients’ concerns voluntarily, further developing their communication skills: this draws attention to the concept of a rethink in the doctor-patient relationship—an important prerequisite for mapping out long-term the path towards doctor-patient communication on an equal footing.

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Project “Weisse Liste”: A German Best Practice Example for Online Provider Ratings in Health Care

Sophia Fischer

Abstract Due to changing media environments, online provider rating websites become facilitators for patients in health-related decision-making. However, existing online tools vary in respect of information quality and validity. Therefore, this case study introduces the German internet portal *Weisse Liste* as a best practice example, especially in terms of transparent information policy and scientifically grounded rating methodology. After briefly portraying the conceptual pillars of *Weisse Liste*, special attention is paid to the physician rating questionnaire and its development. Lastly, this case study verifies *Weisse Liste*’s *modus operandi* against quality criteria of online rating websites provided by the German Agency for Quality in Medicine. Overall, *Weisse Liste* should be considered as best-in-class in the German online provider rating landscape.

1 Today’s Patients: Active and Online

Today, patients have tons of information at their fingertips. In order not to lose their way on the information super highway, people search for reliable information sources they can trust. Research shows that when choosing a hospital, advice from primary care physicians, informal recommendations from friends, relatives, and colleagues, as well as online information matter the most (Streuf et al. 2007). When today’s patients are looking for a general practitioner, personal and online information exchange merge into one phenomenon: *online provider ratings* based on other patients’ experiences.

In recent years, multiple online platforms have emerged across Germany that make patient-reported quality evaluations about their providers transparent. However, these online provider rating websites vary in information quality and validity (Emmert et al. 2013; Niehues et al. 2012). Depending on many operational aspects, for example organizational resources such as man power or financing, provider

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rating websites differ in terms of data collection methods, data security, usability, transparency in communication, and susceptibility to manipulations.

The aim of this case study is to present a German best practice example: a cross-sector project initiating an online provider rating website called *Weisse Liste*. This online platform aims at providing guidance as well as decision support in health-related decision-making and provider selection. In the following, this case study reports briefly on the project's formation and its organizational goals. Subsequently, the focus shifts towards the *physician rating tool* to display the unique methodology applied for data collection. In the end, aspects distinguishing project *Weisse Liste* as best-in-class are discussed.¹

2 Introducing Project “Weisse Liste”

The internet portal *Weisse Liste* (German for “White List”, symbol of structured information in the medical context) is a joint project initiated by the Bertelsmann Foundation and several umbrella organizations of the largest German patient and consumer organizations.² All partners are said to be involved in the project's control and management. The online portal started in 2008 with a hospital search tool. The project was expanded in 2011 and 2013 to include physicians and ambulatory care. Today, patients and their families are able to inform themselves about physicians, nursing homes and outpatient care. A rating modus has only been implemented for hospitals and physicians. As an add-on service, patients have the opportunity to access health information, which is provided in cooperation with the Institute for Quality and Efficiency in Health Care.³ Figure 1 shows the conceptual pillars of *Weisse Liste*.

The project claims that all partners attribute great importance to maintaining *Weisse Liste* an independent medium that is operating on a non-profit basis without any commercial interest. Indeed, all project-related information is publically available and information of the project accessible free of charge. According to Bertelsmann Foundation (2013), patients require easily understandable and

¹ Please note that the information within this article is obtained from the project's website if not indicated otherwise (see *Weisse Liste* 2013).

² These include, for example, Bundesarbeitsgemeinschaft SELBSTHILFE e. V., Deutsche Arbeitsgemeinschaft Selbsthilfegruppen e.V., FORUM chronisch kranker und behinderter Menschen im PARITÄTISCHEN Gesamtverband e. V., Sozialverband VdK Deutschland e.V., and Verbraucherzentrale Bundesverband e.V.

³ The Institute for Quality and Efficiency in Healthcare (German: “Institut für Qualität und Wirtschaftlichkeit im Gesundheitswesen”, abbr. IQWiG) is an independent scientific institute that publishes evidence-based reports, e.g., on drugs, non-drug interventions, diagnostic test and clinical practice guidelines. It also provides easily understandable health information for the public (IQWiG 2013).

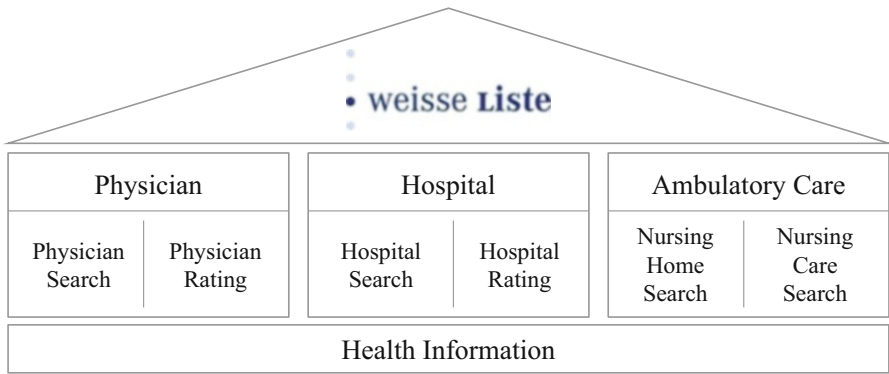


Fig. 1 Conceptual pillars of project *Weisse Liste*

accessible information to become more active, well-informed decision-makers in health care. This is the purpose *Weisse Liste* was created for.

3 Insights into Provider Rating Methodology

One distinct characteristic of *Weisse Liste* stands out most when compared to other provider rating websites: the scientific rigor and transparency in rating methodology. Taking the physician rating methodology as an example, the project published a detailed report⁴ about which methods were applied for developing the survey instrument for the online evaluation of general practitioners and specialists (Bertelsmann Stiftung 2012). The final survey instrument emerged from a scientific literature review, a qualitative pre-study, a questionnaire development phase as well as multiple pre-tests in various samples. Figure 2 shows the multi-staged methodological development of this survey instrument.

The final questionnaire regards the principle of including as few items as possible, but as many items as necessary. Moreover, the project *Weisse Liste* took additional prerequisites into account: all items needed to be clearly formulated and respondents should only need a short period of time to complete the questionnaire. Thus, the implemented online portal is highly user-friendly and involves few navigation levels.

Based on the findings from the qualitative exploration in questionnaire development, the project says that patients optimally report about their experiences when they are asked about all contact points in their encounter with the physician along their clinical pathway. This involves the access to the practice, the first contact at the reception counter, the premises, on-site processes, personal and professional

⁴The methodology applied to the hospital rating section of *Weisse Liste* has also been published online.

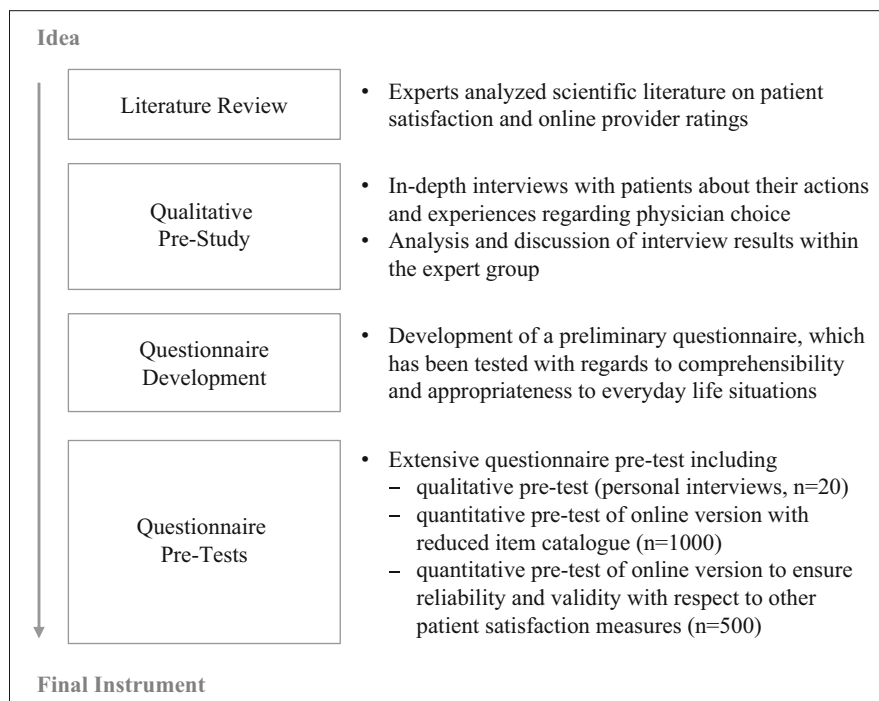


Fig. 2 Methodological development of the survey instrument for physician ratings (adapted from Bertelsmann Stiftung 2012)

competence of the physician, and treatment equipment. The final survey for general practitioners includes 33 items which cover four main processing steps that reduce the survey complexity for the respondents (see Fig. 3).

