The Electronic medical record: Designing with the patient in mind

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The Electronic Medical Record: Designing with the Patient in Mind
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Abstract

The Electronic Medical Record: Designing with the Patient in Mind

Alyssa Costino

The transition from paper charts to Electronic Medical Records (EMR) is intended to create a more efficient health care industry. The use of EMRs eliminates paper waste and allows doctors and other medical staff to communicate with others conveniently wherever they happen to be located. Currently, the focus is on working through functionality and design issues in the hospital EMRs and getting doctors acquainted with how the EMR works. The patient focus has not been addressed at this time in terms of how they use and interact with their personal medical history. Based on my own personal experiences suffering from a chronic illness, I designed an EMR called iCareLog that is patient friendly and allows those with chronic health issues to keep track of their medical information and store it all in one convenient place.

Keywords: EMR, EHR, electronic medical record, electronic health record, health care, patient, acute illness, chronic illness, track, health, data, Photoshop, Flash, user interface design, user experience design

Project URL: myvisualmark.com/icarelog/iCareLog.html
Blog Documentation: myvisualmark.com/thesis
Introduction

Thesis Problem

My thesis explores how technology is making an impact in the field of health care at the current time. There are many changes being implemented in hospital settings and medical facilities and one of the major changes is the transition from paper charts to electronic medical records (EMR/EHR). Currently, hospitals and other facilities are focused on solving technical issues with the implementation of their EMRs and getting comfortable with how patient information is entered and accessed in this new environment. Because of this, it has not been decided how the patient will interact with his or her health information.

As someone who is a cancer survivor and has spent a lot of time in a large variety of health care settings, I believe my personal experience as a patient with a chronic illness was an advantage to solving the problem of how to design an EMR that is patient friendly and easy to use and understand. I have learned that people in health care do not make things easy for themselves. My design background combined with my knowledge of health care allowed me to create an EMR that is convenient for patients to store large amounts of health information, as well as being able to visually understand that health information.

I wanted this EMR to be specifically for patients only and to feel that they are in control of their health. When patients are involved with their health care decisions and can visually see how certain things are affecting their bodies, it leads to better outcomes and healthier lifestyles.
They are better prepared for how to deal with possible health issues that may come up in the future and can learn how to prevent these issues. It is a learning tool just as much as it is an organizational tool.

Current EMRs that are being used in hospitals suffer from the same design issues. Meditech is a popular vendor choice by hospitals. This is an example of what an interior page of Meditech’s EMR looks like (Figure 1):

![EMR Interface]

Figure 1 - source: http://www.min-ns.org/staging_demo/meditech2.html

I was given a tour of how this EMR works by a nurse that works in health IT. There were several flaws I noticed that included too much clicking, minimal visual cues, lack of hierarchy and
information that should be condensed and simplified. The main navigation is also on the right
side of the interface, which seems unfamiliar to the user because we read from left to right.

iCareLog has the main navigation located on the left side, as well as the welcome panel so the
patient reads down and then across the screen. Meditech’s EMR has several sub sections,
which I feel is information overload for the user. I made sure to simplify content and include all
sub sections as headings under one section of the main navigation instead of having to click
through sub-menus.

Visual cues are also prominent in iCareLog. Meditech does not make good use of feedback
letting doctors know where they are in the EMR. In Figure 1, the yellow and white boxes are
what the doctor clicks on to get deeper into the content, however the box is not highlighted
and a tool tip does not appear. In the interface of iCareLog, the patient knows exactly where
they are in the main navigation because the button will turn into an arrow, pointing them to
the content in that section. The color palette is also significant because each section of the
main navigation is associated with a certain color. This is easy for the patient to determine
which information is located in a section because they associate it with a certain topic (ex. light
blue is where the advance directives are always stored).

Another current EMR used is NextGen’s product. This is a screenshot of the interface (Figure 2):
NextGen organizes content in a very different way from Meditech. This interface is broken up into different sections and appears very “boxy.” It is also unclear what the nine icons are related to in the bottom right corner. iCareLog utilizes proximity of information for the different parts of content in each section. The instructions for how to fill out the information always appears first and then headings follow related to the text fields, which follow a consistent design pattern throughout the EMR. One challenge I was aware of while designing the interface was the potential to input and store large amounts of information. I created a solution that fits all of the information on the screen so it can be read comfortably while having enough room to “breathe.”
Perhaps one of the most popular and widely used EMRs is produced by Epic. MyChart is an electronic medical record designed specifically for patients that is integrated with medical practices and hospitals. It is the same medical record that a patient’s doctor uses and the patient can update information, view test results, refill prescriptions, and schedule appointments just to name a few (http://www.epic.com/software-phr.php). iCareLog is different from MyChart because it doesn’t allow for communication between doctor and patient. I personally use MyChart and have found it to be the easiest EMR that is currently available. I feel it has good ease of use and would like to incorporate some of the features into iCareLog in the future. At this point and time however, iCareLog is still a prototype so I felt it was unrealistic to incorporate every feature possible in the very beginning.

