OUTPATIENT MOBILE INFORMATION

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Final Report

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FINAL REPORT

INTRODUCTION

Tablet PCs in the consumer market have shown increased popularity in the past few years. Their small form combined with the ability to allow natural handwriting input and recognition makes them highly portable, and not as unwieldy as a normal laptop computer. Adoption of these devices into the medical community has been limited mostly to medical staff including doctors and nurses, but the use of Tablet PC devices by patients lies mostly unexplored. By incorporating Tablet PCs into normal procedure at outpatient clinics, we can potentially make a more streamlined and efficient process while further maximizing information retention by the patient. This report serves to describe our initial research findings that indicate how such a system could be implemented to fulfill the needs of both the patients as well as the medical staff.

PROJECT OVERVIEW

The outpatient mobile information project aims to develop an educational information system to be used in the hematology and oncology outpatient clinic of Children's Hospital of Pittsburgh (CHP). Ideally, patients would be able to access relevant and trusted medical information about their particular condition. Additionally, the patients would be able to take notes or write down questions on the Tablet PC for the doctor while in the waiting room. Since all of the information would be digitized, the patient could either save it for later reference, or print out a hard copy.

RESEARCH CONDUCTED

Initially, we met with both Professor Gunawardena and the staff at the oncology and hematology lab at Children's Hospital of Pittsburgh. After setting the scope of the project to focus on the education of parents and families of hematology patients, we performed a series of research methods to better understand the scope of the problem. We started with a literature review and moved into shadowing doctors during their consults with patients. Finally, we performed contextual inquiries with doctors, nurses, and parents of patients.

Literature Review

We initiated our research with a review of the current tools used to educate patients in the medical field as well as the current applications for the Tablet PC device. We were exposed to various applications developed under Professor Gunawardena and found many more applications relevant to the medical field. We also read about various psychological effects in waiting rooms and learned about various kiosks, booklets, and other educational media intended to aid in the passing of time when in the waiting room and to aid in patient education of a particular medical condition. Our review consisted of various sources, including journal articles, existing applications, newspaper articles, conference papers, and online databases. In total, we reviewed over 50 different sources.

Affinity Diagram

Our affinity diagram is presented in figure 1, which we developed from our literature review. We were able to break our research down into various categories, including: current medical sources and Tablet PC applications, concerns, implications, wants and desires, proof of concept, competition to our device, technological trends and implications, and interactions that might prove useful. With this information at hand, we were able to move ahead, initiate our shadowing, and begin developing a series of questions for our contextual inquiry. The questions that we developed can be found in Appendix B.

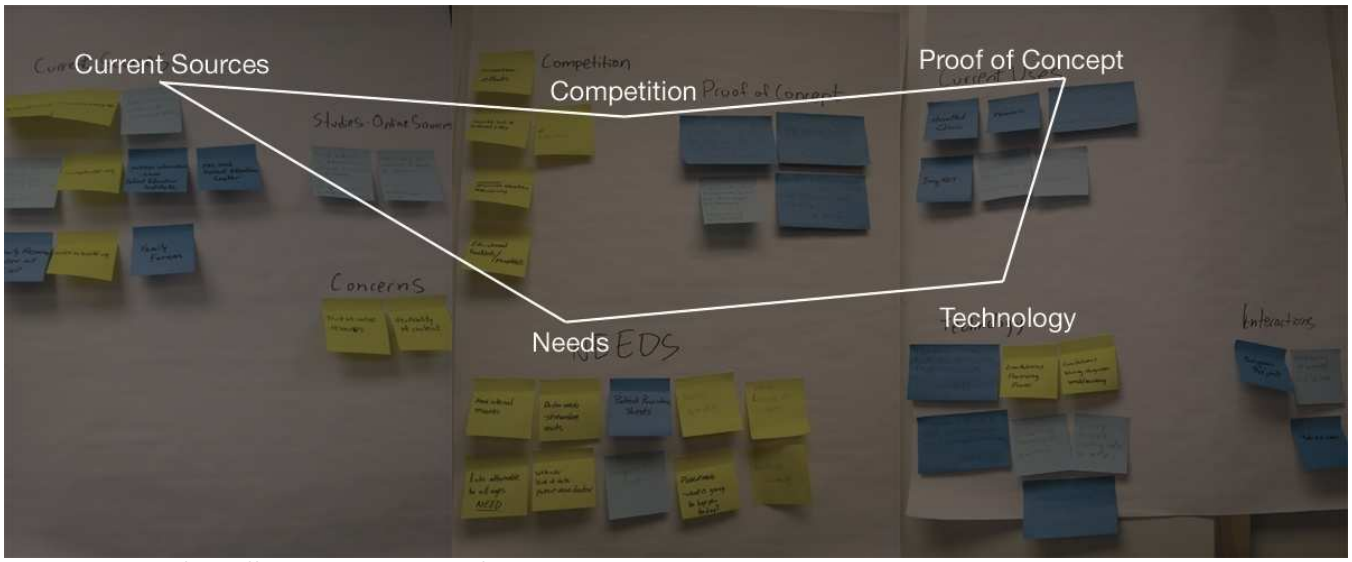


FIGURE 1 – Part of the affinity diagram created from the literature review. The diagram was broken into several sections to help organize the research space and provide motivation for further research methods.

Shadowing

The team shadowed two doctors for a total of five patients over the course of our primary research. Four patients were shadowed independently, and the last shadowing was conducted in parallel with a contextual inquiry.

For the shadowing process, the team divided into two groups of two and followed two doctors, Dr. Shaw and Dr. Gunawardena, around while they visited patients in order to understand the details of the work. The team conducted a brief interview before the doctor saw the patient, observed during the patient visit, and asked the doctor additional questions after the visit. While we were conducting the short interview prior to the visit and asking follow up questions, one team member was assigned to take notes and the other acted as the interviewer. During the patient visit, both team members observed and took notes. We alternated roles between patients.

The content of the shadowing was focused on the doctors' process and their interaction with the patient's family. Because the patients were mostly children, they were accompanied by their parents or guardians. The team tried to learn about the doctors' process before, during, and after meeting with patients and how information is passed between the doctor and the patient's family.

The team chose to shadow the doctors during patient visits because the patient and doctor's time were valuable, and questions would have been intrusive while the doctor was interacting with the patient.

Across the five patient visits that we shadowed, we found that Dr. Shaw's and Dr. Gunawardena's processes are the same. The process for new patients began with checking over the patient's medical history, family

history, why the patient was referred, and any tests the patient has been subject to. A resident would then meet with the patient and their family. After the resident met with the family, they would brief the doctor on why the patient was there. The doctor would then meet with the patient and their family. During this visit the doctor verified the patient's medical records and history. The doctor then performed a physical examination on the patient.

If this was the patient's first visit the doctor would go over why the patient was there. Following this, any test results done by the referring primary care physician were discussed. If sufficient tests were conducted, the doctor would go over the diagnosis with the patient and family. This included measures to be taken and symptoms to be aware of in the future as well as how the condition would affect the patient currently. If there was a pamphlet on the patient's condition available, the doctor would provide that information on the condition and any reputable online resources about the condition. If the patient needed to go on medication, the doctor would discuss the medication, any side effects it would have on the patient, and other medical options. If there was insufficient testing done, the doctor would discuss what the patient needed to undergo and the possible outcomes of each test. Lastly, the doctor gives the family their contact information so that they could contact the doctor with any questions.

If this was a returning or follow-up visit consultation, the doctor would go over what happened between the previous visit and the current visit, and go over any concerns including medication and the patient's condition.

Through the interviews prior to each visit, we found out that the doctors wanted the patients to get a better understanding of why they are there, to understand their condition, and to belay their fears. We also found out that all information pamphlets given to families are developed in house by Dr. Shaw and Kristen, a nurse. The doctors do not provide a pamphlet until the patient's condition has been diagnosed, and no pamphlet or external information is provided if more testing is required. Dr.Shaw explained that they do not give unnecessary information to the patient before they are sure of the diagnosis because they do not want to add fuel to the fire of worry if there was nothing wrong with the patient.

While observing the patient visits we were able to observe and hear the patient's and their family's questions. Patient questions were distributed throughout the visit, none of the families had a written list of questions to ask the doctor, and none of the families that we shadowed took notes. The questions showed a need for reassurance on the patient's current and future life, as well as a guarantee of the risks that the condition posed to the patient. We also found out that the majority of the visits were educational; many of the first time patients came in because they were referred by their primary care physician and did not have clear information about exactly why they were there.

CONTEXTUAL INQUIRES (CI) AND FINDINGS

Method

From February 1st to February 6th, we conducted a total of six contextual inquiries with the doctors, nurses, and families at the Children's Hospital of Pittsburgh (see Appendix B for CI questions). Since we conducted these contextual inquiries after our shadowing of the doctors and families, we were already familiar with what the typical hospital visit is like and how the entire process is currently done. As a result, we were able to both affirm what we had already learned and ask more useful and informative questions. This helped give us insight to how patient education is currently done and some of the difficulties there are with the current method. It also helped us discover the wants and needs of the families as well as the design implications for the Tablet PC interface.

Contextual Inquiry - Doctors

On February 1st, we had a chance to conduct contextual inquiries on two of the doctors at the Children's Hospital, Dr. Gunawardena and Dr. Shaw. Our team split up into two groups, one for Dr. Shaw and the other for Dr. Gunawardena. Many of our questions pointed out some of the communication breakdowns between doctors and families, how families are currently educated, and what the families are looking for when they come in to the office. The results of these contextual inquiries also led to a number of design implications to keep in mind when designing and developing our Tablet PC interface.

In terms of the communication between doctors and families, we found valuable information on how information is currently communicated and some of the current breakdowns. Doctors currently communicate with families primarily through face-to-face interactions, but information is also given by phone, email, and mail. All four of these modes of communication are used to provide patient education to families.

When discussing test results or diagnoses, doctors mentioned that they prefer to do it through face-to-face interactions or on the phone. Information, such as pamphlets, are mailed to families when doctors know for sure if they have a certain condition, and those pamphlets are all developed in house to have less technical jargon. Email works well for less serious issues and questions, but Dr. Shaw mentioned that he does not like giving results through email because he feels the need to explain them to families. He highly values face-to-face interactions, and mentioned that, "Text message and email should not replace personal interactions," but rather that "email should be used in conjunction." The benefit of email, as Dr. Shaw noted, is that it gives doctors time to think about the answers they provide families. In terms of providing external resources, doctors mentioned that they like to direct patients to trusted medical sources so that they don't get any false information.

The communication breakdowns that we noted from both Dr. Shaw and Dr. Gunawardena involve external sources of information, support groups, and data retention. Dr. Shaw mentioned how it's not unusual to have families come in with false information from other people, especially from people like the aunt who's an herbalist and the grandmother who is into traditional medicine. Dr. Gunawardena mentioned that the online support groups sometimes circulate incorrect information between families, and those families sometimes get more anxious and stressed rather than receive support from these online communities. Additionally, both doctors mentioned the breakdown with families' retention of information. Dr. Shaw spoke about this issue, and he mentioned that with some families, "you see them the next week and they have the same questions." Dr. Gunawardena mentioned how sometimes when she calls families about test results, she isn't always sure if they remember what they talked about at the hospital. Some families do, and some don't. Sometimes she needs to repeat information and answer the same questions.

One of the key wants of families that we noticed from our interviews with the doctors is the need for trust and reassurance. Dr. Shaw stressed the importance of building trust with families by mentioning things like calling some families to explain certain things to them and directing his patients to sources of information. He also mentioned how important it was for doctors to be reassuring with the families because the families and patients feed off of anxiety. As Dr. Shaw said, "If you're calming, then the family will be more calming." Dr. Gunawardena noted that one of the problems that they have is that families generally don't know where to find trustworthy information, and so it is important for doctors to provide that guidance to families.

Contextual Inquiry – Families

On February 5, we had a chance to conduct contextual inquiries on two different families at the Children's Hospital. One family was visiting the clinic for the first time while the other was visiting as a part of a routine checkup at the office. Most of our questions revolved around the sources of information that the families had and how they prepared for the hospital visit. These contextual inquiries with the families were very valuable in terms of determining their wants and needs before, during, and after the hospital visit.

For the first family, their 11-month-old child was diagnosed with Wolffe-Parkinson-White (WPW) syndrome. When asked about why they came in to the Children's Hospital, the family answered that they came for the sake of thoroughness, not because they were overly concerned. They had already discussed the condition with their pediatrician, who wasn't concerned about the baby. As a result, the parents wanted to know what to be concerned with in the future, such as sports, lifestyle, changes, etc.

In terms of the sources of information, the first family sought information through a general pamphlet they had received, the internet, and the online support groups. This particular family had a scientific background, so they knew to look at the sources to judge whether a site was trustworthy and to disregard information if there were no sources. In terms of the support groups, the family mentioned that some of the stories on the board were horrifying, some of the stories didn't even apply to them, and some patients were uninformed and asked off-the-wall questions. The family's involvement with the support groups didn't seem too useful because of those breakdowns. During the consult at the Children's Hospital, Dr. Gunawardena also spoke about the test patient's results and mentioned that there was an increased clotting risk for the baby. When asked about it, the mother said that if she knew that there was a clotting issue, then she would have looked it up beforehand.

For the second family, their 3 year-old came in for a follow-up visit for Von Willebrand disease. When asked about their sources of information, the family mentioned that they received pamphlets on the condition and performed online research with resources from local universities recommended to them by their family friend, who is a doctor. The family had a lot of external resources, and one of their key reasons to come in was for clarification. A relative of the family is a doctor, and so they wanted to verify information with Dr. Gunawardena. The family also received advice from a family friend, who is an EMT/medical professional. It was also very valuable to hear what the family wanted from their hospital visit because they mentioned specifically that they wanted to know how to control the bleeding because the current clotting medication wasn't working. When asked how they retained all the information they heard from their hospital visit, the grandmother said that she took notes during the consult, reviewed the notes on the ride home, and then filed the notes away. This has very important design implications for our system because it shows that the family values patient education and that they want to stay informed. The grandfather mentioned that he only goes online to look up information if he knows exactly where to look, which is something that we are looking to provide with our Tablet PC system.

Contextual Inquiry – Nurses

On February 6th, we had a chance to conduct contextual inquiries on two of the nurses at the Children's Hospital, Kathy and Kristen. Most of our questions revolved around nurses' involvement with the patients and families, and some of the communication breakdowns that they encounter. The primary source of information for families is the doctors themselves, so the nurses do not have a whole lot of involvement with patient education. After meeting the patient and the family at the start of the family's visit, the nurses typically do not talk to them again. Any follow-ups or follow-up questions are handled by the doctor or the phone triage nurse. In terms of the information that the nurses want families to leave with, they want families to know why they are there and the procedures that will be done. When patients need to stay in the infusion room to receive a blood infusion, there is an instruction sheet that nurses give to families, which contains all the

information that the family needs to know about like fluid consumption instructions. The nurses go through this instruction sheet line by line to make sure that the family understands all the information. It was also interesting to find out that the nurses are the ones who create the pamphlets and send them to the doctors for approval. These pamphlets will eventually be given to the families when they are diagnosed with a condition.

The most frequent breakdown that the nurses mentioned involved the information that families receive from other people. Kathy mentioned that there are always the families that heard "Grandma's stories", and it's just a matter of giving them the right information. In terms of doing research on the internet, both the nurses felt that it was good and bad. Sometimes, families receive good information from online sources that leads to better questions while others find completely incorrect information.

POSSIBLE SOLUTIONS, DESIGN IMPLICATIONS AND IDEAS

Based on our findings we found the following implications.

Reassurance – From the questions the patient's family asked during the shadowing we found that a lot of the families are asking for reassurance from the doctors on their child's condition. We also found out, from the contextual inquiries, that the doctors want to belay the patient's and family's fears during the patient visits. We found that reassurance is very important and that pamphlets need to be created so that their wording does not frighten families.

Clarification – From shadowing the doctors through their patient visits we learned that a lot of patients came to the children's hospital without knowing why they were referred there.

Education – From shadowing and performing contextual inquires on the doctors, nurses, and patients we found that many of the patients' visits are educational. The patient and their family often came in with incorrect or misleading information from the internet or their family and friends.

Proficiency with Technology / Usability – In the contextual inquires with the patients and families, we found that each family's proficiency with technology varies. This means that our solution would need to be easy to use so that a wide variety of patients and families with different technological skill levels would be able to use the system.

Information should be supplementary, not the sole repository – During a contextual inquiry with the doctors we found they want the information to be supplementary to the patient's visit to the doctor, not try to replace the information given through face-to-face interactions with the doctor.

Information retention – While shadowing the doctors we found that families try to remember all information from visits but often times forget and ask the same questions on follow up visits. .

Based on these implications we will focus on explaining conditions, which will provide reassurance, education, and clarity, designing for persistent information, data retention, making the information trustworthy, and making the system user friendly.

WANTS, NEEDS, AND IMPLICATIONS

After shadowing Dr. Shaw and Dr. Gunawardena over the five patient visits and conducting two contextual inquires each on doctors, nurses, and patients, we consolidated all of our information into a work flow and sequence diagram.

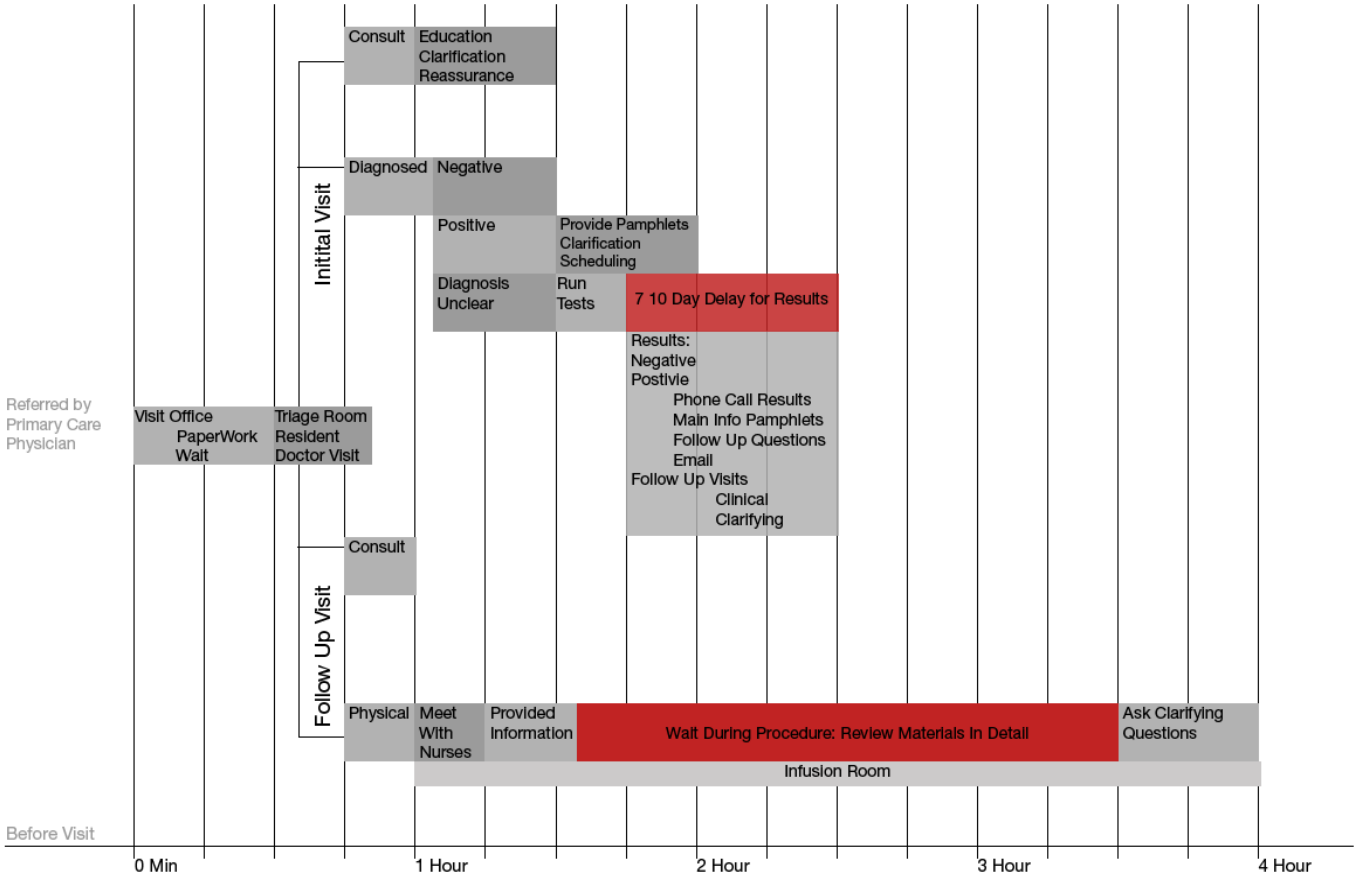


FIGURE 2 - SEQUENCE DIAGRAM

The sequence diagram chronicles the process a patient goes through when visiting the hospital. The patient is usually referred to the hematologist and oncologist by their primary care physician. For the first visit the doctor checks the patients test work and either diagnoses the patient or sends the patient to do further testing. If the patient is diagnosed, they are given information by the doctor, a pamphlet on the condition, and possible resources on the condition. If the patient is not diagnosed with a condition, the doctor reassures and clarifies the issues and concerns that the patient and family might have. If more test work needs to be done, the results are usually given through a phone call by the doctor. Additional follow up visits are usually split into two groups, one being a consultation and the other being a longer stay for a blood infusion. Before the infusion is done, a nurse goes over the infusion process with the family and goes over an informational pamphlet on it. The procedure lasts from 1-3 hours and, afterwards, the family is able to ask any questions they might have.

