

Handbook of Research on Optimizing Healthcare Management Techniques

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The Need for Developing Learning Healthcare Organisations 1

*Nilmini Wickramasinghe, Swinburne University of Technology, Australia & Epworth
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As the volumes of data generated in healthcare delivery grows, the need for embracing big data strategies and data analytic techniques to better navigate dynamic and complex healthcare environments becomes more and more pressing. This focus has been further fuelled by the advances in technologies and medical science and the incorporation of digital health solutions that enable us to isolate genome sequencing data. However, it is the thesis of this chapter that unless healthcare organisations become learning organisations and incorporate the techniques of knowledge management and organisational learning, these large and essentially raw data assets will become a burden and not a benefit. Thus, healthcare systems need to be redesigned into intelligent health systems that maximise technology and utilise valuable knowledge assets. To do this, it is imperative to understand the link between the principles of organisational learning and knowledge management (KM) to facilitate the building of learning healthcare organisations.

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*Luuk Simons, Delft University of Technology, The Netherlands
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Catholijn M. Jonker, Delft University of Technology, The Netherlands*

WhatsApp was evaluated as a peer coach group support tool in a healthy lifestyle intervention with 15 young professionals. These individuals were time-constrained professionals, so two design challenges were to create enough attractiveness and quality in the peer group interactions. There were three main health domains: food, physical activity, and mental energy. As a result of the 12 week pilot, there were 127 WhatsApp peer coaching inputs. The variety of inputs was better than in a previous pilot; peer coaching quality improved; plus there was more continuity following the initial two weeks. Community building

remained a challenge, especially in the longer run. Two design solutions seemed to work: pre-designed coach-inputs across health domains, plus the instructions for a health advocate from the group, per health domain. Based on the results, the authors hypothesize that user needs in the first five weeks were well supported but that user support needs seemed to change after the initial five weeks, which impacted the perceived added value from the WhatsApp group.

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The growth of the healthcare sector has led to innovative ways to cater to consumers' needs, with some of the rich, developed countries at the forefront. An in-depth understanding of them enables a successfully implemented and useful system for consumers. Public reporting is developed mainly for and around consumers. In this chapter, the authors take a general look at public reporting on health and social care services. They examine the existing reporting systems and the issues they encounter. There are significant benefits of public reporting on health and social care services, but we currently do not know the limits of such reporting. Citizens need such information services when deciding from there to acquire health and social care services for themselves or their families and relatives. Service providers need these information services for benchmarking purposes and for the development of their service offerings.

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This chapter reports how interaction between family members and caregivers as perceived by family members could be improved via context-aware, imperceptible internet of things (IoT)-based solutions. The qualitative study focused on investigating experiences of the family members and the communication between caretakers in sheltered accommodation. Interviews including both open and closed questions revealed that there is high need for improving the communication, adding to the sparse earlier knowledge. The study revealed that the family members were willing to adopt an application to improve the communication that currently was experienced as too limited and vague. The results provide a fruitful base for further actions to improve communication between family members and professional caretakers.

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<i>Karoly Bozan, Duquesne University, USA</i>	
<i>Kevin R. Parker, Idaho State University, USA</i>	
<i>Bill Davey, RMIT University, Melbourne, Australia</i>	

The motivating factors that influence patient portal acceptance among the elderly are not well understood. Using the social heuristic theory, the elaboration likelihood model, and the unified theory of acceptance and use of technology, this study proposes a model that examines the persuasive mechanisms for the elderly to use patient portals. An empirical study involving 117 subjects in the United States was used to

test the proposed model. Using the partial least squares method, social power, and imitate-the-successful social heuristics were found to significantly influence patient portal acceptance among the elderly. These findings indicate that older people invest less effort cognitively elaborating when presented with technology acceptance decisions and accept influence from their higher status peers from their network. Imitate-the-majority heuristics and central route processing were not found to be significant, implying that older people are more inclined to take advice from sources, which they find credible and invest less cognitive effort in evaluating the complex phenomena.

Chapter 6

Better Future for Home-Cared Elderly Patients: A Prototype of Smart Clothing 91
Ruwini Edirisinghe, RMIT University, Australia

The need for innovative technologies that monitor and assist the independent living of elderly people in their homes is growing. The socio-economic benefits by utilizing such solutions are shared between many parties including the elderly people, support services and caregivers, and the medical system. This chapter proposes a wearable smart clothing-based monitoring system for home cared elderly patients. The development of the prototype smart cloth, which currently senses and alerts about body temperature, is discussed in this chapter. The proposed system is expected to provide a more dignified life for the elderly home cared patients by maintaining their independence and privacy while saving public and private money.

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Mohan Tanniru, University of Arizona, USA

Information technology has enabled healthcare providers such as hospitals to extend their internal operations into external facilities such as urgent and ambulatory care centers and optimizeresources in support of patient care. With the development of the internet, social media, wearables, and telehealth technologies, the potential for patient engagement in preventive and post-discharge care transition has increased. Unlike other organizations where the provider has limited insight into the customer ecosystem, hospitals, for example, have an opportunity to gain insight into the patient ecosystem and influence patient behavior while the patients are within the provider ecosystem. This chapter looks at hospital engagement with patients in two settings—the emergency room (ER) and the patient room (PR)—to illustrate both the opportunities and the strategies that can help hospitals use patient touchpoints to improve continuity of care inside and outside hospital walls.

