

## “Evaluating Information Prescriptions in Unstructured Environments”

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### Abstract

*Information exchange in the Emergency Department between patients and providers is critical for safe, effective patient care. The episodic nature of ED interactions between patients and doctors who are essentially unknown to each other makes this communication even more tenuous. The use of Information Prescriptions (InfoRx) is an attempt to provide patients with the opportunity to access evidence-based information via the internet. Our concept is to examine the impact of InfoRx in two common conditions, low back pain in adults and pediatric fever and attempt to measure patient preferences for site of delivery, content presentation and subsequent access of InfoRx from the ED. The results of this study may impact the type of information and method of delivery of healthcare information in the Emergency Department.*

### 1. Introduction

In the Emergency Department (ED), the effective exchange of information between patients and health care providers is critically important to patient care. However, the chaotic nature of the environment and the transient nature of the provider-patient interaction pose significant challenges to communication. Additionally, the large ED patient volumes and increasing pressure for emergency physician productivity further complicate the effective transfer and retention of discharge instructions.

The challenge is to enhance compliance with discharge instructions from the ED, thus promoting health and decreasing ED recidivism.

It is well established that patients have difficulty understanding discharge instructions provided in the ED.[1, 2] Direct assessments of patient and caretaker comprehension after ED

discharge have demonstrated difficulties with recalling diagnoses and discharge instructions.[3, 4 5] These deficits have been shown to exist immediately after an ED visit and thus are not merely a function of people forgetting information over time. This lack of understanding is multifaceted, but the major contributors are that written materials often exceed patients' literacy levels; few EDs provide medication-specific information; and there is no record of verbal discharge instructions, thus not allowing patients to hear verbal instructions more than once. Disturbingly, recent ED research has shown that 20% of individuals who think that they understand their discharge instructions failed to do so, and that nearly 40% of patients who correctly understood their discharge instructions thought that they did not.[2]

Information given in the Emergency Department at time of illness or injury has been shown to have a greater impact on patients than the same information given outside the ED. [6,7]. The implication for our concept is that information given to patients during the ED visit and accessible and after the ED visit will enhance their recall and utilization of the instructions given.

Better-informed patients who retain health knowledge are more compliant with medical treatments and advice[8], and have improved health outcomes.[9] Furthermore, increasing patients' health knowledge also results in them asking their doctor more questions. One Pew Internet & American Life Project survey found that health information found online led to 50% of people asking their doctor new questions or to get a second opinion.[10] Not surprisingly, the highest frequency of comprehension deficit of post-ED care occurs with medications and follow-up instructions.[2] A similar trend has been found in previous studies that have demonstrated patients have greater difficulty recalling information about

their medications and home care than their diagnoses.[11]

Poorly understood or poorly rendered instructions are at the root of this misunderstanding. Information prescriptions (InfoRx) are an attempt to provide patients with the opportunity to access evidence-based information that is specific to their needs via the Internet.[12] The InfoRX, whether a simple website with links to other information or a multimedia presentation about the condition, gives patients the capacity to revisit the instructions in a more calm environment and to seek further information through the web links in the InfoRx. The ability to revisit the instructions without the stress of the immediate ED visit may decrease the need for repeat visits and will be one of the variables that will be measured when this concept is studied.

The scope and potential impact of ED-based InfoRx is enormous: in the U.S., ED visits now total more than 120 million per year. This proposed research also has the potential to extend the use of InfoRx from unstructured environments such as the ED to more controlled settings such as a primary care office as well, where patient health literacy and time constraints on physicians also apply.

When implemented, this investigation may provide a better understanding of the relationship between patient learning and compliance. The implementation of this concept as a research study would help answer the fundamental question of what type of InfoRx patients prefer. It would also compel clinicians to rethink how behavioral interventions, such as discharge instructions, should be delivered as new opportunities for intervention are realized.

It may lead to patients having a better understanding of their acute and chronic health problems, treatment compliance, and health-related behaviors and has the potential to provide the basis for novel and powerful interventions for patients in the ED and primary care.