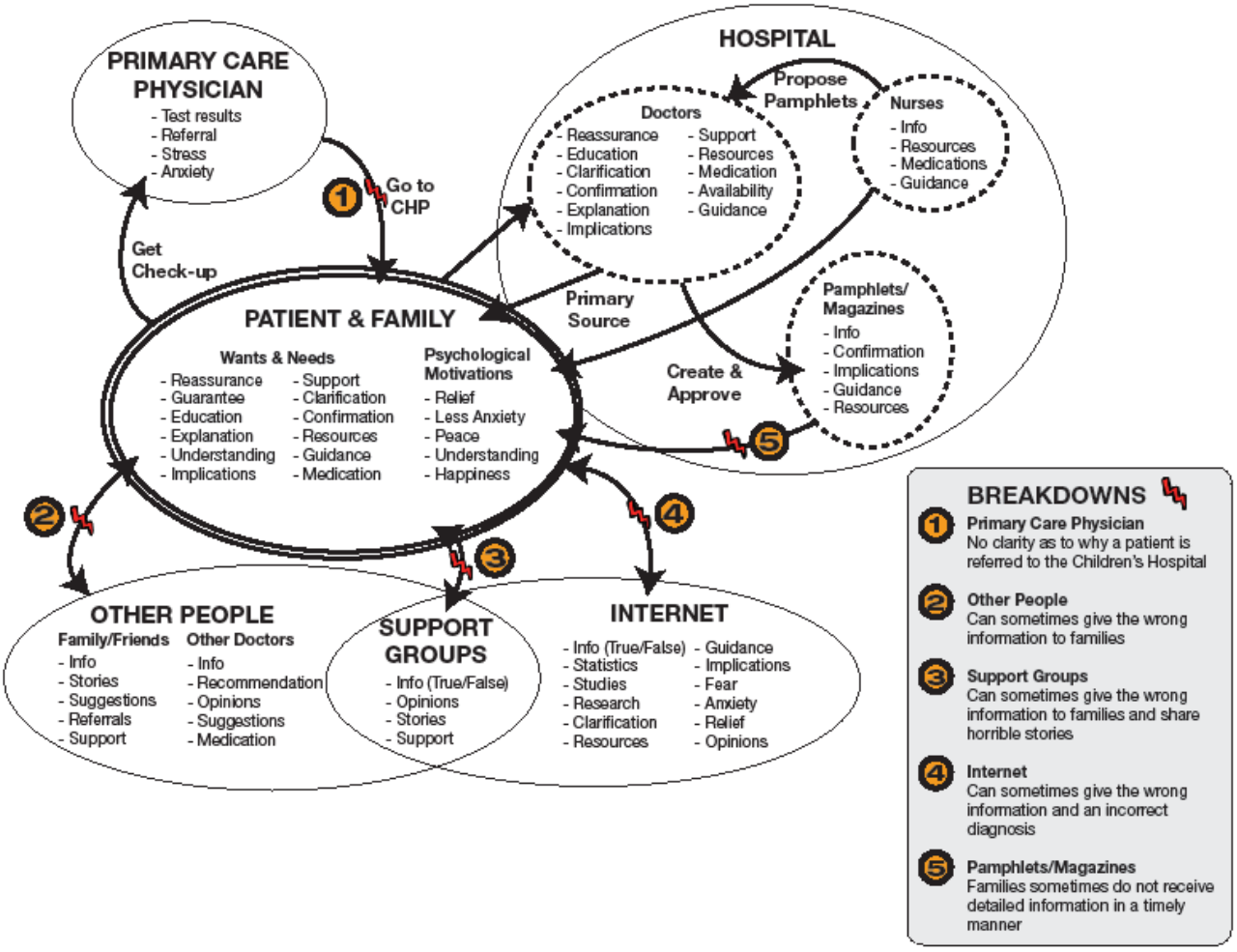


FIGURE 3 - WORKFLOW DIAGRAM

In the work flow diagram all of the breakdowns occurs between the patient and family and other sources of information including the internet, other people like family and friends, support groups, the patient's primary care physician, and the pamphlets / magazines.

One breakdown occurs between the primary care physician and the patient and family. This breakdown occurs because the primary care physician would often times not give the patient and their family enough information about why they are referring the patient to a hematologist / oncologist. This would cause the patient and their family anxiety because they do not know why they are seeing a specialist in bleeding disorders and cancer, and parents are unsure if their child has a condition or not.

Another breakdown occurs between the patient, their family, and other people including family and friends. During the contextual inquiry with the doctors, we learned that the patient and their family would often receive advice or suggestions from their friends, which turned out to be incorrect or misleading.

Other sources of misleading or incorrect information are the internet and support groups, which lead to breakdowns between each group and the patient. Patients often came in to the hospital with incorrect

information from the internet, or saw horrifying stories and incorrect information being spread on some support group sites / chat rooms.

The last major breakdown occurs between the pamphlets and the patient and family. Because families do not receive any information until the patient is diagnosed, some of them look to or receive information from other, possibly inaccurate or untrustworthy, sources of information.

PAPER PROTYTPE

This next section serves to describe our user testing of the paper prototypes of our initial outpatient mobile education system.

During this phase we each created paper prototypes of the patient education system based off of our previous research done in the last phase. We collected a group of features we wanted to include in our final interface and refined our own paper prototypes to reflect feedback we received and changed them to incorporate the previously mentioned group of features. We then conducted several think aloud user tests of our paper prototypes on parents of patients, doctors, and nurses. During the user tests we focused on how we were going to implement each feature.

PERSONAS

We created our personas based on the following research implications, which we gathered through our contextual inquiries and shadowing. One of the implications we found during our previous research was that our users had a wide range of technical computer skill, ranging from rarely using the computer and Internet to extremely competent and frequently using the computer. Other implications we found were that all of the patient's families want education, that patients come to the hospital with their parents or grandparents, that they often received false information from family and friends, and that they are sometimes worried about their family history.

Based on those implications, we created two personas, each exemplifying a key set of implications. Sue is a mother who has moderate technology skills. She has a brother-in-law who may have given her misleading information, and this is her first time at Children's Hospital. Sue wants information and reassurance for her child. Our second persona, Albert, is a grandfather who has little technical skills but can use a computer. This is Albert's fifth time visiting Children's in 18 months and he is concerned about his grandchild Frankie because his family has a history of clotting, and Frankie's sister has Von Willebrand disease. Albert wants information and education about his family's implications.

Sue

First Time Visit

- 34 year old mother
- First child
- 17 month old daughter
- Regularly uses computer for menial tasks
- Uses computer at work
- No medical knowledge
- Brother in law works as an herbalist

Wants education and reassurance that child is ok

Albert

- 5th visit in 18 months
- Grandfather and guardian for three grandchildren
- Grandchildren: Frank, 3 years old
- Alice, 5 years old
- Alice has Von Willebrand Disease
- Albert rarely uses technology
- Owns cell phone for kids school
- Computer at home
- Grandchildren use, Albert doesn't
- No medical knowledge
- Family history of clotting
- Concerned for Frankie
- Wants education on family implications

INTERFACE DEVELOPMENT

In order to develop the interfaces to test, we opted to make four initial designs. To start, the four members of the team independently sketched out what the interface should look like. At a meeting set before the research was to be conducted, we reviewed the various interfaces and began to form a list of similarities and differences. From this, a list of core requirements was created and after a brief critique each team member went off to redesign their own iteration of the application. Still, each interface followed a different set of implications found in our research. See Appendix A for a full set of the interface designs.

Design 1 was developed to have an introductory wizard and a list of medical reasons for the visit. The interface also showcased a general print and email function as well as personalized wording. A separate space for questions and answers from the general notes section was also a main focus.

Design 2 was developed with a similar introductory wizard but parsed the information shown after the user used the tablet's ink feature to write in a reason for the medical visit. The design also had a dedicated notes section that would appear next to or above the interface. Finally, this interface had dedicated menu buttons including a doctor's access section to enable the patients to receive more specific information.

Design3 had a brief introduction to the system instead of an introductory wizard. In addition to a list of reasons, there was always a present list of topics to aid in navigation. Articles would be rich with links to additional topics and the pen tools would allow direct mark up of the information for personal use later. The print queue also provided various options to the levels of information saved.

Design 4 focused on some of the technical needs of the tablet interface, such as dominant hand use. The interface was unique in having notes and questions appear together on the same screen.

After this initial meeting, each team member brought a second round interface to the table and after brief modifications they were submitted as the final paper prototypes to be tested. Ultimately, we tested all four designs along the same work path to gain an understanding of the strengths and weaknesses of each.

USER RESEARCH METHOD

In order to evaluate the four design concepts developed, the design team constructed a list of questions intended to guide users through the system. Users were asked to think aloud and point with a pen where they were looking and what they were thinking as they were asked to pursue specific tasks in each interface. By randomizing the order the interfaces were shown between users, a generally unbiased set of data was obtained.

In addition to the tasks set forward, general review of the designs were sought. Users were asked to offer their feedback on all of the interfaces both as individual systems and in comparison to the other interfaces that they saw. Due to time constraints, patients and families were shown anywhere from one to four of the interfaces but the design team was able to show all four interfaces to each of the two nurses and the doctor involved in the study as well.

USER TESTING

A total of seven patients, one doctor, and two nurses were shown our designs.

Doctors and Nurses

Even though the interface isn't explicitly designed for doctors and nurses, we felt that they would be able to provide valuable insight on how medical terminology should be presented, as well as the overall level of information that they want patients to receive from the system. Indeed, the doctor involved suggested valuable information in regard to our "Reason for Visit" screen, mentioning that many patients may be going

to the clinic for broad reasons such as abnormal blood test results or bruising. Additionally, the suggestion was made that we should avoid including categories that may scare the patients (such as leukemia) and instead focus on hematology. One interesting suggestion from the doctor was to include a free ink option to write in the reason for visiting the clinic and to allow the system to search for appropriate materials. As will be discussed, this idea will not be developed further.

One of the nurses that we spoke to had developed brief literature pamphlets for patients in the past, and was able to tell us three important categories to cover: prevalence of the disease, symptoms, and treatment options. The second nurse really liked the idea of being able to see definitions of medical terms that users may not understand. From both of the nurses we found it was important to keep the notes and information separate but both visible, especially when making comments or writing questions.

Patients

Interviewing patients proved to be more difficult than interviewing the hospital staff. Limited to the time they would be in the waiting room, participants saw anywhere from one to all four interfaces. For this reason, we intentionally randomized the order the interfaces were shown to try to get broad and unbiased feedback.

While interviewing the patients, it became apparent that our designs would have to cater to all different levels of user experience with computers. While most of the patients we interviewed have never used a Tablet PC, many of the patients with higher self-rated computer proficiency were able to catch on quickly, with one of the users mentioning that the interfaces were very “straight forward” and “self-explanatory.” On the other hand, there were also patients who had much lower levels of computer proficiency, and needed more time to navigate through the interface.

A few of the ideas that the doctors and nurses suggested were also shared by the patients, validating their need. One such feature was the ability to see the definition of medical terminology that the patient may be unfamiliar with. One patient also explicitly mentioned how nervous it was to be going to the clinic, and liked the idea of being able to take notes since she would often forget what questions to ask due to her nervousness. Additionally, patients made many suggestions comparing the various notes sections and offered their thoughts on how the various functions would act. These suggestions included being able to view notes and articles at the same time, pulling out sections from articles to the notes, and being able to highlight sections from articles. Overall, the patients seemed receptive to the interfaces and enjoyed the functionality that they provided.

FINDINGS AND IMPLICATIONS

Based on our findings, we found the following implications for our system.

Single column or row – For several of our interfaces, confusion often arose when users saw lots of different buttons in different places. One of our users even suggested that we keep all the fixed buttons in either a single column or row in order to reduce clutter and make the interface less confusing. We also want to lower the button overload that many users experienced with some of our interfaces.

Quick tutorial – For our different interfaces, we had several options for the introduction: an introductory wizard, a brief introduction, and a single screen with callouts to individual system features. We found that many users preferred the introductory wizard since it took them step-by-step through the interfaces. The nurses that we user tested indicated that the single screen callouts would be better for the more computer

savvy users while the introductory wizard would be better for beginners. Additionally, there was a tendency to prefer the tutorials that had a more user-friendly and guiding tone rather than a strictly demonstrative tone of voice.

Side by side notes and article – Most of our interfaces provided a note-taking section that was separate from the actual information, but we also had one interface that allowed notes to be taken right in the article's margins itself. The majority of users indicated that they liked the separation of the notes section, but users seemed to prefer the side-by-side look of the margins. On many occasions users said they write notes on separate paper to keep them together but always in parallel to the original information.

Consolidate notes and questions – Some of the interfaces provided different sections for notes and questions. We received a variety of responses to this. Many liked a separate questions section, but some weren't sure if they liked having the two sections or just to consolidate them and have one. Most users did not have a strong preference for one over the other. Since there was no clear reason to maintain the system as it stood, and a certain level of confusion by the user, we have chosen to consolidate the two sections into a more general notes section.

List reasons why visiting to filter information – In some of our interfaces, we provide an introductory wizard that provides users with the ability to indicate why they are at the hospital, whether that is Von Willebrand Disease, Platelet Disorders, or other bleeding and clotting diseases. One of the issues that we ran into with this is whether it would be fine to allow patients to self-diagnose themselves. Dr. Gunawardena indicated that we should have more general reasons such as abnormal blood clotting, but overall, she liked the idea of filtering the information for users. We plan on co-developing a list of medical reasons to visit the clinic with the hospital staff.

Ease of learning and use over visual complexity – Through our user testing, we found that we should think more along the lines of ease of learning and use rather than visual complexity because of the wide range of potential users of this system and the relatively short learning time the users will have in a waiting room. We don't want to make the interface too flashy for design's sake if it makes the interaction more complex for users. Although we want the interface to be clean and sharp, one user interpreted certain actions in the prototypes to be "very nice but confusing if you're not tech savvy." Finding the balance between a standard web look and a more dynamic interface is important.

Need to search general information – One of the needs that we found that users wanted was the ability to search through general information. This would be particularly useful if users do not know why they are at the outpatient clinic.

DESIGN IDEAS

Definition links for medical terms – One of our users suggested the option to circle a word and get the definition because it is not uncommon to be confused with medical terms. When other users were asked about this, most seemed to like the idea very much. Though the exact interaction is yet to be determined, the option to obtain definitions will be moved into the next prototype.

Sending text to notes – Another design idea is to allow the user to select certain sections of text in order to send that to the note taking area. The technical aspect of this may be a limiting factor and the possible interactions available will need to be perfected if this idea is implemented in the final prototype.

Text recognition for questions and words – Since we are hoping to consolidate the questions and notes, we want the system to be able to recognize any questions or notes that people write down. This would function both in the notes section to provide space for answers but also if the user writes a question such as 'what?' in the margins. The system, depending on technical limitations, would be able to copy the text to the notes section, saving the user the time needed to rewrite a question.

Printing – Many users were confused with the print queue that we had in some of our interfaces, so we have decided not to use a print queue but simply to send the document to the nurse or desk attendant to print out. Printed materials can then be picked up at the end of the visit. Instead of showing a print queue to users, we hope to provide a confirmation dialogue.

Documents from Doctors – Doctors can designate information to be printed for patients. We learned that doctors do not want patients and families to get information on a certain condition unless they are sure that they have it, so this would allow doctors to monitor the information that patients and families receive.

HI-FIDELITY PROTOTYPE IMPLEMENTATION

This section serves to describe our implementation and design of our initial high fidelity outpatient mobile education system.

During this phase we implemented a low fidelity prototype of our interface and detailed wireframes of our system based off our initial paper prototypes and user feedback we received from usability testing in the last phase. We developed the interface in C# so that we could take full advantage of the pen capabilities of a Tablet PC.

DESIGN OVERVIEW

Our design features a wizard that introduces the user to our system. It also filters the information the user sees based on his or her purpose for visiting the clinic. One of the main concerns of the doctors was that patients become overly anxious and nervous from an information overload. As a result, we have decided to filter the amount of information that the user sees.

After the user selects the reason(s) for their visit, they are shown the system's main screen. The buttons on the right side of our system allow the user to view different sections. Information may be viewed by choosing the topics button. If the user wants to take notes, they can press the notes button and a notes panel will appear next to the information they are viewing. The user can print or email documents by pressing the print button and selecting the articles and notes they want to print or email to themselves. Finally, there is a help button for users that need help with using the system.

MAIN INFORMATION SCREEN

As a team, we decided to implement the main information screen using HTML and CSS for several reasons. First, it allows the designer to easily create and modify the information layout and design as long as he or she knows how to design with CSS. This also makes it easy to design the page without having to go through the coders, and makes a lot of design ideas and concepts more technically feasible. Another reason why we chose to use this method is because it is easy to implement using C# and it distributes the work more evenly among the coders and the designers in our team. Finally, it offers an easy way to update the information within the system once a final product is delivered to the hospital personnel.