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Nilmini Wickramasinghe, Swinburne University of Technology, Australia & Epworth HealthCare, Australia

With the advancement of the technologies of the internet of things (IoT), we are witnessing great advances in the areas of analytics, sensors, platforms, 3D printing, and mobile. At the same time and unrelated, we are also witnessing a growing increase in the decreasing health and wellness of people in minority communities especially with regard to increase in chronic conditions such as diabetes and obesity. Thus, there exists an opportunity to leverage these IoT technologies to try to support better minority health and wellness. This chapter explores this opportunity.

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Intelligent Mental Health Analyzer by Biofeedback: App and Analysis 127

Rohit Rastogi, ABES Engineering College, Ghaziabad, India

Devendra Kumar Chaturvedi, Dayalbagh Educational Institute, Agra, India

Mayank Gupta, Tata Consultancy Services, Noida, India

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Many apps and analyzers based on machine learning have been designed to help and cure the stress issue. The chapter is based on an experimental research work that the authors performed at Research Labs and Scientific Spirituality Centers of Dev Sanskriti VishwaVidyalaya, Haridwar and Patanjali Research Foundations, Uttarakhand. In the research work, the correctness and accuracy have been studied and compared for two biofeedback devices named as electromyography (EMG) and galvanic skin response (GSR), which can operate in three modes—audio, visual, and audio-visual—with the help of data set of tension type headache (TTH) patients. The authors have realized by their research work that these days people have lot of stress in their lives, so they planned to make an effort for reducing the stress level of people by their technical knowledge of computer science. In the chapter, they have a website that contains a closed set of questionnaires from SF-36, which have some weight associated with each question.

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From Resource to Outcome: Addressing the Barriers of Healthcare Policy Implementation 154

Khadijeh Roya Rouzbehani, University of Victoria, Canada

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Governments often create policies that rely on implementation by arm's length organizations and require practice changes on the part of different segments of the healthcare system without understanding the differences in and complexities of these agencies. This research describes components of a health system and explains how they affect outcomes. It argues that implemented policies affect various components of a health system in terms of service delivery, workforce, information, financing, medical products, technologies, leadership, and governance. Using health system as framework of analysis, the chapter explains that the outcome of health policy implementation determines the availability, quality, and equability of program service delivery. The chapter further argues that policy implementation barriers affect the poor and vulnerable groups from benefiting from public spending on public health policies and programs.

Chapter 11

Scaling Up Telemedicine Initiatives: Requirements for a New Telemedicine Maturity Model 167

Lena Otto, TU Dresden, Germany

Diane Whitehouse, European Health Telematics Association, Belgium

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Telemedicine maturity models aim to support telemedicine scaling up. Even though a diversity of telemedicine maturity models, and further support tools, exist, they are often unable to support users proactively or offer substantial guidance for the improvement of the status quo. A new maturity model is therefore needed that overcomes the shortcomings evident in existing approaches. This chapter aims to identify requirements that such a model has to fulfil based on an analysis of existing maturity models. The results guide future research and can support the scaling up of telemedicine initiatives.

Chapter 12

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For patients undergoing surgery in a multi-day admission, standard care requires that their surgeon review the patient post-operatively to check on their progress. This is usually done by the specialist attending in person. However, in the Australian setting, most specialists work at multiple institutions. As a result, review ward rounds, especially of post-operative patients, can be delayed, which can delay management decisions and discharge, which in turn may lower patient satisfaction. A telemedicine solution is designed, and results from a pilot test are examined to assess the benefits of incorporating an electronic discharge capability into the current process.

Chapter 13

The Role of Crowdsourcing in the Healthcare Industry 191

Kabir C. Sen, Lamar University, USA

Crowdsourcing has a role to play in solving healthcare-based problems as it can tap into a vast pool of global medical knowledge. This chapter first categorizes the various problems in the healthcare industry. It then describes the differences in various medical traditions in solving medical problems. The chapter also discusses the challenges in identifying the ideal medical solution. It notes the various types of obstacles to adopting effective healthcare solutions and suggests crowdsourcing solutions that could build up an impetus for bringing about positive change. Finally, the chapter emphasizes the potential of crowdsourcing to disrupt old ideas and introduce new ones as well as make a significant improvement in the social quality for different population groups.

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The negative and unbalanced nature of media and social media coverage has amplified anxieties and fears about the Ebola outbreak. The authors analyse news articles on the Ebola outbreak from two leading news outlets, together with comments on the articles from a well-known social media platform, from March 2014 to July 2015. The volume of news articles was greatest between August 2014 and January 2015, with a spike in October 2014, and was driven by the few cases of transmission in Europe and the USA. Sentiment analysis reveals coverage and commentary on the small number of Ebola cases in Europe and the USA were much more extensive than coverage and commentary on the outbreak in West Africa. Articles expressing negative sentiments were more common in the USA and also received more comments than those expressing positive sentiments. The negative sentiments expressed in the media and social media amplified fears about an Ebola outbreak outside West Africa, which increased pressure for unwarranted and wasteful precautionary measures.

