

Clinical Decision Support Systems Use in Wisconsin

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ABSTRACT

Context: Clinical decision support systems (CDSS) are becoming increasingly common in medical practice.

Objective: To assess utilization, level of interest, and potential barriers to implementation of CDSS among physicians providing inpatient care in Wisconsin.

Design and Participants: A Web-based survey consisting of 20 questions e-mailed to 5783 members of the Wisconsin Medical Society.

Results: Of those contacted, 496 (9%) responded and 356 (72%) were eligible for the survey. According to 38% of respondents, CDSS were in place in their facility; less than a third were computer-based. Few existing users of CDSS reported being dissatisfied (2%) although 38% of the respondents were unfamiliar with CDSS or their use in medical practice. Most (79%) described themselves as receptive to new decision support tools, though the most commonly anticipated barrier to implementation was physician acceptance.

Conclusions: CDSS are used in limited capacity in Wisconsin and existing systems are not likely to be computer-based. Despite physicians expressing a generally favorable interest in CDSS, a knowledge gap persists.

BACKGROUND

Nearly 50 years ago, researchers suggested that computers may soon play an important role in medical decision making.¹ In 1961, Warner and colleagues proposed

and evaluated a mathematical equation to aid in the diagnosis of congenital heart disease.² Clinical decision support systems (CDSS) followed naturally from this early work, with paper-based algorithms and eventually computer software to “assist in the analysis of data to assist decision making.”³ They have been designed to “provide the clinician...with clinical knowledge and patient-related information intelligently filtered ...to enhance patient care.”⁴

In early 2004, US President George W. Bush released the administration’s “Health Information Technology Plan,” challenging the industry to outfit Americans with an Electronic Health Record (EHR) by 2014. As computerized CDSS compliment advances made by the implementation of EHRs, one can expect that CDSS will rapidly evolve in the fields of diagnosis, preventive medicine, disease management, and prescribing practices.⁵ Regional measures on the use and receptiveness of existing CDSS remain largely unknown and studies are often restricted to individual software products or within particular institutions. The aim of this survey was to assess utilization, level of interest, and potential barriers to implementing CDSS among physicians currently providing inpatient services in Wisconsin hospitals. The survey was conducted as part of a larger grant-funded initiative targeting antimicrobial resistance in the inpatient setting. Partners in the initiative included Wisconsin Antibiotic Resistance Network (WARN), The University of Wisconsin Office of Continuing Professional Development, CME Enterprise™, and Healthcare Performance Consulting™. This survey was submitted to the Marshfield Clinic Research Foundation’s Institutional Review Board and deemed to be IRB exempt.

METHODS

The 20-question, multiple-choice, anonymous survey was developed by the authors and piloted to 15 physicians to assess comprehension and usability. Survey questions were mandatory, not allowing for incomplete responses. Participants completed the survey on-line,

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Table 1. Physician Perceptions and Attitudes about CDSS

Statements	Disagree	Somewhat Disagree	Neither Agree Nor Disagree/ No Opinion	Somewhat Agree	Agree
I am familiar with what CDSS are and how they are used in clinical practice.	24%	14%	12%	29%	21%
I am in favor of utilizing CDSS whenever possible in delivering patient care.	7%	9%	36%	31%	17%
I feel that CDSS have the capacity for improving patient care.	4%	2%	28%	38%	28%
I am open to learning/using new CDSS.	3%	1%	16%	38%	41%
My institution has the internal capacity and information technology resources required to successfully implement computerized CDSS.	11%	10%	27%	28%	24%
My institution is committed to investing greater resources in CDSS in the next 5 years.	6%	6%	52%	18%	18%