The main information screen will show information on a particular disease or symptom, and will provide different sections for each screen. The main screen of our prototype looked like this:

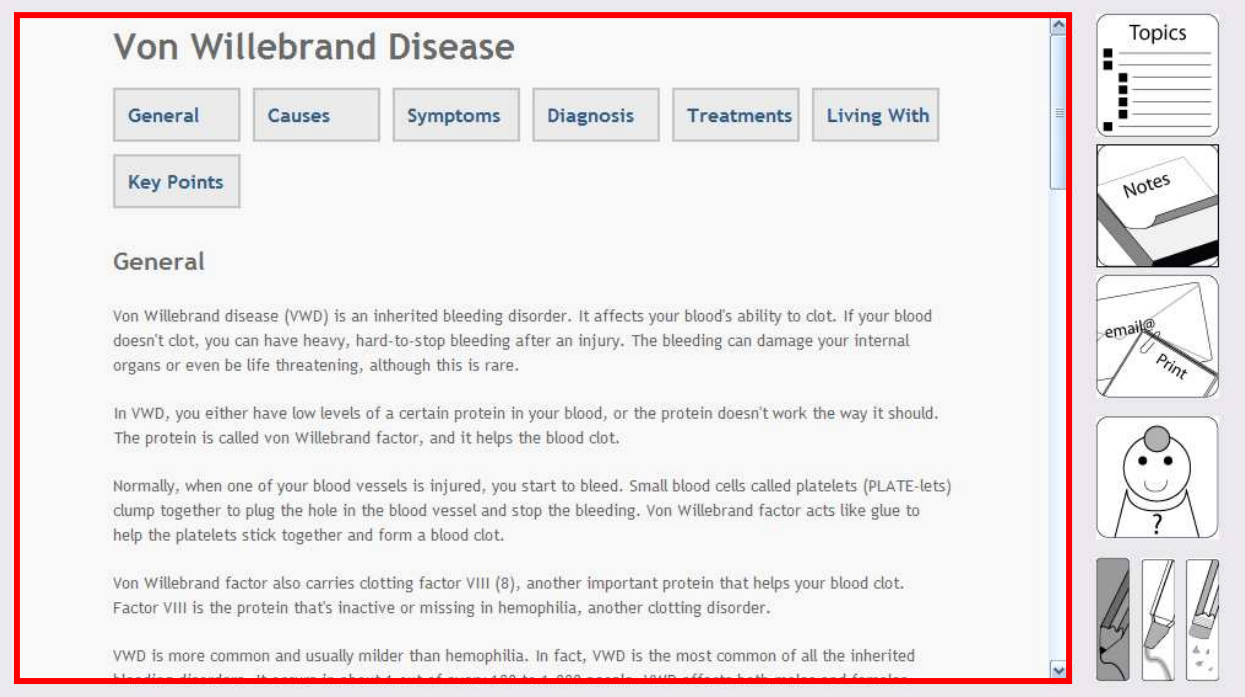


FIGURE 4: MAIN INFORMATION SCREEN

The main information screen is split up into sections. In this example, information on von Willebrand Disease is shown and sections include *General*, *Causes*, *Symptoms*, *Diagnosis*, *Treatments*, *Living With*, and *Key Points*. These section titles are currently there as a placeholder; actual section titles will be determined with the help of the hospital staff. Figure 2 displays links on top of the article page to assist users in finding desired sections quickly. Through our user testing, we noticed that there would be a lot of information presented to users and anchor links were developed to alleviate that issue. In one of our user tests, one of the nurses mentioned that she would want to be able to go back to the original page after she's looked through the information, which is why we included the "Return to top" links after each section. Additionally, we are taking into account visibility for older patients and are planning to implement the ability to change the font size. It should also be noted that these screens are still in the low-fidelity prototype stages, so the high-fidelity prototypes are yet to be created. We plan on designing them after our first round of user testing with the current prototype.

FIGURE 5 - LINKS AND INFORMATION

LIST OF TOPICS

After going through the welcome and introductory screens, the first screen that users will see is the list of topics screen. This list will contain all the topics that the user chose during the introductory stages, or if he or she did not know why he or she was at the hospital, then the list will show a predetermined list of filtered topics. This was done to meet several needs and wants of the users, to provide reassurance, clarification, and knowledge. Many concerns of the doctors and nurses are that users get too much information and unneeded anxiety, which is why we implemented this idea of having a list of topics. With this list, users would only be able to look at the relevant information. For example, the staff does not want a patient with von Willebrand Disease looking at information on leukemia because it would cause unnecessary anxiety and concerns. In Figure 3, our prototype assumes that the user has selected three different reasons for their visit, which include *von Willebrand Disease*, *Abnormal Bruising*, and *Nose Bleeds*. After selecting one of the topics in this list, users will then be shown the appropriate information. In order to look at another topic, then the user would need to go back to the topics page and select another option.

FIGURE 6: LIST OF TOPICS

NOTES AND PEN TOOLS

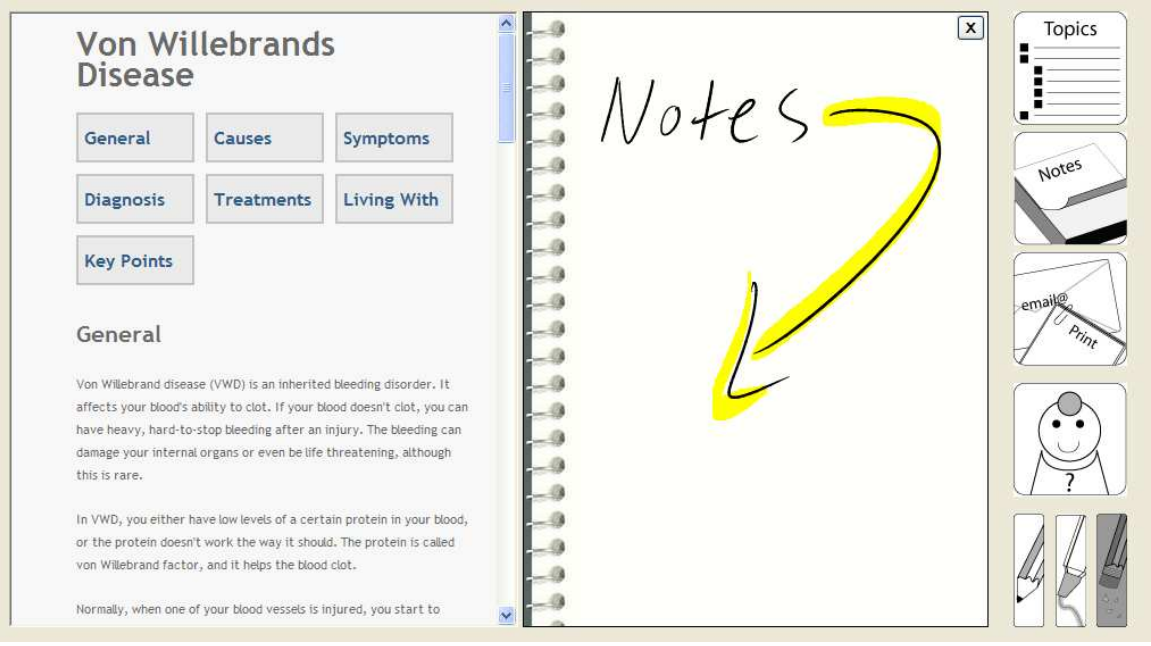


FIGURE 7 - NOTES AND PEN TOOLS

One of the main features of the interface was to provide a suitable area for patients and families to take notes about the information presented, questions they might have, and relative answers. The main concern was whether to provide a full screen to take notes on or if the half screen would be sufficient. In order to maintain simplicity, the notes are limited to a half panel view. In this way, the notes button opens or closes the notes but there are only these two states. There is no third full screen state. This was also supported by our paper prototype testing where users expressed a desire to see their notes alongside the article they are reading.

When designing the pen tools, we chose to focus on the three main analog functions typical users would have. We removed any additional functions such as color, text size, and weight. Additionally, the pen tools only function in the notes section. Some original research led us to believe highlighting article material would be beneficial but in our design phase we determined that this would provide confusion as to where notes can be taken.

PRINT AND EMAIL

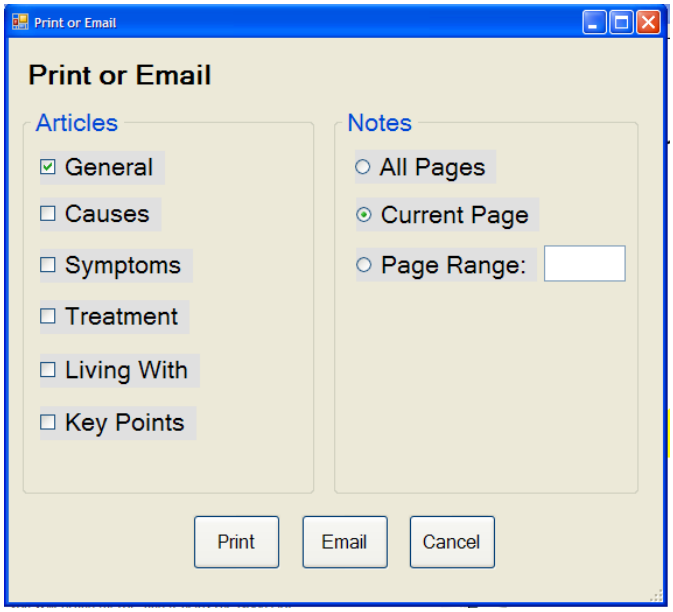


FIGURE 8 - PRINT OR EMAIL

Much discussion surrounded the development of the print and email function. The main decision was whether to allow users to choose specific articles to print, specific sections, or both. In reviewing our research, we felt much of the confusion around the features was based on the wording and the limitations of the paper prototype. Again to promote simplicity, we have enabled users to choose what articles they want to print but not the sections. We also felt that it would be better to make users print or email the whole article for future reference rather than give them the option to print specific sections. Figure 5 shows an earlier implementation of this function where the users are bombarded with many more options that the final interface at this stage of testing will actually have. We plan on updating our prototype before our user tests to reflect this change. When addressing notes, we were faced with the desire to print select pages, to print past notes, or to print all

notes. After addressing the needs of our personas Sue and Albert, we believe that the majority of users are single time visitors and the length of notes will not be too large. With that in mind, we have opted to enable a print notes function to yes or no. Any parsing of notes would be unnecessary and confusing to the users. Additionally, we have enabled a print queue type system that allows users to send information to the printer to pick up upon checking out of the office.

HELP

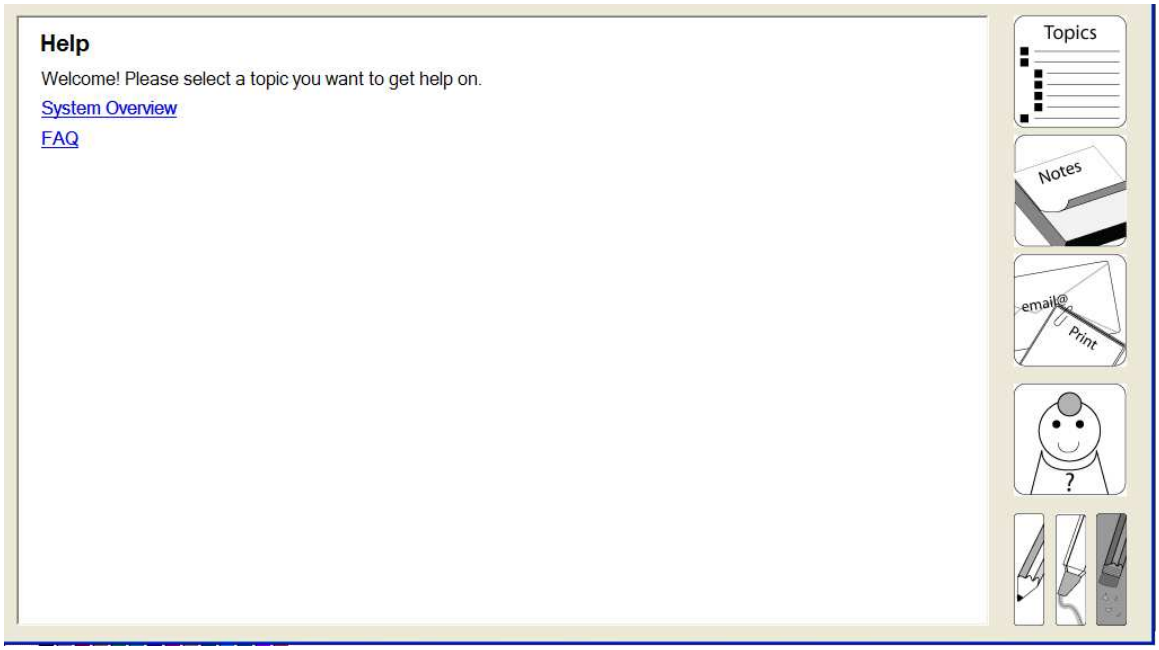


FIGURE 9 - HELP

The help function for the current prototype is as yet undeveloped. Being a secondary focus, we have chosen to develop and test the interactions around the notes and articles. Because the help function has been requested by our client, we plan on implementing this feature for the next test phase. The function will include two main features: a walk-through of the tablet device, help pertaining to the system and aid with the medical providers.

REVIEW OF FIRST HI-FIDELITY PROTOTYPE

The initial high fidelity prototype was an adaptation of the various features found to be successful in the paper prototype. The system featured a right-docked navigation featuring topics, notes, print and email, and a help function. The pen tools were also positioned in this area. The application showcased a linear topic selection and limited note taking functionality. The print and email function was for aesthetics only and the help feature was not implemented at all. The entire interface was completed in grayscale to allow for a rough look while testing with users. This was done so that users would give feedback mainly on the interaction rather than the look and feel.

Testing

At the Children's Hospital, the team evaluated the system a total of five times. The task list can be found in appendix E. The main challenge at this point was introducing the system to such a degree that users felt comfortable following the task without a developed tutorial. Additionally, the system was tested on the Samsung Ultra Mobile PC to allow for investigation using that hardware.

Findings

There was a lot of hesitation by the users with the Ultra Mobile PC. Since it was a technology that users were unfamiliar with, we noticed that they were unsure as to how fragile the device was. Additional problems arose when users started writing in the notes section. Due to technical limitations of the device, one may not place their hand on the device when writing – a complication that frustrated many users due to the fact that people usually place their hand on a sheet of paper when they write. Overall though, the system was widely appreciated and accepted. There was some confusion over the icons and many of the users overlooked the navigation entirely. From the investigators standpoint, the task list proved to be poorly worded without a more detailed tutorial.

Implications

Moving into the next design phase, the team chose to focus on refining the interface as a whole. The entire graphic side would be revamped in full color and a more cohesive look. The system help was also a primary focus for the next level of testing.

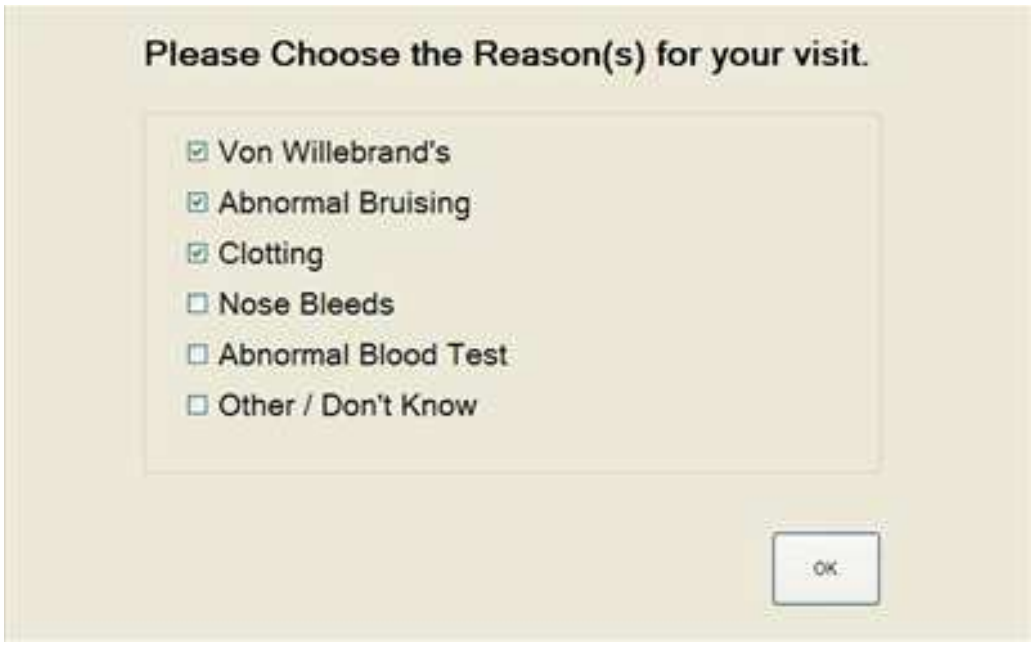
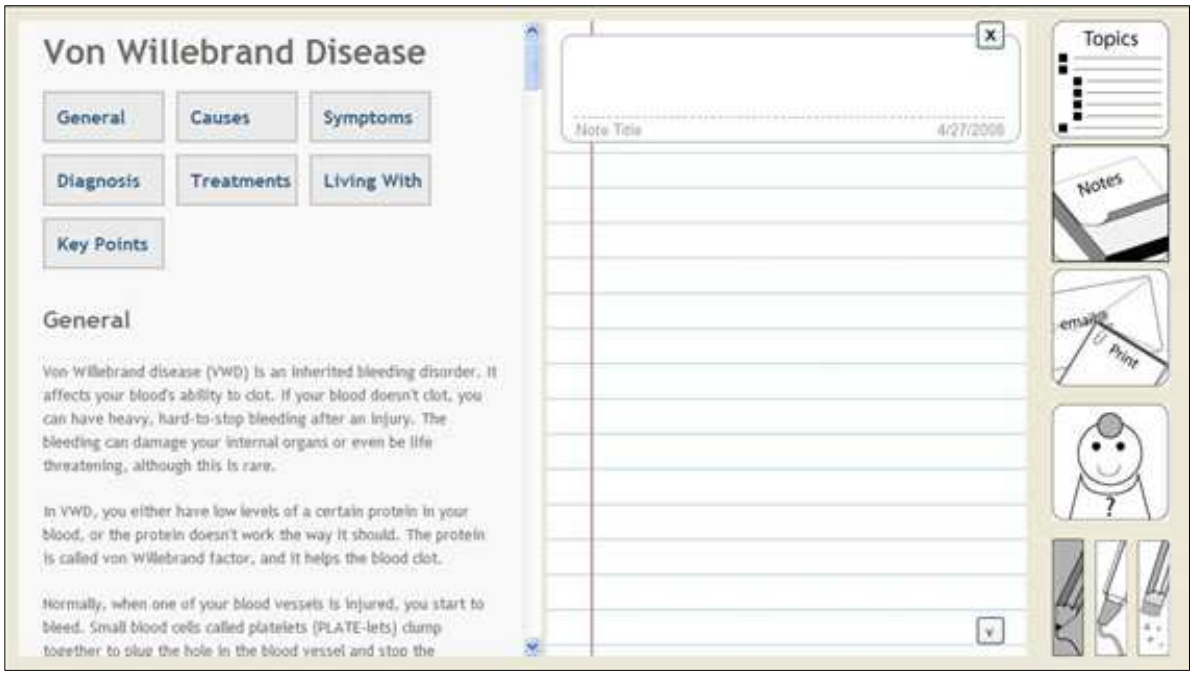


FIGURE 10- HI FIDELITY INTRO SCREEN

FIGURE 11 - HI FIDELITY 1 MAIN SCREEN



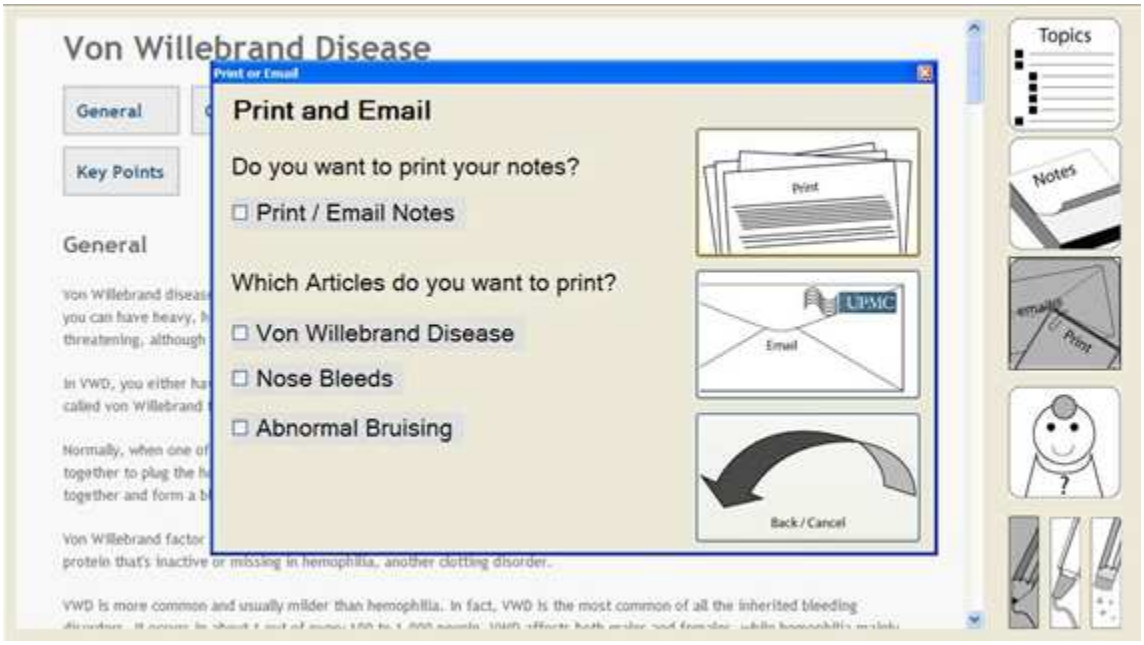


FIGURE 12 - PRINT AND EMAIL

REVIEW OF SECOND HI-FIDELITY PROTOTYPE

For the second hi-fidelity prototype of the tablet PC interface, there were a number of changes that were implemented. The primary and most noticeable transformation from the first hi-fidelity prototype to this one was the addition of color to the interface, particularly with the information page, the icons, and the notes section. Other changes included fully functional pen tools, back-end functionality, an initial tutorial of the system, and icon improvements. These changes gave our interface a more polished and realistic look and feel.

