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## Computer Decision Support Tools in Primary Care

Peter Hoonakker<sup>a,\*</sup>, Adjhaporn Khunlertkit<sup>a</sup>, Matthew Tattersal<sup>b</sup>, Jon Keevil<sup>b</sup>, and Paul D. Smith<sup>c</sup>

<sup>a</sup>Center for Quality and Productivity Improvement, University of Wisconsin-Madison, 3128 Engineering Centers Building, 1550 Engineering Drive, Madison, WI 53706, USA

<sup>b</sup>Department of Medicine, University of Wisconsin-Madison, 600 Highland Avenue, Suite H6 336, Madison, WI 53792, USA

<sup>c</sup>Department of Family Medicine, University of Wisconsin-Madison, 1100 Delaplaine Ct., Madison, WI 53715, USA

### Abstract

Computer Decision Support Tools (CDSTs) can support clinicians at various stages of the care process and improve healthcare, but implementation of these tools has been difficult. In this study we examine the need for, the use of, and barriers and facilitators to the use of a CDST from a human factor perspective. Results show that there is a need for CDSTs, and that physicians do use well-developed CDSTs. However, there are also barriers against the use, such as usability issues and problems fitting them into the clinical workflow.

### Keywords

Health Information Technology; Computer Decision Support Tool; Usefulness; Usability; Workflow

## 1. Introduction

Health information technology shows great promise for improving the efficiency, quality, and safety of medical care. Electronic health records (EHR) have the potential to facilitate patient care and benefit clinicians by improving access to information at various service points within the system. Computer provider order entry (CPOE) with *clinical decision support tools* (CDST) has been shown to decrease medication ordering errors [1]. There are several CDS tools such as: Computerized alerts and reminders, clinical guidelines, order sets, patient data reports and dashboards, documentation templates, diagnostic support, and clinical workflow tools.

CDST can provide support to clinicians at various stages in the care process, from preventive care through diagnosis and treatment to monitoring and follow-up, but results with CDST implementation have been mixed. CDSTs have been found to improve measures of clinician performance in the diagnosis [2, 3], prevention and management [4] of a number of different health problems. CDST systems can improve clinical practice and prevent adverse drug events [5]. Despite these benefits, there are many barriers to successful CDST implementation [6, 7]. Although several different CDSTs exist in health care, most have been *unsuccessfully* implemented in clinical practice [6]. In addition to intrinsic

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\*Corresponding author. phoonakker@cqpi.engr.wisc.edu.

characteristics of the CDST, incorporation and integration in the clinical workflow remains one of the largest barriers to success [8].

In this study we examine a CDST in family practices from a human factor perspective. We examine the need for a CDST to assess the risk of a cardiac event in the next 10 years; we assess the current use of such tools, and we examine barriers, barriers, and possible improvements to a specific tool, HeartDecision (HD), to assess cardiac risks.

HD is an easy to use online assessment tool, both in a stand-alone version and as part of an Electronic Health Record (EHR) system. The tool consists of 6 web pages: (1) Data Entry Page (automatically populated as part of the EHR); (2) a Risk Page that displays the risk of a cardiac event in the next 10 years; (3) a Goal Page that summarizes the specific risks (e.g. triglycerides are high) and possible causes for these risks (e.g. elevated triglycerides are associated with elevated body weight, a diet high in carbohydrates, including alcohol, and genetic disorders); (4) an Ideal Graph Page that graphically represents the risk in the next ten years that also allows for manipulation of several variables (e.g. blood pressure, triglycerides, etc.) that are used to calculate the risk; (5) a Hand Out Screen on which several hand-outs can be selected, such as information on fish oil capsules, etc, that can be printed out and handed to the patient, and (6) a Summary Page, that summarizes the information for patient and physician..

## 2. Methods

### 2.1. Setting

The study was performed with the aid of the Wisconsin Research and Education Network (WREN), a network of primary care clinicians in the state of Wisconsin; the Department of Family Medicine (DFM); and the Department of Medicine (DOM) at the University of Wisconsin. WREN consists of more than 40 practices and over 100 clinicians in 24 communities, from 17 different healthcare organizations distributed across Wisconsin in an array very similar to the distribution of Wisconsin's population.