CDSS=clinical decision support system; N=356 respondents

using the on-line survey provider Zoomerang™ (www.zoomerang.com). The survey utilized “skip-logic” whereby the survey remains linear for all participants, but specific answers may “skip” a participant ahead, eliminating the need for censored responses or unnecessary questions. The survey focused exclusively on those providing direct care to hospitalized patients and, as such, respondents were first asked whether their practice involved inpatient care. Persons selecting “No” were thanked for their participation and not allowed to continue the survey. Remaining respondents were asked to assess their attitudes about CDSS using a 5-point Likert scale and to indicate perceived obstacles likely to prevent their facility from successfully implementing future CDSS. Physicians were also asked their specialty area, years in practice, facility bed size, and type of community (urban/suburban or rural). Participants were asked if their primary inpatient facility currently uses some form of CDSS. Those responding “Yes” were asked more specific questions about their CDSS in terms of delivery (computer, paper, or a combination), clinical modules affected, and user satisfaction. Lastly, all participants were offered the opportunity to leave comments (not mandatory).

Clinical decision support systems were defined, for the purposes of this survey, as “a tool (paper or more commonly computerized) used by health care providers to guide individual level practice and may include therapeutic or diagnostic algorithms.” This definition was available on every page of the survey mentioning CDSS and included a non-proprietary paper-based example of 1 type of CDSS.⁶ The initial definition included a link whereby the respondent could review additional information on decision support systems, including several more examples. Although it is common to limit the def-

inition of CDSS to computer-based systems, noncomputerized modes were included to more fully assess the utilization of decision-making tools in Wisconsin.

With an introductory note authored by the CEO of the Wisconsin Medical Society (Society), a link to the survey was e-mailed to 5783 available Society members on September 15, 2006, with a reminder sent a week later. The survey was closed to respondents on October 16, 2006. Completed surveys were reviewed and results were analyzed using descriptive statistics such as proportions.

RESULTS

A total of 496 physicians responded to the survey, 356 (72%) of which self-identified as providers of inpatient care. The majority of respondents reported being in practice for more than 10 years (>20 years [37%], 10-20 [26%], <10 years [26%]). Resident physicians comprised 12% of the respondents. Internal Medicine/Family Medicine practitioners were the most well-represented (39%), while medical subspecialists (24%) and surgeons (22%) comprised the majority of the remaining respondents. Physicians were more apt to report practicing at urban/suburban area facilities (67% or 239/356) with fewer than 250 beds (63% or 226/356).

A large portion of the respondents (38% or 134/356) stated that their facilities utilized some form of decision-support, while a lesser number indicated that their institution did not (26%). The remaining 36% were uncertain whether such systems were in place. Users expressed approval of systems within their own institutions, with only 2% reporting themselves to be dissatisfied or somewhat dissatisfied. The availability of CDSS did not meaningfully differ by dichotomized bed size (<250 beds versus >250 beds) or years of physician

Table 2. Excerpts of Select Physician Comments*

1. "I do not want to see 'cookbook' medicine and sometimes the algorithm fosters that kind of thinking where a physician cannot 'think out of the box.'"
2. "Using algorithms to replace cognitive function will only lead to a dumbing down of the system, as economics forces practitioners to take short-cuts."
3. "It doesn't take into account the full diversity of the patients and that's where the potential liability lies."
4. "I don't know what CDSS is. I guess that makes me old."
5. "If CDSS will really make patient care safer and medical practice more accurate and efficient, I'm all for it."

CDSS=clinical decision support system.

* All respondents to the survey were offered the opportunity to comment. There were 47 comments received.

practice. Among those with CDSS, only 29% (39/134) reported that such systems were computer-based while 20% reported the coexistence of computerized physician order entry (CPOE). Over a third of CDSS users (37%) reported measuring patient outcomes pre- and post-implementation of the decision support tools. In terms of the specific clinical situations for which CDSS is used, infectious disease-related modules (antimicrobial selection, pneumonia, bloodstream infections, or urinary tract infections) were less commonly supported by decision support systems (66%) than non-ID modules (ventilator management, cardiovascular medicine, diabetes, or anticoagulation therapy management) (89%).