## 2. Overview

The limited research to-date on InfoRx has been simply descriptive. For instance, Ritterband et al. provided an information prescription to 22 families of children with encopresis over a 2 year period.[13] Follow-up determination found a decrease in soiling bowel movements in the children, but there was no control group. The authors concluded, "Although it is not clear whether this improvement is directly related to the

use of the Internet intervention, patient feedback suggests that the program was an important element." Williams et al. have described their efforts at creating medical librarian-initiated InfoRx, with no outcome data.[12]

In developing the concept of InfoRx use in the ED we determined that the initial goal of an InfoRx implementation program is not whether an InfoRx is better than standard discharge instructions from the ED, a question that also needs study, but rather, we approach the problem in two novel ways. First, before an adequate trial of InfoRx efficacy could be performed, it is imperative to determine what kind, or format, of InfoRx is best. We would propose to determine whether a standard InfoRx, or a multimedia presentation is preferred by patients. Second, it is unknown whether patients more often will access the InfoRx at home or while in the ED. These two questions would be answered through a randomized trial using the following outcome measures: (1) patient knowledge; (2) InfoRx access data; (3) patient preference; and (4) patient ED recidivism.

In applying this concept in the ED, rather than studying an infrequent clinical condition (such as encopresis) or a condition with numerous etiologies (such as undifferentiated abdominal pain), we would study two diagnoses with broad applicability to both EDs and primary care – low back pain (LBP) in adults, and fever in children. Limiting this initial application of the Information RX concept to two diagnoses is important for several reasons. First, until we have established what type of InfoRx patients prefer and from what type of InfoRx they gain the most knowledge, it is both impractical and inefficient to develop InfoRx for several diagnoses. Second, by choosing an adult-specific and a pediatric-specific diagnosis we would address the utility of the InfoRx type and method of delivery across two very different patient populations. Third, until more knowledge about InfoRx preference type and delivery method is obtained, a randomized controlled trial of InfoRx vs. standard instructions would need to be very large, otherwise only a tremendous treatment effect would be detectable.

The growth in Internet access and use by people of all ages and socioeconomic groups provides us with the means to give patients and families accurate and diagnosis-specific instructions that they can review at their leisure. The Pew Internet Project estimates that between 75% and 80% of Internet users have looked online for health information. Along with all this engagement, however, is an understanding that the

internet is not a cure-all. In a recent Pew survey, approximately 60% of Internet users agreed that the internet is full of misinformation.

Socioeconomically disadvantaged patients and families also use (or plan to use) the Internet for health information. One study found that in an inner city ED patient population, 13% of patients who wanted a list of medical web sites did not even have home Internet access.[14] This finding could be due to several reasons. First, friends or family members may have Internet access. Second, public access to the Internet via libraries and schools has grown. Third, a person without a computer may purchase one in the future. This last finding is highlighted by other Pew Internet Project data that shows Internet access in household incomes of less than \$25,000 per year has doubled nearly every 3 years.

Low back pain and pediatric fever are ideal medical conditions in which to initially apply the concept of InfoRx use in the ED. LBP affects two thirds of adults at some time in their lives. Back pain is second only to coughing among symptoms of people who seek medical care.[15] Not only is LBP common, but continued or recurrent LBP is a frequent cause of ED recidivism. In our ED, from January 1 to March 30 of 2009, there were 720 adult patient encounters for LBP - an average of 8 per day. Of these 720 encounters, 30 patients presented more than once within 7 days to the ED with continued LBP – a recidivism rate of greater than 4%. Thus, LBP represents an important opportunity for patient education.

Acute and chronic LBP are also important causes of time off from work and decreased productivity. LBP is the most common and expensive reason for work disability in the U.S.[16] The overwhelming majority of LBP is benign in nature, with no benefits to early and expensive imaging.[17] The total annual costs of back pain in the United States range from \$20–\$50 billion.[18] Thus, the economic impact of acute and chronic LBP is staggering.