Language was also an issue that I felt was necessary to explore when writing the content for iCareLog. Many patients do not understand the medical jargon involved in health care, which is a very important issue in keeping patients healthy. They need to understand what is going on with their bodies, why a health concern is important to track, and how everything that is going on with their bodies affects their health. An article titled “Does Your Patient Really Understand?” by Charlotte Huff states, “Roughly 80 million Americans, according to the latest estimates by federal officials, navigate the complexities of the U.S. health system without sufficient literacy skills.” (35) In this same article, a woman, Jaime, shares a story about a time when her sick mother was in the hospital and recalls the following,

“I was nearly 50, but I really knew nothing at all. I mean, I knew what doctors and nurses were, but that was about it. When a woman in a flowered smock
introduced herself as “R.N.,” Jaime had to ask what that meant. “They took it for
granted that we knew the lingo. Here I was already a nervous wreck over my
mother, and every time anybody said anything to me it seemed to be in code,
with initials and abbreviations and acronyms (38).”

When I wrote the content for iCareLog I made sure to use language that was easy to
understand. I used basic medical terms that the patient would need to know for tracking health
information and stayed away from using acronyms. I also included a link that says “what does
this mean?” in sections where the patient might not understand what information is being
asked of them. For example, in the “Advance Directives” section, some people do not know
what a living will or healthcare proxy is or what the difference is between the two so I included
the “what does this mean” link for each one. When patients understand what information is
being asked of them when filling out health information, it helps them to feel more in control
and part of their health care.

Patients will benefit from iCareLog because it is convenient, intuitive, simple, and easy to
understand. As a patient, I know firsthand how overwhelming it can be to keep track of several
years of important health information in binders and file folders. iCareLog is designed to help
alleviate the stress of having to sort through disorganized papers and store necessary health
information all in one place while being able to understand that information clearly.
Review of Literature

My design research was a thorough and extensive process. I began with a few ideas in mind of areas in health care that I knew would be beneficial to my project. I felt it was important to research new areas of how technology is being used in the health care industry as well as what the future of this field might look like.

I found several resources about how EMRs are being used in hospitals and was also fortunate to receive a walkthrough of an EMR from one of the most common vendors on the market. I also had the advantage of parents that work in health care, which allowed for easy access to a variety of medical journals that focus on the impact of technology in health care. It was important to become familiar with several EMRs that are currently on the market to improve upon the design issues most commonly found in these applications. I found through my research that most suffer from the same problems such as, type size, clutter, lack of visual cues, and too much clicking to find information.

As someone who has suffered from a chronic illness, I also had the advantage of asking people I’ve met that also suffer from chronic illnesses what systems they use to keep track of their health. This was key in figuring out what information needed to be included in iCareLog because I believe the experiences of your target audience are the best resources for content.
Process

Thesis Parameters

Project Goals

The main goal for iCareLog was to make it as easy as possible for any patient regardless of age, to navigate and understand their health information. The entire record needed to be designed in a way that allowed for visual understanding of the patient’s information. I wanted to make use of color-coding each section of the medical record so that the patient always associates a specific color with a specific section (i.e. dark purple is always where the personal information is stored).

Solution

The solution to design an easy to use patient EMR focused heavily on the design of information. Anyone with a chronic illness has the potential to collect large amounts of information in a short amount of time. When deciding on what content to include for each section of the main navigation, I used print patient forms that are currently used by outpatient medical facilities as a starting point for the format. The following are questions I considered when deciding on content:

What information is asked first on print patient forms?
What information is absolutely necessary?
What information is just excess?
How can the information be consolidated and simplified?
The design of the entire interface was also critical. I created a design that was open with comfortable resting space, while making sure the information did not appear cluttered.

**Target Audience**

iCareLog is designed for anyone that has or has had a chronic illness. Those who are considered healthy would also benefit from using this patient specific medical record because being involved in your own health care leads to healthier lives and better outcomes.

