

Triaging patients at risk of influenza using a patient portal

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ABSTRACT

Vanderbilt University has a widely adopted patient portal, MyHealthAtVanderbilt, which provides an infrastructure to deliver information that can empower patient decision making and enhance personalized healthcare. An interdisciplinary team has developed Flu Tool, a decision-support application targeted to patients with influenza-like illness and designed to be integrated into a patient portal. Flu Tool enables patients to make informed decisions about the level of care they require and guides them to seek timely treatment as appropriate. A pilot version of Flu Tool was deployed for a 9-week period during the 2010–2011 influenza season. During this time, Flu Tool was accessed 4040 times, and 1017 individual patients seen in the institution were diagnosed as having influenza. This early experience with Flu Tool suggests that healthcare consumers are willing to use patient-targeted decision support. The design, implementation, and lessons learned from the pilot release of Flu Tool are described as guidance for institutions implementing decision support through a patient portal infrastructure.

OBJECTIVE

Healthcare organizations using electronic health record (EHR) systems are increasingly implementing patient portals to provide patients access to the healthcare system.^{1–6} Patient portals provide an infrastructure for patients to access and review their medical record,^{2 4 7–18} manage medication therapy,^{9 19–25} exchange electronic messages with their healthcare providers,^{8 15 25–34} complete medical and administrative forms,^{3 8 35} browse educational materials,^{12 36 37} and receive health and appointment reminders. Such patient portals benefit both patients and healthcare providers by increasing efficiency and productivity of care.^{1 9 26} Examples include the pioneering work of Masys with the PCASSO (Patient-Centered Access to Secure Systems Online) system at the University of California, San Diego,^{15 26 38–40} and systems at Kaiser Permanente, the Veterans Administration,^{4 41} New York Presbyterian Hospital,⁴² Vanderbilt University Medical Center (VUMC),^{12 43} and Partners Healthcare.² Patient portals have been shown to enhance patient-provider communication, increase overall satisfaction with care, increase access to health information, and improve disease management for patients with chronic diseases, including diabetes.^{9 10 44–50}

Although much has been written about patient portals in the biomedical literature, there is little

research evaluating their ability to deliver patient-targeted decision support. Information technologies designed to support healthcare provider decision making, including messages suggesting specific clinical decisions or actions, have become an increasingly prevalent component of EHR systems.^{6 51–67} Decision support targeting patients directly may have a rate of success equal to or higher than decision support targeting healthcare providers, as supported by a number of recent investigations.^{68–83} Health information technologies providing patient education, reminders, online education, and targeted decision aids have been described.^{84–106} Linking patient-targeted decision aids to a patient portal allows the patients to receive personalized content and take actions based on the information they receive, such as sending messages directly to their healthcare provider.

We developed an influenza-screening application called the Flu Tool, designed to leverage the infrastructure from MyHealthAtVanderbilt (MHAV), a widely adopted patient portal, and to empower patients' decision making related to a specific disease syndrome requiring prompt treatment for optimal clinical outcomes. Flu Tool addresses the challenge of triaging patients with an influenza-like illness to pursue the most appropriate level of care in an efficient way. Although initiated to address concerns raised by the pH1N1 pandemic, the Flu Tool was designed to apply to all strains of seasonal influenza during a typical influenza season. The model and infrastructure supporting the Flu Tool are generalizable to other types of patient-targeted decision support. In this brief communication, we describe the implementation, pilot deployment, and lessons learned from this pilot release of a patient-targeted decision-support tool developed for a patient portal.

MATERIALS AND METHODS

Setting

The VUMC has a locally developed patient portal called MHAV⁴³ that is fully integrated into the institutional EHR system. MHAV currently has over 150 000 registered users, and, on average, 5500 users access the site each day. Core functionality includes direct, bidirectional, secure electronic messaging between patients and healthcare providers (used 673 971 times in 2010), access to laboratory, imaging and vital sign testing results (702 980 times in 2010) and immunization records (37 451 times in 2010), and an ability to review billing and insurance information (250 985 times in

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2010). The MHAV system has also been successfully used to deliver targeted educational materials to patients based on their clinical problems.¹² The VUMC has established a series of policies, procedures and best workflow practices for patient portals.⁴³

