Chapter 14
Data-Driven and Practice-Based Evidence:
Design and Development of Efficient and Effective Clinical Decision Support System

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ABSTRACT

Decision making is such an integral aspect in health care routine that the ability to make the right decisions at crucial moments can lead to patient health improvements. Evidence-based practice, the paradigm used to make those informed decisions, relies on the use of current best evidence from systematic research such as randomized controlled trials. Limitations of the outcomes from RCT, such as "quantity" and "quality" of evidence generated, has lowered healthcare professionals' confidence in using EBP. An alternate paradigm of Practice-Based Evidence has evolved with the key being evidence drawn from practice settings. Through the use of health information technology, electronic health records capture relevant clinical practice "evidence". A data-driven approach is proposed to capitalize on the benefits of EHR. The issues of data privacy, security and integrity are diminished by an information accountability concept. Data warehouse architecture completes the data-driven approach by integrating health data from multi-source systems, unique within the healthcare environment.

INTRODUCTION

Chronic diseases and multi-comorbidities continue to persist in both developed and developing countries. There are also an increasing number of people who are unaware that they are at risk of chronic condition and it would be excellent and helpful if such patients can be detected or diagnosed at an earlier stage. In order to do achieve effective treatment and intervention, the key is improved clinical decision-making by

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healthcare professionals. Effective clinical decision-making is a fundamental requirement of healthcare professionals. With healthcare professionals routinely faced with occasions where making informed decisions can be the difference between life and death, providing them with the appropriate tools can vastly improve their chances of being right. This may in turn, aid in reducing healthcare expenditure by reducing unnecessary treatments, tests and even medications.

Most healthcare organizations by now, would have adopted care management strategies to manage patients. One key factor that has facilitated in those management strategies has been the use of Healthcare Information Technology (HIT) such as electronic health record systems and clinical decision support systems. The use of the clinical decision support system helps care providers make well informed decisions at crucial moments in the care delivery process. This becomes pivotal as decision making is an integral aspect characteristic of healthcare. As patient care becomes complex and complicated, there is a need to improve clinical decision-making. Sharing of information has become more essential than before, especially with patient care being handled by multiple doctors, specialists and allied healthcare professionals. Aggregation of patient data from multi-sourced hospital information systems becomes imperative; supplementing healthcare professionals with information that enriches them. Therefore, clinical data, such as electronic medical records and patient medical records, collectively known as electronic health records, has efficiently captured meaningful evidence of practical applications of patient care treatments. It in turn, contains valuable information, which may provide clues that can assist healthcare professionals through the course of patient care.

In this chapter, the authors will discuss on the introduction of an alternative clinical practice paradigm called 'Practice-Based Evidence'(PBE), highlighting the important and key roles of electronic health records in PBE and how decision-making capabilities of healthcare professionals can be improved through the use of Clinical Decision Support System (CDSS).

BACKGROUND

Evidence-Based Practice (EBP) continues to play a major role in the practice of clinical medicine. The key to EBP is in assisting healthcare professionals, such as doctors and clinicians make well-informed clinical decisions. According to Greenhalgh, Howick, and Maskrey (2014), EBP demands the use of evidence from excellent randomized controlled trials and observational studies, combined with clinical expertise and applied based on individual patient requirements has made clinical practice "more scientific and empirically grounded" allowing it to be safer, more consistent and more cost effective. The ability to deliver evidence-based practice on the other hand, ensures that care is catered to individual patient and that quality of healthcare is upheld today as well as for the future, and without it, healthcare delivery could probably cause serious harm to patients or them losing out on the opportunity to benefit from it (Dawes et al., 2005).

Until quite recently, EBP has not been faced with much resistance. Though it has been implemented in healthcare and medical decision making processes for quite a long time, healthcare professionals are beginning to question its validity and reliability when used in real clinical practice settings. Evans, Connell, Barkham, Marshall, and Mellor-Clark (2003) and, Horn and Gassaway (2007) believe that the scientific research conducted to elicit evidence for EBP is too small in quantity and insufficient quality that conclusions can be drawn from it. Treatments, medication or intervention therefore might not be applicable to a whole spectrum of patient types. At the same time, when evidence is translated into clini-

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