Lastly, the frequent use of opioid medications to treat both acute and chronic LBP has health, economic, and societal implications. Use and misuse of opioid medications are an increasing public health problem. The Substance Abuse and Mental Health Services Administration's 2003 national survey on drug use and health reported that 31.2 million people 12 or older (13% of the population) had used prescription pain medications for nonmedical reasons.[19]

Similarly, our rationale for including pediatric patients with fever is also well grounded

with broad implications to medicine and society. Pediatric (defined as less than 18 years of age) fever is one of the most common ED chief complaints. There are approximately 10 million ED visits per year for children with fever. In our ED, from January 1 to March 30 of 2009, there were 1,194 pediatric patient encounters for fever – an average of 13.6 per day. Of these encounters, 89 patients presented more than once within 1 week to the ED with fever, representing a recidivism rate of over 7%.

Productivity loss due to caring for a child or transporting to and from an ED also represents a significant societal cost. It has been estimated that nearly \$3 billion per year in lost productivity occurs due to caring for a sick child.[20] Clearly not all of this lost productivity would be regained through better parental information. However other benefits such as decreased anxiety for parents and children as well as decreasing ED overcrowding are significant. Lastly, much like adult LBP, the overwhelming majority of cases of childhood fever in those children who have received currently recommended vaccinations is benign. Thus pediatric fever represents a great opportunity to implement an InfoRx in the ED.

Interactive multimedia is felt to present an ideal learning condition. Research has shown that the presentations need to be learner centric and give different learners the ability to navigate the presentation in a way that best suits their learning style. [21] The need for a learner centric environment will be an important part of the development of the multimedia InfoRx.

### 3. Actualizing the Concept (Methods)

In applying the concept InfoRX, the first efforts will be devoted to developing and testing the multimedia InfoRx. This InfoRx will be based on the health Information kiosk developed by Virtual Health Solutions ([www.virtualhealthsolutions.com](http://www.virtualhealthsolutions.com)).

The kiosk is a patient-oriented computer with disease-specific information modules. Each module consists of a diagnosis specific pre-test, multimedia presentation, and post-test. Currently a LBP module exists. However, we will modify and tailor the multimedia presentation to address specific medications (opioids, skeletal muscle relaxants and non-steroidal-anti-inflammatories) and recommendations regarding imaging.

This novel approach to an InfoRx, using video, text, animated pictures, hyperlinks, and prescription information will take advantage of

existing and widely accepted media technologies and adapt them to the patient education and discharge processes. During development of the multimedia InfoRx we will pilot it in the ED to determine the appropriate duration for best patient acceptance. This will be done with assistance from our medical school multimedia technology group and our medical library (a member of National Network of Libraries of Medicine).

We would also design and pilot the standard InfoRx during this first portion of the study, utilizing the same pre and post tests as in the multimedia presentation. Specific websites such as MEDLINEplus, WebMD, and Pediatrics.about.com will be reviewed for diagnosis-appropriate content. The standard InfoRx will include links to the webpages that we consider optimal. It is possible, however, that we will need to create new webpages for this study – for instance, a webpage devoted to appropriate medication use for LBP and antipyretic dosing.

When developed, the InfoRx would be piloted on ED patients with LBP and pediatric fever. Their knowledge, attitudes, and beliefs about LBP and fever will be assessed, as will their impression of the InfoRx using simple Likert 5-point items. During the pilot period patients would only be offered the InfoRx in the ED and not at home. This would allow gathering of immediate feedback from patients. The InfoRx would be modified as necessary (in length, content, and presentation) based upon the feedback of the pilot patients.

It is possible that at this time we would find patients do not like the multimedia InfoRx. This is not an expected finding, based on previous research investigating multi-media presentations for patient education. [22,23] However, if the multimedia InfoRx is found to be disliked by patients during the pilot period we would decide whether to rework the multimedia format or change to an online Powerpoint-type presentation with links to evidence based sources-the standard InfoRx.

After we developed and trialed our InfoRx, we would perform a randomized trial in the ED at our institution. Our ED sees a total of 88,000 adult and pediatric patients per year. As previously noted we treat approximately 8 adult patients with LBP and 14 pediatric patients with fever every day.