Interestingly, the project decided against an overall rating score per physician. Instead, the portal strengthens the aspect of recommendations and displays how many percent of the patients would advise others to visit the same physician. The only mean to compare the single physician's performance is an indicator showing the national average of the respective medical specialty. This comparison is available for all sub-dimensions of the questionnaire (e.g., physician communication or treatment).

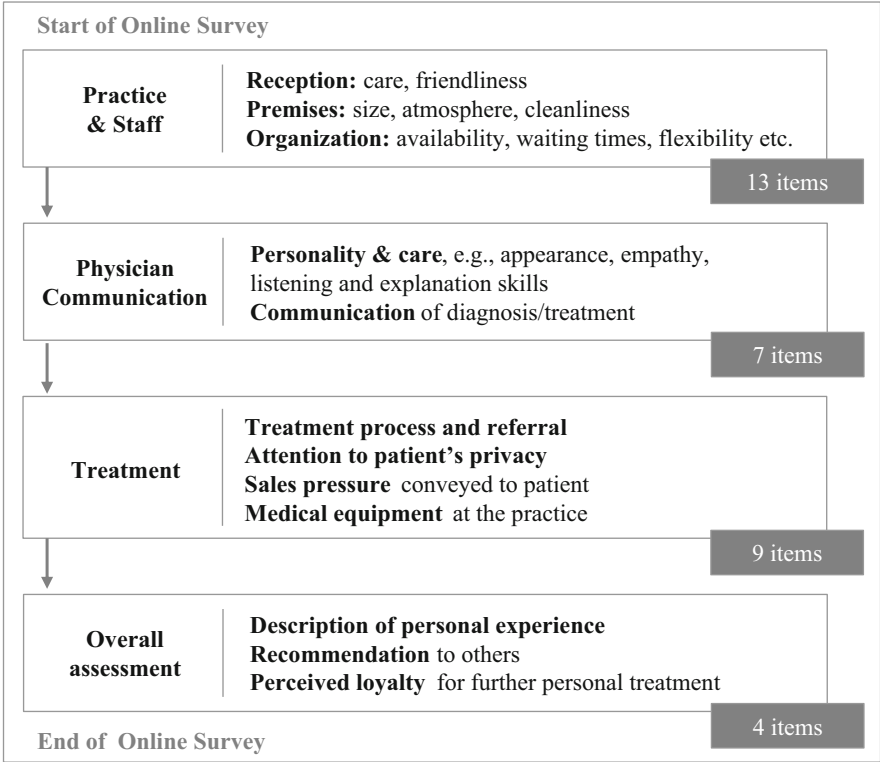


Fig. 3 Overview of online survey tool (adapted from Bertelsmann Stiftung 2012)

4 Best-In-Class Through Value Orientation and Quality Management

Recent literature is discussing which essential features are required in provider rating websites to be a valid instrument for patient satisfaction measurement (e.g., Emmert and Meier 2013). Meanwhile, the German Agency for Quality in Medicine (abbr. AQuMed)⁵ took a practical approach in the interest of their professional association and summarized requirements for online provider rating websites within one catalogue (BÄK and KBV 2011b; Schaefer and Schwarz 2010). To illustrate that Weisse Liste is indeed a best practice example, Table 1 summarizes which explicit measures are taken to ensure the compliance with these quality criteria. When AQuMed tested German provider rating websites in 2011, it reported

⁵The German Agency for Quality in Medicine is a joined institution of the German Medical Association and the National Association of Statutory Health Insurance Physicians (AQuMed 2012).

Table 1 Requirements for “good” physician rating portals according to AQuMed

Quality criteria according to AQuMed	Example Weisse Liste
Compliance to legal requirements	– According to German Medical Association and German National Association of Statutory Health Insurance Physician (BÄK and KBV 2011b), Weisse Liste fulfills all criteria with regard to compliance to German legal standards. The portal has a legal notice, contact information for various interest groups, references to the German Telemedia Act and a privacy statement.
Transparency	– Weisse Liste maintains a policy of open communication with the public and all interest groups. As it is a core premise to provide easily understandable and high-quality information, this requirement has to be fulfilled with respect to project information as well as to the portal content itself.
Data security	– Data protection premises have been central to the project since its formation. Data security experts have been involved in all stages of project development. At the moment “Weisse Liste” is striving for the European Privacy Seal. – Physicians have been informed about the launch of the portal via a national mailing.
Rating methodology and presentation	– The survey instrument was developed according to scientific standards and physicians’ representatives were involved in its development. – The online system requires a critical number of ratings per provider before recommendation scores are published online. At the moment, each provider needs to have at least five assessments.
Measures against abuse and manipulation	– Only people insured by one of the collaborating health insurance funds are able to provide a rating. Providing unique identification information to each insured person ensures that there is only one rating given at a time. In case patients change their mind about providers, previous ratings are overwritten within the system. Thus, it is not possible to rate the same provider multiple times. – Patients do not have the possibility to post free text evaluations about the providers to avoid improper criticism and defamation. Providers have the possibility to comment or even block their results.
User friendliness and content	– The project placed great importance on easy navigation within the online platform. Moreover, requirements for patient participation are made transparent on the FAQ pages. – AQuMed did not find any form of discriminating content.

that Weisse Liste met 85 % of all criteria.⁶ Thus, Weisse Liste took the first place among all 12 provider rating websites assessed (AQuMed 2010). The agency positively highlighted that the project is based on a reliable, validated survey instrument. Additionally to the criteria mentioned by AQuMed, Weisse Liste also fulfils the standards of a non-profit orientation since it neither sells “packages” to physicians so that they appear in the first place of the search results nor does it sell any ads or search engine optimization.

5 Reflection and Outlook

Although Weisse Liste sets a high standard in online provider ratings, there is still room for further improvement. A core point of criticism may be that only those patients insured at partnering health insurances have the opportunity to actively rate physicians. Although Weisse Liste is currently cooperating with three major insurers covering approximately 50 % of the German population, the other 50 % of the population can only view the results without actually contributing their personal experiences. Moreover, the requested data privacy seal has not been granted yet⁷. However, Weisse Liste is taking efforts to fulfill the needs of all interest groups. For example, the patient representative of the German government is patron of the project but at the same time representatives of the medical associations work in the project’s steering committee as well.

In the future, the project wants to work even harder to integrate medical professionals. Besides making quality information transparent to patients, Weisse Liste offers great insights for providers to learn more about their individual process gaps and potential for quality improvement. Yet, this source of knowledge has been mainly untapped by physicians and hospitals. Therefore, one future challenge of the project will be to take the providers’ fears of complaining patients in online portals and to make medical professionals aware of the potential benefits they can gain through dealing with patient evaluations.

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⁶ The AQuMed’s final report and the corresponding statement of *Weisse Liste* can be found online (see BÄK and KBV 2011a; AOK et al. 2011).

⁷ The European Privacy Seal is provided by the Independent Centre for Privacy Protection Schleswig-Holstein (German: “Unabhängiges Landeszentrum für Datenschutz Schleswig-Holstein”) which is said to be one of the strictest data protection authorities in Germany (ULD 2013).