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Blockchain in Healthcare: A Primer 213

*Nilmini Wickramasinghe, Swinburne University of Technology, Australia & Epworth
HealthCare, Australia*

Blockchain is a decentralized, digital ledger that keeps a permanent, unalterable record of transactions between users. One of the greatest advantages of Blockchain is that it is much more secure than other data storage platforms, and thus particularly relevant for healthcare. The chapter serves to outline areas and opportunities for deploying this technology into key healthcare contexts to support effective and efficient operations as well as heightened transparency and trust around activities between and within stakeholders.

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3D Printing in Healthcare: Opportunities, Benefits, Barriers, and Facilitators 220

*Nilmini Wickramasinghe, Swinburne University of Technology, Australia & Epworth
HealthCare, Australia*

3D printing has developed as a modification of an old injection printer. Today, it is rapidly expanding offering novel possibilities as well as new exciting applications for various sectors including healthcare, automotive, aerospace, and defense industries. This chapter presents key application areas within the healthcare sector. In medicine, 3D printing is revolutionizing the way operations are carried out, disrupting prosthesis and implant markets as well as dentistry. The relatively new field of bioprinting has come to be because of advances with this technology. As will be discussed, numerous applications of 3D printing in healthcare relate to personalized medicine. For instance, implants or prostheses are 3D printed for a specific user's body, optimizing the technology to work for an individual, not an average user as with most mass-produced products. In addition, 3D printing has applications on the nanoscale with printing of drugs and other smaller items. Hence, 3D printing represents a disruptive technology for healthcare delivery.

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*Muhammad Nadeem Shuakat, Epworth HealthCare, Australia
Nilmini Wickramasinghe, Swinburne University of Technology, Australia & Epworth
HealthCare, Australia*

Cancer is among the top three chronic diseases both in developed countries as well as underdeveloped countries. The diagnosis, medication, and treatment for cancer is extremely costly. Typically, cancer treatment involves surgery, radiotherapy, and chemotherapy. Owing to the extremely high price of medicine and treatment along with cytotoxicity of medication, cancer treatment warrants extraordinary care in treating cancer patients. Oncology information systems (OIS) provide an all-in-one solution for such problems. The OIS can integrate different treatment protocols and update change in dose and treatment in real time.

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Thais Gabriel Pincigher Silva, Rio de Janeiro State University, Brazil

Carolina Mendes e Senna de Castro, Rio de Janeiro State University, Brazil

Daniel Bouzon Nagem Assad, Rio de Janeiro State University, Brazil

Ana Carolina Vasconcelos, Rio de Janeiro State University, Brazil

Thais Spiegel, Rio de Janeiro State University, Brazil

Patient lead time in emergency units is a critical factor for quality of care and patient safety. The objective of the chapter is a public emergency care hospital of a Brazilian city, important for its localization in the second more populated area of the city. Green risk patients constitute more than half of attendances and represent the largest volume of out-of-goal attendances in the hospital. Considering this analysis, it was conducted the process modelling in order to understand patient pathway and the main related problems. A list of undesirable effects was subsequently composed, allowing the construction of the current reality tree (CRT). With the root causes identified, the literature suggested fast track as an alternative to reduce the average waiting time in queue until the medical care. The method used for testing scenarios of fast track was discrete events simulation.

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Digital Systems Innovation for Health Data Analytics 261

Kamaljeet Sandhu, University of New England, Australia

Digital innovation for health data analytics has faced obstacles in systems implementation and consumer acceptance. Research suggests that digital health innovation has been a challenge and a slow process for acceptance. At the same time it offers tremendous opportunities in health data analytics for consumers of health services and service providers, such as health information portability, personalization of health information by consumers, easy access and usefulness of health information, better management of data records by institutions and government, and management of information by healthcare staff for patients' engagement and care. Health data analytics is the key for driving digital systems for health innovation. This research seeks to identify the digital health innovation opportunities and obstacles, develop a framework and a conceptual model for digital health innovation that empowers consumer of digital health to use the information to make informed decisions and choices.

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Predictive Analytics to Support Clinical Decision Making: Opportunities and Directions 271

Nilmini Wickramasinghe, Swinburne University of Technology, Australia & Epworth

HealthCare, Australia

A key activity in healthcare is clinical decision making. This decision making typically has to be made rapidly and often without complete information. Moreover, the consequences of these decisions could be far reaching including the difference between life or death. Today analytics can assist in clinical decision making as the following chapter highlights. However, to gain the most from any type of analytics, it is first necessary to fully understand the dynamics around the clinical decision making process.

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Isabella Eigner, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany

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HealthCare, Australia*

On the one hand, predictive analytics is an important field of research in information systems; however, research on predictive analytics in healthcare is still scarce in IS literature. One area where predictive analytics can be of great benefit is with regard to unplanned readmissions. While a number of studies on readmission prediction already exists in related research areas, there are few guidelines to date on how to conduct such analytics projects. To address this gap the chapter presents the general process to develop empirical models by Shmueli and Koppius and extends this to the specific requirements of readmission risk prediction. Based on a systematic literature review, the resulting process defines important aspects of readmission prediction. It also structures relevant questions and tasks that need to be taken care of in this context. This extension of the guidelines by Shmueli and Koppius provides a best practice as well as a template that can be used in future studies on readmission risk prediction, thus allowing for more comparable results across various research fields.