### **Limitations associated with this concept:**

- Accrual of participants: We will recruit participants 24 hours per day from our ED using

salaried research associates. Considering that the ED patient volume has increased by 3-4% per year over the last decade, we feel that accrual of study participants is assured.

- Attrition of participants: Upon enrollment, patients will provide us with a telephone number, email address, mailing address, and cell phone number, as well as their preferred method of contact. Thus, the ability to contact patients is robust. We also plan on remunerating patients \$25 for their participation in the study. We believe that these measures adequately address the attrition of participants.

- English speaking patients: Because this study will utilize a multimedia presentation and Internet use, patients must be able to read English. Over 90% of the patients in our ED speak English, and we feel that duplicating efforts to develop the multimedia or standard InfoRx in other languages is not currently justifiable. However once the concept is proven, translation of the multimedia site and/or the standard information prescription could be accomplished to allow dissemination to any language group. Further study with different language groups would help to determine if there are cultural differences in use of the InfoRx.

Our concept of implementing InfoRX avoids the pitfall of previous InfoRx implementation. In a real world implementation of InfoRx in a primary care setting, Leisley and Shipman[22] encountered at least one critical barrier to InfoRx use – physician cooperation. In their study of 110 women from a primary care setting, none of the women could recall hearing the term “information prescription” and only 14% recalled their physician recommending Internet health sites. These numbers are even more startling when one considers that the physicians stated that they provide InfoRx to all of their patients. Thus, physicians themselves appear to be one of the most significant barriers to InfoRx implementation. We would overcome this barrier in our implementation phase by the use of trained research assistants 24 hours per day in the ED at our medical center.

Use of an EDIS (Emergency Department Information System) will allow research assistants to track all patients in the ED at any time from any computer. Furthermore, by being based only in the ED, the research assistants will have continuous physical access to all patients, ED staff nurses, and physicians. This will enable them to enroll patients who are not identified as having LBP or fever in the EDIS.

Furthermore, because our ED uses electronic prescription writing, we can

automatically link the appropriate medication InfoRx to an individual patient. That is, if a patient is discharge with an opioid prescription (e.g.: percocet, vicodin, oxycodone, etc.), we are able to have the “opioid InfoRx” assigned to that patient in an automated fashion. With the EDIS we are also able to assign various medications to a medication group. Therefore, patients who are prescribed one of the various skeletal muscle relaxants with different pharmacologic mechanisms are able to be given the “skeletal muscle relaxants InfoRx”.

Unlike the limited previous InfoRx research, we aim to determine if a standard InfoRx is better than a multi-media presentation. We believe that this approach is important, as it is necessary to determine how to administer an InfoRx before one can determine if an InfoRx is better than standard discharge instructions.

After evaluation and treatment by the emergency physician, but before discharge, research assistants would consent patients in the study. Patients will be randomized by computer in a 1:1:1:1 ratio to receive Multimedia InfoRx in ED, Multimedia InfoRx at home, standard InfoRx in ED, or standard InfoRx at home. After describing the study and obtaining consent, a research assistant will provide each patient a sheet of paper with the study website login page and a unique access code.

Patients randomized to InfoRx access in the ED will be provided access to the ED research study room (located between the patient care areas and the ED exit) upon discharge. Those patients who elect to access the InfoRx will login to the study web portal that will automatically take them to either the multimedia InfoRx or standard InfoRx (based upon their randomization). If randomized to the multimedia InfoRx, patients will be able to hear the presentation via headphones or computer speaker. Regardless if a patient accesses the InfoRx in the ED or not, all patients will be able to access the InfoRx from home or other computer location for a period of 6 months. We will be able to determine if they accessed the InfoRx in the ED from the computer IP address.

Patients who are randomized to access at home will also have the opportunity to login with their unique access code for the duration of the study period, but will not have access to the ED research study room. “At home” InfoRx delivery refers simply to the fact that the patient does not access the InfoRx in the ED; they may access it at a library, friend or family member’s house, or wherever they access the Internet. By allowing login access for 6 months we can determine how

many patients (or their friends or family) access the website in a longitudinal fashion.

