

Book Review

Advances in Clinical Informatics -Transforming Health Care Through Health Information Technology and Adaptive Health Management Information Systems: Concepts, Cases, and Practical Applications

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Key Advances in Clinical Informatics: Transforming Health Care through Health Information Technology
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Adaptive Health Management Information Systems: Concepts, Cases, and Practical Applications
Joseph Tan with Fay Cobb Payton

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Emerging technologies and informatics in health care are complex issues. Organizations within the healthcare industry are made up of many stakeholders that must interact and engage among themselves or with others to share information so as to optimise patient healthcare outcomes. Clinicians and healthcare managers have employed different data collection techniques and shared tools to achieve positive health outcomes without sacrificing organizational efficiencies. Advances in information and computer technology (ICT) have given way to the development of two disciplinary focus within the healthcare information technology (HIT) environment: (a) healthcare managers with a clinical background will understand HIT to comprise mostly of Clinical Informatics (CI) systems that are used to serve the patient and improve their quality of care (here, CI components include medication and laboratory order entry systems, clinical decision support systems (CDSS),

and electronic clinical documentation (ECD) for which clinicians will use these systems to record patients' medical conditions, and share that information with other care providers); and conversely, (b) managers in healthcare with an administrative background will use healthcare management information systems (HMIS) as a tool to optimise resource utilization, similar to enterprise resource planning (ERP) systems.

Technological advances have created an external pressure on healthcare organizations to become generally more efficient with changing demands of patients causing the CI subfields and HMIS domains to become increasingly interconnected. A comparative review of the two texts, (a) *Key Advances in Clinical Informatics (Clinical Informatics)*; and, (b) *Adaptive Health Management Information Systems (Adaptive HMIS)*, is clearly a useful exercise to examine the differences in the two disciplinary perspectives. The editors of *Clinical Informatics* study within the field of medicine, and have vast academic and practical experience in CI, whereas Joseph Tan, the editor and primary author of *Adaptive HMIS*, is an information technology (IT) professor at McMaster University's DeGroote School of Business with many years of experience mentoring graduate level business and information systems (IS) students.

Adaptive HMIS, published in 2010 (and to be updated soon), is not as technologically relevant as *Clinical Informatics*, which is presently released in 2017. Even so, it is useful to examine the change and progression in HIT trends and/or challenges. Knowledge and understanding from *Clinical Informatics* should be incorporated with the themes and perspectives of *Adaptive HMIS* to connect concepts in CI and HMIS, for an updated version of the current thinking in health informatics and technologies. Current understanding of CI will be explored first as to identify trends to be implemented in a revised *Adaptive HMIS* undertaking.

Sheikh et al. (2017) are editors and authors from the clinical camp of HIT. They largely perceive healthcare organizations as Learning Health Systems (LHS). Accordingly, learning systems in health care continually capture knowledge, determine best practices, and implement change. HIT within LHS is used to improve care quality, patient safety, and operational efficiencies. Not surprisingly, Sheikh et al. focus on continuous improvement to quality, safety, and efficiency throughout their text.

All contributing authors of *Clinical Informatics* understand that the organizations existing in today's healthcare industry are undergoing transformation to become LHS. Learning health systems use continuous improvement cycles to implement and integrate knowledge throughout organizations in order to develop and maintain best practices. Continuous improvement cycles are leading to best practices that improve the quality, safety, and efficiency of health care. Topics in *Clinical Informatics* are introduced and explained in a manner that aligns with continuous improvement methodologies. The history, development and progression of CI components are examined as intended for "nonexpert clinical and academic audiences across the globe."¹ In order to set the foundation for a more specific HIT discussion, *Clinical Informatics* unveils topics in CI - all of these topics are discussed in a way that readers are assumed not to have specific medical education. Each chapter is extensively researched to serve as summary literature reviews to academic readers interested in certain HIT topics. Additional resources for audiences to further develop their understanding of HIT are provided after the conclusion of each chapter.

The overarching goal of *Clinical Informatics* is to provide an overview of HIT systems through the perspective of practicing healthcare professionals. The authors tailored the text to highlight the state of change HIT is experiencing, and its progression in improving quality, safety, and efficiency.² *Clinical Informatics* fulfills its purpose of engaging with non-expert audiences through the use of the authors' tone, and the easy-to-understand themes, structure, and content of the text.

The positive tone of *Clinical Informatics* is refreshingly different from other textbooks because of its emphasis being placed on conveying HIT as a continuous improvement journey within LHS. Thinking of HIT initiatives as a journey helps readers understand the motivation for change in the

healthcare environment, and instills a sense of collective progress that is leading to better care and health outcomes. In *Clinical Informatics*, improvement is defined across several dimensions not solely on process or operational improvement, but predominately focusing on patient care and end-user experience. Topics of patient care and user experience are greater motivators to nonexpert clinical readers and are better justifications for CI-purposed projects compared to financial incentives.