**Design Considerations**

Current EMRs on the market and applications used by patients to track bits and pieces of their health are not designed in a way that makes disease management convenient, intuitive, and user friendly. In some cases, patients have to create several accounts spread across several applications. This creates more stress and energy needed from the patient, but the advantage of iCareLog is that it stores all of the health information in one place.

**Prominent visual cues, tool tips, and “you are here” states**

It is very important that the patient knows where they are at all times because of the amount of information being entered, stored, and sifted through. The information needed to be organized well and in a way that makes sense in how the information flows, as well as being able to understand the information clearly. This is illustrated in Figure 3.
Figure 3 - iCareLog screenshot of “My Medical History”

**Minimal clicking**

This is a common design issue in several current EMRs being used in hospitals. I wanted to make sure the patient did not have to click through pages of information to get to a specific section. They need to be able to log in to the EMR, click on a main section, and find the information they are looking for quickly.

**Type size and hierarchy**

The main part of iCareLog is the health information. One of the very first design choices I made was the size of the text. I had to strike a balance between making the text large enough to read, but also small enough that the information did not create clutter and still had enough room to
breathe. Hierarchy was also key for the content in each section of the main navigation.

Headings needed to be clear and visible to understand what information was being asked for in the text field. All information follows the same design pattern in each section and the placement is consistent throughout the record (Figure 4).

Figure 4 - iCareLog screenshot of “Family History”

**Contrast and color palette**

It was important to use high contrast so that the information stands out and can be found easily when searching through the record, but not in a way that it is harsh on the eyes and difficult to
read. A neutral background and color-coding each section of the main navigation helped solve this problem (Figure 5).

![iCareLog screenshot of "Medical Testing History"](image)

**Figure 5 - iCareLog screenshot of "Medical Testing History"**

**Branding**

I wanted to brand this EMR, as seen in Figure 6, because the difference between this EMR and those that are used in hospitals and medical facilities is that iCareLog is specifically for patient use. The patient has control over all the information that gets put into the record. The name iCareLog has personal meaning for each patient. “iCare” represents the patient taking control of their health and saying, “I care enough about my health to be involved and keep track of what
is going on with my body in order to stay healthy.” It is important for patients to be their own advocate, be involved with their care, and know what is going on with their health.

Figure 6 - iCareLog welcome screen after application is launched

**Technical Issues/Trouble Shooting**

During the process of creating my project, I was not completely sure how interactive the EMR was going to be. It developed as I went along and started incorporating design elements into Adobe Flash. The main interactivity in this project comes from typing text into the input fields to fill in the health information and from clicking buttons to advance to another section.
Technical issues began to arise when trying to get the information in the input fields to stick and display as a list that starts populating underneath each section as information is added. The current prototype shows only one example for each section for patients to get a visual idea of how iCareLog saves patient information.
Summary

I created a very thorough and detailed questionnaire for participants to evaluate iCareLog. I was worried this would result in a lack of feedback due to the time it would take for participants to answer the questions. However, I was pleasantly surprised when I received a large selection of willing participants who provided helpful and positive feedback about the project.

The questionnaire was designed in a specific way because asking questions about a person’s health issues is a very private matter. I wanted my participants who were evaluating the project to know that they only had to provide information they felt comfortable with and they could stop the questionnaire at any time. I chose two specific groups of participants to fill out the questionnaire- those who are currently suffering from at least one chronic illness and those who consider themselves to be healthy, but do not require tracking health information closely. My reason for choosing to ask those without a chronic illness to participate was to see if the average healthy person would consider using iCareLog.

Before I sent the questionnaire out to participants, I had some suspicions and was expecting to receive certain answers. The feedback I received led me to one final conclusion. Not only is there a need for a patient focused EMR, but there is more of a want than I thought by those who are suffering from chronic illnesses. Many said that they have been looking for something like this for quite some time to keep track of health information instead of collecting papers in binders and folders.
As for the group that considered themselves healthy, a few said they would not use iCareLog because they felt they had nothing important to track at the current time. However, as any doctor would tell you, it is important to keep track of all parts of your health as a preventative measure to stay healthy.

I also received some excellent feedback to improve the design and content of iCareLog. One of the most important suggestions came from a participant who is currently suffering from a chronic illness. The patient wanted abnormal numbers to show up in red when entering numbers in the “Medical Testing History” section. This is a necessary addition because it is easier for the patient to go back and see where numbers are abnormal and report back to their doctor.

Some other comments I received are listed below.

“I would use this in a heartbeat! I have been waiting for so long to have something like this available.”

