

## Preface

Clinical technologies integrate the fields of Information Technology and Systems with healthcare, clinical design methodologies, and medicine. The constantly changing landscape of clinical technologies makes it challenging for experts and practitioners to stay informed of the field's most up-to-date research. That is why Information Science Reference is pleased to offer this three-volume reference collection that will empower students, researchers, and academicians with a strong understanding of critical issues within clinical technologies by providing both extensive and detailed perspectives on cutting-edge theories and developments. This reference serves as a single, comprehensive reference source on conceptual, methodological, technical, and managerial issues, as well as providing insight into emerging trends and future opportunities within the discipline.

*Clinical Technologies: Concepts, Methodologies, Tools, and Applications* is organized into eight distinct sections that provide wide-ranging coverage of important topics. The sections are: (1) Fundamental Concepts and Theories, (2) Development and Design Methodologies, (3) Tools and Technologies, (4) Utilization and Application, (5) Organizational and Social Implications, (6) Managerial Impact, (7) Critical Issues, and (8) Emerging Trends.

**Section 1, Fundamental Concepts and Theories**, serves as a foundation for this extensive reference tool by addressing crucial theories essential to the understanding of clinical technologies. Chapters such as *Risks and Benefits of Technology in Health Care*, by Stefane Kabene and Melody Wolfe, introduce some of the fundamental issues involved with integrating technology into the field of healthcare. Other chapters introduce electronic health records, such as *Adoption of Electronic Health Records*, by Yousuf J. Ahmad, Vijay V. Raghavan, and William Benjamin Martz Jr., detailing the future of health records as they move forward in an increasingly electronic era. Other topics include medical (*E-Medical Education* by D. John Doyle) and nursing education (*The use of Personal Digital Assistants in Nursing Education* by Adrian Bromage and Nina Godson), and how e-learning has begun to take hold as a technological advancement allowing for off-site, online education. Overall, the first section is a fantastic introduction to some of the concepts and theories that will be addressed as the collection continues.

**Section 2, Development and Design Methodologies**, presents in-depth coverage of the conceptual design and architecture of clinical technologies, focusing on aspects including the Balanced Scorecard framework, computer-aided diagnostics, biomedical imaging, and much more. Chapters in these areas include *The Integration of Systems Dynamics and Balanced Scorecards in Strategic Healthcare Policy Simulation Analysis* by Mahendran Maliapen and Alan Gillies, detailing the potential for improving simulation analysis in healthcare policy, useful for tacticians and hospital designers interested in system dynamics and the Balanced Scorecard framework. Likewise, *An Integrated System for E-Medicine (E-Health, Telemedicine and Medical Expert Systems)* by Ivan Chorbev and Boban Joksimoski, is an included chapter, chosen for this reference book for its general breadth and articulation of the latest in design methodology within the clinical setting. Also included in this section are chapters on designing new medical vocabulary, and the alignment of clinical and general semantics. Together, section 2

comprises a comprehensive collection of the most recent publication in the design and development methodologies in clinical technologies.

**Section 3, Tools and Technologies**, presents extensive coverage of the various tools and technologies used in the development and implementation of clinical technologies, including some of the newest applications to healthcare and bioinformatics. This comprehensive section includes such chapters that detail new methods for diagnosis and treatment of genetic, chronic, infectious, and other types of diseases and conditions. Such chapters include *Transcranial Magnetic Stimulation (TMS) as a Tool for Neurorehabilitation in Parkinson's Disease* by Javier Cudeiro, Nelson Espinosa, and Pablo Arias, and *Quantitative Analysis of Hysteroscopy Imaging in Gynecological Cancer* by Marios Neofytou, Constantinos Pattichis, Vasiliios Tanos, Marios Pattichis, and Eftyvoulos Kyriacou. The section also specifically focuses on imaging technologies, with emphasis in chapters such as *3D and 4D Medical Image Registration Combined with Image Segmentation and Visualization* by Guang Li, Deborah Citrin, Robert W. Miller, Kevin Camphausen, Boris Mueller, Borys Mychalczak, and Yulin Song, as well as *Image Registration for Biomedical Information Integration* by Xiu Ying Wang and Dagan Feng. Section 3 concludes with a fascinating look at some recent developments in robot-assisted surgery.