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Trying to Predict in Real Time the Risk of Unplanned Hospital Readmissions..... 299

Nilmini Wickramasinghe, Swinburne University of Technology, Australia & Epworth

HealthCare, Australia

This study aims to identify predictors for patients likely to be readmitted to a hospital within 28 days of discharge and to develop and validate a prediction model for identifying patients at a high risk of readmission. Numerous attempts have been made to build similar predictive models. However, the majority of existing models suffer from at least one of the following shortcomings: the model is not based on Australian Health Data; the model uses insurance claim data, which would not be available in a real-time clinical setting; the model does not consider socio-demographic determinants of health, which have been demonstrated to be predictive of readmission risk; or the model is limited to a particular medical condition and is thus limited in scope.

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Using Intelligent Tools to Support Clinical Decision Making: The Case of Hip and Knee

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Nilmini Wickramasinghe, Swinburne University of Technology, Australia & Epworth

HealthCare, Australia

Jonathan L Schaffer, Cleveland Clinic Foundation, USA

Intelligent tools and collaborative systems can be used in healthcare contexts to support clinical decision making. Such an approach is concerned with identifying the way in which information is gathered and decisions are made along specific care pathways. This study develops a real-time collaborative system using an intelligent risk detection model (IRD) to improve decision efficiency in the clinical case of patients undergoing hip or knee arthroplasty. The benefits of adopting this improved clinical decision-making solution include increasing awareness, supporting communication, improving the decision making process for patients and caregivers while also improving information sharing between surgeons

as key collaborative parties in the research case. This in turn leads to higher levels of patient and clinical satisfaction and better clinical outcomes.

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Chinedu I. Ossai, Swinburne University, Australia

Steven L. Goldberg, Inet International Inc, Canada

*Nilmini Wickramasinghe, Swinburne University of Technology, Australia & Epworth
HealthCare, Australia*

Diabetes type 2 is a chronic condition that currently has no cure. Hence, proper management is key as the best approach to ensure the wellness of sufferers. To establish the attitudes of self-care patients towards the management of this ailment, the authors designed a study that targeted 100 Australian residents in the first phase. These participants provided quantitative and qualitative information about various diabetes type 2 management practices that include exercising and diet management and the co-morbidities they currently suffer.

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Mobile Health: Precision Post-Operative Wellness Monitoring Solutions..... 338

Nilmini Wickramasinghe, Swinburne University of Technology, Australia & Epworth

HealthCare, Australia

Today most people have at least one smart phone irrespective of socio-economic standing. Such a penetration of mobile phones has enabled mobile health to rapidly develop over the last 5 years. There are many benefits to patients and clinicians afforded by mobile health including the convenience of any time anywhere access to data and information and the possibility to monitor so that critical issues can be caught early. One key area is in the post discharge phase as patients return home to ensure they are making good progress. This chapter discusses developments of mobile health solutions and precision post-operative wellness monitoring solutions.

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Facilitating Mobile Initiatives in Healthcare and Wellness Management 350

Nilmini Wickramasinghe, Swinburne University of Technology, Australia & Epworth

HealthCare, Australia

Steve Goldberg, Inet Intl Inc, Canada

Arguably, the most prevailing chronic disease today is diabetes. The World Health Organization (WHO) notes that diabetes is a silent epidemic, and by 2020, there will be a 54% rise in the total number of individuals diagnosed with this disease. These are distressing figures. Many are turning to technology solutions to assist. What becomes important is the ability to rapidly design and develop appropriate digital health and wellness solutions.

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Technology’s Enabling Role to Improve Care Coordination 358

Rima Gibbings, University of Illinois in Chicago, USA

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The U.S. healthcare system has been often characterized as fragmented and disconnected. Lack of effective and concurrent adoption of information technology has been known to be a factor that contributes to the decentralization of healthcare systems. Fragmented systems are also responsible for creating silos that operate with minimal coordination. Clinicians in such systems are providing duplicate services because they are not aware of patient care plans set by other practitioners. These duplications could lead to prescription drug errors due to inconsistencies and lack of coordination in the treatment services and in some cases drug-drug interactions. The following suggests a role for technology to facilitate better care coordination.

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Foreword

The health and wellbeing of individuals and their families is one of the most important underpinnings of personal happiness and of a productive society. It is a universal focus of human experience, spanning cultures, societies and history.

At heart, it is the aspiration and desire of all healthcare stakeholders – including clinicians, organisational leaders and managers, policy makers, funders, and of course citizens and their families – to seek to improve and continually ensure that the very best health and healthcare outcomes can be delivered for all members of society. However, the reality of the diverse contexts and perspectives of those stakeholders, the pressure of time and funding constraints, and the need to ensure that a myriad of compliance and performance requirements are met, often conspire to narrow the focus away from the potential to adopt novel approaches to achieve their common aspiration.