The Flu Tool: design phase

In creating the Flu Tool, we began with a design phase, during which we sought to specify the software components and algorithms that would best provide decision support for patients, without specific concern about potential implementation challenges. The goals were to: envision a system that could deliver appropriate, time-sensitive, and patient-initiated care to patients with an influenza-like illness; facilitate thorough clinical documentation; and operate within normal clinical workflows. A multidisciplinary team developed a series of algorithms and educational materials for guiding patients with influenza-like illness who use the MHAV system. Team members included biomedical informaticists (authors STR, SS, GPJ), experts in infectious diseases and epidemiology (TLD, TRT), hospital and clinical management (TM, RH, JJ, SM), and clinical information flow (JJ, SM), and the team had oversight from experts in law and policy, from the committee that provides oversight to MHAV development and use, and from VUMC leadership. The project team formulated an approach for extending the existing MHAV messaging infrastructure to include the algorithms for influenza screening that would both triage messages from high-risk patients to be flagged for immediate attention, and advise patients how to escalate care quickly when appropriate. The formulation process took place through an iterative procedure that involved conversations with institutional stakeholders, reviewing then-current practice standards for influenza management,¹⁰⁷ reviewing current institutional policies related to MHAV system use, and mapping common workflow patterns around MHAV patient-provider messaging.

The Flu Tool algorithms present patients with a series of questions to determine whether their symptoms suggested a serious or complicated respiratory condition, typical influenza infection, or a minor viral respiratory illness. The Flu Tool was initially designed to accommodate the following workflow. A patient with an influenza-like illness seeking medical advice would log into the MHAV portal, which would display a link to the Flu Tool. The patient would then be prompted to answer questions about their illness and any potential comorbid conditions. Patients' answers would lead to one of four outcomes: (1) they would be advised that they may have a serious illness and should engage the medical system immediately; (2) they would be advised that they have symptoms consistent with influenza and may require antiviral therapy, and a high-priority message would be sent through MHAV to their healthcare provider; (3) they would be advised that they have symptoms consistent with influenza but that antiviral therapy is unlikely to be of benefit, and a normal-priority message would be sent through MHAV to their healthcare provider; or (4) they would be advised that they do not have symptoms consistent with influenza, and a normal-priority message would be sent through MHAV to their healthcare provider. Messages sent as a result of navigating the algorithms would include the answers the patient provided to the questionnaire. For all patients who would potentially benefit from antiviral therapy, their case would be reviewed and any treatment prescribed by the licensed healthcare provider who normally addresses the high-priority message sent through MHAV for a given clinic. In the case that the patient filled out the questionnaire outside of normal busi-

ness hours and qualified for antiviral therapy, he or she would be advised to call an on-call healthcare provider directly, rather than send a message through the MHAV system and wait for a response. A sample algorithm is presented in figure 1.

The Flu Tool: implementation phase

The Flu Tool was piloted coincident with the 2010–2011 influenza season in Middle Tennessee. Specifically, it was deployed during the 9-week period from February 8 through April 13, 2011. This period overlapped with the CDC assessment of influenza activity in Middle Tennessee as becoming 'wide-spread' and when Google Flu reported influenza activity in Nashville as being 'high'; these designations are given by each system to the highest category of influenza activity. To promote usage, the Flu Tool pilot was deployed through both (1) institutional consumer-oriented websites for the VUMC and Children's Hospital and (2) a public application in Facebook. The Flu Tool was advertised through a number of channels to alert patients that it was available, including a press release to local media, electronic mail messages to the VUMC community, and in institutional newspapers.

We piloted Flu Tool by implementing just the MHAV components as described above, without the links to the patient-provider messaging system. This was primarily due to concerns that institutional clinical leaders had in launching the messaging system without around-the-clock human oversight and monitoring, such as by a 24 h/7 day nurse triage, which would have been out-of-scope for this pilot. In particular, patients might: (1) send messages outside of business hours even though the Flu Tool advised them to call their healthcare provider instead (eg, if their symptoms were consistent with influenza and antiviral medications were indicated, but it was outside normal business hours); (2) send messages outside business hours with the expectation that they would receive a call back even though the Flu Tool advised them that they did not need immediate care (eg, when they would not benefit from antiviral therapy and had no evidence of serious illness); or (3) send a message to the wrong healthcare provider (eg, to an ophthalmologist they had previously seen, who would therefore be listed as a potential recipient for patient portal messages).

