Chapter 42
Decision-Making and Decision Support in Acute Care

Brett W. Taylor
Dalhousie University, Canada

ABSTRACT

Clinical Decision Support Systems (CDSS) are information tools intended to optimize medical choice, promising better patient outcomes, faster care, reduced resource expenditure, or some combination of all three. Clinical trials of CDSS have provided only insipid evidence of benefit to date. This chapter reviews the theory of medical decision-decision making, identifying the different decision support needs of novices and experts, and demonstrates that discipline, objective and setting, and affect of the nature of support that is required. A discussion on categorization attempts to provide metrics by which systems can be compared and evaluated, in particular with regard to decision support mechanics and function. Throughout, the common theme is the placement of clinical decision makers at the center of the design or evaluation process.

BACKGROUND

Life is short, art long, opportunity fleeting, experience treacherous, judgment difficult. -Hippocrates Aphorisms, Section 1

Clinical decision support comes with an implicit promise: better patient outcomes, faster care, reduced resource expenditure or some combination of all three. There is no shortage of improvements to be had. In 2003, Bates and his coauthors lamented the issues found in a review of their own institution's practices: "... only 27% of antiepileptic drug levels had an appropriate indication and, among these, half were drawn at an inappropriate time... only 16% [of digoxin levels] were appropriate... 28% [of lab tests] were ordered too early[to be useful]... the initial thyroid test performed was [inappropriate] in 52%... Only 17% of diabetics who needed eye examinations had them... guidelines for vancomycin use were not followed 68% of the time." (Bates, et al., 2003, p. 523) Brigham and Women's Hospital (Bates' home institution) is a well known center of excellence for medical care; the issues listed are indicative of an epidemic

of medical error and inefficiency found in virtually every care setting. The scope of this problem was made clear three years earlier by the publication of "To Err is Human" by the Committee on Quality of Health Care in America (Kohn, Corrigan, & Donaldson, 2000). Their review suggests that between 3% and 4% of all hospitalizations are associated with adverse events, over half of which result from medical error. Extrapolation suggests that "at least 44,000 Americans die each year as a result of medical errors." (Kohn, Corrigan, & Donaldson, 2000, p. 1) Many other publications have since expanded on this issue.

Clinical Decision Support Systems (CDSS) are tools intended to optimize medical choice such that error is minimized and efficiencies are found. Early versions of these products became available in the late 1950s (Miller, 2009); with the advent of cheap and widely available computing, interest in CDSS has exploded. Literally thousands of medical apps are now available for mobile devices, electronic health information systems generally come with the promise of decision support, and the concept is ubiquitous in modern culture.

Medical error is a huge problem, and one which decision support seems well suited to answer. It is a bit frustrating, then, to see that the evidence of benefit from CDSS is relatively insipid.

In 1998, a systematic review of CDSS revealed that while 60% of studies on drug dosing systems and 74% on preventative care systems showed positive effects on physician performance, only 42% of studies showed benefits to patient-oriented outcomes. Diagnostic support was particularly troubling; only 20% of these studies documented evidence of benefit (Hunt, Haynes, Hanna, & Smith, 1998). In 2012, Bright and her colleagues performed another systematic review (Bright, et al., 2012), revealing little evidence of benefit for length of stay, mortality, or risk of adverse event. Only modest impact on morbidity was found. CDSS did appear to be effective at improving the health care process; the delivery of recommended treatments, studies, and preventative care appeared better with the systems than without them. However, 14 years after Hunt's initial systematic review, Bright and her colleagues found that there was still insufficient literature to assess the effect on user knowledge, clinician workload, physician efficiency, or patient satisfaction (Bright, et al., 2012). A review in 2010 by Lau, more generally aimed at health information systems, demonstrated that while medication errors were reduced and preventative care was somewhat improved, these systems did not lead to improvements in resource utilization, healthcare cost or patient oriented health care outcomes. Thirty percent of studies demonstrated a negative effect on provider time efficiency; that is, the use of the system actually slowed the clinician down (Lau, Kuziemsky, Price, & Gardner, 2010). A more recent review concluded that "the majority of CCDSSs demonstrated improvements in process of care, but patient outcomes were less likely to be evaluated and far less likely to show positive results" (Sahota, et al., 2011).

The evidence, in other words, that decision support improves the health of patients, efficiency of clinicians or the cost of health care is slim at best. "Better patient outcomes, faster care, reduced resource expenditure or some combination" does not seem to be a promise we are fulfilling.

Why is there so little consistent evidence of benefit for decision support systems?

One answer may lie in the quality and nature of the literature. Systematic reviews tend to lump together disparate systems (Berlin, Sorani, & Sim, 2006). Those that demonstrate excellence might be lost in the great mixing pots that reviews and broad based surveys become; any conclusions regarding efficacy from these reviews are dubious at best. As well, although things are improving, the quality of academic writing regarding benefits and risks of decision support has been notably poor. Descriptive articles or case studies are much more common than controlled clinical trials, and even these often suffer from inadequate statistical power (Lau, Kuziemsky, Price, & Gardner, 2010). Such studies do not offer much to a systematic review of the literature.

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