Throughout the text, contributing authors relate to HIT implementation as a journey of continuous optimization that serves the needs of stakeholders.³ It is suggested that rapid continuous improvements to an organization's HIT will lead to the transformation of health care, which supports better health outcomes and creates an environment that cultivates patient involvement, enablement, and empowerment.⁴ This understanding portrays HIT with a positive tone that suggests the challenges associated with change management are justified by positive stakeholder outcomes. Contributing authors use motivational speech, with positive connotations, to address the HIT journey, for instance, "The march toward ... interoperable systems continue."⁵ With this example, 'march' was used opposed to 'struggle' or 'challenge' that would negatively impact the readers' perceptions. The authors' positive tone is deployed effectively to communicate the importance of continuous improvement, and a supportive organizational culture, leading to the success of HIT projects that are essential to the creation of LHS.⁶

More specifically, *Clinical Informatics* is composed of three parts, (a) An Introduction to Clinical Informatics (Part One); (b) Improving the Quality, Safety, and Efficiency of Care (Part Two); and (c) Future Developments (Part Three). Respectively, the three parts discuss the development and background of HIT, current use of HIT to achieve quality, safety, and efficiency, and the trends guiding HIT into the future. Each part of the text builds upon the previous and examines the elements of healthcare transformation as they fit within the journey towards LHS.

Part One, *An Introduction to Clinical Informatics*, introduces CI from a clinician's perspective by discussing basic components of CI, and key challenges with its use. The introductory chapter presents an overview of different themes that are intertwined with HIT, including, quality, safety, and efficiency as expected outcomes, different contexts HIT exists within, and end-user workflow and technical optimization. Subsequent chapters (chapters 2 and 3) examine HIT use in hospital settings, inpatient (IP) and outpatient (OP) settings that inform readers of different demands of HIT. ECD (Chapter 4) is then discussed in context of the demands of the IP/OP systems, highlighting the importance of high quality, safe systems. The issues of interoperability (Chapter 5), privacy and safety (Chapter 6), are then examined as they relate to current HIT demands, and their impact on the progress towards LHS is examined. The first part of *Clinical Informatics* is generally effective in introducing intersecting topics of HIT to nonexpert clinical and academic readers and aids their understanding of the complex environment in which HIT exists.

Chapters in Part Two, Improving Quality, Safety, and Efficiency incorporate concepts previously introduced in Part One to explain and examine different facets of HIT currently used. Key topics and concepts incorporated include, but are not limited to, HIT use in hospital settings, and ECD, which are concepts used to further our understanding of challenges when assessing HIT and value (Chapter 8). Complexities in CI often relate to organizational and behavioural issues (Chapter 9), medication management and test ordering (Chapter 10), the possibilities of bioinformatics and precision medicine (Chapter 11), challenges in decision support and knowledge management (Chapter 12), and predictive analytics and population health (Chapter 15). Concepts of interoperability, privacy, and safety, with the theme of multiple contextual views of HIT, also extend into Part Two of *Clinical Informatics*. The authors' discussion of public policy (Chapter 7), mobile health (mHealth, Chapter 13), and role of applications (apps) in health care (Chapter 16) are formed around interoperability and safety. The authors argue public policy must incentivise healthcare providers to adopt HIT systems, but also must maintain safety and privacy governance. The authors encourage the standardization of mHealth protocols, to promote interoperability, and encourage the establishment of regulations that govern mHealth apps so that the public may be assured their privacy and safety is upheld. Chapters in Part

Two also address the social context HIT systems operate in and present models to understand the influence of these contexts (Chapter 14).

Sociotechnical trends and technological innovations are explored in the third part of the text, Future Developments. Patient engagement through mHealth apps and social media characterise Social & Consumer Informatics (Chapter 18), the social trends that will impact the HIT current and future environments. Cloud-based computing (Chapter 17), and machine learning (Chapter 19) are two technical trends that stand to increase their influence in new HIT environments. As the two technologies become more accepted in healthcare settings, an increased emphasis must be placed on patients' privacy and safety. Rapid advances in technology to support self-care and define the Future of Medical Informatics (Chapter 20) provide a means to ensure care may become more personalized, giving patients access to their own health records, and allowing them to actively manage their personal health.

Altogether, each chapter of the CI book is constructed in a similar fashion, beginning with an overview and history, the current relevance of the topic of study, and the outlook of the topic. The chronological structure of each chapter mirrors the flow of ideas through the parts of the text, and aligns with the continuous improvement cycle. Examining topics in each chapter with a past, present and future perspective helps readers understand how the topic fits within the journey of HIT progress. Such a systemic approach to the different CI subtopics not only makes each chapter valuable as a part of the entire text, but also as stand-alone readings.

Chapters are enhanced with small case studies and specific industry examples that help contextualize the importance of a given topic. Case studies are useful to readers with an academic background in business because of their experience with case learning. Models and figures that explain abstract concepts of HIT are another strength of *Clinical Informatics*. Contributing authors most often use figures to explain how technology fits within social environments, which helps the reader understand contextual factors that impact HIT. More generally, authors of *Clinical Informatics* appear to have achieved their goal of providing an in-depth understanding of CI developments to nonexpert clinical and academic audiences.

