

## Chapter 4.20

# Decision Making by Emergency Room Physicians and Residents: Implications for the Design of Clinical Decision Support Systems

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### ABSTRACT

Clinical Decision Support Systems (CDSS) are typically constructed from expert knowledge and are often reliant on inputs that are difficult to obtain and on tacit knowledge that only experienced clinicians possess. Research described in this article uses empirical results from a clinical trial of a CDSS with a decision model based on expert knowledge to show that there are differences in how clinician groups of the same specialty, but different level of expertise, elicit necessary CDSS input variables and use said variables in their clinical decisions. This article reports that novice

clinicians have difficulty eliciting CDSS input variables that require physical examination, yet they still use these incorrectly elicited variables in making their clinical decisions. Implications for the design of CDSS are discussed. [Article copies are available for purchase from InfoSci-on-Demand.com]

### INTRODUCTION

Clinical decision-making is a complex process frequently complicated by a variety of uncertainties. It is dependent on accurate information,

that according to proponents of evidence based medicine (EBM) and decision making should include the integration of clinical expertise with the best available clinical evidence generated by high quality research (Sackett, Rosenberg, Gray, Haynes & Richardson, 1996). EBM is gaining support and momentum and has been called the prevailing clinical decision making paradigm for medicine (Haynes, 2002). A need to follow EBM guidelines has resulted in a situation where clinicians are dependent on massive amounts of information and knowledge to make decisions that are in the best interest of the patient. These information and knowledge sources include electronic medical records, clinical practices guidelines, academic and practitioner journals among others. Increasingly, information technology (IT) solutions are being considered as crucial decision support mechanism to ensure that clinicians have access to appropriate knowledge sources while making clinical decisions. One particular class of IT solutions that the medical community is showing increased interest in is Clinical Decision Support Systems (CDSS).

According to a well accepted definition, a CDSS is “any program designed to help health-care professionals make clinical decisions” (Musen, Shahar & Shortcliffe, 2001). This definition includes several categories of IT solutions, including:

- *Systems for information management* that provide general data and knowledge for a variety of healthcare workers, including medical information retrieval systems for managing and extracting medical knowledge, and electronic patient record systems (EPRS: Shortcliffe, 1993) for managing patient data.
- *Systems for focusing attention* that are normally present in the intensive care units and are used to remind clinicians about actions that might require attention.

- *Systems for providing patient-specific recommendations* that assess or advise using patient-specific clinical data. These include systems ranging from direct implementation of clinical practice guidelines (Seroussi, Bouaud & Antoine, 2001) to advanced techniques of artificial intelligence (Hanson & Marshall, 2001).

CDSS from the first two categories have been relatively well accepted and used in clinical practice for more than three decades (Anderson, 1997). Increasing interest in systems from the third category is driven by a move towards EBM (deDombal, Leaper & Staniland, 1972), and the efforts to improve patient outcomes (Hunt, Haynes, Hanna & Smith, 1998). Patient-specific recommendation systems usually help clinicians make two types of decisions – diagnostic (what is the underlying health condition of the patient) and management (what is the treatment plan for the patient). Although it is rather artificial to separate the diagnostic process from the management one, many clinicians believe that it is for the management process that they would most often seek support (Musen et al., 2001).

Almost all patient-specific CDSS decision models reflect encoded clinician expertise and are reliant on accurate input to produce appropriate output that is in the best interest of the patient. The implication is that clinicians using such systems have to provide values for input variables to the CDSS that may be correctly elicited only with an appropriate level of expertise. That is, only experienced clinicians will be able to provide such information in a reliable and comprehensive manner, while inexperienced clinicians may be forced to gather information and make assessments for activities that they may lack the clinical acumen to do accurately. Thus, the resulting ‘treatment plan’ output provided by the CDSS may be inappropriate for the patient under question due to the poor quality of the inputs provided by the clinician.

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