### 2.2. Design

Data was collected in a cross-sectional design, using a time study, observations, and interviews during a standardized patient visit in the clinics; and a web-based questionnaire. Use data was also collected, but not used in this paper.

### 2.3. Sample

The time study, observation and interview data was collected in 8 clinics of the WREN network. Questionnaire data is collected in the Department of Family Medicine (DFM) and the Department of Medicine (DoM). In this paper we use the preliminary data of 130 physicians (response rate 31%) who filled out the survey: 78 faculty, 33 residents, 13 interns and 5 others. Questionnaire data collection is still ongoing.

### 2.4. Data collection instruments

A stop watch was used to measure the time the physicians spent on the different pages of the tool. Physicians were observed by both a human factors specialist and a medical specialist. At the end of the standardized patient visit the physicians were asked several questions about the use of the tool.

**2.4.1. Questionnaire**—We developed a questionnaire that was part based on existing questionnaires that have been proven to be valid and reliable in previous research [9, 10], and partly based on the results of the observations and interviews to collect additional

information about the need for such tools, use of the tool, barriers against use of the tool, facilitators, and possible improvements.

### 3. Results

#### 3.1 Time study

Results of the time study in the 8 clinics are shown in Figure 1. Results show that during the standardized patient visit, the physicians spent on an average nearly 13 minutes using the tool.

#### 3.2. Observation and Interviews

Most primary care physicians found the tool easy to use, and had apparently few problems navigating the tool. They made comments about aspects of the tool that they liked and did not like: “It’s useful. The graphic display I think is useful. It is a little slow. I mean, we had to wait maybe 15, 20 seconds for it to come up. It’s very nice that it sort of incorporates the existing values, kind of, you know, so I don’t have to re-enter data”. “Each time I use it I discover sort of new things about it, which is, is kind of neat, so I think it’s one of those things you get as much out of it as you put into it. You know, the more, the more you work with, with it and with patients using it, you kind of just go wow”. But there were also some barriers against the use of the program: “Ninety percent easy and then the 10% that wasn’t easy being things like, if I wanted to go back and put in a cholesterol level of 300, I didn’t quite know how to do that”; “Yes. I mean that is what I have found is usually a tax on more time”; and “So, the one part is the data. Why can’t the blood sugar just flow in? Why do I have to go look for it? Okay, that drives me a little crazy”.

#### 3.3. Questionnaire

Results show that most of the respondents use the HD tool, either as part of the EHR or online (see Table 1). Twenty-nine percent use another online tool. Some respondents use paper to calculate the risks (7%), and other respondents never calculate these risks (15%).

Respondents use the tool relatively frequently: nearly half of the respondents (42%) use the tool at least 2–3 times per month (see Table 2).

**3.3.1. Facilitators, barriers and improvements**—In the questionnaire 35 questions were asked about possible facilitators, barriers against CDSTs, and possible improvements to the tool. Results show that overall respondents like the tool, and especially the fact that data are automatically populated (Table 3); that the biggest barriers against using the tool is that physicians sometimes they have to go back to the EHR system for additional data; that they experience time pressure when using the tool; that the tool is occasionally delayed, and that they forget about it (Table 4). Finally, respondents also had suggestions for improvement (Table 5), such as alerts, being able to print out the information on the different web pages, and suggestions for treatment/medication.

### 4. Discussion

Results of this study show that there is a certain need for Computer Decision Support Tools such as HeartDecison (HD). Most of the physicians in the sample have either calculated the risks on paper or used a tool like HD. Most of the respondents have actually used the HD tool, either as part of the EHR or the online version. Results of the time study showed that on average, physicians spent 13 minutes using the tool, which is too long for a regular patient visit, which lasts on an average 10 minutes [11].

