Physician Attitudes about Patient-Facing Information Displays at an Urban Emergency Department

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Abstract

Hospital information systems have primarily been designed to support physicians and administrators, though recent research has explored the value of patient-facing information displays. Electronic systems can be designed to provide tailored information to patients on their health, their care teams, the status of their hospital stays, and their expected care plans. However, this direct delivery of information from database to patient represents a fundamental change to the traditional flow of clinical information. We therefore explore physician attitudes toward a proposed patient-facing display of information abstracted from a hospital EHR, in the context of an urban emergency department. We find that physicians generally support direct delivery of electronic information to patients, and uncover important concerns to consider in the design of patient-facing information systems.

Introduction

Interest has been growing in extending traditional hospital information systems to directly share information with patients. For example, Personal Health Record (PHR) systems allow patients to access information from their medical records online. Researchers have addressed questions of sharing and security in PHRs[1-4] and have demonstrated that PHRs can bridge critical gaps in continuity of care[5].

However, there has been limited research exploring the sharing of health information with patients *during* hospital visits. Patient-facing views into Electronic Health Record (EHR) systems can provide patients with information on their health, on the expected flow of clinical activities, and on the identity of their care teams during a hospital stay. Such sharing of information can provide unprecedented opportunities to educate patients, and, more generally, to better engage patients and their family members in care planning. Early research in this area has explored the challenges of and opportunities for sharing health information drawn from a hospital EHR with patients prior to their discharge[6-8].

The benefits of direct, automated information sharing come at a cost, however: providers are removed as information filters between patients and their medical data. Concerns arise around patient comprehension of information, liability, and the altered role of physicians and nurses.

In this paper, we explore attending physician attitudes about the ongoing sharing of information drawn from the hospital EHR during visits to an emergency department (ED). We report results of a survey completed by 22 physicians in a large, urban ED, following a trial deployment of patient-facing displays. The survey was designed to explore the following research questions:

(1) Are physicians willing to allow direct, automatic information sharing with patients during clinical visits?

(2) What types of information are physicians concerned about sharing on an information display with patients during visits, and why?

We discuss related research, describe our survey and key findings, and conclude with a discussion of the implications of the results.

Related Work

Several research systems that enable direct information sharing with patients in clinical settings have recently been developed. The Virtual Nurse project uses an intelligent agent to present discharge information[6]. Wilcox et al. present formative studies addressing the design of patient-centric, in-room information displays[7]. Jones assesses the value of educational kiosks at the point of care[9].

Other work has examined patient and physician responses to sharing paper charts with patients in various ambulatory and inpatient settings. Ross and Lin reviewed and aggregated this work[10], and found a modest benefit to such information sharing, but call

Figure 1. Patient-facing information display used in survey (anonymized).

for additional research. Winkelman and Leonard further identified structural characteristics influencing patient utilization of medical records and proposed an evaluation framework for patient-centered health record structure[11].

Survey Methodology

In designing our study, we drew from accounts of early experiences designing PHR systems. In particular, Halamka et al. highlight salient design considerations for sharing medical record contents with patients via online PHRs[2]. They describe candidate information types found in the medical record, such as the patient problem list, medication list, medical history, diagnostic test results, and clinical notes, and they discuss the unique challenges associated with each information type when made accessible to patients online.

In our survey, we aimed to examine these considerations and challenges in the context of real-time information sharing throughout an ED visit via personal, patient-facing computer displays. We also sought to understand opportunities and challenges around new information types that are unique to a real-time display, such as care team information and information about a patient's physical location within the hospital.

We conducted our study in a large, tertiary care hospital in the Washington, DC area. The 40-bed ED primarily supports an urban and underserved population. The survey was approved by the appropriate internal review board, and reviewed by two non-participating experts for content validity.

The survey described a patient scenario representing a common ED presentation: a 52-year-old male with persistent chest pain, whose vital signs and relevant lab values are within normal limits. The proposed patient information display (Figure 1) contained data stored in the hospital EHR, as well as information that could be composed through additional inference and cross-reference with supplemental databases (e.g., images of care team members). We presented information related to the status of the patient visit, such as what was expected next. This information was composed by inferring expected tasks based on current orders (e.g., if labs had been ordered, expected tasks include specimen collection, lab analysis, and lab review by a physician). The display was proposed with the inclusion of patient privacy controls (i.e., the patient could choose whether or not to use the display and could turn the display off at any time).

The proposed display was meant to generate responses to specific candidates for information to be displayed to patients. It contained varying levels of information: information typically relayed to the patient verbally (e.g., steps in work-up and next steps in care), information found in specific fields in the medical record, and associated metadata. For example, if a lab had been ordered for the patient, the name of the lab would be listed on the information display, along with the time that the lab had been ordered and other timestamps related to the progress and current state of that order.