First, major changes were made with the look and feel of the information page. The main colors that dominated the system design were different shades of blue to provide users with a more comfortable and less intimidating look. In the "List of Topics" screen, a bluish background was used with an image of children's faces, and the different buttons were given a more "Web 2.0" look with the rounded corners, shadows, and lighting effects, as can be seen in Figure 13. When the first hi-fidelity prototype was tested, many of the users were initially hesitant to press the buttons because they didn't have a realistic look to them. As a result, these button designs were created to try and solve that.

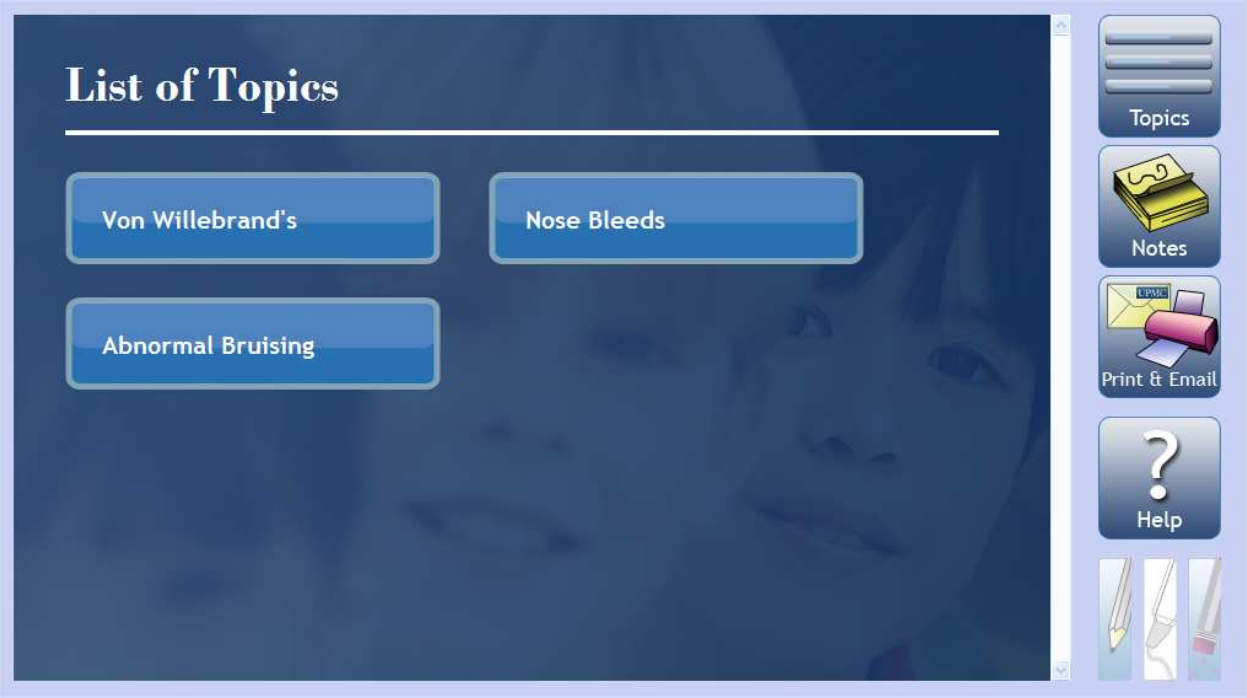


FIGURE 13: HI-FIDELITY INTERFACE WITH COLOR – LIST OF TOPICS

On the information pages for the specific topics, the button design stays the same in order to maintain consistency with the treatment of the buttons. During our user tests with the initial hi-fidelity prototype, many users had some difficulty switching between topics, so in our second iteration, a "Back to Topics" button was created to try and resolve that issue. As a result, users are able to switch to a different topic by pressing the "Back to Topics" button or by using the main navigation and selecting the "Topics" button. With the "Back to Top" links within the article, they were replaced with a button for a number of reasons. First, users will more easily notice the buttons and actually use them. In our user tests with the first hi-fidelity prototype, all the users did not use the "Back to Top" links, but instead used the scrollbar to go back to the top of the article. Another

reason why we made those links into buttons was to increase the hit area so that users can easily touch or tap them. In terms of the layout, the background remains the same with the blue image of the children to maintain consistency, but the information is now contained within a white box. These areas, which can be seen in Figure 14, separate the actual information from the top navigation. Finally, the ability to increase and decrease the text size was implemented so that users can modify the text to their desired size. This can also be seen in Figure 14 on the top right corner of the white box.

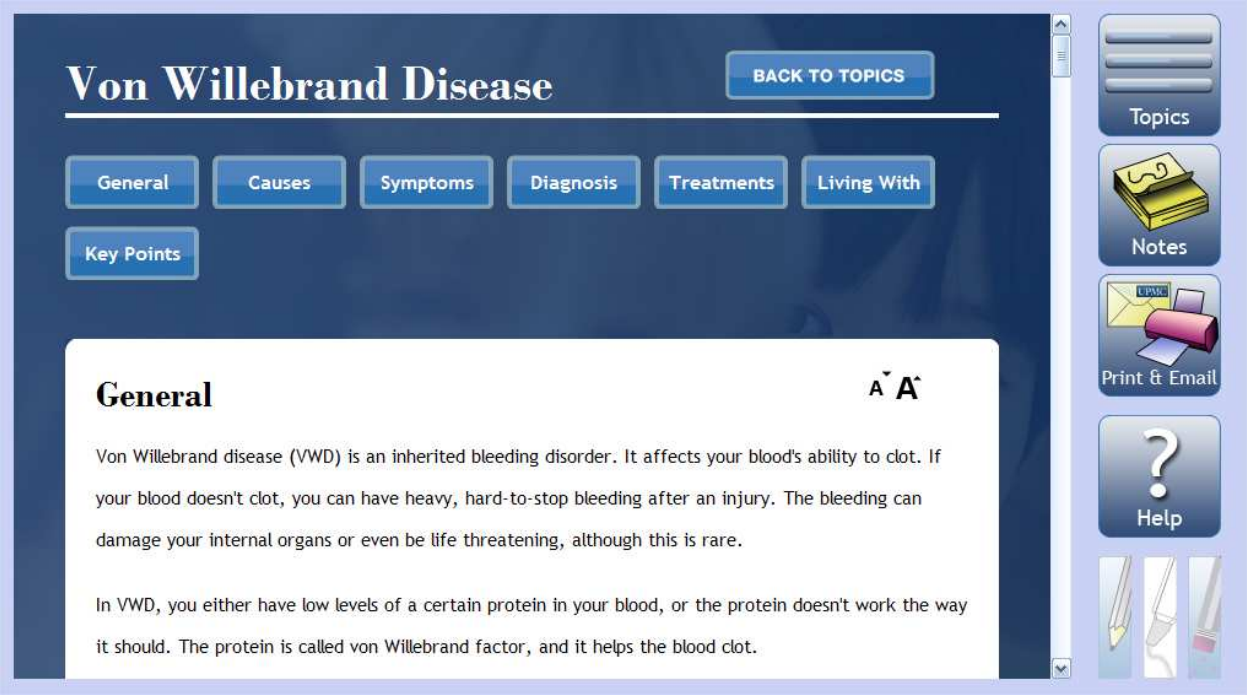


FIGURE 14: VON WILLEBRAND DISEASE ARTICLE

As we see in Figure 14, major changes were made to the icon designs in the main navigation found on the right side of the interface. With this new iteration of icons, not only were the colors added to match the interface, but the icons themselves underwent significant changes. In all of these icons, white text labels were used on the bottom of the icon to maintain consistency, and the fidelity of each icon was increased significantly. The *Topics* button was changed to look more like the actual "List of Topics" screen and the *Help* button was changed to have a more intuitive look with the question mark. The *Notes* and *Print & Email* buttons were also changed to give them a more hi-fidelity and intuitive look.

In the notes section, most of the changes were made in the back-end. Fully functional pen tools were developed with the ability to change pen tool settings, such as colors and text weights, using the right click. Another major change that was implemented with the notes was the ability to save them. For the prototype, the F1 key was used to allow administrators to save patients' notes right on the machine itself. This proved crucial for the user tests as it allowed us to see exactly what the users were writing and gave us the ability to reference their notes. To see these notes, refer to Appendix F.

For the print and email dialog, significant changes were made to move away from the "Windows" look and feel that existed in the previous prototype. As we can see in Figure 15, the background color was changed to match the color scheme of the interface and more hi-fidelity, colored icons replaced the old grayscale ones.

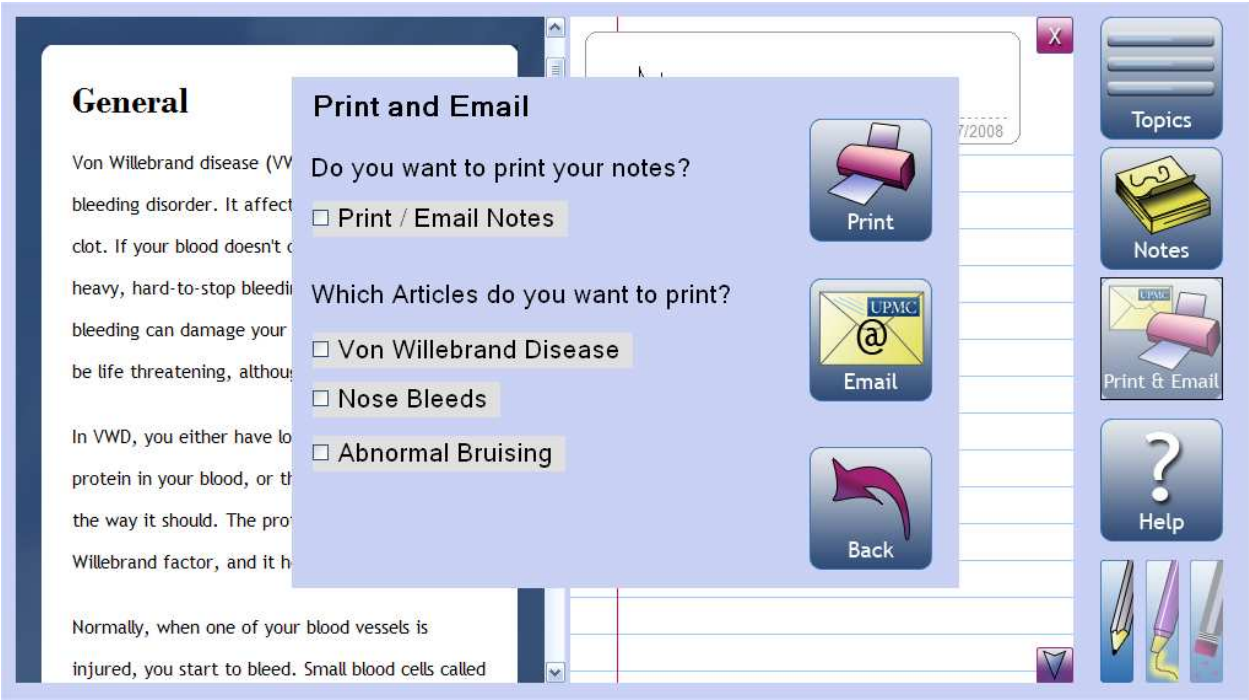


FIGURE 15: PRINT AND EMAIL DIALOG

The help screen underwent a major change with the addition of a flash tutorial (Figure 16). In the previous iteration, the help screen was simply a blank page. However, with this hi-fi prototype, a tutorial was developed in flash to provide help for each of the different sections of the interface. Since the final interface was yet to be completed, this initial tutorial simply provided information points on the left side and cycled through various screenshots on the right.

FIGURE 16: OUTPATIENT HELP TUTORIAL

TASK

In testing our hi-fidelity prototype, users were asked to think aloud as they completed the following tasks with the tablet PC system:

1) Select the following reasons for your visit: Von Willebrand's Disease, Abnormal Bruising, Nose Bleeds.
2) Go to the help section and view the tutorial. Look through the section on notes. Then exit out.
3) Find statistics about how many people are affected by von Willebrand Disease.
4) Make a note of that information in the notes function. Highlight the notes since they are important.
5) Find information article about Abnormal Bruising
6) Find information and take notes about the causes of bruises.
7) Print the articles on von Willebrand Disease, Bruising, and your Notes.

Previously, users had trouble following the task script, so in these user tests, instead of just expecting users to complete each task in the script, we read aloud each task and asked users to do them.

FINDINGS

In general, people really appreciated the notes capability with the article and we observed people taking a significant amount of notes. One of our users mentioned that he doesn't usually take notes, but when he was given the tablet and asked to take notes on a topic, he took a significant amount of notes down (See Appendix F). He also mentioned that he would like to have the notes section interact more with the information page because he expressed a desire to be able to copy and paste text from the article onto his notes. Another aspect of our interface that people had trouble using was the help tutorial. The tutorial was so realistic that users mistook the screenshots as the actual interface, and we observed people trying to select the buttons on the screenshots rather than on the interface itself. One user tried pressing the buttons on the screenshots, and due to the cycling of the screenshots in the tutorial, the user thought that the buttons were actually working. Other findings that we noticed were a need for higher contrast across various button states and a need for color consistency between the information page and the icons.

IMPLICATIONS

Regarding the suggestion to have the notes interact more with the information, we decided to not implement the ability to copy and paste text due to various reasons, which included technical limitations and time constraints for the project. As a result, we decided to include this suggestion in our future plans for the project, if another team were to continue where we left off. In terms of the help tutorial, we were originally already planning on making it more usable by having callouts on the screenshots themselves, but with the lack of the final images, we were limited to simple screenshots. Our next iteration of the help tutorial was developed to remove that overly realistic look of the screenshots. Finally, the findings from our user tests led us to design icons that fit in more with the color scheme of the information page, and helped us to have higher contrasts in the different button states.

FINAL ADJUSTMENTS

For our final prototype, we implemented several adjustments and features which included dictionary tooltips, a help tutorial, printing, navigation, and interface improvements.

Based on our patient tests from the second hi-fi prototype, one patient suggested that we have some sort of dictionary definition for words that he didn't understand so we implemented a dictionary tooltip in the articles. This way, if the patient hovers over or clicks on a dashed underlined word, a tooltip defining the word will appear.

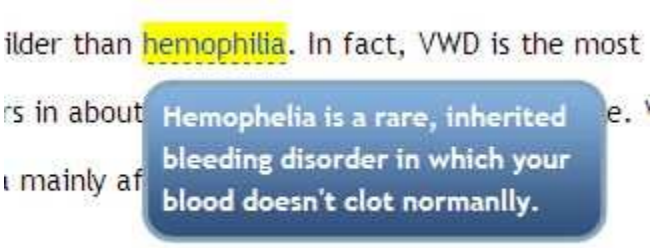


FIGURE 17: DICTIONARY TOOL TIPS

Also from our second hi-fi prototype patient testing we found that patients were having trouble following the tutorial because it looked too realistic so we changed it to highlight specific parts of the interface with callouts rather than just showing a screenshot. We also added detailed instructions for each item and gave users the ability to browse through each one.

FIGURE 18: HELP TUTORIAL

Various other interface improvements were made. We implemented a working print dialog from which the articles displayed were the articles in which the patient actually selected. We also now display which articles are being printed in the print confirmation dialog. Additionally, the patient is allowed to reselect topics once

they have exited the introduction. This was implemented because during patient testing, one of our patients selected the wrong reason for their visit and could not reselect them. Further improvements included tweaking the look and feel of the interface, buttons and styles, which were changed as well as added in based on group feedback.

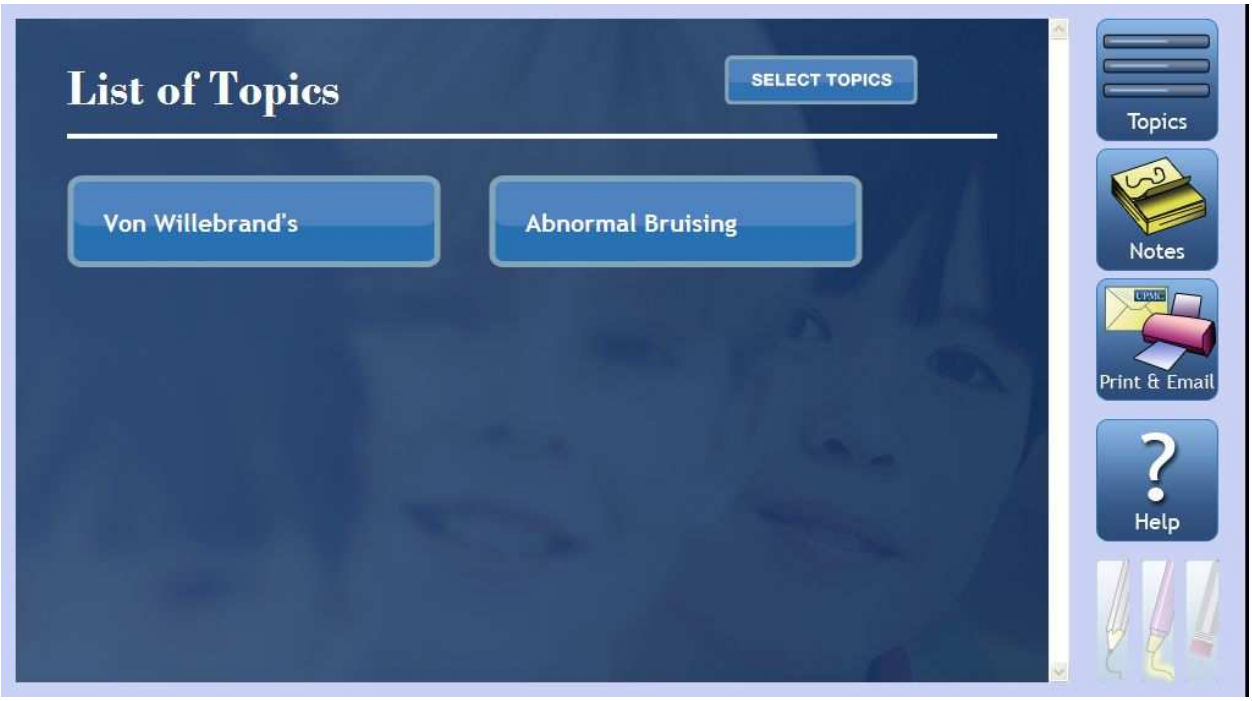


FIGURE 19: LIST OF TOPICS

WALKTHROUGH

Introduction

This is the first screen a patient at the outpatient clinic would see. It introduces them to the tablet pc and asks them if they know the reason for their visit in order to not overload the patient with information.