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Challenges of E-Health Communication: Implementation of Electronic Insurance Payment Receipts

Doreen Reifegerste

Abstract The online provision of personal health data is an important step towards increased patient empowerment. Health insurance providers can offer fast, easy and individual access to accounting data for their clients. However, the implementation of such internet tools is fraught with a variety of challenges, and several technical and legal aspects have to be considered. The structure and labeling of accounting data is not intended for usage by laypersons; it is therefore necessary to translate medical and accounting terms in a user-friendly way. If this is not done, misunderstandings and misinterpretations can lead to confusion and frustration on the part of patients, as well as to conflicts with care providers.

1 Introduction

Immediate access to personal health records is one way to enhance empowerment, transparency and self-management for patients. However, there are a number of challenges, including the concomitant data processing, patient health-literacy requirements and the complexities of the healthcare system (see Fischer and Soyeز 2014).

Due to their central role in paying for health-related services, health insurance providers in Germany have diverse data on health transactions at their disposal. Providers store, for example, detailed information about costs; dates; service provision for hospital stays; prescription drugs; ambulatory care; and rehabilitation devices. These accounting data are stored in various databases within the health insurance system.

German health insurance schemes are obligated to provide payment data to their customers upon request. In §305 of the German Social Security Code it is stated that patients have a right to request information from their health insurance provider about health care services that they have received during the preceding 18 months. Table 1 gives a template of what this information might include.

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Table 1 Example patient receipt

Sector	Service	Date	Provider	Costs
Ambulatory care	Basic charge for pediatrician	1 November 2012	Dr. Müller, Maxstraße 22, Town 22333	3.60 €

Traditionally, this information was sent to the member in question via letter several weeks after the request, and these data were only provided by the Association of Statutory Health Insurance Physicians. In contrast, an online tool provides easy, quick and individual access to this information for each insurant. Therefore AOK PLUS¹ decided to implement a solution developed by the Federal Association of AOK, based on a national database (“AOK PLUS” 2012).

Providing online access to these data offers benefits for both customers and insurers. Online access shortens processing time, increasing customer satisfaction and saving costs related to staff and postage. Additionally, improved transparency generally increases patient empowerment by reducing information asymmetries. Finally, this system gives patients a chance to detect potentially fraudulent billing.

Although e-health systems are a promising tool for patients, care providers and insurers, there are a number of points that have to be considered. The following article provides an overview of the practical challenges of implementing such a tool for health insurers in Germany. To highlight and suggest solutions for potential management concerns, technical, legal and service-related issues are addressed.

2 Technical Issues

2.1 Data Integration

The German health care system is separated into different sectors with different legal foundations, which give rise to very different accounting and data-processing systems (Schwarzkopf et al. 2012). Therefore the integration of these data is a constant challenge. Each sector uses different rules for coding the same health care services, providers and costs. Care-related data reach the health insurance data systems through very different channels and on very different time scales. Table 2 gives an overview of the main sectors in the German health care market and their systems for data provision. Additional accounting systems exist to manage data for dentists (separated into treatment, dental prosthetics and orthodontics), disease management programs, integrated care and cost reimbursement.

Due to ongoing changes in these coding systems, the catalogue data for each sector must be constantly updated. For example, the code for a pharmaceutical

¹ AOK PLUS is a statutory health insurance fund in Germany. It is one of the eleven AOKs (general regional health insurance providers) in Germany, and offers services in Saxony and Thuringia.

Table 2 The main sectors in the German health care market and their systems for data provision

Sector	Coding	Data providers	Timescale for updates	Legal basis
Ambulatory care	EBM-Codes (<i>Einheitlicher Bewertungsmaßstab</i> ; uniform value scales for outpatient services)	Federal Association of Statutory Health Insurance Physicians (<i>Kassenärztliche Bundesvereinigung</i>) separately for each federal state	Quarterly; three quarters after treatment	§295 SGB V (Social Security Code) V
In-patient care	DRG (diagnosis related groups)	Hospitals	Monthly; including most recent data	§301 SGB V
Pharmacies	ATC and DDD (anatomical therapeutic chemical/defined daily dose classification)	Pharmacy computer centers	Monthly; with data from up to 2 months ago	§300 SGB V
Providers for rehabilitation equipment	GPOS (Gebührenpositionsnummer; fee position numbers)	Each provider or via a service provider	Monthly; including most recent data	§302 SGB V

product prescribed as a blood thinner in one year might be assigned to a completely different product the following year.

2.2 Data Interpretation

Table 2 makes it clear that linking these different data can be quite challenging, and poses difficulties for presenting cross-sector results. Some of these difficulties also have implications for the interpretation of individual electronic payments by laypersons. Some of these problems are discussed below.

Identification codes for care providers are quite different and frequently ambiguous; while hospitals have unique identification codes, resident doctors can be identified by either their personal or practice numbers. In addition, due to the varying schedule on which data for different sectors is updated, the data for different sectors may be in very different states. For example, in-patient data is usually quite up to date, while information regarding out-patient treatments may be delayed by up to a year.

The date on which a service was provided is often unclear, as there may be separate dates on which the procedure was prescribed by a physician, approved by the health insurance provider, performed and billed for. As medical accounting is continually audited and negotiated, ongoing corrections of the data are possible. As

a result, the amount on record that was paid for a particular treatment might change if data were accessed at two different times during the same month.

2.3 *Processing of Mass Data*

Processing such a vast amount of data accurately and securely poses a real challenge to the currently available computing techniques. Advanced techniques are necessary to provide secure, rapid and up-to-date access to health information; these techniques must perform functions like partitioning, clustering, mirroring, providing sufficient space for storage and testing, delta-loading, pseudonymization and archiving. Data from different sectors and databases must frequently be combined into a single data base, requiring standardized structures and the correct integration of the various types of information. Finally, the different coding systems (catalogue tables) and master data of the insured persons must be kept up-to-date. Regular quality checks of the database and related processes are necessary to ensure accurate data.

3 Legal Issues

As individual accounting data are personally identifiable, these data are subject to patient privacy regulations (Ihle 2008). Data protection commissioners, therefore, regularly review databases, access protocols and the layout of the patient receipt for compliance.

Access protocols must ensure that only eligible persons (e.g., authorized guardians) gain access to information. This is why clients of a particular insurer must register before they can receive online access to patient information. The login password is only sent via post if the address data corresponds with the information provided to the insurance provider. This ensures that only eligible persons are given access to each individual's data. Children under the age of 15 are not eligible to receive access to this online data, as they are not legally independent.

4 Service Issues

4.1 *Service for Non-users*

Another challenge is how to provide data to persons who are unwilling or unable to use an online service platform. This may be due to personal preference, a lack of access to technology, a long time-span for the requested data or the special nature of

the requested content. For example, certain special treatments or ways of accounting (like refunding) are not included on the online platform. Due to the legal restrictions regarding privacy, the manual provision of this data can be very time-consuming, as each division has to provide the individual data for each sector. This leads to great administrative effort for a very small number of cases.

4.2 Usability of the Tool

The internet generally offers a way to access these data more conveniently, quickly and privately than via post. However, to ensure maximum utility for a lay population, the tool should be [self-explanatory](#) and easy to use, with information presented and explained as clearly as possible. For this reason, the accounting data can be chosen by quarter and by sector. However, as a single tool is provided for all the AOKs by their federal association, not all aspects of the tool are as individually customizable as certain sectors might prefer, and requests for changes have to undergo a long process of development before they can even potentially be implemented.

4.3 Understandability of the Data

Although patient health literacy is increasing, the accounting and coding of the German health care system is very complex. As described above, each provision sector has its own accounting procedures, data exchange processes and coding. Therefore, online data provision needs to include explanations and understandable terms to ensure transparency and prevent confusion on the part of users.