OBSERVATIONS

During the 9 weeks that the Flu Tool was deployed, a total of 1017 patients seen at VUMC and affiliated clinics received an ICD-9 encoded diagnosis for influenza (ie, ICD-9 codes 487.xx or 488.xx). During this same period, the Flu Tool was accessed a total of 4040 times: 684 times within the MHAV system, 2928 times on the general consumer-oriented VUMC website, and 428 times on the general consumer-oriented Vanderbilt Children's Hospital website.

DISCUSSION

Patients are taking an increasingly active role in their own healthcare delivery. This article describes an influenza management tool as a model for patient-targeted decision-support applications that can be delivered through a patient portal. The Flu Tool is designed to empower patient decision making in several ways. First, by being accessible through a patient portal, the tool's use is patient-initiated and patient-driven. Second, the questions and algorithms included in the triage system are designed to educate patients about the most likely cause of their symptoms. Third, for patients requiring escalation of care, the system design provides specific tools or guidance based on

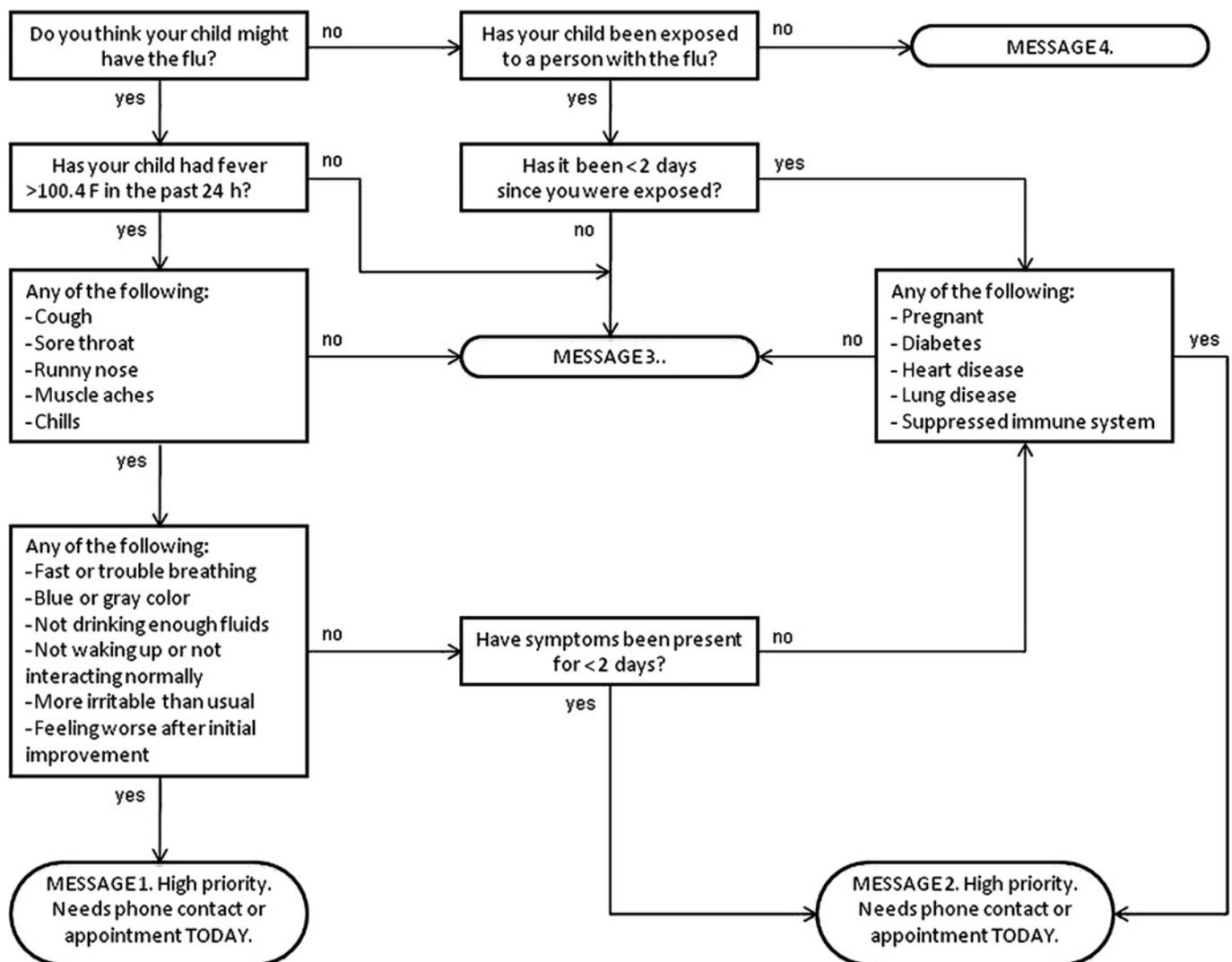


Figure 1 A sample algorithm.

whether or not the patient's primary care services are accessible by the patient portal. For those cases where patients meet criteria for receiving treatment with an antiviral medication and can communicate with providers through a patient portal, treatment can be initiated quickly without a clinic visit.