Results of the observations showed overall, physicians had little trouble using the tool, although they were not always 100% sure about all the functionalities on the different web pages. Results of the interviews confirmed the observations. A large majority of physicians (98%) indicated that they liked using the tool and 94% indicated that the tool was easy to use. However, they also pointed out some barriers against using the tool, such as the lack of a list of medications the patient is currently on, and the fact that they sometimes had to go back to find additional data.

Based on the observations and the interviews, we developed a questionnaire, in order to quantify the results of the limited (N=8) observations and interviews. Results of the questionnaire survey confirmed most of the findings of the observations and interviews.

Overall, results of the questionnaire study show that most of the respondents liked using the tool. The tool is relatively easy to use and avoids duplication such as data entry. Data is automatically populated from the EHR. However, there are also several barriers against using the tool. A main barrier is that the tool is relatively time consuming and thus it is difficult to fit in a physician's workflow. Second, despite data being automatically populated by the EHR, physicians sometimes need to go back to obtain additional information. Third, occasionally the tool is delayed. Finally, respondents had several suggestions for improvement such as making the different pages in the tool printable, providing automated alerts in the EHR when a patient has a certain risk for a cardiac event, and recommendations for treatment.

#### 4.1. Improvements

One of the main barriers against use of the tool is that it is relatively time consuming. Physicians only have only about 10 minutes to see a patient, unless it is a follow-up visit. Therefore, the designers of the tool have decided –based on the results of this study- to redesign the tool. The newly designed tool will be simpler, and necessary information will be displayed on one page. This does not mean that the underlying structure of the tool will change dramatically: physicians still have access to the different pages, but only if they choose to go to those pages by clicking a link on the main page. More recommendations will be added to the tool.

#### 4.2. Study limitations

Evidently the sample size for the time study, the observations and the interviews was small (N=8). However, by using a questionnaire in order to quantify the data in the qualitative part of the study, we were able to confirm most of the results.

Response rate for the questionnaire was relatively low (31%), and particularly in the Department of Family Medicine (24%). The literature shows that response rates for physicians in survey research are often low. Based on a review of the literature, Asch et al. [12] calculated an average response rate of 54% in 68 studies. Results of a second review by Asch et al. [13] showed that responses are especially low for staff-model HMO physicians and solo practice physicians (38% and 35% respectively).

#### 4.3. Conclusion

Results of this study show that Computer Decision Support Tools can play a role in healthcare, provided that they are adapted to the needs of the users. The tools need to be useful, easy to use, and have to fit in the physician's workflow. In this study medical specialists and human factors specialists teamed up to test a tool, and based on the results of this study, the tool will be redesigned.

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### Time (in minutes) spent in HD