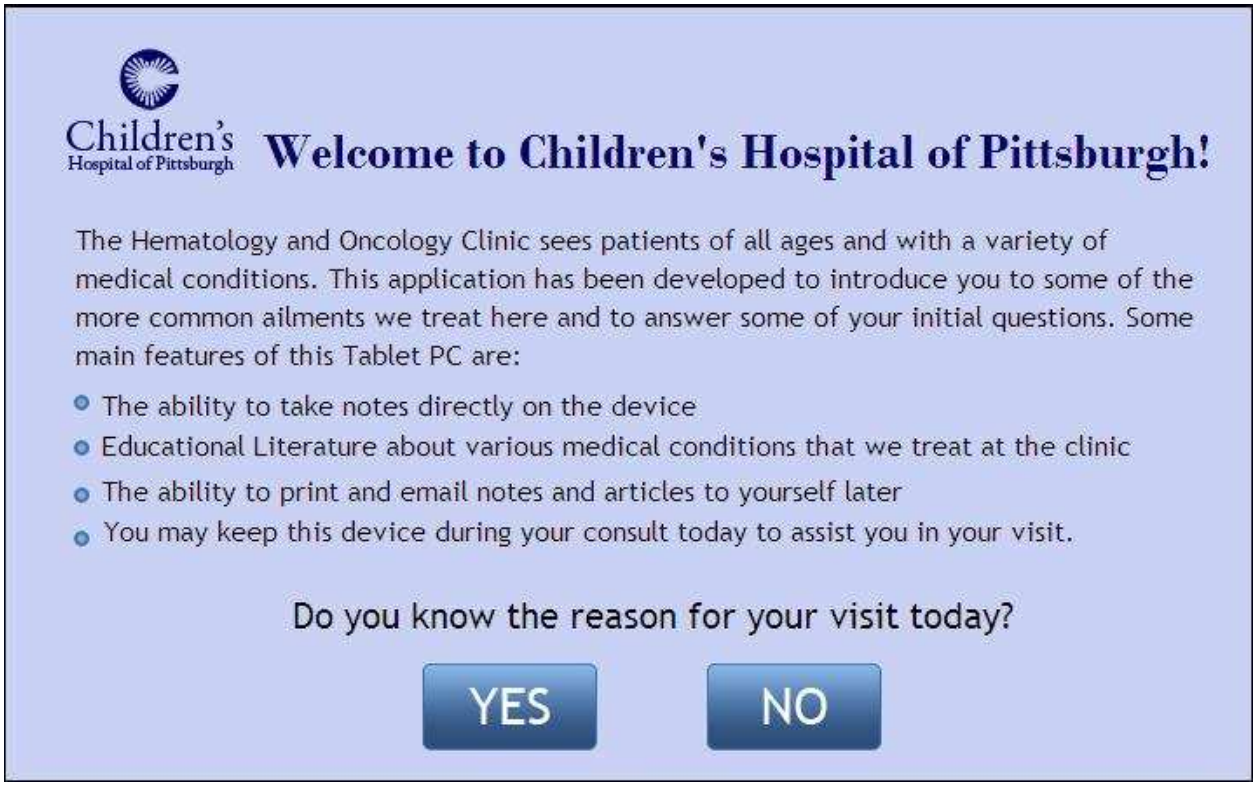


FIGURE 20: INTRODUCTION

Here the patient can select the reason(s) for their visit. We have replaced normal checkboxes with buttons so that the patient can easily press the buttons with their fingers on the touch screen.

FIGURE 21: SELECT REASON OF VISIT

This is the main information page, it displays the information on the reasons the patient selected in the introduction. On this screen, patients can select different articles to view.

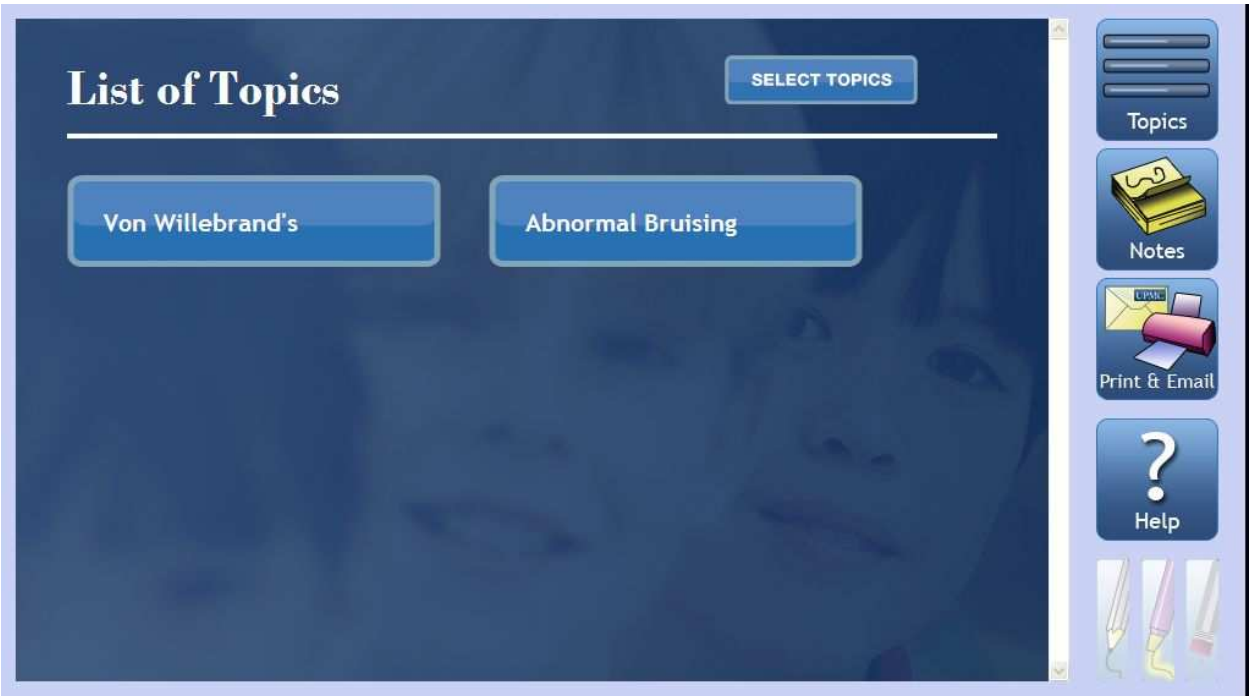


FIGURE 22: LIST OF TOPICS

This is an article; it contains information on a particular topic. The buttons on the top of the page allow the patient to quickly jump to the desired section. In the article, certain words are defined and when the patient clicks on or hovers over it, they can get a definition of the term.

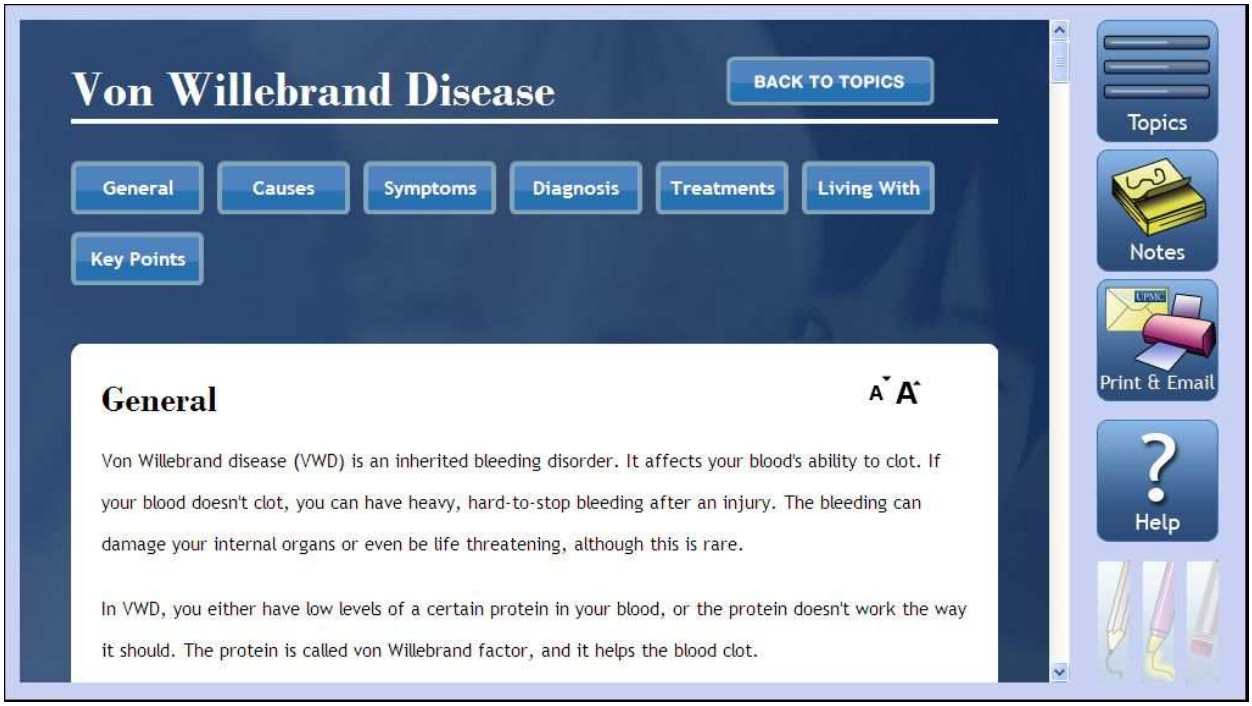


FIGURE 22: ARTICLE

The notes section allows the patient to write down their questions or notes on different articles. The patient can highlight or erase their notes. Notes are automatically saved and will be there when the patient closes the notes.

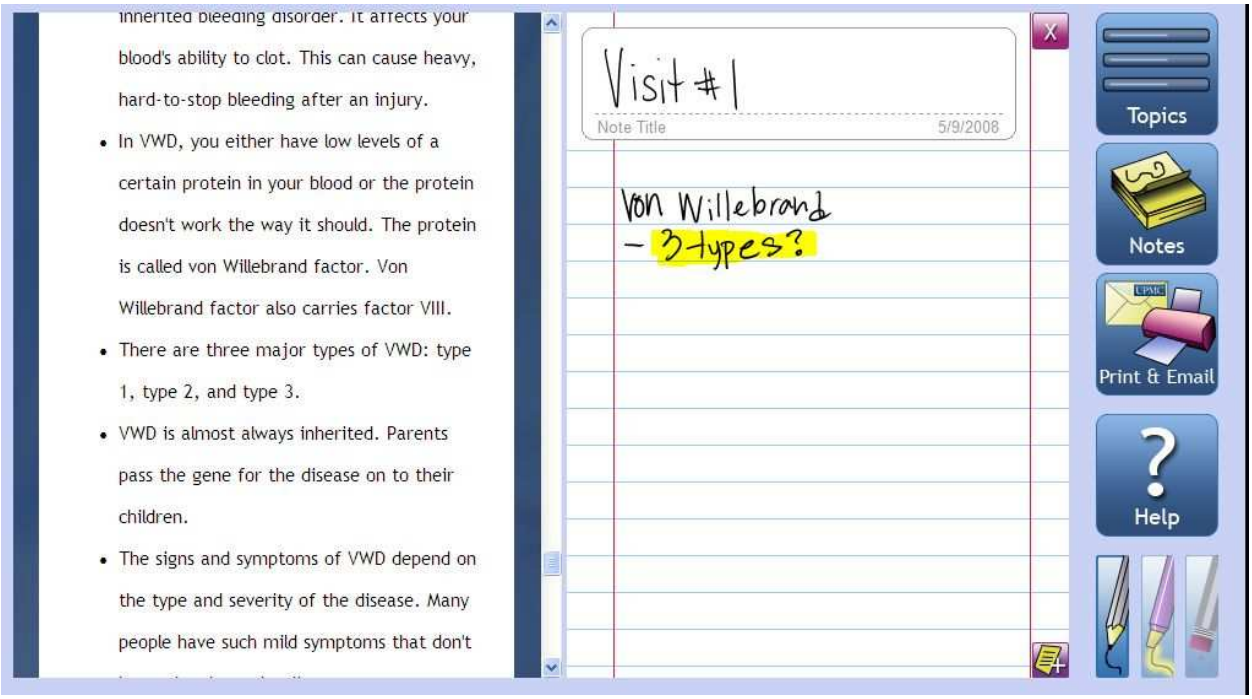


FIGURE 23: NOTES

This is the help tutorial, it shows the patient how to use the interface in case they run into any problems.

FIGURE 24: HELP TUTORIAL

In the print section, the patient can print articles and their notes. The system knows the patient's email address from the patient's files and will send it to the email address on file. All printed files will be picked up from the main desk so that the user can bring them home with them.

RECOMMENDATIONS FOR FUTURE DEVELOPMENT

Although fairly developed, the system has the opportunity for a lot of further development. On the interface side, additional functionality can be implemented in the system. The article dictionary function is currently enabled as a demonstrative tool and not in a functioning method. Additionally, many users expressed a desire to drag information from articles to notes directly. Due to the means of implementation, this proved difficult in the scope of the project but would be a useful addition to the application.

On a more functional level, the print and email functions need to be further developed and implemented. Similarly, the entire back end of how the nurses and hospital staff interact with the device, and its communication to a central server, were not in the scope of the project. This is also true for the development and design of the home web portal where users can access their information when not at the hospital.

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APPENDIX B – CONTEXTUAL INQUIRY QUESTIONS

Doctors and Nurses

- How do you prepare for a meeting with the patient?
- What is the one piece of information you want people to leave with?
- Do you make notes for the patient and families?
- What type of follow up do you have with the patients outside of the consult?
- [Act as though I am a patient with a certain blood disorder. Explain to me the information you would want me to get. (This would probably be reached in the shadowing?)]
- Where would you want the patient/family to go with questions between visits?
- Do you think patients and families benefit from other sources of information (i.e. internet)? Do you think it leads to better questions?
- What kind of information do people leave with? Do you typically give patients and families brochures, pamphlets, etc., or is it only upon request?

Questions based on the shadowing

- Do patients interact with each other? (some games that are available are group games)
- There are video resources (VHS). Are patients given these videos, or are they watching them while they are in the hospital waiting?
- Is the infusion room just for more serious conditions?
- For the games inside the U-Shaped area, do patients use them inside or take them to the infusion room?
- What are your thoughts on using audio in the room?
- What kinds of questions do patients or their families ask you?
- About how often do you get contacted with questions from patients or their families after you initially meet with them?
- What kinds of questions do patients or their families contact you with after you initially meet with them?
- What types of patients typically use the infusion room?

For nurses in particular

- Tell us about the infusion room.
- What type of interactions do you have with patients? What type of questions do they ask you?
- How do they pass the time?
- Are there any common questions that you regularly get?

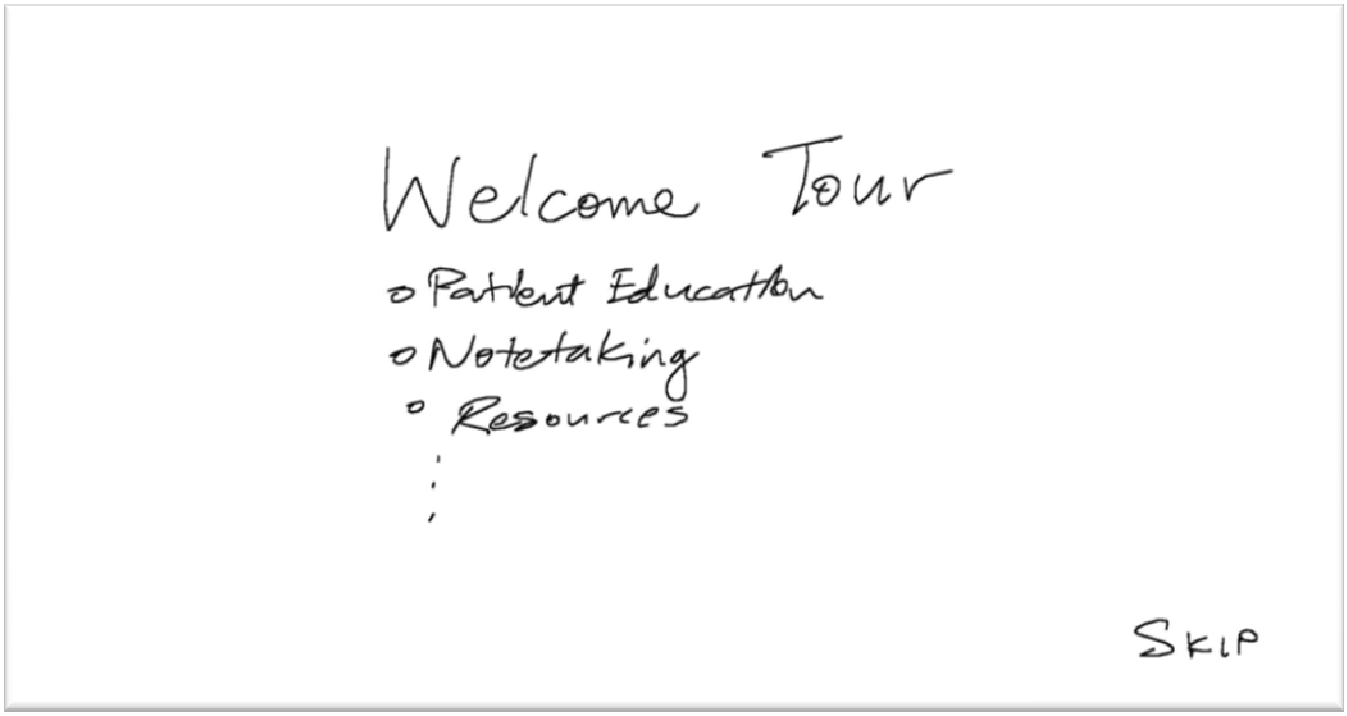
Patients and Families

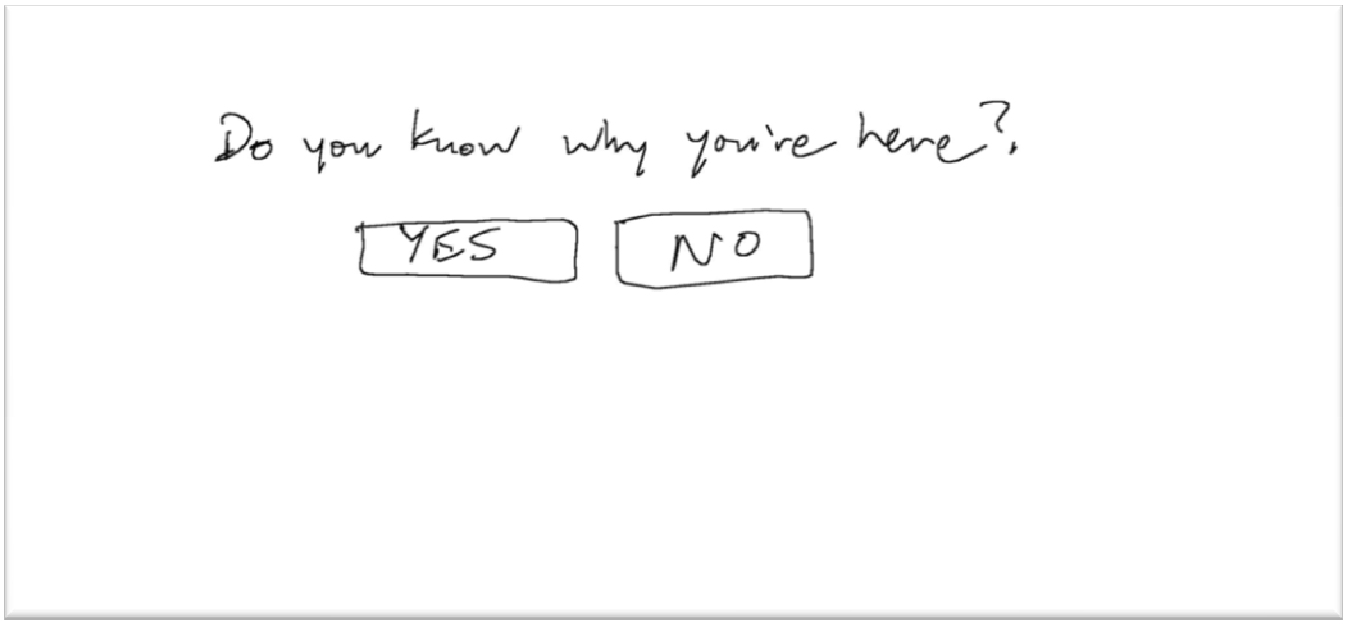
- Is this your first visit?
- Why are you here? What information do you have that has prompted your coming?
- What information did your pediatrician provide to you before this consul?
- Did you seek out any information on your own before this consul? From where/who? Was it valuable?

