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# Using the Electronic Medical Record to Keep Hospital Patients Informed

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**Abstract**

The increasing availability of electronic hospital records has already improved hospital process and provided indirect benefits to patients through increased provider efficiency. However, to date, electronic medical records are typically not presented to patients during hospital visits, and are not structured to be accessible to patients. We suggest that the lack of patient-friendly views into the medical record represents a missed opportunity to keep patients more informed about their own care, more engaged in dialog with physicians, and ultimately more compliant with medical instructions when they leave the hospital. In this position paper, we describe the basis for this perspective, we summarize our own results from a study exploring patient and provider responses to real-time, patient-facing views into a hospital's electronic medical record (EMR), and we propose future work regarding the automation of such displays.

**Keywords**

Electronic medical records, hospital patients, information displays

**ACM Classification Keywords**

J.3 [Computer Applications] Life and Medical Sciences – Health.

### **Introduction: Patient-Facing EMR Systems**

Electronic medical records are gaining traction in both hospitals and private-practice clinics, and numerous nation-scale efforts are presently attempting to make electronic medical records ubiquitous. [2] and [3] discuss the tangible benefits of EMR adoption. Reasons frequently cited for the value of the EMR transition are efficiency of information transfer among providers, comprehensive record-keeping for liability mitigation, and accurate and efficient record-keeping for streamlined billing. Anecdotally, providers rarely cite “keeping patients more informed” as a primary benefit of electronic record-keeping.

In parallel, however, medicine is seeing a philosophical shift toward patient ownership of information. The Health Information Portability and Accountability Act (HIPAA), passed in 1996, provides a legal foundation for this trend, guaranteeing patients in the U.S. access to their medical records. The emergence of personal health record (PHR) systems and their (slow but promising) connection to electronic medical records offers a realistic path for convenient access to the records promised to patients under HIPAA.

However, the *availability* of medical records is just the first step in making those records *useful* to patients and their families. By necessity, EMR systems are structured to be practical for their primary consumers: physicians, nurses, lawyers, and hospital administrators. Patients are rarely (if ever) taken into account when considering the language and user interface built into an EMR. The information at the core of the EMR – diagnoses, test results, tests ordered, medications, etc. – is similarly written by providers for

providers, in language that is accurate and efficient for inter-provider communication.

Furthermore, this may be an inevitable condition within EMR systems: it is likely not possible in the foreseeable future for providers to craft every medical note to be patient-friendly, nor would we want this at the expense of accuracy and efficiency in patient care.

We thus postulate that EMR systems will offer significant direct benefit to patients, but that significant research is necessary in finding the right analysis, translation, and presentation techniques for automatically building practical *patient-facing* interfaces to modern EMR systems.

### **The Real-Time, Patient-Facing EMR**

While there are numerous scenarios in which automatic analysis of EMR content could produce useful patient-facing materials, we focus on a particular scenario in our own work. Specifically, we examine the practicality of using the EMR to keep *emergency department* (ED) patients more informed about their care in *real-time* through *in-room displays*.

We note that large displays and diverse input systems are becoming so ubiquitous and affordable that – particularly given that the cost of such items in a medical context can be amortized over many patients – it is reasonable to propose that such technologies can be made available to patients in a wide array of hospitals. We further note that the emergency department is particularly well-suited to this type of information presentation, since (1) the temporal density of medical events is extremely high, (2) the chaos of the ED environment often prevents providers

from spending extensive time communicating with each patient, and (3) patients often drift rapidly and unpredictably among states of awareness, suggesting that a persistent information display might be especially valuable (so that information can be available whenever a patient is prepared to consume it).