Therefore, a responsible approach to the deployment of such novel methods and tools, and especially of the burgeoning plethora of digital innovations, requires rigorous evaluation to ensure that the shared aspirations of all stakeholders to achieve a better future state of health and wellness for all can be achieved.

It is in that context that applied research in healthcare, and its deployment for the optimal benefit of individuals, communities and populations, continues to be one of the most promising, exciting and diverse areas of the pursuit of scientific knowledge. The exponential growth of innovation in research methods, the ubiquity of digital platforms, the development of intelligent systems, and new methods for rapid prototyping and deployment of novel solutions, in aggregate offer the promise of their application yielding enormous benefit to society.

However, the sheer volume and pace of innovation and the desire for finding perfect solutions to complex challenges, must also be tempered by ensuring that those innovative solutions do, in fact, deliver their intended benefits. It is therefore in the application of such solutions that a critical appraisal of their true value, as well as their limitations, and their optimal deployment, is required.

This Handbook of Research on Optimizing Healthcare Management Techniques presents a rich series of timely papers that report and critically appraise diverse approaches to the application of innovative tools and methods that seek to address serious, pressing challenges in health and healthcare management. In doing so it provides valuable and insightful guidance to key stakeholders involved in the delivery of healthcare – especially clinicians, organisational leaders and managers, policy makers, and funders – while also presenting valuable research insights for ongoing related theoretical and applied research.

The breadth of described applications – including for complex health conditions, aged care, mental health, communities of need, coordination of care, analytics, and self-care – are further expanded into the implications of the adoption of innovations from the perspectives of policy setting, planning for care, and management. Further, the rigor of scientific theory as a critical underpinning, is explored in several key and fascinating papers.

This Handbook is a current as well as a forward-looking resource for all stakeholders and offers insight into some of the most effective current applications of innovation in technologies and methods directed to optimizing healthcare management for the benefit of all. I recommend it highly.

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Swinburne University of Technology, Australia

Preface

PREFACE

The preface to the first edition of this Handbook started by noting that “Healthcare is an important industry that touches most, if not all of us at some time in our lives.” This certainly holds true today and one might even say, arguably, is even more important than ever before. Why? Simply stated, because of the challenges facing healthcare delivery including the exponentially increasing costs to keep everyone healthy and living longer, longer life expectancy, an aging population and the rapid rise of chronic conditions.

Indeed, healthcare or modern medicine is noted for using leading edge technologies and embracing new scientific discoveries to enable better cures for diseases and better means to enable early detection of most life-threatening diseases; however, the healthcare industry continues to be extremely slow to adopt technologies that focus on better practice management, support a superior patient experience and / or enable more effective and efficient administrative needs.

Presently, healthcare continues to grapple with many challenges both nationally and globally, including escalating costs, a move to a preventative care environment and a technology savvy patient with high expectations. This in turn necessitates prudent healthcare administration and management in order to realise superior healthcare delivery. A critical aspect to facilitating optimal healthcare delivery is a focus on value.

Value of healthcare operations incorporates an examination of quality over cost, but this goal has distinct aspects depending upon one’s perspective, and only some of these aspects are primarily monetary.

To patients, the value proposition may be enhanced by reducing time spent in obtaining healthcare, lowering stress and worry and increasing satisfaction with the experience. To physicians and clinical support personnel, value may be enhanced by the ability to remotely access medical records and monitor prescribed regimens and patient symptoms. To managers and investors, value may be enhanced by lowering costs of delivering healthcare in ways that do not compromise access or quality or by making processes more efficient, effective and streamlined. Because of the rapidly decreasing cost structure of hardware, technology is now able to provide many functions that were not previously available, such as connectivity through mobile devices. Thus, digital health innovations hold great potential for enhancing the value of healthcare to patients and stakeholders.

When we look at healthcare, we can see that in order to enhance value we must not simply focus on clinical care but also be cognizant of education, research, and administrative needs of this industry.

Unlike the first edition the chapters are not arranged into sections but rather flow logically from a more higher level of themes to more specific aspects. In addition, it is noted that chapters are sourced from around the world to provide insights into unique aspects in particular regions or countries but also

to highlight that many of the issues are universal and affect healthcare stakeholders no matter in which country they live. Taken together they serve to underscore key enablers to facilitating appropriate health-care administration and management, supporting a healthcare value proposition of improving access, quality, and value and providing a superior patient experience enabled by digital health technologies.

CHAPTER 1

This chapter serves to highlight the changing dynamics for healthcare organizations with the volumes and lakes of data they now must process. A situation that is further fueled by the advances in technologies and medical science and the incorporation of digital health solutions that enable us to isolate genome sequencing data. However, it is the thesis of this chapter that unless healthcare organisations become learning organisations and incorporate the techniques of knowledge management and organisational learning these large and essentially raw data assets will become a burden and not a benefit. Thus, healthcare systems need to be redesigned into intelligent health systems that maximises technology and utilises valuable knowledge assets. The chapter notes that to do this it is imperative to understand the link between the principles of organisational learning and Knowledge Management (KM) to facilitate the building of learning healthcare organisations.