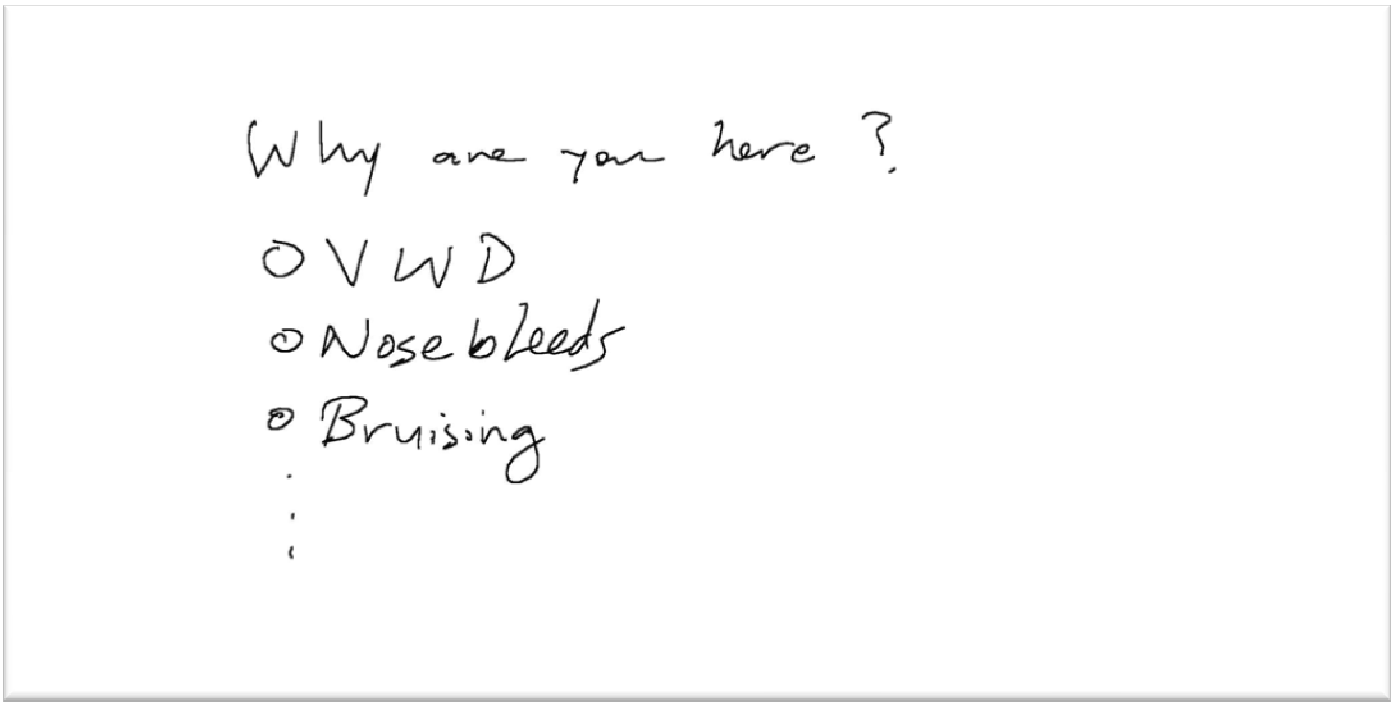
- How do you prepare for this visit?
- Have you ever come to this doctor with a predetermined list of questions? How did you prepare them?
- Did you obtain any information from this office before arriving?
- What information are you looking to gain from this consul about your child's condition?
- What type of computer access do you have? Internet access?
- How comfortable are you using a computer and the Internet?
- Have you ever used a tablet PC?
- How many times in the last week have you used the internet to search for something medical?
- What sources did you use? Why did you choose them?
- Are you involved in any type of support groups? If so, How often do they meet? When and how do they meet? How did you find out about them?
- What is your primary source of medical information? Do you think it's enough or do you feel the need to find out more?
- If this is not your first visit, what kind of information does this office give you when you leave? How valuable is it?
- How do you typically remember information at appointments?
- If this is not your first visit, what did you talk about last time?

APPENDIX C – PROTOTYPE SCREENSHOTS

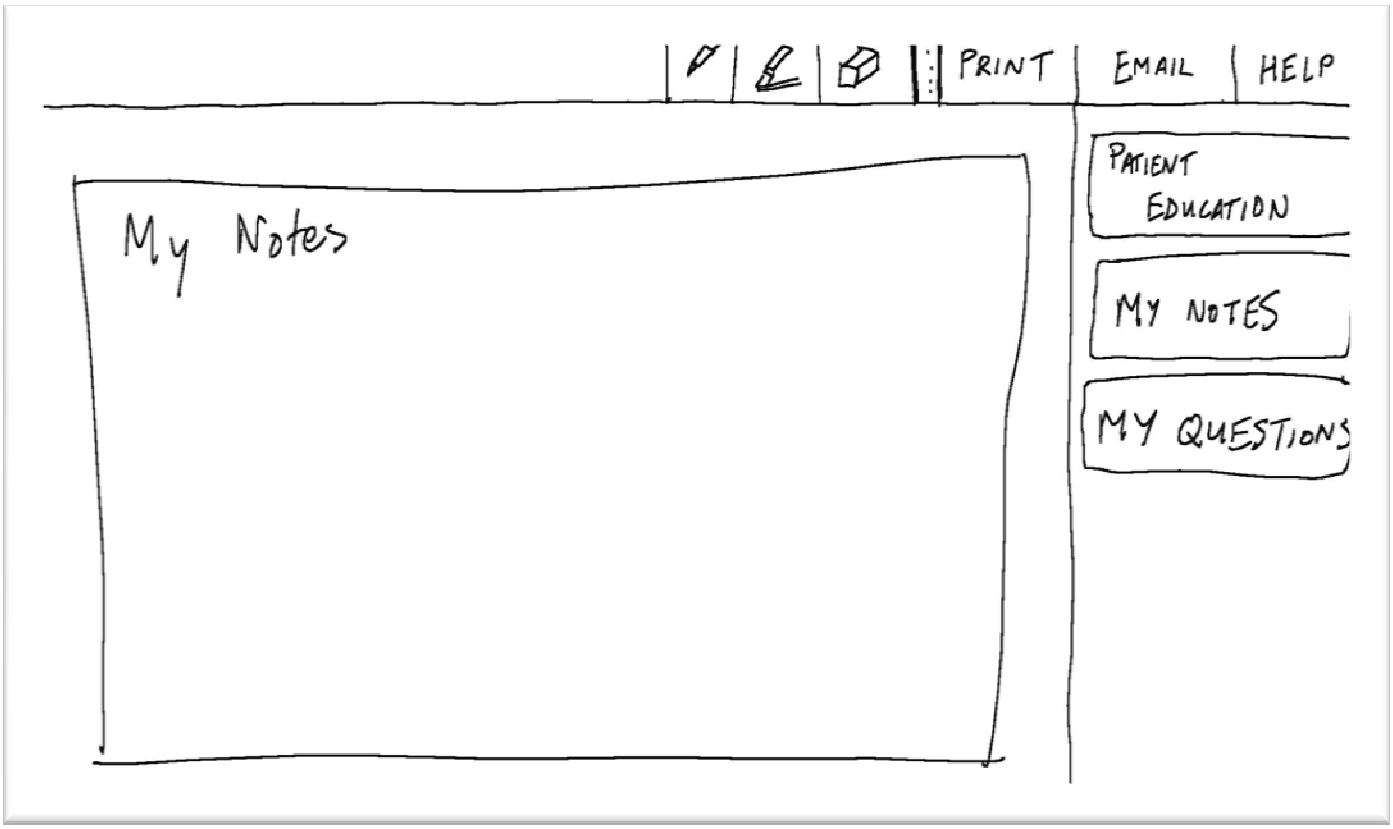
Design 1

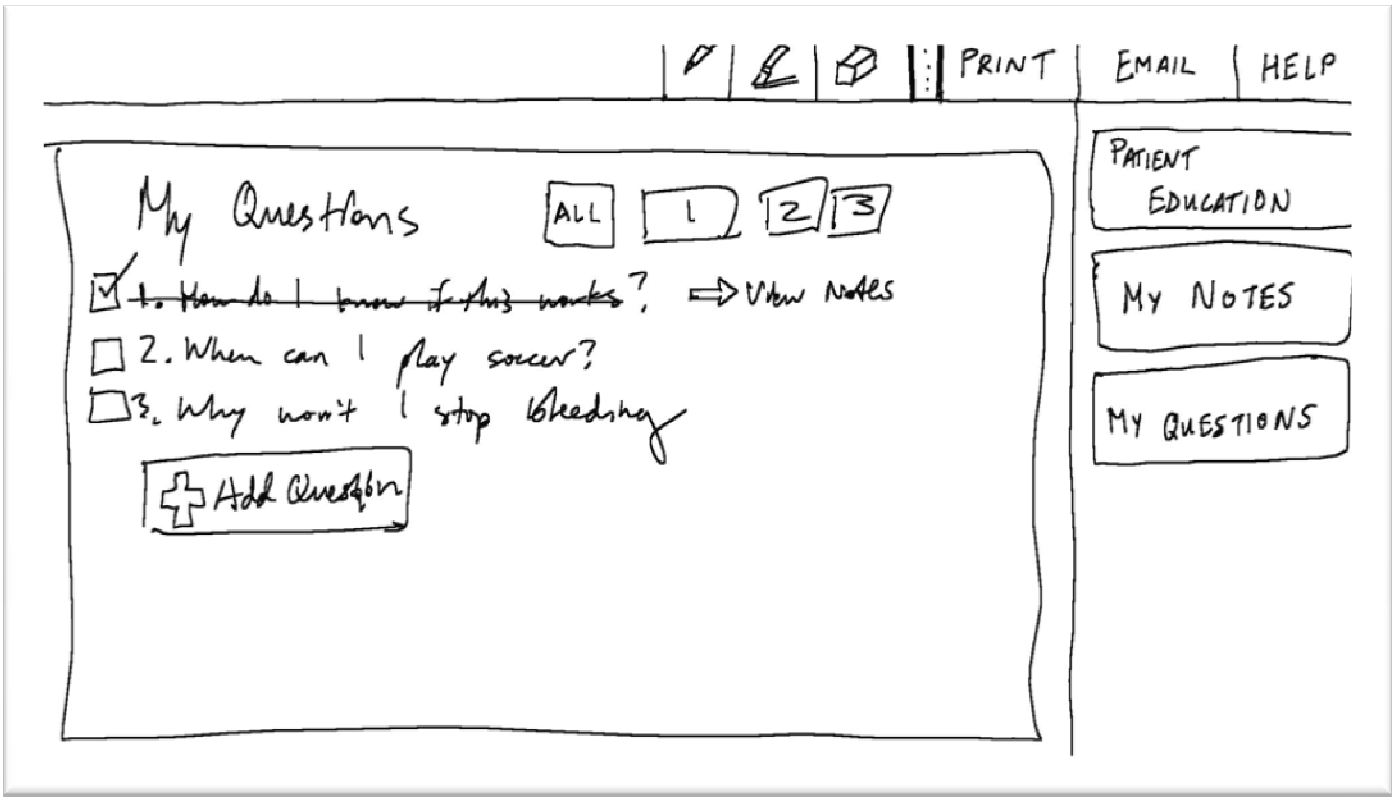


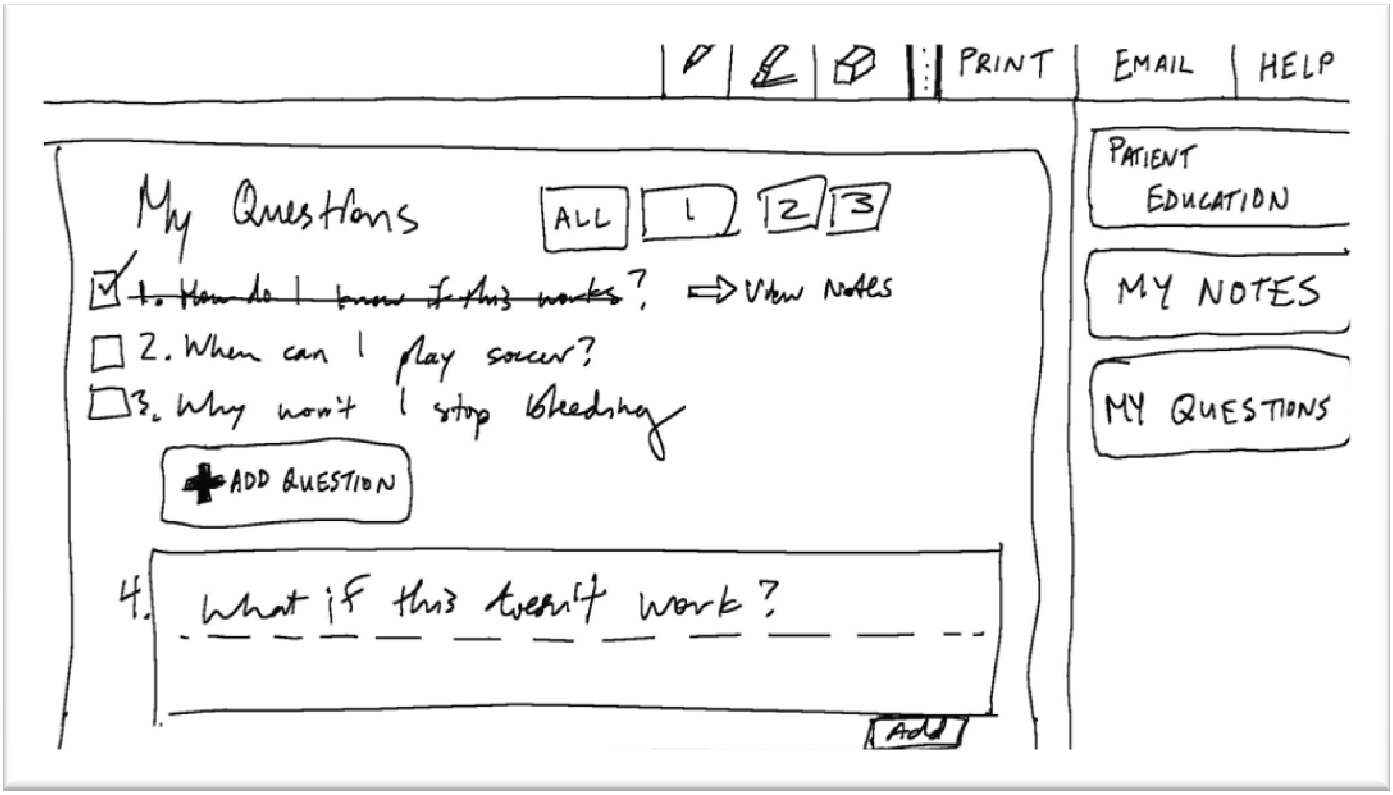


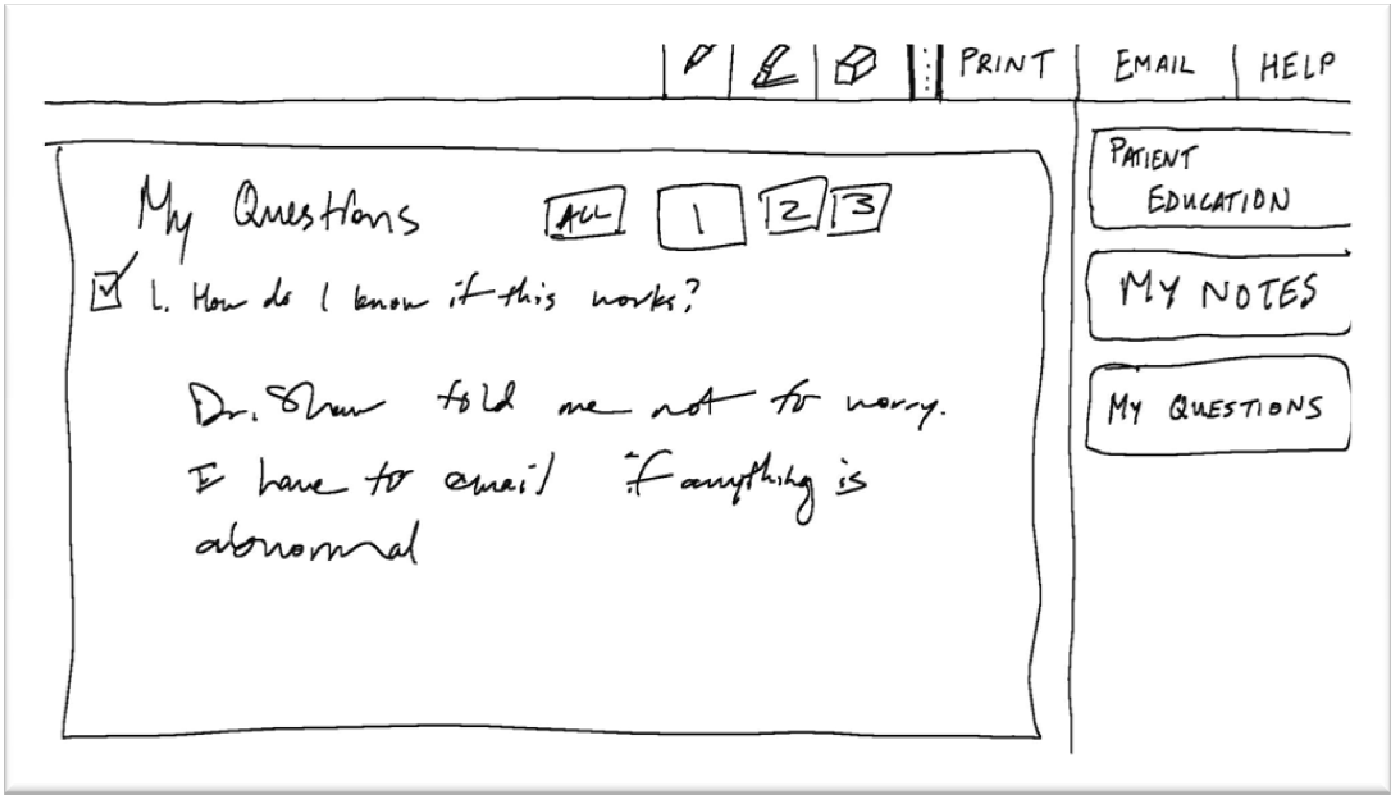

Why are you here?
VWD
Nosebleeds
Bruising


PRINT
EMAIL
HELP
VWD
Nosebleeds
Bruises
Clots
PATIENT EDUCATION
MY NOTES
MY QUESTIONS
General
Studies
Symptoms
Implications
VON WILLEBRAND DISEASE
History