“I haven't seen an EMR site before, but this is SO well put together. The colors are neutral and so it's easy on the eye - very, very user friendly - I think even those who aren't familiar with the Internet (elderly) could use it. And I love the title! I hope to see this up and running sometime soon!”
“Keeping track of my health care information is haphazard at best right now, oftentimes I forget things, and none of it is well-organized, this would help greatly.”

“This fills a huge niche that currently exists within the healthcare industry and bridges a major gap between the patient and the healthcare service providers. Maintaining health records at the moment is an extremely cumbersome, error prone process that often involves inaccurate or incomplete and I think this would help solve a lot of those problems.”

“Brilliant idea and execution. The chronically ill accumulate a lot of medical information. Having a comprehensive “one stop shop” online to store important data relevant to one’s care is extremely useful.”

The following is the exact questionnaire used during usability testing:

**iCareLog Evaluation**
*Designer: Alyssa Costino  
Prepared by: Alyssa Costino  
Website: [http://myvisualmark.com/](http://myvisualmark.com/)  
Follow iCareLog on Facebook for updates: [https://www.facebook.com/iCareLog](https://www.facebook.com/iCareLog)*

Thank you for your interest in providing feedback on my thesis project. Your responses will help me improve the final product. I have designed a unique electronic medical record (EMR) specifically for patients to keep track of their health. It is important to be proactive about your health data, especially when it comes to disease management. Patient involvement in personal care can decrease readmission rates and produce better outcomes in keeping patients healthy.
Because the nature of this project includes sensitive information about health, **you do not have to provide any information you do not feel comfortable sharing.** Think about how you would use this product, but do not feel you have to include personal health information. All responses will remain anonymous and you may stop at any time. By filling out this questionnaire you will be automatically entered into a drawing for a prize!

If you have any questions about this questionnaire or you think of questions while recording your responses, please feel free to contact me at alyssacostino@gmail.com.

Once again, thank you for taking the time to help me and I hope you will see the results of your feedback in the future!

*Note: If you would prefer to print this document and handwrite your answers, please contact me so we can arrange for you to mail me your responses.

**Participant Requirements**

- Must be 18
- Must have Internet access
- Must have set aside time to fill out the questionnaire. It shouldn’t take more than an hour. You can leave and come back to the questionnaire, just be sure to save your responses and save this document somewhere on your computer where you will remember.

**IMPORTANT: Please send this questionnaire back to me by May 6, 2012 at alyssacostino@gmail.com so I have enough time to go through your responses.**

**Section 1: General Questions**

Do you currently track anything having to do with your health? If yes, what? (ex. calories, blood pressure, glucose, any type of exercise, etc.)

Do you or have you used some type of paper filing system to track anything having to do with your health? (ex. a binder with specific sections, notebook, file folders, etc.)

Do you use any apps or websites to track anything having to do with your health?
Do you have a chronic illness? (please answer yes or no)

If yes, how are you monitoring your illness?

Are you familiar with EMRs? If yes, which ones?

Age?

Male or Female?

May I contact you regarding your answers if I have follow up questions?

If yes, how do you wish to be contacted? (Please fill in info for one or both)
By phone:
By email:

Throughout iCareLog you will be able to see what each section looks like, but you will not be able to interact with everything. Refer to the directions below each topic when answering the questions.

Section 2: Welcome Screen

In the Welcome Screen, the patient/s will be able to choose a username and password and set them to be used by the entire group of patients or individually. Each patient has the ability to upload a picture associated with their record, but if they choose not to, the picture is set to the default “i” and a color will have to be chosen.

Are the directions clear? Do you understand the welcome message?

Additional comments on the Welcome Screen:
Section 3: My Medical History

Click in the center of the login box on the Welcome Screen if you haven’t done so already. You will now see you are in the first section of the EMR, with a welcome panel displaying some information and links above the main navigation. You can type in the boxes, but the information will not stick once you click on another section. The “Archive” button and “Save” buttons do not work.

Are the directions clear?

Did you notice the page numbers in the bottom right corner?

Additional comments on My Medical History:

Section 4: Family History

Next, move to “Family History” in the main navigation. You can type in the boxes, but the information will not stick once you click on another section. The “Save” button, “Alive” and “Deceased” selections, and “Update” buttons do not work.

Are the directions clear?

Did you notice the page numbers in the bottom right corner?

Is it clear that you can update information once it is put into the list?

Does the order of the content in the list under “Family Member” make sense?

Additional comments on Family History:

Section 5: Allergies and Medications

Move to the next section, “Allergies and Medications.” You can type in the boxes, but the information will not stick once you click on another section. The “Save” buttons do not work.
Are the directions clear?