Terms or catalogue numbers for medical equipment can sometimes be hard to understand, as they often differ from the terms generally used to refer to such items; for this reason, it was decided not to display the 10-digit fee position number for medical appliances, but rather to give the more general term of the product group. Another German health insurance provider, the Techniker Krankenkasse, translated 10,000 medical terms to improve its offline patient receipt ([“Techniker Kasse” 2013](#)).

The amounts given for ambulatory treatments only represent average scores, and do not necessarily correspond with the actual amount the practitioner has received. This means that if a patient and his or her primary care physician compared their data for the same service, they might notice differences. For this reason, a footnote for medical treatment in the ambulatory sector was added: “Health care services by physicians and dentists are based on complex legal contracts and complex accounting systems. Amounts for these services are calculated from scores and their values. Normally, this value is fixed for each service. However, overspending of the budget may decrease the score value. The resulting corrections are done retrospectively

and globally for the accounting of each physician. Therefore, it is not possible to attribute this to a single service item or an individual insured person.”

Additionally, the following explanation was given to minimize any confusion among laypersons due to different updating frequencies between sectors: “Due to differing and time-delayed accounting dates for the various health care sectors, we do not yet have all claim-related information. If you want to have a list of more recent services, you can ask your physician or dentist directly; they are obligated to give you this information upon request.”

To answer specific questions about individual items, clearly defined internal processes are necessary to integrate and coordinate the multiple experts from the various sectors who may be required to fulfill a specific request for information. Although such requests are relatively infrequent, clear-cut interfaces and an acceptable turn-around time are needed for detailed cross-sector requests.

5 Acceptance and Use of This Technology

The acceptance and usage of this technology remain limited. One year after implementation, only about 6,000 AOK PLUS customers were registered for the online service (out of about 2.7 million total customers), and there is no current data regarding to what extent registered users actually use the online platform. Rates of usage of the online platform vary: AOK NordWest, which has about the same number of customers as AOK PLUS, had 20,000 registered users shortly after implementation (“AOK PLUS” 2012).

To date—late 2013—nine of the eleven AOKs, as well as the Barmer (another German health insurance provider), have implemented the electronic patient insurance payment receipt system, and other statutory health insurances (like the Techniker Krankenkasse) are planning to follow (Barmer 2013). Further developments include a smartphone version of the online tool, which has already been released, and a prevention manager, which is still in development. The latter is an electronic application that reminds customers of checkups, screenings and vaccinations, all based on physician data. However, as the data for the ambulatory sector are often delayed and not very detailed (see previous discussion in the present paper), information pertinent to certain vaccinations may be difficult to obtain in a timely enough fashion to make such a tool useful.

In sum, electronic personal health records by health insurance providers are quite challenging to implement in a complex healthcare system. However, they can help to improve transparency to laypersons if they are presented in an understandable way.

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How ICH Uses Organizational Innovations to Meet Challenges in Healthcare Management: A Hospital Case Study

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Abstract Within today's competitive healthcare markets, challenges in healthcare management are manifold. Providers need to simultaneously monitor how to improve treatment quality, increase operational efficiency and win the race for most talented medical staff. To succeed in the light of rapidly changing environments, organizational innovation is one key success factor. Regarding this capability, the Italian *Istituto Clinico Humanitas* (ICH) is an internationally renowned best practice example. Therefore, this chapter illustrates how ICH became a successful operating hospital despite adverse circumstances.

1 Healthcare Management Challenges in the Twenty-First Century

When speaking of challenges in healthcare management, the catch-phrases of improving quality of care and increasing efficiency are omnipresent. In the hospital management context, managerial decision problems to achieve these goals occur in many facets, such as investments in new technologies (Gurtner 2013), bed capacity planning (Akcali et al. 2006) or inter-organizational networking (Mascia and Di Vincenzo 2011). As healthcare is a service provided for people by people, various human resource topics require consideration as well, for example staff salary models like pay-for-performance (Young et al. 2010) or gender and leadership aspects (Lantz 2008). All those facets are deeply intertwined, but their interactions are rarely analyzed comprehensively. Thus, practical examples are needed to learn from best practices.

Therefore, the private Italian for-profit hospital *Istituto Clinico Humanitas* (ICH) serves as a striking example that portrays how to overcome hurdles in healthcare

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management and how to reach economic success by delivering public services. As best practice example, ICH has been one of the prominent cases used by the Harvard Business School (Bohmer et al. 2002). It has been the hospital's management approach, which is mainly characterized by the combination of economic and social responsibility, application of integrated information technology systems and the use of the internet to facilitate the relationship with its stakeholders, that contributed most to its success story. Its guiding management principles were complete cost control via immediate cost analysis, reduction of length of hospital stays and waiting time, high level of service provision, as well as constant interaction between medical staff and management (Techint Group 2013). After briefly introducing ICH, this article illustrates aspects of organizational innovations leading to the hospital's achievements.

2 About Istituto Clinico Humanitas

Established in 1996, ICH is located in the peripheral area of Milan, Italy. It is owned by the Humanitas Group which is in turn mainly held by the Techint Group. Techint itself is a diversified consortium of six companies ranging from steel production to healthcare. It reports that “the delivery of health care [...] is based on Humanitas' economically successful, patient-oriented management model, supported by state-of-the-art systems of integrated information” (Techint Group 2013, p. 13). As Techint's annual report 2012 shows, total admissions to Humanitas Group have been constantly on the rise, now reaching approximately 180,000 patients per year resulting in USD 700 million revenues (Techint Group 2013). ICH itself has 747 beds and operates as a comprehensive tertiary care hospital with 30 operating theaters and 200 ambulatories. Roughly 2,000 people, including 450 doctors and scientists, work at ICH to handle 50,000 inpatients per year including 25,000 surgeries and 55,000 ER patients (Istituto Clinico Humanitas 2013). Besides specialist medical care, ICH has co-operated with the University of Milan in graduate and post-graduate medical education since 1997. As a main research hospital, ICH also hosts the *Humanitas Cancer Center* exploring optimal cure of cancer patients. Moreover, ICH was the first Italian general hospital certified by the Joint Commission International for Quality and Safety and has re-earned this certificate in 2006, 2009 and 2012 (Techint Group 2013).

3 Organizational Innovation

Harvard professor Richard M.J. Bohmer has analyzed healthcare management practices for many years. Within his works, he calls for organizational changes that follow the rules of (a) applying scientific evidence for treating well-understood diseases (i.e., process standardization), (b) following a trial-and-error approach in poorly understood cases (i.e., deviation from the standard protocol when necessary)

Concept	Description
Shared assets	• No dedicated beds: Multi-specialty wards care for patients of multiple operating units. If beds are unused by one operating unit, they are occupied by another, allowing near 100% occupation rate with flexibility to deal with peaks. • No dedicated ORs: Equipment and clinicians rotate according to where they are needed.
Need-based allocation	• Continuous monitoring of waiting lists, OR utilization, length of stay and more • Monthly/weekly tuning of assets and clinical activities accordingly
Flexible physical space	• Continuous building re-design to expand or to introduce new clinical services • Use of plasterboard in construction to ensure: - Flexible use and ease of conversion - Reduced costs and time for reconfiguration
Separate patient flows	• Inpatient and outpatient paths never cross, to reduce variability and complexity • Pathways are designed to minimize patient walking distances

Fig. 1 Concept of asset management and its implementation at ICH (Istituto Clinico Humanitas 2013)

and (c) establishing a knowledge management system within the healthcare organization learning from everyday practices (Bohmer 2009, 2010). Although there is no one-fits-it-all solution how to implement this advice best, the following key aspects show which measures ICH took to reach patient-oriented delivery of integrated care and optimal resources utilization.

3.1 Corner Stones for Successful Operations: Asset Management and Clinical Pathways

Right from the beginning of its operations, ICH elaborated a detailed *asset management* concept with the aim of maximal operating flexibility and resource utilization. Figure 1 summarizes the concept’s main constituents. This approach aimed at increasing economic sustainability and organizational efficiency by asking how much of a certain resource is needed at what time. Yet, streamlining the utilization of hospital resources potentially endangers optimal patient treatment processes. To ensure that each patient is cared for according to individual, clinical needs, ICH merged its asset focus with the implementation of *clinical pathways* in specialized treatment centers.