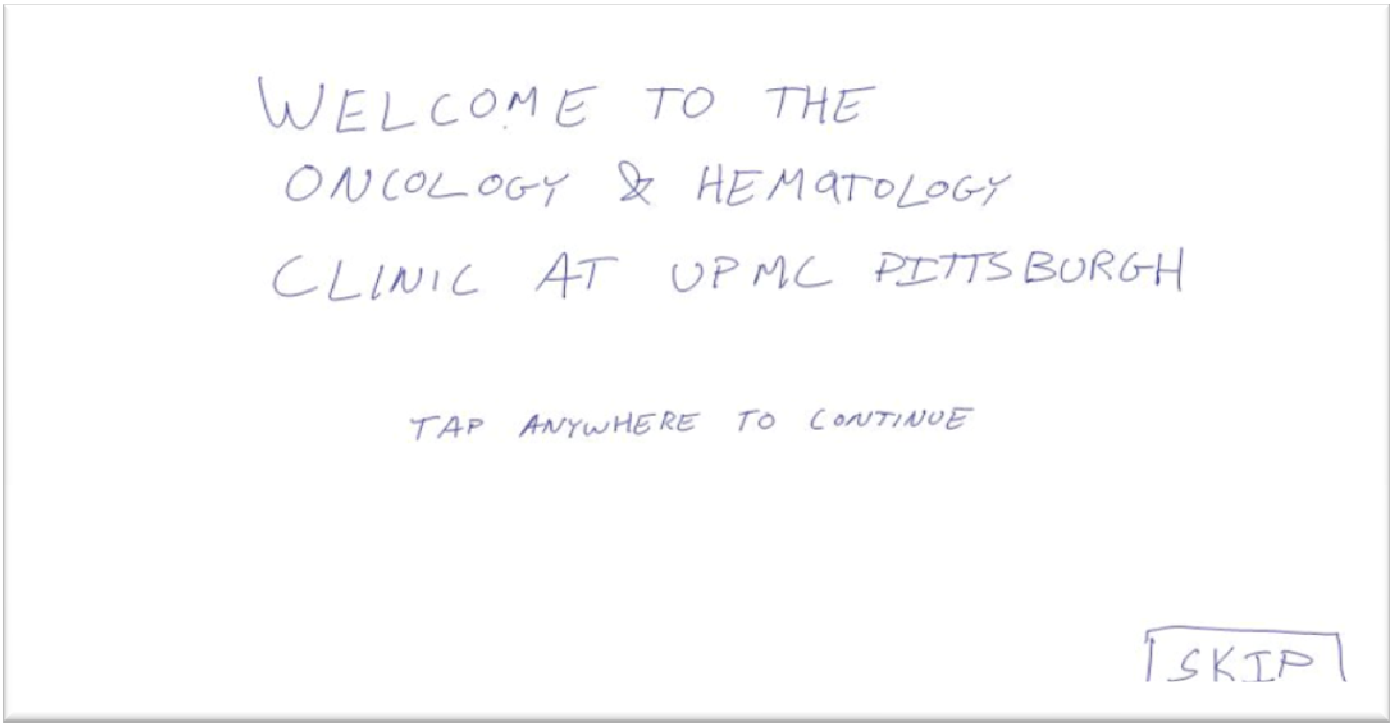

PRINT
EMAIL
HELP
My Notes
PATIENT EDUCATION
MY NOTES
MY QUESTIONS

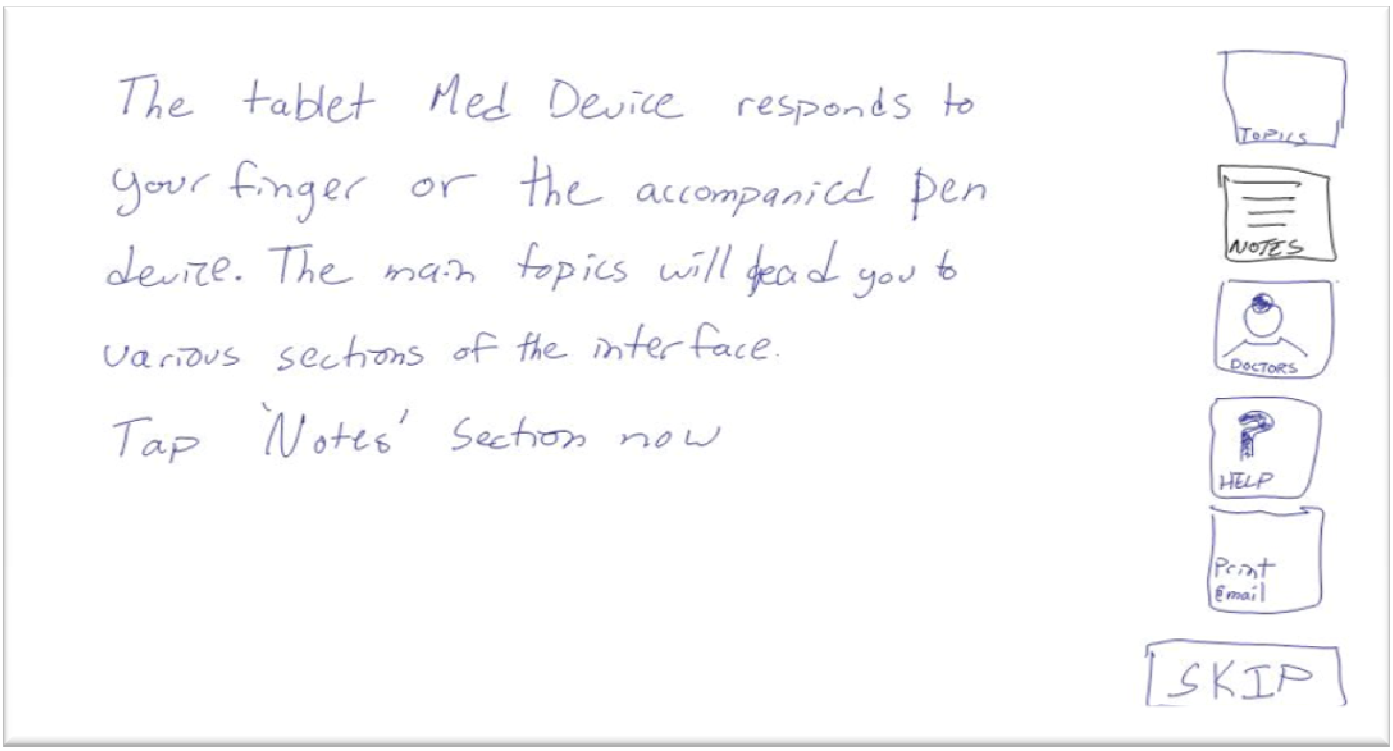

PRINT
EMAIL
HELP
My Questions
ALL
1
2
3
1. How do I know if this works? ⇒ View Notes
2. When can I play soccer?
3. Why won't I stop bleeding
Add Question
PATIENT EDUCATION
MY NOTES
MY QUESTIONS


PRINT
EMAIL
HELP
My Questions
ALL
1
2
3
1. How do I know if this works? ⇨ View Notes
2. When can I play soccer?
3. Why won't I stop bleeding
ADD QUESTION
4. What if this doesn't work?
Add
PATIENT EDUCATION
MY NOTES
MY QUESTIONS


PRINT
EMAIL
HELP
My Questions
ALL
1
2
3
1. How do I know if this works?
Dr. Shaw told me not to worry.
I have to email if anything is
abnormal
PATIENT EDUCATION
MY NOTES
MY QUESTIONS

Design 2

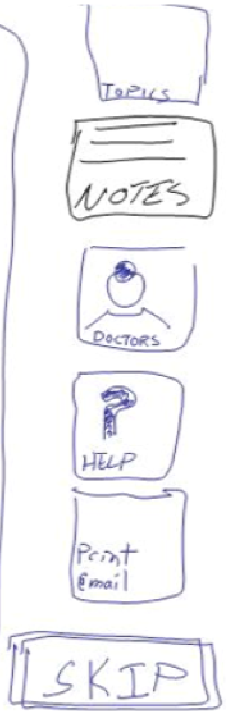

WELCOME TO THE
ONCOLOGY & HEMATOLOGY
CLINIC AT UPMC PITTSBURGH
TAP ANYWHERE TO CONTINUE
SKIP


The tablet Med Device responds to your finger or the accompanied pen device. The main topics will lead you to various sections of the interface.
Tap 'Notes' Section now
TOPICS
NOTES
DOCTORS
HELP
Print
Email
SKIP

This opens the notes section. Use the pen to write any questions, notes, etc. You will later have the option to print or email these notes for later use.

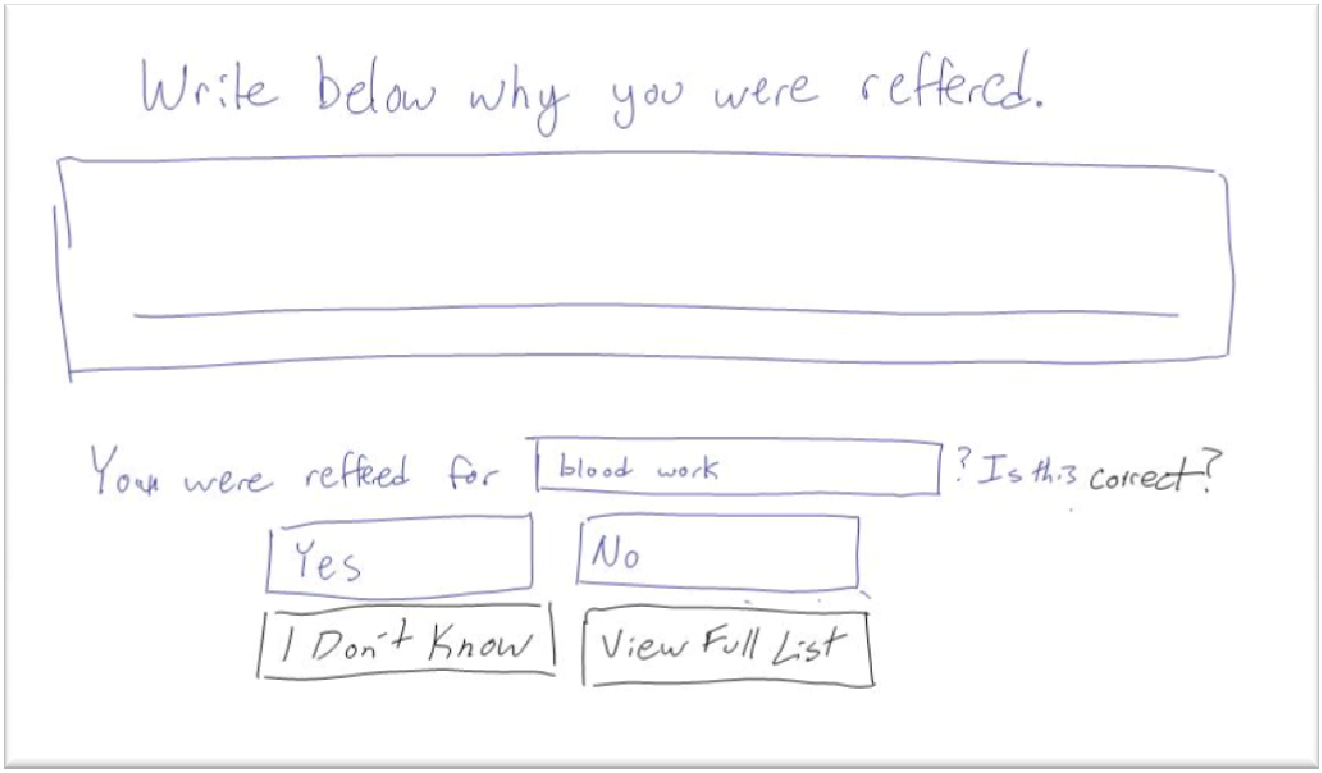
At any time, you can circle a section of text to save it to your notes. The article will also be tagged for later reference.

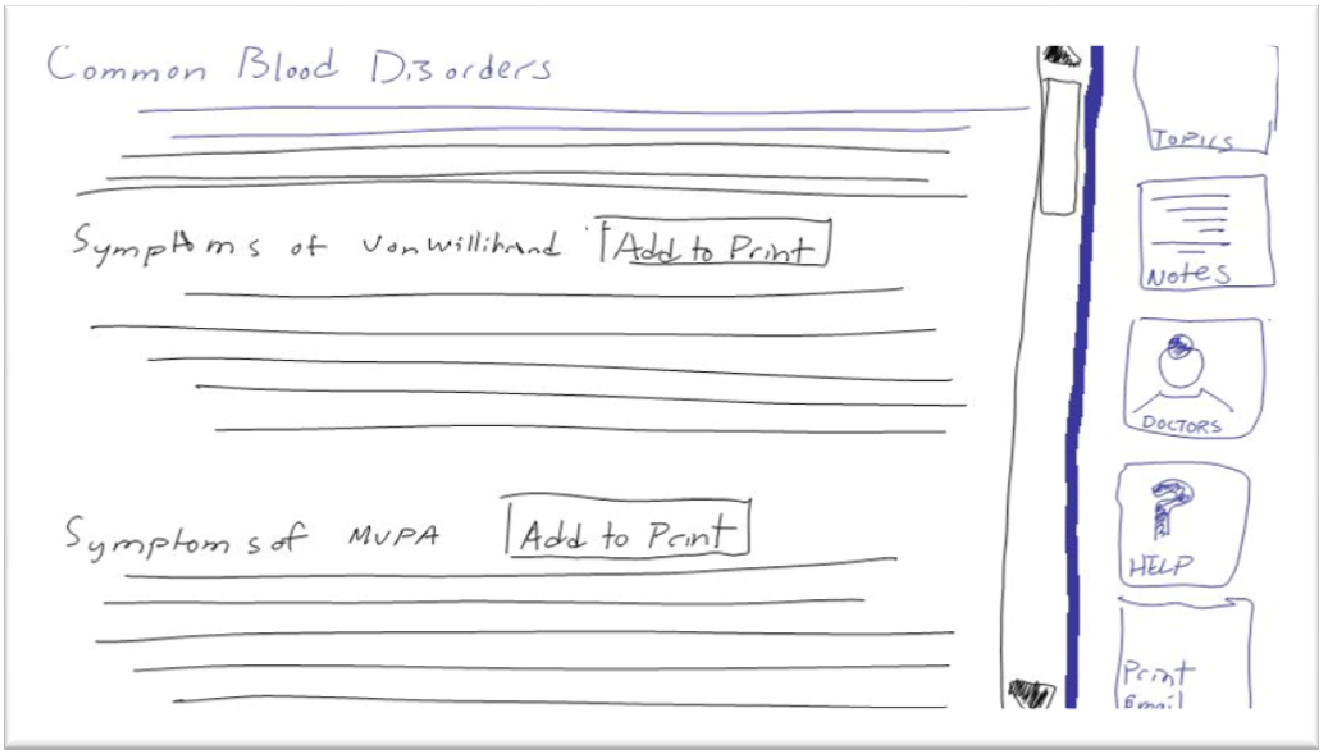
Write any where in the note box to continue.

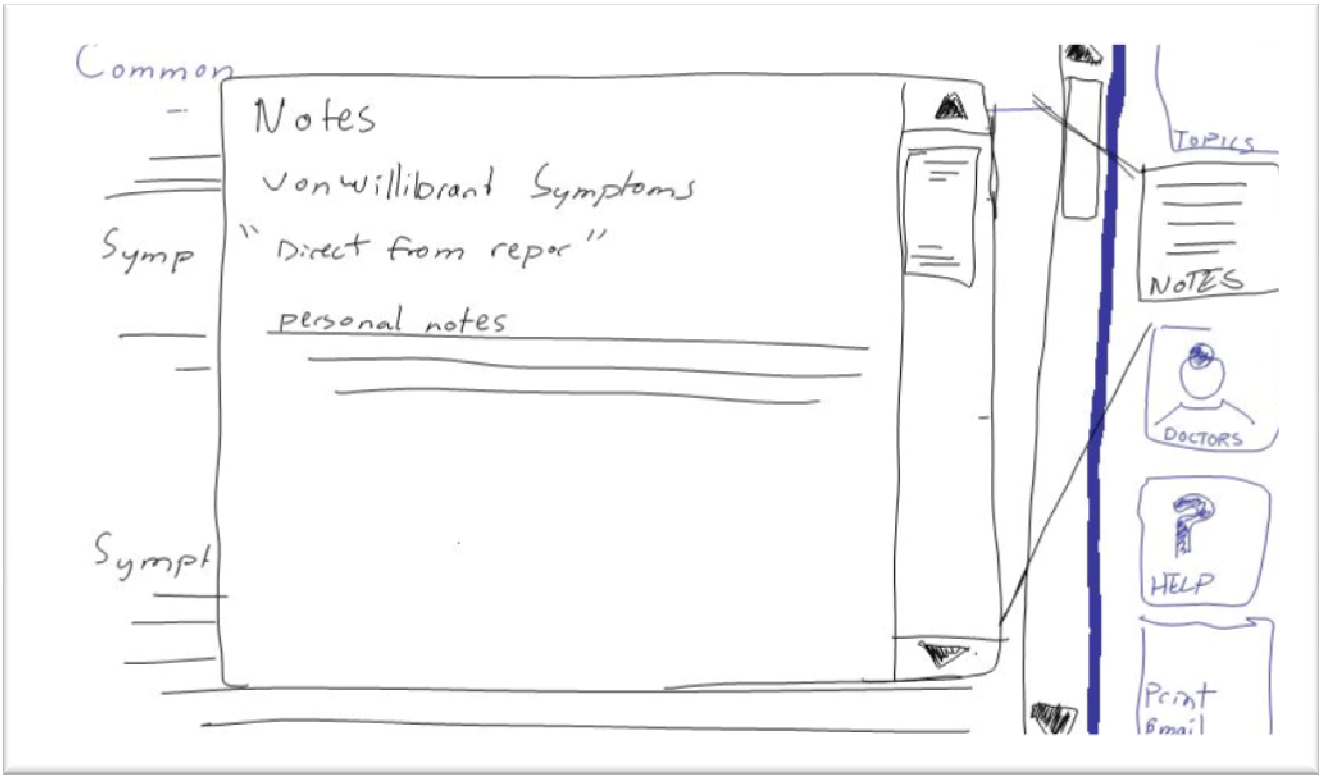


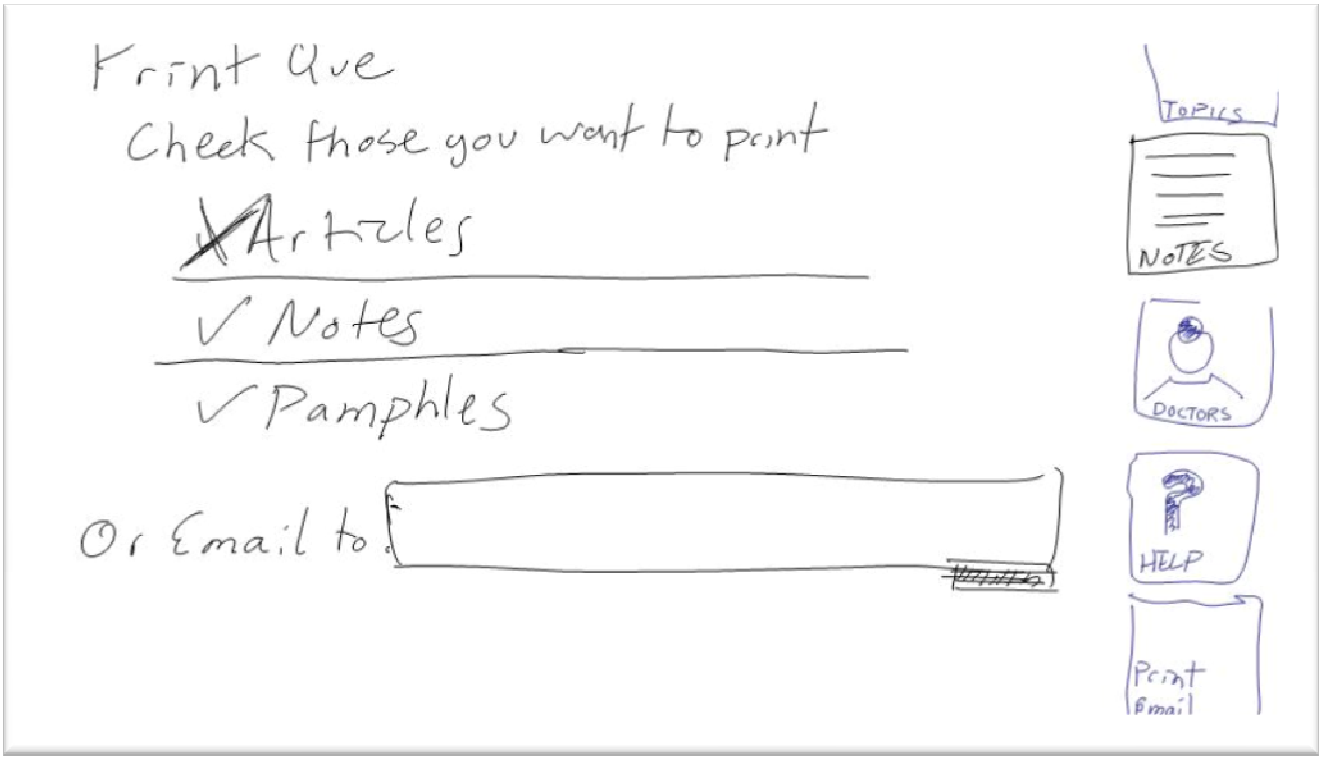
Do you know why you were reffered to this clinic?