The Flu Tool was fully deployed during the 2010–2011 influenza season, with limited integration into the MHAV patient portal. Although the Flu Tool was widely used, with its limited integration, it did not take advantage of the connections to the EHR or the integrated patient-provider messaging capabilities unique to a patient portal. We believe that the usage was sufficient to demonstrate a willingness of healthcare consumers to consult patient-targeted decision support; Flu Tool was used four times more often than the number of patients diagnosed with influenza during an inpatient or outpatient clinical encounter at VUMC. The Flu Tool was implemented during the local influenza spike, so there was not much lead-in time to advertise to patients (ie, potential users), and the fact that implementation excluded the messaging integration may have limited usage.

The deployed version did include patient-targeted decision-support algorithms and educational materials, and it provided the patient with general advice about whether they should escalate their level of care, such as whether they needed to see a healthcare provider immediately. Our usage data inform

institutional clinical leaders what type of support would be necessary to release a fully integrated version of Flu Tool in MHAV. With full integration, all Flu Tool-initiated messages could be audited in real time to ensure that messages requiring immediate follow-up were addressed in a timely manner. With this service available, it may be possible to allow urgent messaging at any hour or on any day, irrespective of usual business hours. Anecdotal reports from the institutional leadership suggest that the Flu Tool and other patient-targeted decision-support tools have convinced them to consider full 24 h nurse call backup.

The model underlying the Flu Tool can serve as a template and can inform a set of workflows that would support any number of patient-targeted decision-support tools. While the contents and the specific algorithms might change, the infrastructure, policies and procedures should be constant and reusable across the institution, and may generalize to other clinical sites and institutions. By contrast, while the Flu Tool implementation was designed to respect existing workflows, institutional leadership took a relatively conservative view of potential patient risk. As a result, they requested that workflow and staffing results be changed (at some future point) to include 24 h/7 day nursing triage before integration of the Flu Tool with messaging.

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As patient portals become more prevalent in settings of healthcare delivery, it will be important to measure their influence on patient-driven decision making. A more complete rollout of the Flu Tool and other portal-based patient-targeted decision-support systems will need to incorporate plans for system evaluation. Investigators have previously posited research agendas for patient portals,^{108 109} including evaluations of adoption, architecture, privacy and security, and their use for managing populations of patients. The limited implementation in the 2010–2011 influenza season reduced our ability to perform a formal evaluation. In the current form and during the recent 9-week implementation, the Flu Tool likely had an unmeasurable impact on healthcare utilization. With a deeper and longer implementation that includes links to the MHAV messaging system, it is possible that any impact on outcomes will be measurable. In a study evaluating this, we would likely assess a number of outcome variables, including: user demographics, patterns of algorithm recommendations, rates of MHAV users versus non-users seeking in-person care for influenza-like illness, and possibly rates of acute care and emergency department visits over several seasons. We would also hope to assess qualitative outcomes, including perceptions that patients and healthcare providers have about the Flu Tool and about patient-targeted decision support. It may also be possible to assess a series of quantitative outcomes using pre/post or time-series data obtained through queries of our institutional clinical data warehouse. This research agenda would align with those previously suggested for patient portals by other investigators.^{108 109}

CONCLUSION

Patient-targeted decision-support tools can empower patients to make informed decisions about their own healthcare, to know when it is appropriate to access clinical care using patient health record messaging tools, and to identify situations in which they need to seek direct clinical care quickly. We developed a patient-targeted decision-support tool to help patients with influenza-like illness to identify situations in which they may need to escalate care, and those in which they can self-manage their illness. The Flu Tool was designed to integrate with secure electronic patient-provider messaging to guide personalized healthcare delivery. The version of the Flu Tool described in this article excluded messaging because of concerns about staffing to monitor messaging around the clock. However, without the messaging feature, the Flu Tool was heavily used. This experience highlights the importance of workflow considerations as well as staffing and stakeholder buy-in to the implementation of a novel health information technology.

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