All eligible participants were asked several questions regarding their perceptions of CDSS and their institutions' capacity for future development (Table 1). Only half of survey respondents indicated a working knowledge of CDSS, yet a small number responded negatively to learning or using such decision tools. Though most respondents felt CDSS had the capacity to improve patient care, 52% were unaware of any anticipated investment within their own institutions. One in 5 respondents felt that their facility may lack the capacity for development and implementation of such systems. The 2 most commonly cited barriers to future implementation were lack of acceptance by physicians (55%) and lack of knowledge about CDSS (19%).

At the end of the survey, respondents were offered the opportunity to leave comments. Highlights are available in Table 2. Of the 47 comments entered, a recurring theme centered on variations of CDSS creating a "cookbook medicine" climate.

DISCUSSION

This survey describes the current status of the use of

CDSS in Wisconsin hospitals as reported by physicians. The results of the survey were mixed, with nearly 40% of respondents stating that such systems were in use within their facilities, while half were unfamiliar with CDSS. Factors such as institutional size or duration of practice were unrelated to the use of such systems, the latter in support of findings by Gardner and colleagues.⁷ Established CDSS were less commonly reported for infectious disease modules than others, despite the tremendous potential for their use in such areas as antimicrobial management strategies and sentinel event alerts.^{8,9}

A recent review of 100 clinical trials revealed that while practitioner performance and adherence to guidelines are commonly improved through the use of CDSS, favorable patient outcomes have not been extensively evaluated and, when studied, results have been inconsistent.⁶ Despite the positive views of CDSS, including a willingness to learn new technologies, lack of acceptance by physicians was the most commonly cited barrier to future implementation efforts.

Though a small number of physicians expressed concern about CDSS, Gardner and colleagues found that most physicians believed that such tools did not reduce physician decision-making power.⁷ These concerns have prompted 1 group to recommend that decision support tools incorporate a certain degree of flexibility for physician override.¹⁰

The survey included paper-based systems in its definition of CDSS, and in an effort to avoid proprietary endorsement, used a non-computerized model as an example. This definition was utilized with the intent to broaden the scope of the assessment in hopes of expanding the dialogue beyond technology alone but may have caused respondents to be more cognizant of paper-based systems. In a systematic review, Garg and colleagues suggested that non-computerized systems may "be equally or more effective in improving care and reducing medical errors."⁵ If only computerized versions are recognized as CDSS, the prevalence in Wisconsin is diminished to only 11%, suggesting an overall disconnect between the promise of health care information technology and existing practice in Wisconsin hospitals.

The target population for this survey consisted of Wisconsin physicians providing inpatient services, yet there was no discernible method to sample this group. Therefore, the Society membership roster served as a proxy, resulting in an unnecessarily large sampling frame and the inability to compare contacts with the target study group. Findings are restricted to the inpatient set-

ting and results may differ among physicians providing services in the ambulatory care setting. By disseminating the survey via e-mail, a degree of selection bias may have occurred as respondents may be more accepting of technology. The overall response rate of <10% may have had a limited effect in terms of response bias, as a previous study showed results of information technology surveys among physicians to not be adversely impacted by a poor response rate.¹¹

Given the relative lack of computer-based systems and the receptiveness of respondents, now is an opportune time to strategically plan for the future. Previous studies have described components of successful CDSS implementation strategies to include building strong technical foundations, anticipating user needs, fitting into existing workflows, and critically evaluating clinical and financial outcomes.^{10,12} As described by Wears and Berg in 2005, CDSS and similar IT acquisitions should be on “an organizational change trajectory.”¹³ If future CDSS are implemented in the absence of effective organizational change management, the positive views expressed by participants in this survey will likely dissipate rapidly.

CONCLUSION

In general, decision tools have been introduced to Wisconsin hospitals, though computerized CDSS remains in limited use and many physicians are not fully aware of this new technology. Advances in EHR and CPOE are likely to impel computerized decision support tools to become a standard of care. Identifying and developing systems based on user requirements, combined with effective organizational planning, will be essential to sustainable success.

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