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Chapter XI

Medical Decision Support Systems and Knowledge Sharing Standards

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Abstract

This chapter discusses about the concept of medical decision support system and the knowledge sharing standards among medical decision support systems. The author discusses the evolution of decision support in the healthcare arena, the characteristics and components of a medical decision support system, the medical decision support problem domains, and the popular medical decision support systems. Furthermore, a unique challenge in the healthcare arena—sharing of knowledge among medical decision support systems is discussed. The author discusses about the need for knowledge sharing among medical decision support systems, the evolution of various knowledge sharing standards, and the application of the knowledge sharing standards by the medical decision support systems. Finally, interesting aspects about the future trends in the medical decision support systems, its awareness, its usage and its reach to various stakeholders are discussed.

Introduction

The healthcare industry has been a pioneer in the application of decision support or expert systems capabilities. Even though the area of medical informatics and decision support has been around for more than four decades, there is no formal definition for a medical decision support system. Wyatt & Spiegelhalter (1991) describes a medical decision support system as a computer-based system using gathered explicit knowledge to generate patient specific advice or interpretation. The healthcare industry has witnessed a phenomenal growth and advances both in the areas of practice and research. This rapid growth of medical science has made the practice of medicine both challenging and complex. To address these challenges, the recognized medical standards organizations developed medical practice guidelines to simplify the research findings to practical applications in order to improve the overall healthcare quality and delivery. Despite such initiatives, it has been difficult for the physicians to keep up with the guidelines and to tune it to their practice settings. A clear gap began to develop between developing of practice guidelines and the implementation of the same. Grimshaw and Russell (1993) identified that the knowledge dissemination and implementation strategies are critical to the impact the developed guidelines will have on the physician behavior.

The natural evolution was to develop paper-based decision support workflow or protocols. Paper-based decision support models were developed and are widely used at most physician practices to apply the guidelines into practice. Paper-based decision support models, while effective, are also error prone. For example, dose recommendation models could require tedious calculations and can be error prone when performed manually. Such errors could defeat the purpose of using a decision support model. Also, paper-based models require education and training to the personnel performing those calculation and require an additional layer to review the calculations. Most paper-based models are used by the medical personnel as a batch work flow process.

Thus computer-based decision support systems were developed to provide accurate guideline compliance and to enhance physician performance (Hunt, Haynes, Hanna, & Smith, 1998). Computerized decision support system can be extremely valuable for treatment or diagnosis support and compliance accuracy when used at the point of care (Lobach & Hammond, 1997). This feature of computerized medical decision support system is a key differentiator that makes the paper-based decision support models inferior. A well designed computerized medical decision support system can be used to provide patient specific support at the desired time and location with the adequate content and pace. When decision support systems are blended into the day-to-day practice workflow, these systems have the potential to function as a valuable assistant and also as an educational tool (Thomas, Dayton, & Peterson, 1999).

The computerized decision support systems make decisions based on the clinical practice guidelines. Clinical practice guidelines are the rule-based knowledge that guides the decision makers in a medical setting. These guidelines have been developed over the years to reduce the variations among medical practices with a common goal to provide cost effective and high quality healthcare services (Field & Lohr, 1992). The availability of several decision support systems and the use of common knowledge and rules triggered the need for a common method of sharing the knowledge. This technique can