CHAPTER 2

WhatsApp is evaluated in the presented study as a peer coach group support tool in a healthy lifestyle intervention with 15 young professionals. These individuals were time-constrained professionals, so two design challenges were to create enough attractiveness and quality in the peer group interactions. There were three main health domains: food, physical activity and mental energy. Based on the results, the authors hypothesize that user needs in the first five weeks were well supported, but that user support needs seemed to change after the initial five weeks, which impacted the perceived added value from the WhatsApp group.

CHAPTER 3

This chapter focusses on the fact that the growth of the healthcare sector has led to innovative ways to cater to consumers' needs, with some of the rich, developed countries at the forefront. Further, its thesis is that an in-depth understanding of them enables a successfully implemented and useful system for consumers. Thus, the authors in this chapter, take a general look at public reporting on health and social care services. They examine the existing reporting systems and the issues they encounter.

CHAPTER 4

This chapter reports on how interaction between family members and caregivers as perceived by family members could be improved via context-aware, imperceptible internet of things (IoT)-based solutions. The presented qualitative study focused on investigating experiences of the family members and the communication between caretakers in sheltered accommodation. Interviews including both open and closed questions revealed that there is high need for improving the communication, adding to the sparse earlier knowledge. The study revealed that the family members were willing to adopt an application to improve the communication that currently was experienced as too limited and vague. The results provide a fruitful base for further actions to improve communication between family members and professional caretakers.

CHAPTER 5

Using the Social Heuristic Theory, the Elaboration Likelihood Model and the Unified Theory of Acceptance and Use of Technology, the presented study in this chapter proposes a model that examines the persuasive mechanisms for the elderly to use patient portals. An empirical study involving 117 subjects in the United States was used to test the proposed model. Using the partial least squares method, social power and imitate-the-successful social heuristics were found to significantly influence patient portal acceptance among the elderly. These findings indicate that older people invest less effort cognitively elaborating when presented with technology acceptance decisions and accept influence from their higher status peers from their network.

CHAPTER 6

This chapter looks at the need for innovative technologies that monitor and assist independent living of elderly people in their homes is growing. The socio-economic benefits by utilizing such solution are shared between many parties including the elderly people, support services & caregivers and the medical system. Moreover, the chapter proposes the wearable smart clothing based monitoring system for home cared elderly patient. The development of the prototype smart cloth, which currently senses and alerts the body temperature is discussed in this chapter. The proposed system is expected to provide a more dignified life for the elderly home cared patients by maintaining their independence and privacy while saving public and private money.

CHAPTER 7

This Chapter notes that information technology has enabled healthcare providers such as hospitals to extend their internal operations into external facilities such as urgent and ambulatory care centers and optimize resources in support of patient care. Specifically, this chapter looks at hospital engagement with patients in two settings—the emergency room (ER) and the patient room (PR)—to illustrate both the opportunities and the strategies that help hospitals use patient touchpoints to improve continuity of care inside and outside hospital walls.

CHAPTER 8

The thesis of this chapter is that with the advancements of the technologies of the Internet of Things (IoT) we are witnessing great advances in the areas of analytics, sensors, platforms, 3D printing and mobile. At the same time and unrelated we are also witnessing a growing increase in the decreasing health and wellness of people in minority communities especially with regard to increase in chronic conditions such as diabetes and obesity. Thus, there exists an opportunity to leverage these IoT technologies to try to support better minority health and wellness.

CHAPTER 9

Many apps and analyzers based on machine learning have been designed already to help and cure the stress issue which is increasing as epidemic now a days' rapidly. The presented project that forms the focus of this chapter is based on an experimental research work that we have performed at Research Labs and Scientific Spirituality Centers of Dev Sanskriti VishwaVidyalaya, Haridwar and Patanjali Research Foundations, Uttarakhand. In this research work, the correctness and accuracy have been studied and compared for two biofeedback devices named as Electromyography(EMG) and Galvanic Skin Response (GSR) which can operate in three modes: audio, visual and audio-visual with the help of data set of Tension Type Headache (TTH) patients. The authors have realized by their research work that these days people have lot of stress in their life so we planned to make an effort for reducing the stress level of people by our technical knowledge of Computer Science.

CHAPTER 10

Governments often create policies that rely on implementation by arm's length organizations and require practice changes on the part of different segments of the health care system without understanding the differences in and complexities of these agencies. The research presented in this chapter describes components of a health system and explains how they affect outcomes. It argues that implemented policies affect various components of a health system in terms of service delivery, workforce, information, financing, medical products, technologies, leadership and governance. Using the health system as a framework of analysis, the chapter explains that the outcome of health policy implementation determines the availability, quality and equability of program service delivery.

CHAPTER 11

The focus of this chapter is on telemedicine maturity models which aim to support telemedicine scaling up. Moreover, the chapter notes that even though a diversity of telemedicine maturity models, and further support tools, exist, they are often unable to support users proactively or offer substantial guidance for the improvement of the status quo. A new maturity model is therefore needed, which overcomes the shortcomings evident in existing approaches. This chapter thus, aims to identify requirements that such

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a model has to fulfil, based on an analysis of existing maturity models. The results guide future research and can support the scaling up of telemedicine initiatives.