This second stage of pathway management ensures the appropriateness of medical procedures and helps to monitor process controlling. By building up a matrix structure of care paths and assets, ICH aims at creating a positive internal

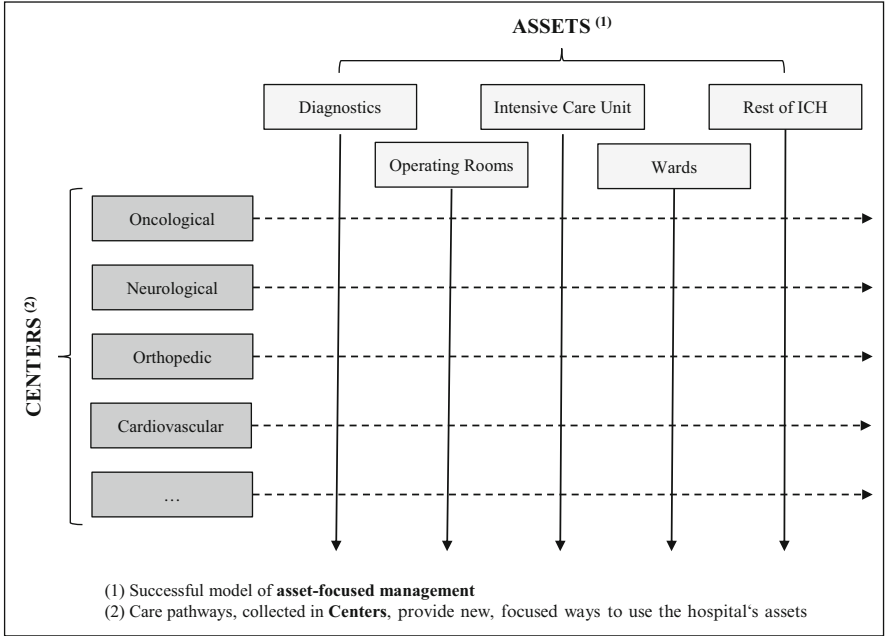


Fig. 2 Matrix organization between assets and clinical pathway at ICH (Istituto Clinico Humanitas 2013)

tension between efficiency and quality (see Fig. 2). Having different specialties, for example oncology and orthopedics, share the same operating rooms and intensive care units leads to improved decision-making about the treatment and therefore also to better patient outcomes (Istituto Clinico Humanitas 2013)

3.2 Openness to Continuous Shifts in Management Paradigms

Although ICH has already taken two management paradigm shifts since its opening in 1996, namely first the alignment of operations to asset management and second to pathway management, this is not sufficient in today’s highly competitive healthcare markets. Since 2012, ICH is again in the middle of a transition towards yet another direction: comprehensive disease management (Ellrodt et al. 1997). After ensuring the resource and time dimension, one further aspect is incorporated: clinic knowledge is needed to address the questions “why” and “how” each process activity is conducted. This means that ICH’s management reviews the coherence and the appropriateness of each process step in order to enhance patient outcomes. To live up to its aspirations, ICH transformed its operations into three building blocks, each one having a different focus. The first is the “client service” which is

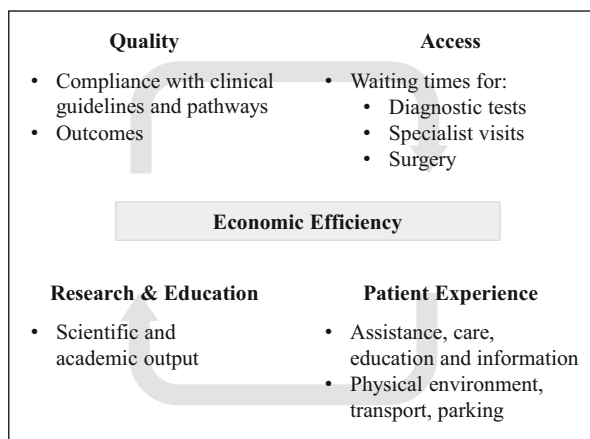
directed towards all patient needs, from information and booking to invoicing. Second, “operations management” adjusts all assets and strategically plans and supports management. The third entity called “lean and continuous improvement” is taking care of all process, innovation and change management aspects at ICH. Only by ensuring a tight interaction of these three components, the dimensions of excellence in asset and resource allocation, excellence in care pathways and excellence in service can be achieved. In the end, ICH’s philosophy of providing a sustainable, patient-centered care with optimal clinical outcomes, high patient safety, positive patient experience, innovativeness and research can become reality.

3.3 Focus on Core Activities and the Hospital’s Mission: The Humanitas Cancer Center

Since 1997, ICH is cooperating with the medical faculty of the University of Milan. Besides education, scientific research has always been an essential part of the hospital’s mission. At the moment, around 400 clinical studies are conducted at ICH’s research institute which is steered by an international committee of renowned doctors. In addition, cancer-related care has always been one of ICH’s core activities mounting up to roughly a third of its total revenues. Combining these two aspects led to the foundation the Humanitas Cancer Center in 2011. Investments of 30 million euros were made to advance research efforts in newly designed research labs, a bio bank and a cell-factory.

What is special about the Humanitas Cancer Center is its well thought-through organization. At the center numerous multidisciplinary teams are assembled around care pathways. As each pathway cuts across a number of functional units (e.g., breast cancer or hepatic cancer programs), the formation of a matrix-organization is repeated. However, this organizational design is complex and requires staff guidance. Hence, physicians were required to fill out new roles including extended skills such as leadership ability. At times, the medical staff has to handle the merge of functional and disciplinary responsibility. To provide guidance for the medical personnel and to ensure high quality treatment outcomes, the teams needed to develop three core deliverables: clinical algorithms, pathway maps and so-called “blue books” to ensure standardized processes based on evidence. Additionally, all groups meet weekly to discuss complex cases and choose the most appropriate care plans. To ensure transparency of performance outcomes, team members work together to formulate meaningful performance indicators along five dimensions outlined by hospital management (see Fig. 3). Constantly updated dashboards reflect the performance of all actors along the clinical pathways, but also on a team and an individual level.

Fig. 3 Dimensions for key performance indicators (Istituto Clinico Humanitas 2013)



4 Summary

As mentioned before, there is no one-fits-all approach to overcome the challenges in healthcare management as markets and especially regulatory environments are heterogeneous. Still, ICH represents a viable example for internal and external alignment to these challenges (Bohmer 2009). Besides the process-related innovations described here, further advances (e.g., payment system based on incentives and technological investments) ensure that the management system as a whole functions optimally. As an organization, ICH has to learn and improve constantly although its past success is already highly remarkable. Thus, both academia and practice should monitor how ICH is responding to current and future challenges to come.

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Multidisciplinary Collaboration for the Development of Innovative Solutions in Health Care: The Case of the IMED Project

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Abstract This chapter describes the IMED project, a multidisciplinary, transnational effort to endow clinicians with state-of-the-art computer-based methods to assist them in the diagnosis of new breast cancer cases and to provide innovative training tools in specialized academic programs. It involves research and medical institutions in Portugal and Spain and its main achievements include (1) designing a workflow for radiographic data acquisition, annotation and analysis, (2) developing a workstation for computer-aided diagnosis and (3) creating a team of specialized radiologists, mathematicians and computer engineers sharing a common understanding and methodology on the domain.

1 Introduction

The IMED project aims at providing clinicians with practical methods to support their diagnosis decision in breast cancer cases. Although this is an area of much research in recent years, transferring results to clinical practice remains in most cases an enterprise full of challenges. Many of those arise from the constraints and particularities of medical environments, whose dynamics and implications are foreign and of difficult access to researchers from other areas, mostly computer engineers and mathematicians.