The display included the following categories and subcategories of information: *Your Profile* (confirmation that past medical history was examined, allergies, and summary of medications taken at home), *Your Visit* (an outline of expected and completed steps in care), and *Your Care Team* (names, titles, and images of the care team members assigned to the patient). The survey included a combination of closed- and open-format questions about projected utility, sensitivity, and appropriateness of the level of detail of the information. The closed-format questions asked participants to indicate their willingness to allow each of the available information types to be shared automatically with patients (willing or unwilling). For information types related to lab results, participants could indicate "only after speaking with the patient". Tables 3 and 4 in the Results section include the specific information types listed. Open-

Which section of the information display (e.g., "Your Health Profile", "Vitals", etc.) do you think the patient will find most useful? Why?
Are there sections of the information display that you are concerned about showing to the patient? If so, why?
Which section do you think the patient will find the least useful? Why?
Do you think that the word choices and phrasing used in the information display should change? If so, what headings or items would you change and how?
Does the information display match the topics and level-of-detail that you typically discuss with the patient? How does it follow or differ from the way in which you structure your discussions with patients?
Do you think the information on the display is too detailed? Or not detailed enough?

Table 1. Survey questions eliciting opinions about information categories.

format questions solicited participants' rationale for these responses (Table 1).

Additionally, the survey asked open-format questions to collect further suggestions and considerations for an electronic patient-facing information display. These questions requested additional sections or information types to include, structural modifications, and alternative phrasing, and asked participants to annotate the sample display with any feedback.

Results and Discussion

Attending physicians present at departmental staff meetings (n=31) were given the option to participate in a six-page written survey. 24 physicians agreed to participate, and 22 physicians (71%) completed the survey. Participants included twelve male and ten female physicians. Eight participants were under 34 years of age, eleven between 35 and 44, and three between 45 and 54. Participants had a wide range of clinical experience, from three to 27 years of practice.

What's Next	6	Your Health Profile	2
Your Vitals	4	Medications (given in ED)	1
Current Status	3	All in *Your Visit*	1
Reason For Visit	2	All	1
Your Care Team	2	Labs (not section specific)	1

Table 2. The number of participants selecting each information category as most important to the patient. Some participants mentioned multiple categories as being most important.

Physicians concur with patients in assessing the most important information display category.

Table 2 summarizes participants' selections of the most important section of the display. "What's Next" was most frequently selected as the most important section of the display to the patient. This corresponds to the category section that *patients* indicated as being the most important during a study conducted on a similar set of displays[9].

Overall, physicians were willing to allow automatic information sharing.

Tables 3 and 4 indicate participants' willingness to allow each information type to be shared automatically with patients on an information display. Table 3 presents results for general information types, Table 4 for specific information about lab results. These responses demonstrate that the perceived net benefit of information sharing—in terms of increased patient engagement and information availability—outweighed potential drawbacks. Vital signs, medication information, and care team information were almost ubiquitously assessed as appropriate information categories for automatic sharing.

Physicians were more cautious about sharing lab results and time estimates than other information categories.

As indicated in Table 4, physicians were more willing to have information about labs (other than simple timestamps) available on in-room displays *after* speaking with the patient than *before*. Open-form responses suggest that this can be largely

Preferences for sharing proposed information categories on display	Vital signs at triage	Vital signs updated periodically	Names of medication given	Reason for medication	Names of care providers or teams consulted	Computed estimate: time until lab or procedure results available	Computed estimate: time until result reviewed
I would share this information	(21) 95%	(20) 91%	(22) 100%	(21) 95%	(22) 100%	(18) 82%	(11) 50%
I would not share this information	(1) 5%	(2) 9%	(0)	(0)	(0)	(4) 18%	(10) 45%
				1 unanswered			*1 unanswered*

Table 3. Physicians' willingness to allow general information types to be shared automatically with patients.

Preferences for sharing details of laboratory progress on display	Labs ordered by name (e.g., "Basic Metabolic Panel", "CHEM8", "Liver Function Tests")	Time specimen received	Time lab results stored	Quantitative lab results (e.g., "CBC: Hemoglobin: 14.5 gm/dL")	Descriptive lab results (e.g., "Elevated BUN", "Low Hemoglobin", "High Potassium")	Time lab results reviewed
Either before or after speaking with the patient	(9) 41%	(9) 41%	(11) 50%	(6) 27%	(7) 32%	(11) 50%
Only after speaking with the patient	(11) 50%	(3) 14%	(4) 18%	(7) 32%	(10) 45%	(4) 18%
I would not share this information	(2) 9%	(9) 41%	(7) 32%	(9) 41%	(4) 18%	(7) 32%
		1 unanswered			*1 unanswered*	

Table 4. Physicians' willingness to allow specific information about lab results to be shared automatically with patients, with the option of indicating "only after speaking with the patient".

attributed to concerns about patients' inability to interpret numeric values. This raises a key challenge for subsequent research: automatic information sharing may be more feasible and more agreeable to physicians when some level of automated interpretation can be layered above low-level results.