CHAPTER 12

This chapter presents a novel approach to solving a particular pain point in acute care contexts in Australia. For patients undergoing surgery in a multi-day admission, standard care requires that their surgeon will review the patient post-operatively to check on their progress. This is usually done by the specialist attending in person. However, in the Australian setting, most specialists work at multiple institutions. As a result, review ward rounds, especially of post-operative patients for example, can be delayed, which can delay management decisions and discharge, which in turn may lower patient satisfaction. A telemedicine solution is designed and results from a pilot test are examined to assess the benefits of incorporating an electronic discharge capability into the current process.

CHAPTER 13

Crowdsourcing has a role to play in solving health care based problems as it can tap into a vast pool of global medical knowledge. This chapter first categorizes the various problems in the health care industry. It then describes the differences in various medical traditions in solving medical problems. The chapter also discusses the challenges in identifying the ideal medical solution. It notes the various types of obstacles to adopting effective health care solutions and suggests crowdsourcing solutions that could build up an impetus for bringing about positive change. Finally, the chapter emphasizes the potential of crowdsourcing to disrupt old ideas and introduce new ones as well as a make a significant improvement in the social quality for different population groups.

CHAPTER 14

The negative and unbalanced nature of media and social media coverage has amplified anxieties and fears about the Ebola outbreak. In this chapter the authors analyse news articles on the Ebola outbreak from two leading news outlets, together with comments on the articles from a well-known social media platform, from March 2014 to July 2015. The volume of news articles were greatest between August 2014 and January 2015, with a spike in October 2014, and were driven by the few cases of transmission in Europe and the USA. Sentiment analysis reveals coverage and commentary on the small number of Ebola cases in the Europe and the USA were much more extensive than coverage and commentary on the outbreak in West Africa. Articles expressing negative sentiments were more common in the USA and also received more comments than those expressing positive sentiments. The negative sentiments expressed in the media and social media amplified fears about an Ebola outbreak outside West Africa, which increased pressure for unwarranted and wasteful precautionary measures.

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Blockchain is a decentralized, digital ledger that keeps a permanent, unalterable record of transactions between users. One of the greatest advantages of Blockchain is that it is much more secure than other data storage platforms, and thus particularly relevant for healthcare. This chapter serves to outline areas and opportunities for deploying this technology into key healthcare contexts to support effective and efficient operations, as well as heightened transparency and trust around activities between and within stakeholders.

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3D printing has developed as a modification of an old inject printer. Today, it is rapidly expanding offering novel possibilities as well as new exciting applications for various sectors including: healthcare, automotive, aerospace and defense industries. This chapter presents key application areas within the healthcare sector. In medicine 3D printing is revolutionizing the way operations are carried out, disrupting prosthesis and implant markets as well as dentistry. The relatively new field of bioprinting, has come to be because of advances with this technology. As will be discussed, numerous applications of 3D printing in healthcare relate to personalized medicine. For instance, implants or prostheses are 3D printed for a specific user's body, optimizing the technology to work for an individual, not an average user as with most mass produced products. In addition, 3D printing has applications on the nanoscale with printing of drugs and other smaller items. Hence, 3D printing represents a disruptive technology for healthcare delivery.

CHAPTER 17

The number of cases claimed by cancer places it among the top 3 chronic diseases both in developed countries as well as underdeveloped countries. The diagnosis, medication and treatment for cancer is extremely costly. Typically, cancer treatment involves surgery, radio and chemo-therapy. Owing to the extremely high price of medicine and treatment along with cytotoxicity of medication, cancer treatment warrants extra ordinary care in treating cancer patients. Oncology information systems (OIS) provide an all in one solution for such problems. The OIS can integrate different treatment protocols, update change in dose and treatment in real time. This chapter provides an evaluation of different OIS.

CHAPTER 18

Patient lead time in emergency units is a critical factor for quality of care and patient safety. The object of this chapter is a public emergency care hospital of a Brazilian city, important for its localization in the second more populated area of the city. Green risk patients constitute more than a half of attendances and represent the largest volume of out-of-goal attendances in the hospital. Considering this analysis, it was conducted the process modelling in order to understand patient pathway and the main related problems. A list of undesirable effects was subsequently composed, allowing the construction of the Current Re-

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Digital Innovation for Health Data Analytics have faced obstacles in systems implementation & consumer acceptance. Research suggests that digital health innovation has been a challenge and a slow process for acceptance. At the same time it offers tremendous opportunities in Health Data Analytics for consumers of health services & service providers, such as health information portability, personalization of health information by consumers, easy access and usefulness of health information, better management of data records by institutions & government, and management of information by healthcare staff for patients' engagement and care. Health Data Analytics is the key for driving a Digital Systems for Health Innovation. The presented research in this chapter seeks to identify the digital health innovation opportunities and obstacles, develop a framework & a conceptual model for digital health innovation that empowers consumer of digital health to use the information to make informed decisions and choices.

CHAPTER 20

A key activity in healthcare is clinical decision making. This decision making typically has to be made rapidly and often without complete information. Moreover, the consequences of these decisions could be far reaching including the difference between life or death. Today analytics can assist in clinical decision making as the following chapter highlights. However, to gain the most from any type of analytics it is first necessary to fully understand the dynamics around the clinical decision making process as this chapter sets out to present.