If anyone from either the ED-based or at home group did not access the study webpage with login after 48 hours, a research assistant would follow-up with the patient via email, phone, or text message (based upon a patient’s preference). Follow-up in this manner will continue for 6 days or until the patient logs into the webpage, whichever comes first.

Study population. We would use patients presenting to our ED, with enrollment 24 hours per day. Inclusion criteria would be developed to allow selection of appropriate patients.

#### 4. Outcomes

The primary outcomes of implementation of the InfoRx would be to measure

- 1) The number of times that patients and caretakers access the InfoRx in the ED or home groups.
- 2) Patient and caretaker medical condition and medication knowledge, based upon pre- and post-InfoRx access.
- 3) Patients and caretaker preference for the multimedia or standard InfoRx.
- 4) Patient ED recidivism.

Patients would be grouped by type of InfoRx (multimedia vs. standard) and access (ED vs. home). The initial implementation of this concept would not have sufficient power to detect differences for all outcomes among all 4 groups, particularly as the percentage of patients who will access any InfoRx is unknown and the treatment effect of the different types of InfoRx could be small. Regression models to predict access to the InfoRx and recidivism may need to be developed. One of the authors who has current research support for similar modeling of ED patient recidivism, would be primarily responsible for regression modeling and statistical analyses.

ED recidivism would be determined in two ways. First, we would electronically track ED visits, primary care physician visits, and hospital admission for all patients in our system. Our system is the second largest healthcare system outside our state’s capitol. The system constitutes over 1,600 physicians and approximately 1.5 million outpatient visits a year. Second, research assistants would also contact patients and caretakers (via their preferred method) at 4 weeks after enrollment to assess for ED recidivism, primary care follow-up, and hospitalizations.

## 5. Conclusion

This concept is forward-thinking: while computer literacy and access may now be problematic for some patients, the technological revolution in education and high penetration of Internet use in older adults will make this less of an issue in the future. Figure 1 graphically demonstrates the increased Internet use by age in the U.S from 2005 to 2008.

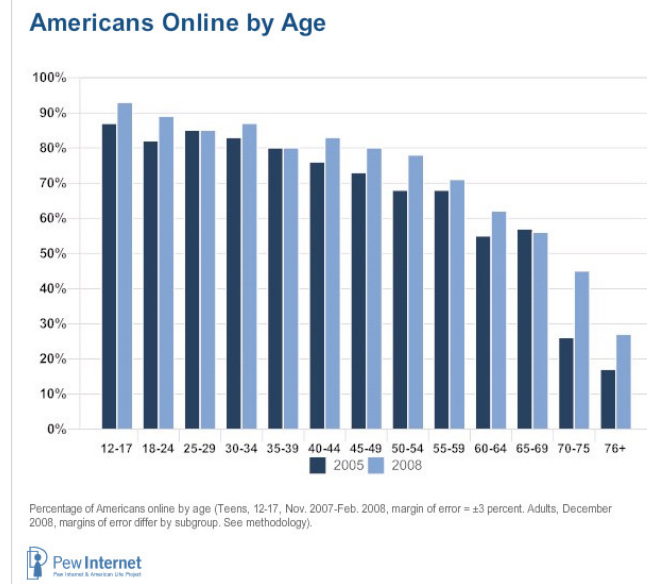


Figure 1 Americans Online by Age

Not only will older Americans become facile with the Internet, but as younger Americans age and the Internet becomes a routine part of everyday life, one should expect that the percentage of older adults using the Internet will increase significantly.

Furthermore, broadband Internet connections are becoming more widely available and economical, thus contributing to broadband's 91% penetration in the U.S. market.

The growth in mobile phone access and use by patients similar to that currently seen with the Internet provides us with a reliable means to contact patients. In fact, the increasing use of video-capable smart phones such as the iPhone and Blackberry could allow us to offer the InfoRx via a text message link. This would represent a logical extension of the research that we may need to explore during the developmental phase.

Many modern hospitals are adding computerized education facilities for patients and their families. If the ED-based InfoRx is found to work, it could inform future decisions regarding facility design and layout, discharge processes, and computer allocation and radically change the interaction and flow of information and understanding between physicians, patient and families.

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