**Section 4, Utilization and Applications**, describes how clinical technology has been utilized, and offers insight on important lessons for its continued use and evolution. Due to the breadth of this section's subject matter, section 4 contains the widest range of topics, including chapters such as *The Use of Artificial Intelligence Systems for Support of Medical Decision-Making* by William Claster, Nader Ghotbi, and Subana Shanmuganathan, and *Applying Social Network Analysis in a Healthcare Setting* by Salvatore Parise. As broad as the applications of clinical technology are, chapters within this section are pointed and precise, detailing case studies and lessons learned from integrating Information Technology with clinical systems. One intriguing example of this comes in the final chapter of the section, *Predicting Ambulance Diversion* by Abey Kuruvilla and Suraj M. Alexander, a detailed look at statistical and predictive analysis of one vital part of emergency care.

**Section 5, Organizational and Social Implications**, includes chapters discussing the organizational and social impact of clinical technologies. Chapters are expository (*Demystifying eHealth Human Resources* by Candace J. Gibson and H. Dominic Covvey), pioneering, and based in research (*Multi-Agent Systems in Developing Countries* by Dean Yergens, Julie Hiner, and Joerg Denzinger). Overall, these chapters present a detailed investigation of the complex relationship between individuals, organizations and clinical technologies.

**Section 6, Managerial Impact**, presents focused coverage of clinical technology as it relates to improvements and considerations in the workplace. In all, the chapters in this section offer specific perspectives on how managerial perspectives and developments in clinical technologies inform each other to create more meaningful user experiences. Typically, though the fields of industry and healthcare are not always considered co-dependent, section 6 provides looks into how clinical technologies and the business workplace help each other. Examples include *Operationalizing the Science* by Joseph L. Kannry and *Technology in the Supervision of Mental Health Professionals* by Daniel W. Surry, James R. Stefurak, and Richard L. Hayes.

**Section 7, Critical Issues**, addresses some of the latest academic theory related to clinical technologies. Importantly, this refers to critical thinking or critical theory surrounding the topic, rather than vital affairs or new trends, which may be found in section 8. Instead, this section discusses some of the latest developments in ethics, law, and social implications in clinical technology development. Chapters include: *eHealth and Ethics* by Penny Duquenoy and Diane Whitehouse, *Legal Issues in Health Information and Electronic Health Records* by Nola M. Ries, and *A Bio-Psycho-Social Review of Usability Methods and their Applications in Healthcare* by Morgan Price.

**Section 8, Emerging Trends**, highlights areas for future research within the field of clinical technologies, while exploring new avenues for the advancement of the discipline. Beginning this section is *New Technologies in Hospital Information Systems* by Dimitra Petroudi and Nikolaos Giannakakis, which gives a summary view of some of the newest technological developments in hospital communications and health records. The section advances through medical imaging techniques, diagnostics, virtual reality, and more new technologies by means of describing some of the latest trends in clinical research and development. The book concludes with *The Study of Transesophageal Oxygen Saturation Monitoring* by Bo Gao, Guojie Liao, Ling Mu, Wei Wei, and Zhiqiang Zhang, a chapter from some of the most updated publication on digital clinical technology.

Although the primary organization of the contents in this multi-volume work is based on its eight sections, offering a progression of coverage of the important concepts, methodologies, technologies, applications, social issues, and emerging trends, the reader can also identify specific contents by utilizing the extensive indexing system listed at the end of each volume. Furthermore, to ensure that the scholar, researcher, and educator have access to the entire contents of this multi volume set, as well as additional coverage that could not be included in the print version of this publication, the publisher will provide unlimited multi-user electronic access to the online aggregated database of this collection for the life of the edition, free of charge when a library purchases a print copy. This aggregated database provides far more contents than what can be included in the print version, in addition to continual updates. This unlimited access, coupled with the continuous updates to the database, ensures that the most current research is accessible to knowledge seekers.

As a comprehensive collection of research on the latest findings related to using technology to providing various services, *Clinical Technologies: Concepts, Methodologies, Tools and Applications*, provides researchers, administrators and all audiences with a complete understanding of the development of applications and concepts in clinical technologies. Given the vast number of issues concerning usage, failure, success, policies, strategies, and applications of clinical technologies in healthcare organizations, *Clinical Technologies: Concepts, Methodologies, Tools and Applications* addresses the demand for a resource that encompasses the most pertinent research in clinical technologies development, deployment, and impact.