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The project arises to tackle these difficulties by establishing a multi-disciplinary team across all phases of the project from its early definition stages, which include data acquisition, development of Graphical User Interfaces (GUI), data analysis and integration in clinical practice.

Even if the project has been funded through different programmes, its success is rooted on the support committed by the participating institutions ensuring the constant involvement of specialists from different areas. Particularly important is the participation of specialized radiologists, the final target users of the project results whose knowledge is especially valuable and time scarce.

This chapter is structured as follows. The first two sections describe the project, its birth and major obstacles and expectations. Following that point, its main results and utility are presented and, to conclude, the future work and expected evolution are discussed.

2 Overview of the Project

As a cross-disciplinary project, IMED involved from its beginning specialized knowledge in breast cancer diagnosis, artificial intelligence and high performance computing techniques. A diverse team of medical doctors, computer scientists and mathematicians has closely collaborated from the early stages of the project to assure that the project results fit the needs of the end users. To achieve this, the project started as a collaboration among the following partners:

- The Extremadura Centre for Advanced Technologies (CETA-CIEMAT), a public computing centre in Spain
- The Institute of Mechanical Engineering and Industrial Management (INEGI) at the Faculty of Engineering of the University of Porto (Portugal)
- The Faculty of Medicine-Centro Hospitalar São João (FMUP-HSJ), at University of Porto (Portugal)

Each institution has provided different kinds of specialists and professionals throughout this collaboration, in order to cover the profiles required for the proper development of the project. In 2013, the Institute of Electronics and Telematics Engineering of Aveiro—University of Aveiro (IEETA-UA) joined the consortium.

As a major outcome, the project has developed a pipeline to produce Computer-Aided Detection and Diagnosis systems (also known as CADe and CADx systems) which consists of the following steps:

1. Mammograms and patient related information are integrated from different information systems and equipment.
2. Specialized doctors select and annotate mammograms enhancing patients' associated clinical data and these annotated cases feed a repository built and curated to allow the standardization of information.

3. Grid computing clusters (Ramos-Pollán et al. 2010) perform massive data analytics over such repositories producing predictive models for breast cancer diagnosis.
4. Models are integrated into graphical workstations to support doctors in their diagnosis tasks.

Moreover, the accomplishment of this development has implied a different set of processes, for example assessing the quality of medical images and associated patient cases, devising new image processing techniques and data analysis processes, developing appropriate user interfaces for medical doctors to interact with and, last but not least, integrating the results with in-hospital information systems and acquisition devices.

In addition, it should be pointed out that the challenges of the project have become its successes nowadays and IMED has built a multidisciplinary team including professionals from different backgrounds, established a pipeline for data acquisition, annotations and analysis for conventional and digital mammograms and made the project results accessible to final users (*clinicians*) through a workstation both for their clinical practice and specialized training.

The project has been possible through a solid commitment from all participating professionals and institutions, which have channelled funds from different sources (e.g. European Regional Development funds) to support the effort for 5 years. In 2012, the project was awarded as *a success story of Research & Development & Innovation* by the Spanish Foundation for Science and Technology (FECYT).

3 First Steps: Starting the Transnational Collaboration

The beginnings of IMED can be traced back to 2008, when researchers at CETA-CIEMAT and INEGI identified a potential line of research to produce predictive analytic models to support breast cancer diagnosis. At that time, CETA-CIEMAT had an institutional mission to apply Grid computing infrastructures to the medical domain, in an effort to fill the gap between the potential of large scale computing and the challenges to exploit it in medical practice.

Through its development, the project had to overcome many challenges of different nature (i.e. technical and organizational) and it is the combined resolution of all these issues that has enabled its development. One key requirement that was soon identified was the need to have a solid partnership with a medical institution, both to provide the appropriate data to feed the processes used for building predictive models and to guide and validate project results as applicable to clinical practice. However, this implied a commitment for a sustained effort from medical specialists, a resource that is scarce and expensive in general, making it difficult to ensure the required funding, especially in the first exploratory phases of the project.

The existing synergies between the Engineering and Medicine faculties at the University of Porto enabled the alignment of the interests of the Radiology Department at FMUP-HSJ with those of the project. In this case, FMUP-HSJ pursued to

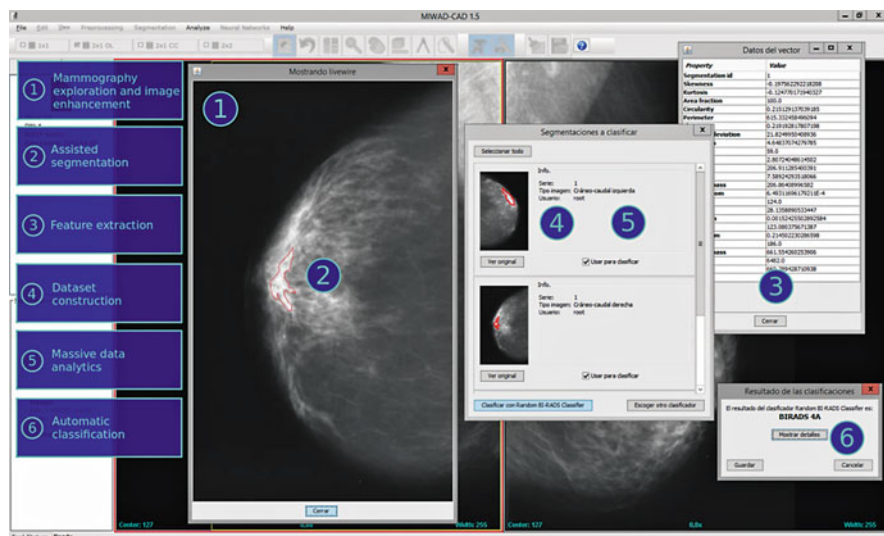


Fig. 1 Mammography image workstation developed in IMED

gain experience and build their own knowledge in adopting computer-aided detection and diagnosis systems from different vendors and, eventually, developing them. Therefore, FMUP-HSJ was willing to spare between 2 and 5 hours a week of a specialized radiologist to select and annotate breast cancer patient cases and to validate the development of a mammography workstation to integrate such processes.

The first prototypes of the workstation (see Fig. 1) were then rapidly developed, enabling the specialized radiologist to import mammograms from their acquisition equipment, visually inspect them, segment suspicious lesions and annotate them with a standard classification (Breast Imaging Report and Database System, BIRADS (D'Orsi et al. 2003)). With this, we were able to calibrate the curation process of the first datasets, use computing resources to build the first predictive models and quickly offer a concrete view on the system's potential to FMUP-HSJ as feedback.

This was a crucial step in which a trust relationship with medical specialists could start to be built. A trustful relationship with medical specialists is essential, since their knowledge is both the source and the reference for building and validating automatic systems for diagnosis support. At this point, it was also clear that the systems to be developed would strictly remain for diagnosis support, leaving the final judgement entirely to the criteria of the specialist using the system. Realizing this was also a turning point, in the sense that it allowed the research team to articulate a respectful discourse with clinical practice and through which expectations with our medical colleagues could be managed.

Obviously, there are many other challenges that have emerged throughout the development of the project and for which the above two issues were basically key enablers. These other challenges include:

- Aligning the project goals with the funding instruments through which the collaborating institutions were supporting the project, notably the European Regional Development Fund (ERDF).
- Formalizing agreements among the collaborating institutions, establishing the appropriate intellectual property sharing mechanisms and labour coordination.
- Establishing a common vocabulary and terminology for specialized radiologists and computer scientists at software reviews and feedback sessions.
- Ensuring patient anonymity across all processes.
- Integrating the Mammography Image Workstation and associated data analysis systems developed in the project within FMUP-HSJ information systems and networks, a restricted computing environment as in many medical institutions (in terms of connectivity, data sharing, etc.)
- Deploying methods of predictive analysis (e.g. Support Vector Machines, Artificial Neural Networks) over the Grid computing infrastructure of CETACIEMAT.

