Chapter 76
Clinical Decision Support Systems for 'Making It Easy to Do It Right'

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ABSTRACT

Medical guidelines and best practises are used in medicine to increase the quality of the health-care delivery system. To support implementation and application of these guidelines, clinical decision support systems (CDSS) have been developed. These systems are defined as 'Computer-based information systems used to integrate clinical and patient information and provide support for decision-making in patient care' (MeSH) These are integrated with so-called Electronic Health Records (EHR), which have been developed by companies and National Governmental Institutes, and are used to register and present the patient medical data. The integration of an EHR with CDSS modules will revolutionize the way medicine will be practiced. In pediatrics, as well as geriatrics, such systems might prove to be even more needed. The development, use, and maintenance of CDSS in a hospital are complex and far from trivial. This chapter focuses on several aspects and challenges of EHR's and CDSS-modules in daily clinical practice in the hospital.

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INTRODUCTION

Clinical decision support systems (CDSS) are a diverse group of interactive computer tools—primarily customizable software —designed to assist decision-making. The goal of a CDSS is to make patient-management more efficient and effective, particularly with ad hoc and discretionary decisions (versus routine or programmatic ones that require little judgment). Interactivity is the key; unlike related expert systems and many artificial intelligence tools, CDSS generally do not attempt to make the decision themselves. They rather present information in a manner that facilitates the ease of making an informed and effective decision, which is based on evidence-based guidelines, clinical rules and in agreement with the professional standards of care. Also, by making practice more efficient and effective, more time remains for complex patient situations that cannot be automated.

A wide variety of CDSS is available, ranging from computerised to non-computerised systems as well as from basic to advanced systems. This makes the systems that are mentioned in literature difficult to compare. Basic decision support includes for example checking on drug-drug interactions, duplicate therapy, drug-allergies and generalized drug dosing. Advanced CDSS, used in addition to basic CDSS, includes for example checking on contra-indications (disease and drugs), individualized dosing support during renal impairment or guidance for medication-related laboratory testing. In this chapter, we will focus only on the advanced systems, as this are the systems that can really change healthcare practice.

The application of decision support systems on electronically stored patient data, preferably in an electronic health record system, (EHR) will revolutionize the health care delivery system. That is the prediction of James (2001), published as an editorial in the New England Journal of Medicine, almost a decennium ago (James, 2001). Despite the speed of development of new technology, treatments and techniques in medicine during the last decennium, the development of ICT-technology in medicine clearly remains behind. This is a system-wide failure of the "modern" healthcare system, as the author James states (2001). This system could perform much better; it is estimated that 50% of the North Americans are being under treated. An expert-panel from the Institute of Medicine, part of the National Academy of Sciences, USA found that medical errors kill from 44000 to 98000 Americans each year (Kohn, Corrigan & Donaldson, 2000). The chairman of the 19 member panel stated; "These stunningly high rates of medical errors – resulting in deaths, permanent disability, and unnecessary suffering – are simply unacceptable in a medical system that promise first to 'do no harm' (Charatan, 1999). The number of patients, dying from medical errors is probably a low estimate.

The situation in Europe is not expected to be different. The Dutch statistics are, for example, not encouraging either. From the patients that died in Dutch hospitals in 2007, 10.7% experienced preventable medical complications; resulting in the death of 1735 patients (4.1%). Even more discouraging is the fact that the number of unnecessary deaths tends to increase. For the Netherlands these were 1745 deaths in 2004 and 1960 in 2008; an increase of 11.5%, despite advances in knowledge and IT-systems (Langelaan, et al., 2010).

BACKGROUND

Mack, Wheeler & Embi (2009) reviewed the use of a CDSS in the pediatric intensive-care unit (pp. 23-28). They defined CDSS as computer software programs that support healthcare providers in their clinical decision making. Once used solely for diagnostic support, nowadays many CDSS have the ability to transform clinical practice by providing interactive assistance based on therapeutic best practices. The recent emphasis on improving quality and patient safety by using electronic