CHAPTER 21

On the one hand, predictive analytics is an important field of research in Information Systems; however, research on predictive analytics in healthcare is still scarce in IS literature. One area where predictive analytics can be of great benefit is with regard to unplanned readmissions. While a number of studies on readmission prediction already exists in related research areas, there are few guidelines to date on how to conduct such analytics projects. To address this gap this chapter presents the general process to develop empirical models by Shmueli and Koppius and extends this to the specific requirements of readmission risk prediction. Based on a systematic literature review, the resulting process defines important aspects of readmission prediction. It also structures relevant questions and tasks that need to be taken care of in this context. The authors contend that this extension of the guidelines by Shmueli and Koppius provides a best practice as well as a template that can be used in future studies on readmission risk prediction, thus allowing for more comparable results across various research fields.

CHAPTER 22

The presented study in this chapter aims to identify predictors for patients likely to be readmitted to a hospital within 28 days of discharge and to develop and validate a prediction model for identifying patients at a high risk of readmission in an Australian healthcare context. Numerous attempts have been made to build similar predictive models. However, the majority of existing models suffer from at least one of the following shortcomings: the model is not based on Australian Health Data; the model uses insurance claim data, which would not be available in a real-time clinical setting; the model does not consider socio-demographic determinants of health, which have been demonstrated to be predictive of readmission risk; or the model is limited to a particular medical condition and is thus limited in scope.

CHAPTER 23

Intelligent tools and collaborative systems can be used in healthcare contexts to support clinical decision making. Such an approach is concerned with identify the way in which information is gathered and decisions are made along specific care pathways. This chapter presents research that develops a real-time collaborative system using an Intelligent Risk Detection Model (IRD) to improve decision efficiency in the case of Hip and Knee Arthroplasty. The benefits of adopting this solution include increasing awareness, supporting communication, improving decision making process and also improving information sharing between surgeons as key collaborative parties in the research case. This in turn leads to higher levels of patient and clinical satisfaction and better clinical outcomes.

CHAPTER 24

Diabetes type 2 is a chronic condition that currently has no cure. Hence, proper management is key as the best approach to ensure the wellness of sufferers. To establish the attitudes of self-care patients towards the management of this ailment, the authors in this chapter designed a study that targeted 100 Australian residents in the first phase. These participants provided quantitative and qualitative information about various diabetes type 2 management practices that include exercising and diet management and the co-morbidities they currently suffer.

CHAPTER 25

Today most people have at least one smart phone irrespective of socio-economic standing. Such a penetration of mobile phones has enabled mobile health to rapidly develop over the last 5 years. There are many benefits to patients and clinicians afforded by mobile health including the convenience of any time anywhere access to data and information and the possibility to monitor so that critical issues can be caught early. One key area is in the post discharge phase as patients return home to ensure they are making good progress. This chapter discusses developments of mobile health solutions and precision post-operative wellness monitoring solutions.

CHAPTER 26

Arguably, the most prevailing chronic disease today is diabetes. The World Health Organization (WHO) notes that diabetes is a silent epidemic, and by 2020, there will be a 54% rise in the total number of individuals diagnosed with this disease. These are distressing figures. Many are turning to technology solutions to assist. What becomes important is the ability to rapidly design and develop appropriate digital health and wellness solutions. The following chapter discusses key considerations around Design Science Research Methodology coupled with User-centred design principles and Co-creation as well as presents the Adaptive Mapping to Realization model.

CHAPTER 27

The U.S. healthcare system has been often characterized as fragmented and disconnected. Lack of effective and concurrent adoption of information technology has been known to be a factor that contributes to the decentralization of healthcare systems. Fragmented systems are also responsible for creating silos that operate with minimal coordination. Clinicians in such systems are providing duplicate services because they are not aware of patient care plans set by other practitioners. These duplications could lead to prescription drug errors due to inconsistencies and lack of coordination in the treatment services and in some cases drug-drug interactions. The following suggests a role for technology to facilitate better care co-ordination.

As noted in the first edition, it is not possible in one volume to address all the factors that can facilitate healthcare value creation. This book presents a miscellany of initiatives written by leading international scholars and practitioners aimed at addressing various aspects of enhancing value in healthcare operations and thereby enabling superior healthcare practice to ensue and prudent healthcare administration and management to be realised. It serves to build on the first edition by incorporating new material and developments. This is thought to be especially prudent given the rapid and dynamic nature of digital health innovation; often what is possible today was not even imagined yesterday.

The book is targeted at all healthcare stakeholders who have an interest in the role of- and for digital health. It is useful for healthcare practitioners, healthcare executives, managers as well as researchers, consultants and students and/or even the population at large. It is expected that on reading this work not only will many questions be answered but many more will arise, because it is only through questioning, reflecting and discourse that we can ensure our healthcare delivery systems are continuously improving and incorporating the latest and best digital health solutions that enable the realisation of better quality, access and value as well as a superior patient experience. Healthcare affects us all, and it is my hope that on reading this you will feel inspired to move the needle in improving healthcare delivery.

The Editor

Nilmini Wickramasinghe

Swinburne University of Technology, Australia & Epworth HealthCare, Australia

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