Preface

Alexander Pope wrote: “To err is human.” Mistakes made by humans are inevitable, and very common within the healthcare system. A recent Australian newspaper article reported that of 1.5 million people admitted annually to Victorian hospitals, about 10% were admitted due to preventable conditions, usually medication errors. Similar statistics have been reported in Europe and the USA. Medical lawsuits against adverse events such as adverse drug reactions and inappropriate treatments due to lack of communication between staff are increasing, indicating significant health challenges to be solved globally.

Health budgets are under pressure for a number of reasons, including the increasing burden of chronic disease associated with the aging population, increasing utilization of health services and new and more expensive technologies. Advances in Information Technology (IT) have enabled improvements in preventative medicine and self-efficacy through access to education programs. How can technology be used to improve quality of care by minimising human errors and improving communication between treating staff?

Clinical Decision Support Systems (CDSS) are information systems designed to improve clinical decision-making. Patient characteristics are matched to knowledge datasets, and algorithms generate patient-specific recommendations. CDSS, together with Computerised Physician Order Entry (CPOE) and Electronic Health Records (EHR), have been suggested as solutions for improving patient safety, especially with respect to medication prescription errors and adverse drug events. CDSS are used for different purposes, including assisting with diagnosis, pharmacy and billing, and may be particularly useful in chronic diseases where the disease has unique characteristics, and requires standardized treatments. CDSS can also be used to mine data for clinical research.

Evaluation of CDSS is difficult and there are few published studies. However there is evidence of improved outcomes, particularly in terms of practitioner performance, although more work needs to be done in this area. The success of implementation will depend on successful IT integration, timing of support and easy accessibility for clinicians.

The chapters in this book cover a range of applications of health information technology to improve healthcare and contain costs. The contributing authors are at the forefront of research and development in this field.

This book is divided into three sections: Technology-Based Medicine, Health Budget, and Future Healthcare.
TECHNOLOGY-BASED MEDICINE

Chapter 1 is an introduction to Clinical Decision Support Systems in health by Jane Moon and Mary Galea. They present the historical development of CDSS, how they have been used in various aspects of health, challenges involved in using technology in health and the potential future impact on healthcare.

The following six chapters are devoted to the impact of technology on health.

In Chapter 2, Peter Idowu discusses the development of a prototypical HIV/AIDS surveillance and monitoring system in Nigeria where millions of people are infected with this deadly disease. The country does not have any electronic database system to capture these patients’ data. This system enables users to determine the pattern and distribution of HIV/AIDS disease in a specific location. The system may be used for other countries within Sub-Saharan Africa region.

In Chapter 3, Sanjay Singh and colleagues provide an overview of various technologies to assess pain, including facial coding, in order to assess pain in young children and non-communicative and intubated patients who are unable to verbally describe their pain.

Chapter 4, by Reece George, describes the use of mobile SMS programs to help monitor maternal healthcare of Indigenous Australian women. This is an example of how technology can be designed to embrace the traditional culture of Indigenous women as well as to meeting medical requirements.

Edgardo Palza and colleagues in Chapter 5 present the design and implementation of a forecasting model of neonatal morbidity. The model is based on a repository of 10,000 medical records at a hospital in Peru and aims to identify the factors that lead to morbidity in newborns. It is based on data mining techniques and developed using the CRISP-DM methodology.

In Chapter 6, Connie Harmsen and colleagues describe the design and implementation of a digital hospital, including design parameters, technology components, management and organizational considerations, work redesign and clinical transformation, change management, and realisation of benefits.

In Chapter 7, Janelle Guerrero and colleagues discuss the establishment of a national registry for patients with hematochromatosis. This involves coordinating results with doctors after patients have had their blood tests and sending an alert message either by email or text message to patients to invite them to attend for venesection. This system will ensure that blood from patients with hematochromatosis is not wasted and may be used for other patients requiring blood transfusion.

HEALTH BUDGETS

The middle section of the book is concerned with how technology can assist in containing rising healthcare budgets.

Advances in technology and the cost of human resources are factors pushing for automation. In Chapter 8, Ronal Nallas and Jane Moon present the implementation of automation and CDSS in a clinical biochemistry department. The chapter addresses the advantages and issues encountered during the installation of the new automated system Roche Cobas 8000 and Middleware IT3000 for the Clinical Chemistry Laboratory in a major teaching hospital in Australia.

In Chapter 9, Roland Ma discusses clinical costing for clinical improvement. Clinical data linkage unifying clinical, financial and administrative datasets may facilitate the spending of scarce health care resources in a way that produces the biggest difference in clinical outcomes. Empowering clinicians with clinical costing information is central to the success of containing costs.
In Chapter 10, Steven Shaha discusses the importance of using healthcare information systems toward innovative and impactful approaches to patient care, rather than narrowly focusing on costs. He recommends the use of technology that enables local adaptation with analytics, in order to improve quality of care, cost-effectiveness and efficiency.

In Chapter 11, Nilmini Wickramasinghe and colleagues present a conceptual model for leveraging health care analytics using an Australian private hospital as a case study. The application of bespoke predictive analytic tools techniques can be designed and then applied to a hospital data warehouse, called the Hospital Casemix Protocol (HCP) Extended data set, in order to improve decision efficiency.

**FUTURE HEALTHCARE**

The final section of the book is concerned with the electronic health record (EHR) as important way of bringing disparate datasets together for more effective communication. As more data health records are linked and shared amongst many providers and stakeholders, security and privacy is a big concern.

In Chapter 12, Jitendra Jonnagaddala and colleagues report on how data and text mining techniques may guide and support the building of clinical decision support systems and emphasize the need for a well-designed EHR. They discuss how mining EHRs has been used in decision support, quality improvement and research.

Jalel Akichi, in Chapter 13, discusses how an ontology-based CDSS might be able to assist in effective emergency management. This involves ascertaining the required medical resources as quickly as possible, identifying the most suitable health care institutions according to the patient’s condition, and ranking them according to whether they have the appropriate resources and staff available at the time.

In Chapter 14, Hamzah Esop and Tony Shahama present the benefits of EHR in capturing evidence drawn from clinical practice to guide clinical decision-making. They recommend the development of a data warehouse as a single repository, integrating health data from multiple sources, and providing a vast amount of information that can be used as a basis for improvement of health care.

Finally, in Chapter 15, Park and Jane Moon discuss the importance of security for clinical information systems in light of the growing dependence of internet usage and technology for health care. With the sharing of clinical information among many stakeholders, there is a greater need for protection of privacy. Various strategies are suggested to improve the security of current systems.