Did you notice the page numbers in the bottom right corner?

Additional comments on Allergies and Medications:

**Section 6: Healthcare Team**

*Move to the next section, “Healthcare Team.” You can type in the boxes, but the information will not stick once you click on another section. The “Archive” button and “Save” buttons do not work.*

Are the directions clear?

Did you notice the page numbers in the bottom right corner?

Why do you think it asks you to include your dentist and any alternative therapy treatments/any treatment received by a medical professional, therapist, etc.?

Additional comments on Healthcare Team:

**Section 7: Advance Directives**

*Move to the next section, “Advance Directives.” The “Save” button, “upload file” links, and selections do not work. You can click on the three links under “Helpful Links.”*

Are the directions clear?

Did you notice the page numbers in the bottom right corner?

Did you know what advance directives were before you saw the information in this section?

Do you have a living will or healthcare proxy?
Additional comments on Advance Directives:

Section 8: Admissions and ER Visits

Move to the next section, “Admissions and ER Visits.” You can type in the boxes, but the information will not stick once you click on another section. The “Save” button and “what does this mean” links do not work.

Are the directions clear?

Did you notice the page numbers in the bottom right corner?

Were you aware that a discharge diagnosis could be different from the reason for admission?

Additional comments on Admissions and ER Visits:

Section 9: Medical Testing History

Move to the next section, “Medical Testing History.” Each part of this section will look a little different based on what is displayed in the top menu. There will probably be at least one section used by the patient that requires tracking numbers. This section displays an example of how blood sugars would be tracked. You can type in the boxes, but the information will not stick once you click on another section. The “Save” button and top menu buttons do not work.

Are the directions clear?

Did you notice the page numbers in the bottom right corner?

Did you notice the “Output to Spreadsheet” link at the bottom?

Additional comments on Medical Testing History:
Section 10: Personal Profile

Move to the next section, “Personal Profile.” You can type in the boxes, but the information will not stick once you click on another section. The “Save” buttons and selections do not work.

Are the directions clear?

Did you notice the page numbers in the bottom right corner?

Additional comments on Personal Profile:

Section 11: See Last Updates

Click the “See Last Updates” link in the top left corner of the welcome panel. Listed on this screen you will see recent activity that has been updated by the patient with the most recent updates at the top.

Do you understand what this section is for and how the information is displayed?

Additional comments on See Last Updates:

Section 12: Uploaded Documents

Click the “Uploaded Documents” link in the top left corner of the welcome panel. Listed on this screen are examples of files that can be uploaded by the patient.

Now that you have seen each section of iCareLog, what are some examples of information you would upload for this section?

Additional comments on Uploaded Documents:

Section 13: General questions about iCareLog

Now that you have seen how iCareLog works, this next set of questions is about your overall impression of this EMR.
Would you use iCareLog?

If no, why?

Would you use iCareLog just for yourself or would you include others? (ex. spouse, family of 4, etc.)

Would you use a cloud-based service of this EMR?

Would you download a mobile app of iCareLog?

Parting thoughts?

You are done! Thank you!!
Project Post Mortem

What Went Right

My thesis project turned out to be very successful. I was surprised at how smoothly the process flowed and that I was able to keep up with it. This was due to my detailed plan of attack to break the project down into manageable pieces. I accomplished my goal of creating an electronic medical record for patients through a simple, intuitive design that many have said they would like to use. The project was well received with excellent feedback from my target audience and has a clear direction for the future.

What Went Wrong

Thankfully, the things that went wrong can be classified as minor. In the beginning of the project, I had planned to take on more than I could handle. I had to scale back my idea to something more realistic that I could manage to ensure I would be able to complete the project. Deciding on a name that fit the product was a struggle and took the most time.
Conclusion

Designing an electronic medical record as a thesis project was something that was very meaningful for me as someone who has dealt with and experienced design flaws in health care. I have found through my research and witnessed in a variety of settings that those who work in health care do not make things easy for themselves. The systems that are in place need to be streamlined and simplified for ease of use.

This is also a very timely project with all of the current changes taking place in the clinical setting. Paper charts are being phased out and hospitals and other health care facilities are implementing their electronic health record systems. Because this is a new way of dealing with patient information, many changes are being made to how patient information is displayed in the electronic file. In most cases, the patient has not been considered yet in terms of how he or she will interact with the chart and this is where iCareLog comes in. It is important that a patient understands his or her health information to ensure a better outcome and healthier lifestyle. The visual elements in iCareLog, such as color-coding of each section, allow for intuitive searching when looking for specific information.