4 Current Status and Project Outcomes

So far, the main outputs of the IMED project are: (1) the development of the first Iberian Breast Cancer Digital Repository (BCDR); (2) a platform to support the full lifecycle of breast cancer computer-aided diagnosis methods; (3) a Mammography Image Workstation for Analysis and Diagnosis (MIWAD); and (4) a doctoral thesis introducing new quality indicators for Artificial Neural Networks training.

The repository is still in development and it is currently composed of 1,734 patient cases, containing 1,010 cases documented with digitized film mammograms, and 724 cases documented with both digital full field mammograms as well as ultrasound imaging. Expert radiologists are manually segmenting all identified lesions, reporting detected abnormalities, and scoring the mammograms for density and probability of malignancy by providing BI-RADS classifications to each lesion. Suspicious cases (BI-RADS scores > 3) are submitted to biopsy, resulting in a reliable (gold-standard) diagnosis. Image-based descriptors (representative of lesion shape, intensity, texture and multi-scale texture) are also being computed. Summing up, BCDR is now a large wide-ranging annotated breast cancer repository with a representative set of patient cases in the Iberian region. It is mammography-based and it contains a set of clinical and image-based features describing lesions with accurate diagnosis validated through biopsies. Furthermore, five public subsets of the repository content have been released for public domain up to present date and can be accessed at the BCDR website.¹ It is the consortium's intention to periodically release new benchmarking datasets.

MIWAD workstation is currently installed at “Centro Hospitalar São João” in Porto, which is one of the biggest and most representative hospitals in the northern

¹ <http://www.bcdr.eu> retrieved March 6th 2014.

region of Portugal. This pilot workstation can work in two different modes named production and diagnosis, respectively. Production mode allows the storage, manipulation and retrieval of the patient cases and it is used by physicians to enrich the repository with new patients, identify new findings, and validate patient-related data. Diagnosis mode allows the analysis and diagnosis of patient cases.

5 Contribution of IMED to Improving Healthcare Systems

From its origins to the moment of writing, this platform has enabled a series of tasks that contribute to the advancement in breast cancer diagnosis. These tasks include:

1. Studying and validating relevant clinical and image-based descriptors.
2. Dealing with round-shaped objects such as masses through a novel image-based descriptor invariant to rotation.
3. Massively exploring machine learning classifiers.
4. Producing and evaluating full lifecycle breast cancer diagnosis methods to give a second opinion to physicians about lesions and abnormalities based on mammography images.

The benefits of the IMED project reach out to a variety of stakeholders in the healthcare system. From a provider perspective, new and more precise computer-based diagnosis methods reduce workload by assisting one single radiologist when reading mammograms and potentially eliminating the need of two radiologists having to read the same exam. From the patients' point of view, the developed methods improve quality of life by helping to reduce unnecessary biopsies. Furthermore, a support platform has been built with a high potential use for teaching students and already graduate radiologists on using computer-aided methods for improving breast cancer diagnosis.

6 Planning the Future of the Project

Nowadays, the consortium has focused their work on two main activities: (1) the maintenance and improvement of the BCDR repository and the Machine Learning Classifiers (MLCs) as well as (2) the dissemination of the latest results and the identification of new collaborators.

Regarding the repository, new patients are added weekly in the repository of high-resolution images, containing new segmentations and classifications generated by the team of radiologists from FMUP-HSJ. Moreover, new datasets are being created with relevant cases from the repository, all supported by biopsies, with the intention to allow the evaluation of new classifiers in breast cancer diagnosis. In addition, new configurations of classifiers are being explored in order to boost their

efficiency. Those with higher accuracy will be certified for clinical practice and distributed as a software package to be included in commercial workstations.

The dissemination strategy covers two main areas. Firstly, the latest results of the project are presented in scientific conferences and high impact journals in order to attract new researchers and specialists in breast cancer. Secondly, dissemination takes place through the membership in innovation networks, which involve research groups and companies and are mainly focused on knowledge transfer among them. As a result, the number of registered users of the repository is growing and several contacts with workstation manufacturers have been made in order to enhance their products with diagnosis capabilities.

These dissemination activities are an essential way to obtain feedback from final users and allow the consortium to organise the project roadmap in order to prioritize functionality with the highest value for final users.

As part of this roadmap, the BCDR will provide a public Application Programming Interface (API), allowing third parties to implement new application and services on BCDR. This service is intended to follow a freemium business model, by which a basic access will be provided free of charge and users will have access to advanced features (i.e. lesion diagnosis and content-based retrieval) and content by paying a subscription fee.

Additionally, the project is evaluating the use of machine learning classifiers in radiologist training. Moreover, a new training tool (Suarez-Ortega and Franco-Valiente 2013) is being designed to analyse the application of CAD systems in the medical education. This tool will implement e-Learning methods, acting as a virtual classroom where students will be able to evaluate real cases of breast cancer and check their knowledge, as well as share resources with other students and teachers.

All in all, the project consortium wants to set the BCDR as a reference tool to build automatic classifiers for breast cancer detection and diagnosis and to train new radiologists as well as to apply the acquired know-how to other diseases.

Conclusions

The IMED project is an international initiative that has enabled the collaboration of doctors, engineers and other specialists in the diagnosis of breast cancer. The project resulted in several products that contribute to the efficiency and quality of the breast cancer detection workflow in a healthcare system.

These products have been developed for and by end-users (i.e., radiologists and allied science researchers on breast cancer), according to their needs, and the research activities are supported by several publications in journals, book chapters, participation in conferences and a doctoral thesis. A complete list of these can be found on the BCDR website.²

(continued)

² <http://www.bcdr.eu/information/publications> retrieved March 6th 2014.

Above all, the project has provided us with extremely valuable knowledge on the building process and dynamics of multidisciplinary teams in this area. From this experience, we can identify as a key success factor: the involvement of professionals from all implicated areas from the very early stages of the project. This approach requires the explicit acknowledgement of the necessity and contribution of each one, as well as an iterative development process enabling a constant communication and evaluation flow across all professionals, with regular deliveries.

These results would not have been possible without a balanced consortium and a high implication of medical doctors. Finally, the project is currently working in technology transfer and in the application of the results in the training of new specialists.

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Group Medical Visits: Primary Care for the Next Century? Rethinking Chronic Care

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Abstract Two of the most pressing issues for health care systems around the globe are the increase of chronically ill patients and the shrinking physician workforce, especially in primary care. Policy makers are looking into new models of primary care delivery to increase quality as well as productivity. Group Medical Visits is a model of primary care delivery, which is increasingly gaining attention in North America, Europe and Asia. This case study illustrates the development, structure and outcome of Chronic Health Care Clinics, a Group Visit Model specifically designed for the treatment of the chronically ill in primary care.

1 Introduction

In the past, primary care delivery used to be dominated by acute care interventions; today this is shifting: Healthcare systems of industrialized as well as developing countries are confronted by a change in demand from acute to chronic care (World Health Organization 2005).

Given the complexity of their health care needs, chronically ill patients tend to consume a particularly high number of primary care consultations and physician time. As health care professionals are a scarce resource and the number of chronically ill patients is ever increasing, it has become an imperative for health care policy makers to look for innovative ways to treat these patients more effectively and more efficiently.

Group medicals visits have proven to be an alternative to one-on-one primary care visits, especially in the case of the chronically ill, for whom special Group Visit Models—such as the Chronic Health Care Clinics—have been developed.

RCTs and systematic reviews show Group Medical Visits lead to

- improved medical outcomes
- enhanced patient satisfaction as well as

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- enhanced physician satisfaction, and have the potential to
- increased physician effectiveness and efficiency.

With new studies coming out from the Netherlands (Mejino et al. 2012), China (Liu et al. 2012) and Germany (Simon and Sawicki 2014) policy makers ought to consider Group Medical Visits when looking into low cost healthcare innovation to prepare healthcare systems for the challenges of chronic disease.