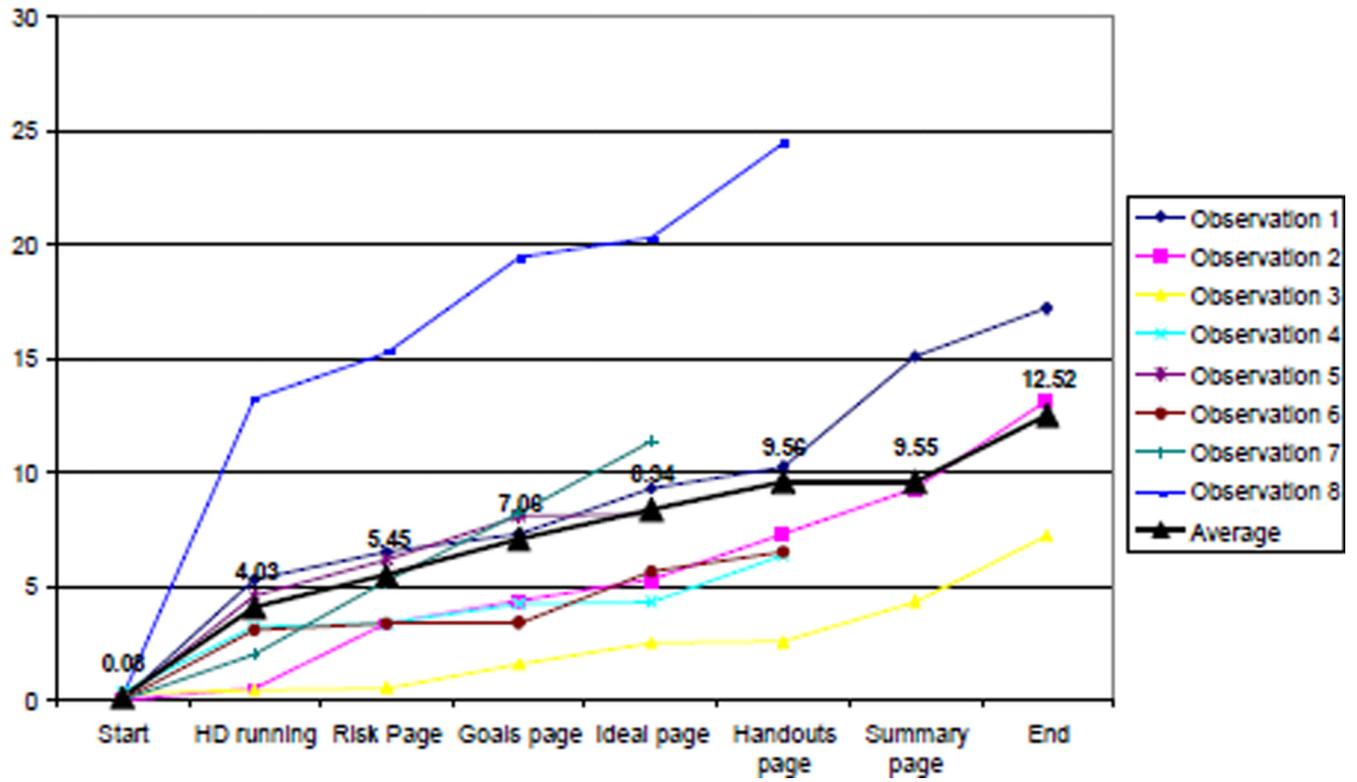


Figure 1.  
Results of the time study

**Table 1**

Do you regularly calculate your patient's cardiovascular risk manually or with the aid of an online tool (Please check all that apply)?

No	15%
Yes, manually on paper	7%
Yes, with an online tool other than HeartDecision	29%
Yes, with the HD tool as part of the EHR	53%
Yes, with the HD online (website)	8%
Other	2%

**Table 2**

How frequently do you use the HeartDecision tool?

Never	38%
Less than once a month	14%
Once a month	7%
2–3 Times a month	18%
Once a week	8%
2–3 Times a week	14%
Daily	2%
Total	100%

**Table 3**

Facilitators, average score on a scale from 1 (strongly disagree) to 5 (Strongly agree)

1. It is convenient that all patient data are automatically populated into the tool.	4.81
2. I understand the purpose of the HeartDecision tool.	4.76
3. I like using the Heart Decision tool.	4.73
4. I like that you can use the (ideal) graph to show patients what happens if for example they reduce their cholesterol	4.54
5. I like the hand-outs (information on diets, exercise, smoking cessation, etc.) in the tool.	4.41

**Table 4**

Barriers, average score on a scale from 1 (strongly disagree) to 5 (Strongly agree)

1. I often have to go back to the EHR to access the patient's list of medications.	3.48
2. I feel like I am under time pressure when I assess a patient with the HeartDecision tool.	3.25
3. Often I have to go back to the EHR to obtain additional information when I use the tool.	3.17
4. When I open up the tool, the tool is occasionally delayed.	3.11
5. I often forget to use this tool with appropriate patients.	2.90

**Table 5**

Improvements, average score on a scale from 1 (strongly disagree) to 5 (Strongly agree)

1. It would be helpful to print out the information on the Summary Page.	4.20
2. It would be helpful if the (Ideal) Graph could be printed.	4.10
3. It would be helpful to add medication recommendations to treat cholesterol in patients with certain risk in the tool.	4.05
4. There should be an alert in the EHR to notify me that a patient has an increased risk of a cardiac event.	3.50
5. It would be helpful if the EHR had an alert noting a high risk of a cardiac event, or cholesterol above goal.	3.5