### Patient-Facing Displays: Initial Study

In [1], we present the results of our initial exploration into the methods, benefits, and limitations of patient-facing, in-room displays in an urban emergency department. This study was conducted using a real-time Wizard-of-Oz technique, in which paper prototypes were prepared using information gathered from the EMR used within the ED. Patients received either large-format (3' x 4') posters (13 patients) or letter-sized

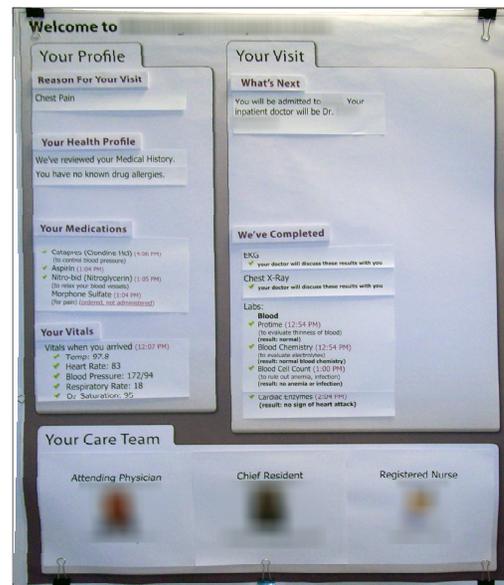


Figure 1. Display prototype prepared as a 3'x4' poster.

handouts (5 patients). Examples of each prototype form factor are presented in Figures 1 and 2.

We designed our prototypes to contain several information categories, allowing us to explore patient responses and preferences, provider responses, and preparation challenges associated with each. We specifically aimed to include the following categories on each poster:

- 1) Reason for present visit
- 2) Vital signs
- 3) Care team (including names and photos)
- 4) "What's Next" (pending steps in the care process)
- 5) "We've Completed" (previous steps in the care process)
- 6) Medications administered in the ED

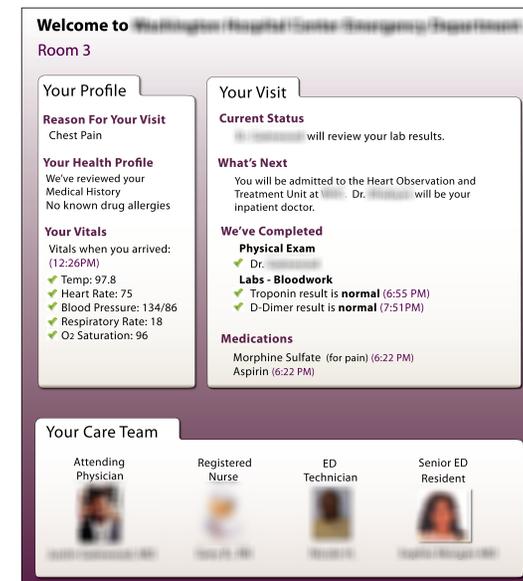


Figure 2. Display prototype prepared as an 8.5"x11" handout.

We point readers to our paper for a full description of our prototypes and the results of semi-structured interviews with patients and providers, but we briefly summarize our results here:

- 1) Overall, "What's Next" is the perceived by patients as the most useful display component, with some dissenters.
- 2) Patients liked the information display in general, *even patients who already felt well-informed*.
- 3) Privacy was much less of an issue than we expected, with a few important caveats.
- 4) Patient displays facilitate within-visit information sharing among patients and visitors.
- 5) Patient displays will likely facilitate post-visit information sharing with family and other providers.
- 6) Patient displays provide memory aids in the ED.
- 7) Providers were generally supportive of an in-room information display.
- 8) Most of the information necessary to prepare an effective information display *can* be extracted from an EMR, but there are still important gaps that need to be filled in by physicians.

### Future Work

Our initial study looked only at a paper prototype, deployed in a single emergency department. We propose two major avenues of future work:

- 1) Our initial study was based on a paper prototype. While some of the information transfer from EMR to poster was straightforward, a significant amount of manual translation, interpretation, and physician consultation went into this process. Future work will focus on the automatic extraction of relevant

data from the EMR and the adaptation of that information for patient viewing, using natural language generation, machine learning techniques, and heuristics that we have built from our initial experiences in the ED.

- 2) Our initial study looked only at a small deployment in a single emergency department. However, we propose that the principles gleaned from our initial work and the technical developments discussed in (1) will apply to a variety of display types (in-room displays, discharge materials, online viewing of EMR data at home, etc.) and a variety of clinical environments. Further work is necessary to evaluate the appropriateness of patient-facing views on the EMR for other scenarios.

### Supplementary Materials

The full set of display prototypes used in our study is available in the supplementary Web page prepared to accompany our paper:

<http://research.microsoft.com/cue/patientdisplays>

### References

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