One of my goals when designing iCareLog was to allow for the project to be expanded upon in the future. I am very passionate about sharing my knowledge of what I have learned as a patient and hope to continue working on iCareLog in the future.
Future Work

In the future, I plan on expanding iCareLog to include more information. This might include sections such as, what to pack and expect during a hospital admission, tracking a pregnancy, tracking milestones for children from birth, and possibly the addition of adding health information for pets. I think the creation of a mobile app would also be something patients are interested in for convenience. It is also relevant to think about how this electronic medical record might work in the realm of living out in cyberspace as a patient portal. iCareLog is a timely product based on all the current changes happening in health care with technology. Health information technology (Health IT) is a major focus in the medical field and I think we all need to be aware of how technology will affect our health.
Appendix

Thesis Proposal for Master of Fine Arts Degree

Rochester Institute of Technology
College of Imaging Arts and Sciences
School of Design
Computer Graphics Design

Title: The Electronic Medical Record: Designing with the Patient in Mind

Submitted by: Alyssa Costino

Date: November 9, 2011
Abstract

The switch from paper charts to Electronic Medical Records (EMR) is intended to create a more efficient healthcare industry. The use of EMRs cuts down on paper waste and allows doctors and other medical staff to communicate with others conveniently wherever they happen to be located. Currently the focus is on working through functionality and design issues in the hospital EMRs and getting doctors acquainted with how the EMR works. The patient focus has not been addressed at this time in terms of how they use and interact with their personal medical history. Based on my personal experiences as a cancer survivor, I will design an EMR that is patient friendly and allows those with chronic health issues to keep track of their medical information and store it all in one convenient place.
Project Description

This thesis explores the switch to Electronic Medical Records (EMRs/EHRs) in the field of healthcare. As someone who grew up with parents who work in healthcare and facing my own struggle with cancer, I believe my past experiences are an advantage to solving problems in the design of healthcare technology. This industry is becoming more technologically enhanced and EMRs are currently being implemented in many hospitals. However, the current focus is not on how patients use and interact with their personal medical history in an EMR and what is provided to them in the form of a print out. I plan to focus on the patient aspect of the EMR by addressing user interface design problems and developing a design for a patient EMR that is user friendly and printable. Hospitals and other healthcare facilities will be required to provide an electronic copy of the record to the patient. The format is not specified, but it could be in the form of a CD or a flash drive and can be thought of as a “portable chart.”

The switch to Electronic Medical Records for hospitals and other healthcare settings has to be made by 2014. Each hospital chooses an EMR from the vendors that design and create them. Currently, these facilities are focused on getting their EMRs deployed and working out the defects to get them to function properly. Doctors also have to familiarize themselves with this technology and move away from paper charts. Focusing on the patients is not a top priority right now. The target audience for this patient EMR is those that have or have had chronic illnesses that need long-term management. Existing medical applications for someone with a chronic illness are not designed in a way that makes disease management convenient, intuitive, and user friendly. Patients with chronic illnesses need their information stored in one place instead of having their information spread across several different applications and possibly
having to create accounts for each of those applications. Ideally, this patient EMR will be the one universal application that solves all of the current design issues that are prevalent in almost all of the applications on the market. This implementation will include the following elements, which are missing in existing implementations:

**Electronic Patient Medical Record**

1. prominent visual cues, tool tips and ‘you are here’ states
2. proximity of information
3. minimal clicking to get information
4. easy to use control panel

**Printable Patient Medical Record**

1. consistent type size and colors
2. the use of headings and “chunking” of information
3. typographical hierarchy
4. grid structure

The graphical user interface will be designed in Adobe Photoshop and a prototype will be built in Adobe Flash Catalyst. Each interior page of separate sections for the GUI will be designed in Photoshop. This is the best way to achieve certain interface design elements such as gradients, the use of blending modes, opacity, and texture to name a few. Flash Catalyst will be a good tool to display visually how buttons, rollovers, links, and other interactive elements will work in this project. The print out of the EMR will be designed in Adobe Illustrator to allow
for the design of a strong grid structure. This project will be designed for the computer and designing for a tablet screen size will be considered.