A similar trend can be seen in the last column of Table 3: physicians are more concerned about sharing automatically-computed estimates of the time required for them to review test results. Wait times are of particular concern to patients, so physicians' caution in having this automatically presented suggests a particular tension between a key information category and physicians' preferences. This points to the need for further research on the development of methods for both accurate estimation of required times and carefully-designed guidelines for presentation of those estimates.

Participants suggested several additional content candidates and functionality.

Suggestions for additional content included information pertinent to navigating practical aspects of the current visit (food availability, restroom location, care provider roles), as well as personalized educational information, detailed medication summaries, and hospital activity information and wait time estimates (number of current ED patients, estimated time until bed is available). Participants also suggested interactive functionality (beyond EHR content presentation), which included bookmarking capabilities to assist patients in noting questions.

Some physicians were hesitant to share information automatically, highlighting important design concerns.

The survey findings highlighted a separation of physicians into those with a propensity toward sharing detailed information (14 of the 22) and those who preferred to suppress detailed information from the display (8 of the 22). Although most physicians were supportive of automatic information sharing, members of the latter category—those who are more hesitant—offer important insights that can guide the design of safe, trusted patient information displays, and ultimately accelerate their adoption. We explored the responses of these physicians and found six primary motivations for suppressing information.

1. *Patient protection*

Some physicians were concerned that certain information types might unnecessarily escalate patient anxiety (e.g., vital sign measurements that are higher than expected).

Furthermore, concerns arose around "information overload", in particular that providing too much information may disengage a patient from general involvement in his or her care, or distract them from information critical to decision-making.

Respondents highlighted the domain knowledge required to correctly interpret information—particularly lab results—and the risk of confusion and anxiety that may arise from examining results without such domain knowledge.

2. *Adverse effects on patient behavior*

Some participants expressed concern that patients could respond irrationally to information delivered in the absence of a provider, potentially including anger targeted at providers. In these cases, concerns around providing physician names were significant: some participants felt that the persistent availability of provider names and photos could exacerbate hostility.

Similarly, some participants feared that excessive information could lead to hostility and mistrust of physicians, (e.g., that patients would demand explanations that they believe fit the data).

3. Mistrust of technology

Some participants expressed concerns that information may be incorrect in certain cases, leading to question profusion, patient dissatisfaction, and patient misinformation.

This concern was particularly prevalent for the only information category we presented that required artificial intelligence: time estimates. Physicians were cautious about the automatic estimation of wait times, even those who were generally supportive of automatic information presentation.

4. Added workload and cost

Some participants expressed concern that information displays will require extended explanations by caregivers, negatively impacting ED efficiency.

Similarly, concerns arose over question profusion about usage and maintenance of the display itself; the introduction of new technology into the clinic often places additional perceived responsibility on providers.

Furthermore, some participants highlighted the potential expense of human monitoring and management that comes with the deployment of any new technology.

5. Liability concerns

Concerns arose over liability, namely that patients will be more likely to question physician actions in light of increased access to data.

6. Disapproval of hospital procedure

Responses indicated concern that patients without knowledge of the demands on hospital resources will disapprove of their care progress (e.g., a delay in processing a lab specimen due to high-priority resuscitation may be misunderstood).

Conclusions

We described a survey of 22 physicians in a large, urban ED, aimed at understanding attitudes about patient-facing displays based on hospital EHRs. We discovered that most physicians are supportive of the automatic presentation of most information types, recognizing that increased patient engagement and education may ultimately outweigh the risks of direct information presentation.

We also found that physicians surveyed can be divided into those (the majority) who favor openness and transparency versus those who lean more toward protecting patients from informational details on the display. Our findings also highlight the concerns of physicians who are more hesitant about having information delivered directly, which we see as a call for further research in creating accurate, safe, and appropriately-filtered information displays.

While our findings point to promising initial results, our study is limited by both the size of the respondent pool and a focus on the ED setting. Further research is needed to examine the generalizability of our findings to inpatient and primary care contexts. Future work will address these environments, and also focus on the development and testing of automated methods for decisions about if, when, and how to present EHR information to patients.

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