2 Background

The history of Group Medical Visits for chronically ill patients goes back to first trials in the early 1970s in Boston (Conte et al. 1974). However, it took 20 years to develop sound Group Medical Visit models, which were applicable to a wide patient range (Noffsinger 2009). Another 20 years later Group Medical Visits finally found their place in primary care, as they were incorporated in medical guidelines for chronic care in the United States in 2011 (U.S. Department of Health and Human Services 2011) and respectively in Canada in 2012 (Health Council of Canada 2012).

Bringing together a group of patients, who would otherwise receive individualized medical care, in one single encounter, is the ground breaking idea of Group Medical Visits. This allows for higher efficiency in primary care delivery, and in turn, for new patient-to-physician and patient-to-patient interaction that improves quality of care and effectiveness (Brennan et al. 2010).

3 Chronic Health Care Clinics (CHCC)

Chronic Health Care Clinics (CHCC) is a specific Group Medical Visits model developed to meet the differentiated needs of the chronically ill (Scott and Robertson 1996; Beck et al. 1997). Especially, the most time consuming needs that are hard to be fully covered in the usual brief one-on-one physician appointment, such as:

- Training of problem solving strategies and coping mechanisms for disease specific challenges that are adaptable by the patient.
- Motivation to alter hazard lifestyles, such as smoking or unhealthy eating habits.
- Dealing with psychosocial aspects of chronic care, such as the handling of diseases specific anxieties.

CHCC are designed to be conducted as a Group Medical Visit-program at the physicians practice: the same 10–12 patients who are affected by the same chronic disease meet repeatedly for CHCC sessions in 2–3 month intervals. A single CHCC session is composed of five phases that are conducted in the group setting. At the end, patients have the option to see their doctor privately (Table 1).

Table 1 Template of a group medical visit following the CHCC model

Phase	Duration
Introduction/warm up	~5–10 min
Group education/group discussion	~20–30 min
Treatment	~30–50 min
Questions and answers	~10–15 min
Closing and planning	~5–10 min
Brief one-on-one visits as necessary	

Each CHCC session starts with the Introduction respectively Warm-up Phase. Here, group members introduce themselves and share concerns regarding their chronic disease. Since it is always the same group of patients that come together, the first phase is commonly used to provide feedback on how health care goals were accomplished by each patient since the last CHCC session.

The second phase is designed for group education or group interaction in regards to a health related topic of specific relevance for the patient group. Typically, every CHCC session is focused on a single topic. This education is complemented by time for patient questions and interaction. During this discussion, the physician takes the role of a moderator, who selectively gives additional information to the group as needed.

This second phase is where the structure of CHCCs differ from health care setting to health care setting: In the original model of the early 1990s, the focus lies on formal group education delivered by the health care provider or a member of his practice (Beck et al. 1997). In contrast to this, the German model for example, focuses on inter-patient exchange of knowledge and coping strategies (Simon and Sawicki 2014). This is grounded on the assumption that many patients have already accumulated substantial knowledge about their chronic disease—be it from the participation in a disease management program or from previous physician appointments. Thus, the formal educational aspect of the CHCC is reduced in Germany to a brief introduction by the physician into the session’s topic. This is followed by an in depth discussion between the patients. Here, they are invited to share their own knowledge, experience as well as their individual coping strategies with regard to their day-to-day challenges in managing their disease.

In the third phase of a CHCC session, patients receive basic primary care as far as it is appropriate for the group setting. This may include blood pressure or blood sugar testing, immunizations, filling of prescriptions or smaller medical exams. While it is the goal to incorporate as many aspects of the traditional one-on-one visit as possible, precaution is needed to what degree patients are willing to receive medical care in front of other group members.

The following Question and Answer Phase is designed to give patients a forum to ask questions, which are not centered on the sessions topic.

Lastly, is the Closing and Planning Phase. This phase allows the physician to summarize the key messages of the group education and discussions, announce dates, time and topic of the next CHCC session. Patients also formulate health specific goals which are to be accomplished by then.

A CHCC session is concluded by the chance for patients to meet one-on-one with their health care provider. Medical issues, unsuitable for group settings, can be discussed and managed at this time. However, research has unveiled that only a small number of patients need to be seen individually following a CHCC session (Liu et al. 2012).

4 Results

As the concept of CHCC demonstrates increased recognition in healthcare systems around the globe, CHCC have constantly been adapted to local needs and health care agendas. The following sections will highlight the most consistent study outcomes.

4.1 *Improved Quality of Care*

Improved medical outcomes through the usage of Group Medical Visits following the CHCC model have been illustrated in various studies; most remarkably for diabetic or hypertensive patients.

Clinical studies with small populations or of short duration show significant improvements in secondary outcomes such as health literacy, self-management, participation in prevention, physical activity or weight reduction. Significant reductions of HbA_{1C} or blood pressure have only been shown in long term studies, respectively studies of larger patient cohorts (Junling et al. 2012; Edelman et al. 2010; Loney-Hutchinson et al. 2009). Most remarkable is the 5 year lasting randomized controlled trial on type 2 diabetics in Italy with significant improvements in HbA_{1C}, weight reduction and diabetic retinopathy (Trento et al. 2004). Another indication of improved health outcomes are the reduction of specialist visits as well as emergency care visits of patients treated in CHCC (Beck et al. 1997; Edelman et al. 2010; Scott and Robertson 1996).

4.2 *Patient Perception: Enhanced Satisfaction*

Enhanced patient satisfaction has been shown extensively in clinical trials of CHCC, as well as other Group Medical Visit models. Patients described the exchange of personal experience with others in the group to be helpful and supportive to them. Issues lending to breach of confidentiality have not been reported. In the Italian long term study, patients commented not wanting to go back to individual care, when given the opportunity to continue the CHCC-Program (Trento et al. 2002).

4.3 Physician Perception: Enhanced Satisfaction

Fueled by the improved medical outcomes, as well as the improved patient satisfaction, physicians perceive Group Medical Visits to be an enrichment to their medical practice (Beck et al. 1997). Physicians enjoy the role-change from being an adjudicator of patient behavior to being a facilitator of good medical care. CHCC are perceived to offer a framework that allows for an incorporation of patient experience and problem solving strategies in their medical care as well as the medical care of others (Lavoie et al. 2013).

4.4 Increased Effectiveness and Efficiency in Health Care Provision

Group Medical Visits are a feasible way to improve chronic illness management. They bare the opportunity to increase physician efficiency. While other Group Medical Visit models have been specifically designed to upscale efficiency, CHCC focuses on a more effective health care delivery through the integration and exchange of patient experience and knowledge (Noffsinger 2009). Efficiency gains are achievable by using CHCC as they allow to bundle 10–12 time consuming chronic patients in a 90 min visit, that substitutes for the respective number of individual appointments (Trento et al. 2004; Sadur et al. 1999).

While the number of randomized controlled study is too small to draw a final conclusion, published reviews underline the positive effects of Group Medical Visits, especially following the CHCC model (Brennan et al. 2010; Housden et al. 2013; Jaber et al. 2006).

5 Summary

Out of various Group Medical Visits models developed since the 1990s, Cooperative Health Care Clinics (CHCCs) and variations thereof are the ones most commonly used today (Brennan et al. 2010). CHCC bring together 10–12 chronically ill patients, who otherwise would seek medical care in individual one-on-one physician appointments.

CHCCs have proven to deliver improved health care outcomes compared to one-on-one encounters. At the same time Group Medical Visits like CHCC bare the opportunity to compensate individual physician encounters by one encounter in a group setting. This allows physicians to free time for other patients.

As chronic care becomes the predominant factor in primary care, Group Medical Visits, and especially CHCCs, are increasingly gaining international attention as being a high potential primary care intervention.

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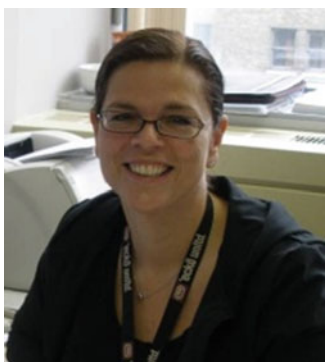
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