The switch from paper charts to Electronic Medical Records is intended to create a more efficient healthcare industry. The use of EMRs will cut down on paper waste and allow doctors and other medical staff to communicate with others conveniently wherever they happen to be located. Currently the focus is on working through functionality and design issues in the hospital EMRs and getting doctors acquainted with how the EMR works. Based on my personal experiences, I plan to design an EMR that is patient friendly and allows those with chronic health issues to keep track of their medical information and store it all in one convenient place.
Survey of Literature

"A Day Made of Glass... Made Possible by Corning. - YouTube." YouTube – Broadcast


<http://www.youtube.com/watch?v=6Cf7IL_eZ38>.

A project with futuristic GUls designed by Corning Incorporated that will act as inspiration.


Mobius is an EMR that integrates features such as, patient dashboards, real-time monitoring, and high-resolution images. There are some nicely designed elements in this EMR, but I think it is actually over-designed. However, it is worth noting that this project won an Adobe MAX Award in 2011 in the “Digital Enterprise: Empowering Employees” category.


<http://www.behance.net/gallery/FL-Studio-Mobile/1678480>.

There are some GUI elements in this project that might be helpful in designing my project.

Brown, Aaron, and Bill Weihl. "An Update on Google Health and Google PowerMeter."


Google Health was started with the intention of giving people control over their health and being able to manage their personal information. However, on June 24, 2011, Google
announced this product will shut down on January 12, 2012 because it did not catch on like they had hoped.


Rochester General Health System implemented their EMR, “Care Connect” on November 5, 2011. This video explains the reason for the switch and how EMRs will improve healthcare.


Eden is a mobile EMR that is one of the few well-designed apps for this technology that I have seen. The overview on their website states, “Envision a medical practice where the technology works flawlessly—and it’s a pleasure to use. Eden gets you there. It elegantly blends the utility and simplicity of Apple technology with the industry’s most powerful cloud-based EMR and Practice Management solution.”


Mckesson is a well-known company that delivers EMR solutions.


This website explains the benefits of EMRS in three key points – “complete and accurate information, better access to information, and patient empowerment.”


<http://www.youtube.com/watch?v=gkZMaVruiGw>.

The University of Rochester Medical Center posted this video on YouTube to show how their EMR “eRecord” works in a hospital setting.


This article explains in basic terms what meaningful use (MU) is. “The term MU came into existence with the passage of the February 2009 American Recovery and Reinvestment Act (ARRA), which included the term meaningful use – but did not define it – as a precondition for receiving reimbursement by physicians who adopted EMRs. The idea was to encourage 100,000 physicians currently using paper-based charts in one-to-10-doctor practices to adopt EMRs that achieved MU and allowed them to put away their paper charts.” MU applies to my project because if a patient requests their medical records, they are required by law to receive them. This is not how it has always been in the past.

Hicks, Jeff. "PACS Helps Medical Center Reduce Turnaround Time from Hours to Minutes." *Health Management Technology* July 2010: 24-25. Print.
I am not including the storage of medical images in my project because of the PACS system (picture archiving and communication systems). This article explains how the PACS system is helping to improve the healthcare environment.

**Lichtenfield, MD, Len. "Q & A: Patients Want Coordinated Care."** *Cure Fall 2011: 19. Print.*

Q & A with a patient who asks a doctor why paper copies of records have to be retrieved when we know patient records are going digital. The doctor explains that the switch to electronic medical records is progress, but it is slow going. He says, “Although the process of health information exchange is gaining traction, it may be some time before networks that will move patient information from one place to another are up and running.” Bottom line is that patients need to be their own advocate and need to keep copies of important records.


This article from the New York Times talks about the switch to electronic medical records.


This is a very interesting article on how the healthcare system needs help when it comes to design. Mcmullen shares a story of a doctor who was fired for not being able to enter notes into patient EMRs fast enough due to the technology barrier. The doctor was used to transcribing notes into paper charts for his entire career and the EMR switch left him unable to keep up. He was a very skilled doctor, but lacked sufficient typing skills. Mcmullen suggests that doctors
should be included in the planning process before the EMR is implemented to catch errors and problems early on.


This product created by Microsoft helps consumers take charge of their health and control who their information I shared with. While this PHR (Personal Health Record) has some similarities with my project, there are features that will not be used in my project.


NextGen is a well-known company that creates EMR solutions, but the design lacks cohesion.


This describes what the PACS system is in basic terms and its uses.


This app is a “coach” for diabetics called “The DiabetesManager.” It tracks glucose levels, medications and behaviors. Results have shown that doctors and patients can communicate effectively with mobile technology.
MEDITECH is one of the well-known EMR vendors. I have seen their EMR system that is used in hospitals in person and there are several design issues that affect patient care.