The understanding of HIT topics in *Adaptive HMIS* contrasts that of *Clinical Informatics* primarily because of the different expertise of the contributing authors, but also the time elapsed between publications. *Adaptive HMIS* is structured more closely to a traditional textbook compared to *Clinical Informatics*, with the inclusion of chapter discussion questions and separate case studies. Presentation of HIT topics in *Adaptive HMIS* is intended for graduate level business and IS readers who will continue into healthcare management or health informatics. Extensively researched chapters are valuable resources for readers who intend to conduct research pertaining to HIT.

Health care system in its entirety is understood to be a Complex Adaptive System (CAS) in *Adaptive HMIS*, within which HIT is used to manage the complex interactions and facilitate the flow of information throughout the system. *Adaptive HMIS* catering to a business audience is evident by its emphasis on the business case of HIT, while sociotechnical factors are not heavily detailed. Other themes of *Adaptive HMIS* are strategic development of HIT, data and information management, and technical capabilities of IS.

Chapters in *Adaptive HMIS* are separated into four parts, while five case studies comprise Part Five. In a manner similar to *Clinical Informatics*, each part continues with concepts and understandings from the previous section; however, ideas do not flow chronologically from past to future uses. Discussion in the text begins with general factors to be considered regarding HIT, through to specific guidelines for technical systems. From a managerial perspective, Part One introduced high-level, strategic concepts, followed by specific technology and applications, then by implementation planning, and concluding with detailed information regarding standardization, policy, and governance. Throughout the different parts of the text the author includes short chapters, or 'briefs,' that explain in detail topics of research, technology, or policy. These 'briefs' give more information about how research, technology, and policy influence HIT. *Adaptive HMIS* presents HIT topics with enough

context for audience without medical or IS education to gain an understanding, but also examines the topics with sufficient detail to be valuable to audience with greater education.

In a fashion similar to *Clinical Informatics*, chapters in *Adaptive HMIS* are structured to mimic the logical flow of ideas present through the different parts of the book. Topics within chapters are discussed first with general overview as they pertain to strategic objectives through to more specific details. To help develop the readers' understanding of subsequent chapter content, each chapter begins with a 'scenario' that outline a miniature case that is woven into the chapter to highlight real applications of the topic.

The structure and content of *Adaptive HMIS* convey a tone that is in opposition to that of *Clinical Informatics*. Chapters that are information dense along with negative representations of HIT projects in *Adaptive HMIS* create a negative tone that highlights challenges and complexities. In a chapter discussing regional health networks system developments are regarded to be, "painstakingly slow." (Tan & Payton, 2010, p. 106).

The use of vocabulary with negative connotations dampens the attitude of readers and does not convince individuals that change is forthcoming.

Perspectives and information from *Clinical Informatics* should be used to guide the revision of *Adaptive HMIS* to continue to close the gap between the CI and HMIS fields. To improve *Adaptive HMIS*, it should bridge the understanding of health care as a CAS, and LHS as a way to merge clinical and management perspectives. Health care has begun to progress into LHS and managers need to understand this transition in order to serve the changing expectations of key stakeholders. The established perspective that manages health care as a CAS might limit managers to only focus on interactions between individuals under their control. Managers with a myopic mindset will miss opportunities to engage with patients to improve the quality of care. The results of a shift towards the perspective of health care as LHS would be an established culture of continuous improvement that is focused on the quality, safety, and efficiency of HIT.

An LHS perspective towards care providers would have required the authors of *Adaptive HMIS* to discuss the impact of end-users on HIT success, a topic that was not covered in detail. Throughout the text, the author states that end-users are the most important factor pertaining to HIT; however, these statements often follow more elaborate and detailed explanations of the financial and technical challenges. A revised version of *Adaptive HMIS* must evaluate the relationships between management, end-users, and HIT systems.

Another benefit of incorporating an LHS perspective to *Adaptive HMIS* is the introduction of a continuous improvement methodology to the texts audience. As LHS become established throughout the healthcare industry, the management and implementation of systems will occur through continuous improvement. A forthcoming revised version of *Adaptive HMIS* should include strategic and practical models of managing the continuous improvement cycles. Other revisions that are required for the next version of *Adaptive HMIS* include updating the 'technology briefs' to include machine learning, cloud computing, and mHealth applications, as well as examining with greater detail patient-centered care.

As the two disciplines of HIT continue to be pressured by a number of emerging factors, it is important that scholars, clinicians, developers, and managers bridge their understanding of HIT and engage in the process of continuous improvements.

REFERENCES

Tan, J., & Payton, F. (2010). *Adaptive health management information systems: Concepts, cases, & practical applications*. Jones & Bartlett Learning.

ENDNOTES

- ¹ Clinical Informatics, p. 9
- ² Clinical Informatics, p. 9
- ³ Clinical Informatics, p. 14
- ⁴ Clinical Informatics, p. 8
- ⁵ Clinical Informatics, p. 70
- ⁶ Clinical Informatics, p. 161