Privacy is a big concern for patients with the switch to EMRs and many are wondering if their health data is safe online. This article explains the difference between health data and Internet data and how paper charts lack patient privacy. Rowley sums it up perfectly by saying that we do our banking online, now healthcare should be done online.


This is GE Healthcare’s mobile version of their EMR, “Centricity Advance” for primary care physicians in small practices.
Timeline

Expenses

Possibility of traveling to different hospitals/medical facilities
Possibility of needing to update software
Possibility of signing up to receive demos from certain applications
Lots and lots of energy
Adding additional resources
Thesis meetings and meetings with others

Remainder of Fall Quarter

Week 7 – blog documentation, flow chart, sketches, mood boards
- 8 hours

Week 8 – blog documentation, edit survey of literature, start typing up proposal
- 8 hours

Week 9 – blog documentation, finish up entire proposal, put presentation together
- 6 hours

Week 10 – blog documentation, present proposal

Week 11 – make revisions to proposal if necessary

Winter Quarter

Week 1 – blog documentation, wireframes

Week 2 – blog documentation, revise wireframes, begin designing GUI in Photoshop
Week 3 – blog documentation, continue GUI in Photoshop
Week 4 – blog documentation, continue GUI in Photoshop, start print layout
Week 5 – blog documentation, GUI revisions, continue print layout design
Week 6 – blog documentation, finalize GUI, print revisions
Week 7 – blog documentation, finalize print layout
Week 8 – blog documentation, begin prototype in Flash Catalyst
Week 9 – blog documentation, continue prototype
Week 10 – blog documentation, prototype revisions
Week 11 – blog documentation, final revisions on parts of project, deploy to web

Spring Quarter

Week 1 – blog documentation, design testing
Week 2 – blog documentation, design testing
Week 3 – blog documentation, evaluate results of design testing
Week 4 – blog documentation, make revisions based on feedback
Week 5 – blog documentation, implement final project
Week 6 – blog documentation, start working on presentation for defense
Week 7 – blog documentation, continue work on presentation
Week 8 – blog documentation, finalize presentation
Week 9 – blog documentation, finalize details, create finished project package
Week 10 – blog documentation, defense
Week 11 – blog documentation, wrap project up
Miscellaneous

1 - 3 additional hour(s) every week to send/reply to emails, adjust things, update resources and edit documents
Color Scheme Moodboard
Sketches
Implementation Strategies

The interface of this project will be designed in Adobe Photoshop and a prototype will be built in Adobe Flash Catalyst. Photoshop is the best way to achieve certain interface design elements such as gradients, the use of blending modes, opacity, and texture to name a few. The patient will be concerned with getting their information and clicking through content, not on animated graphics that are intended to capture attention. Because of this, Flash Catalyst will be a good tool to display visually how buttons, rollovers, links, and other interactive elements will work in this project. The interactive part of this project will be designed for the computer and designing for a tablet screen size will be considered.

The print out of the EMR will be designed in Adobe Illustrator to allow for the design of a strong grid structure. The design of the graphical user interface will influence the design of the print out and will be adapted for continuity.
Dissemination

Plans for submission of thesis project include:

Adobe Design Achievement Awards

These awards celebrate student work created with Adobe creative software.

Adobe MAX

The purpose of the Adobe MAX event is to promote the latest releases from Adobe and discover the latest technologies being used in the computer graphics industry.

CIAS Student Showcase Portal

This website allows RIT CIAS students to upload projects from their experience at RIT.

Communication Arts

Print publication that features feature articles, competitions and resources for designers.

Core77 Design Awards

This design competition features several award categories from “client work to self-initiated projects, entrepreneurial to pro-bono engagements.”

Health Management Technology

This magazine features news from the healthcare industry on how technology is making an impact in this field. Lately, special focus has been on EMR coverage.

HOW Magazine

A magazine for designers on how to be more “creative, successful, productive, and connected.”
Evaluation Plan

The plan to test this project includes the following:

• The group tested will consist of patients eighteen and above with chronic illnesses

• Questionnaires will be provided
  - if the patient is local: it might be helpful to watch the patient interact with the EMR
  - if the patient is not local: an online survey will be created
  - all patients will be asked the same questions

• Feedback will be qualitative

• Based on the feedback, design changes will be made to the GUI and print out

The final project will be assessed using the following criteria:

• Consider feedback from usability testing

• Balance of design – does it take into consideration patients concerns/feedback while maintaining hierarchy, design principles, and a strong grid structure?

• How well did I achieve my goals?

How successful is the project in its delivery?


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