Yes NO

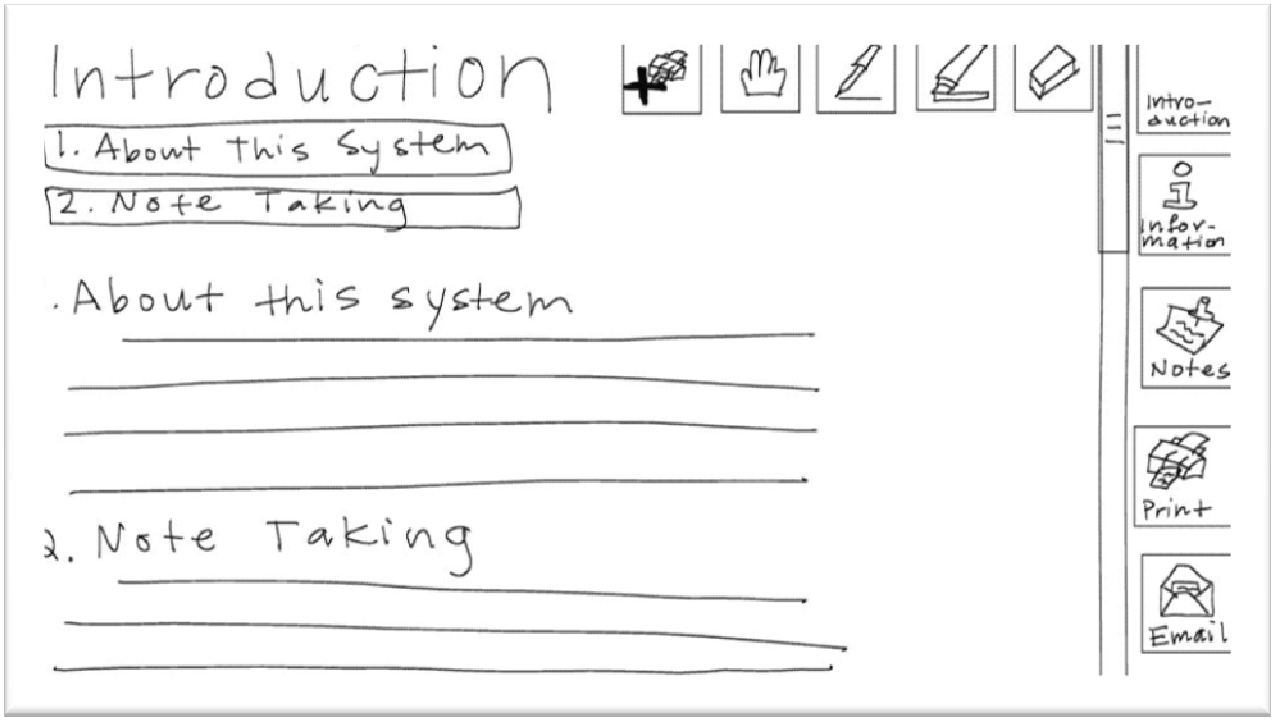

Write below why you were refferd.
You were reffed for blood work ? Is this correct?
Yes
No
I Don't Know
View Full List

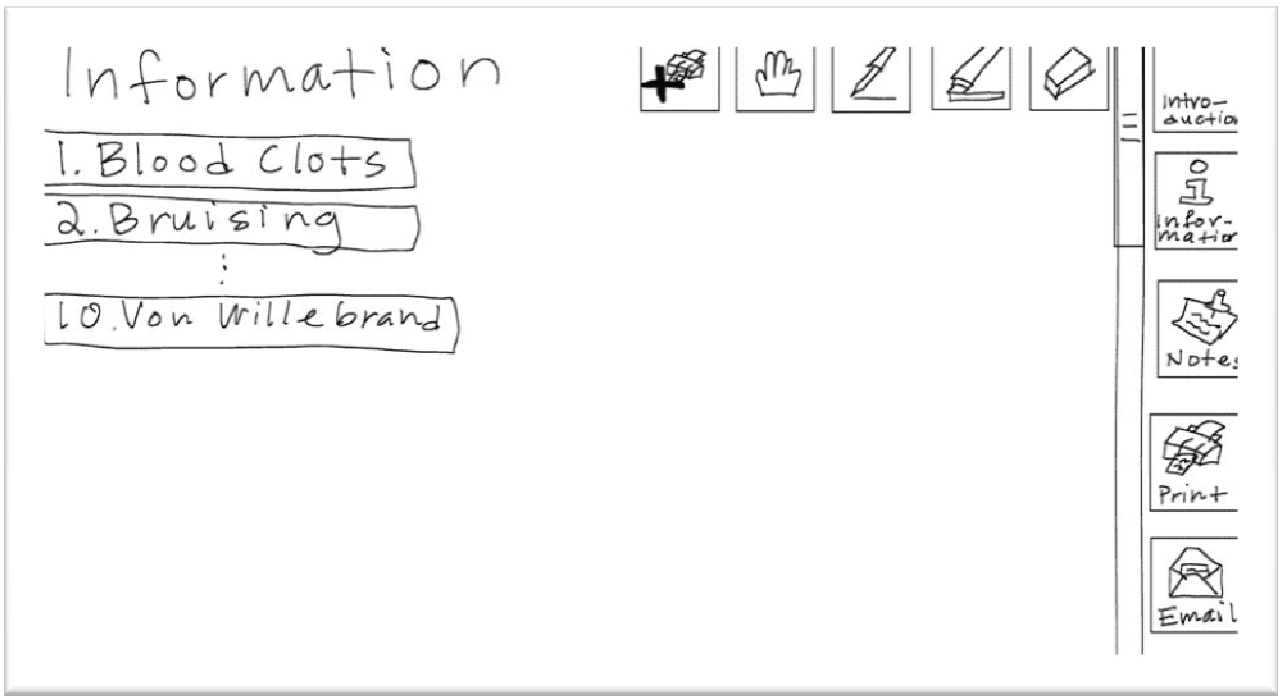

Common Blood Disorders
Symptoms of Von willibrand
Add to Print
Symptoms of MVPA
Add to Print
TOPICS
Notes
DOCTORS
HELP
Print
Email

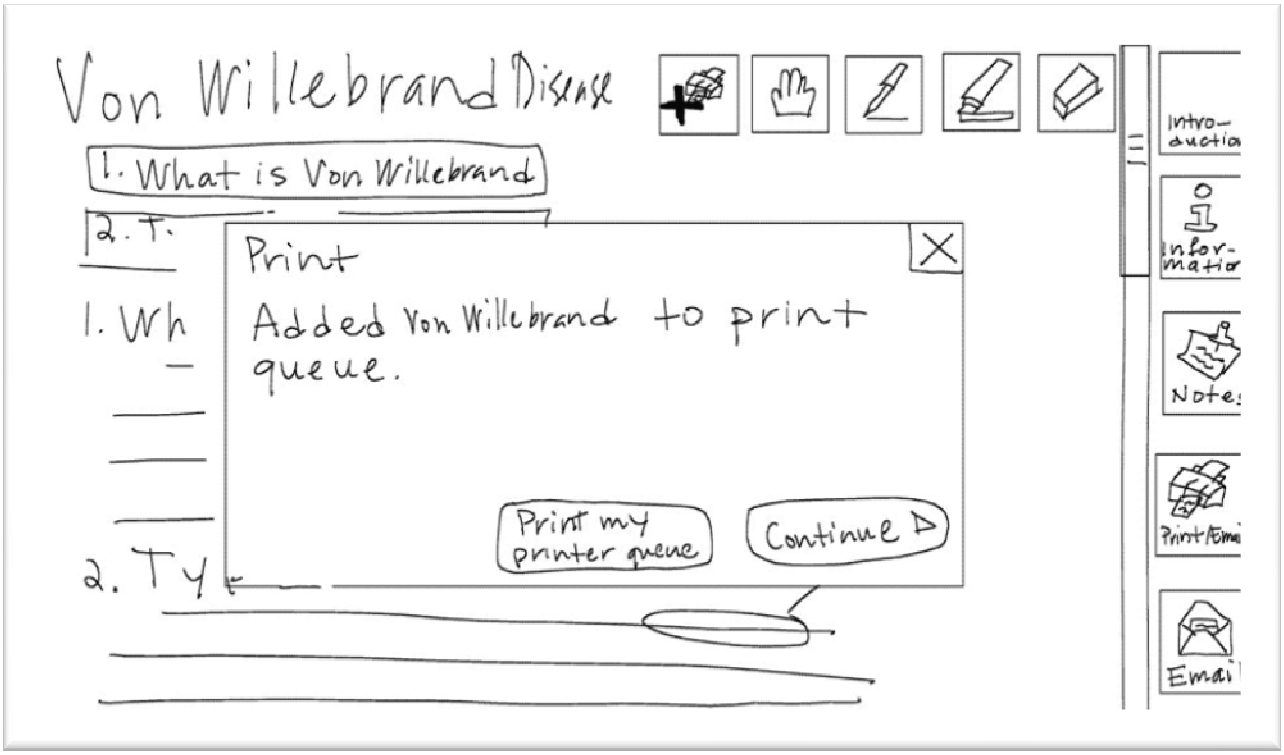

Common
Notes
Von willibrant Symptoms
Symp
" Direct from repor "
personal notes
Sympt
TOPICS
NOTES
DOCTORS
HELP
Print
Email

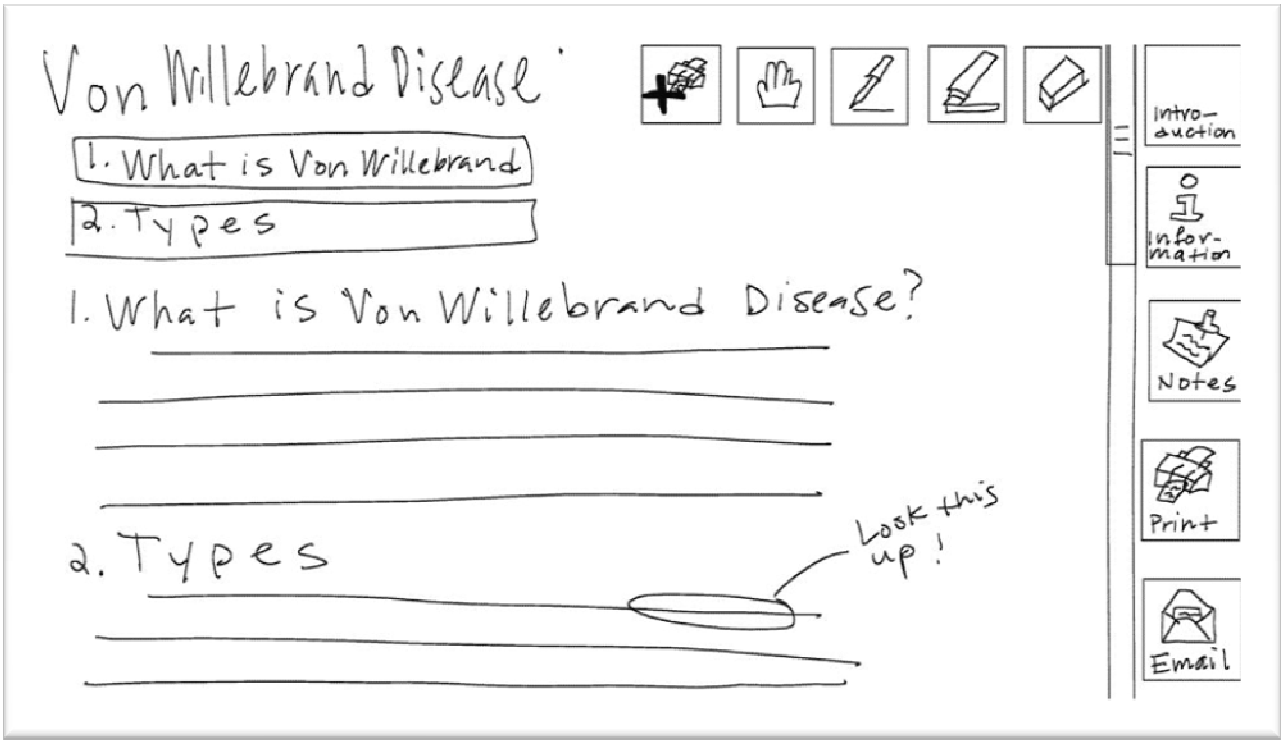

Print Que
Check those you want to print
Articles
Notes
Pamphles
Or Email to:
TOPICS
NOTES
DOCTORS
HELP
Print
Email

Design 3

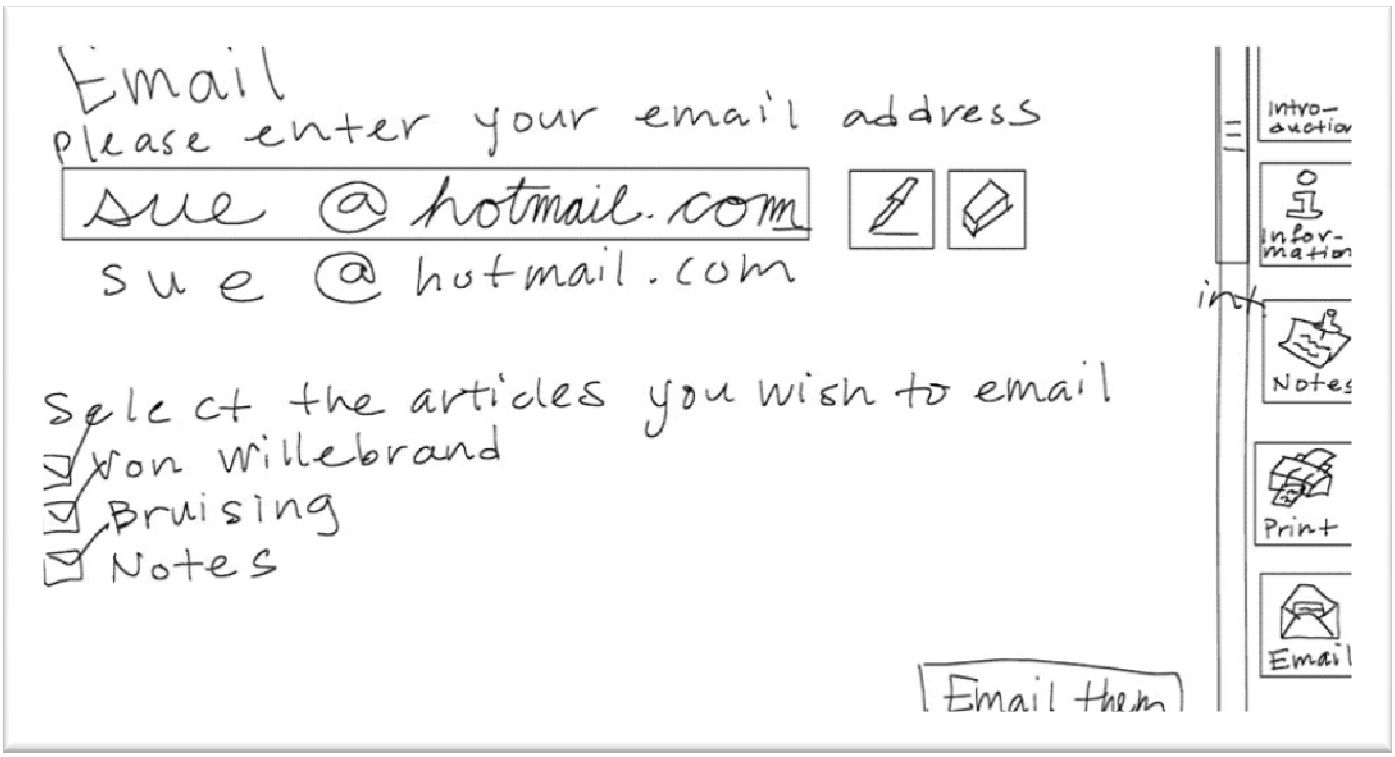

Introduction
1. About this System
2. Note Taking
. About this system
2. Note Taking
Intro-duction
Infor-mation
Notes
Print
Email

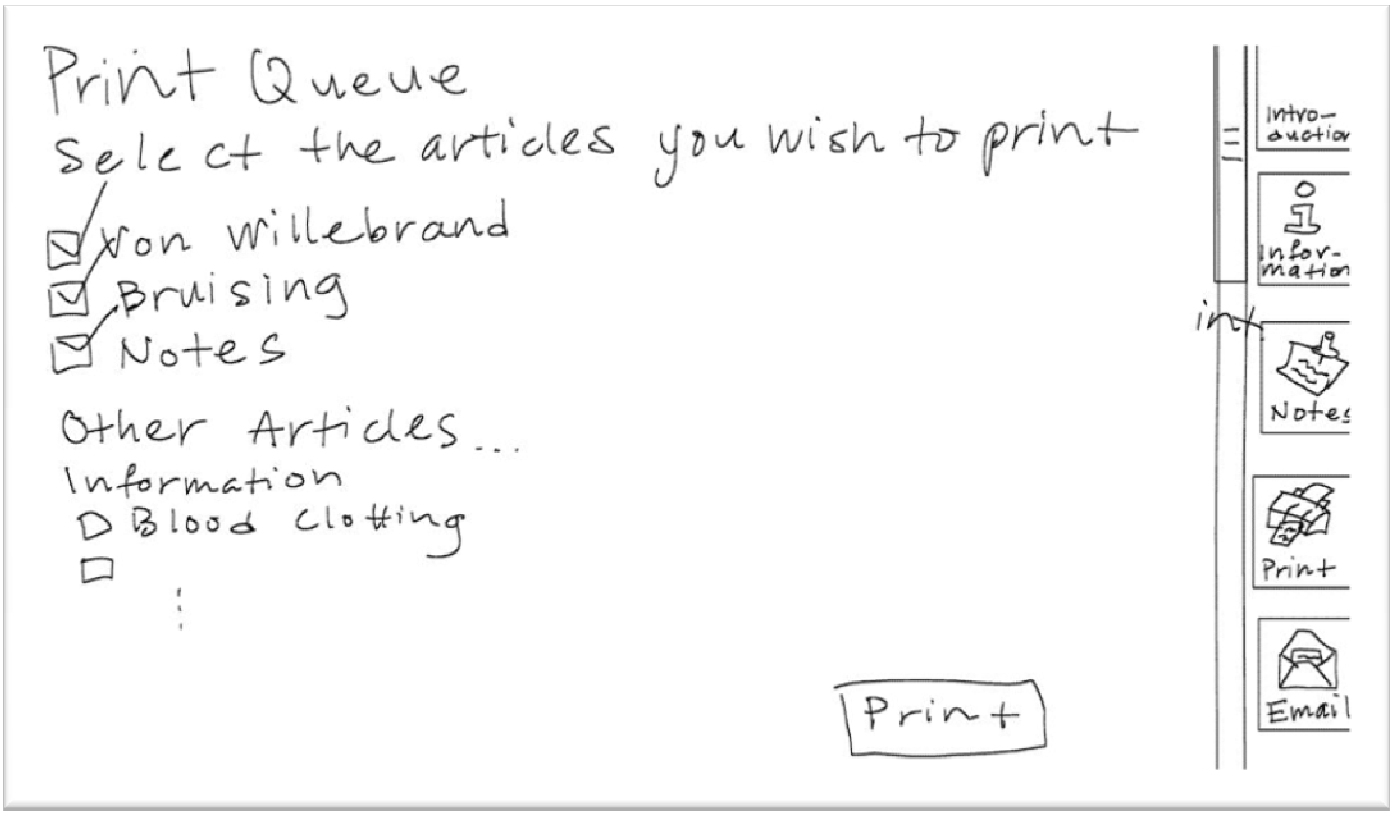

Information
1. Blood Clots
2. Bruising
10. Von Willebrand
Intro-
Infor-
Notes
Print
Email


Von Willebrand Disease
1. What is Von Willebrand
2. T.
Print
Added Von Willebrand to print queue.
Print my printer queue
Continue
1. Wh
2. Ty
Intro-
Infor-
Note
Print/Ema
Emai

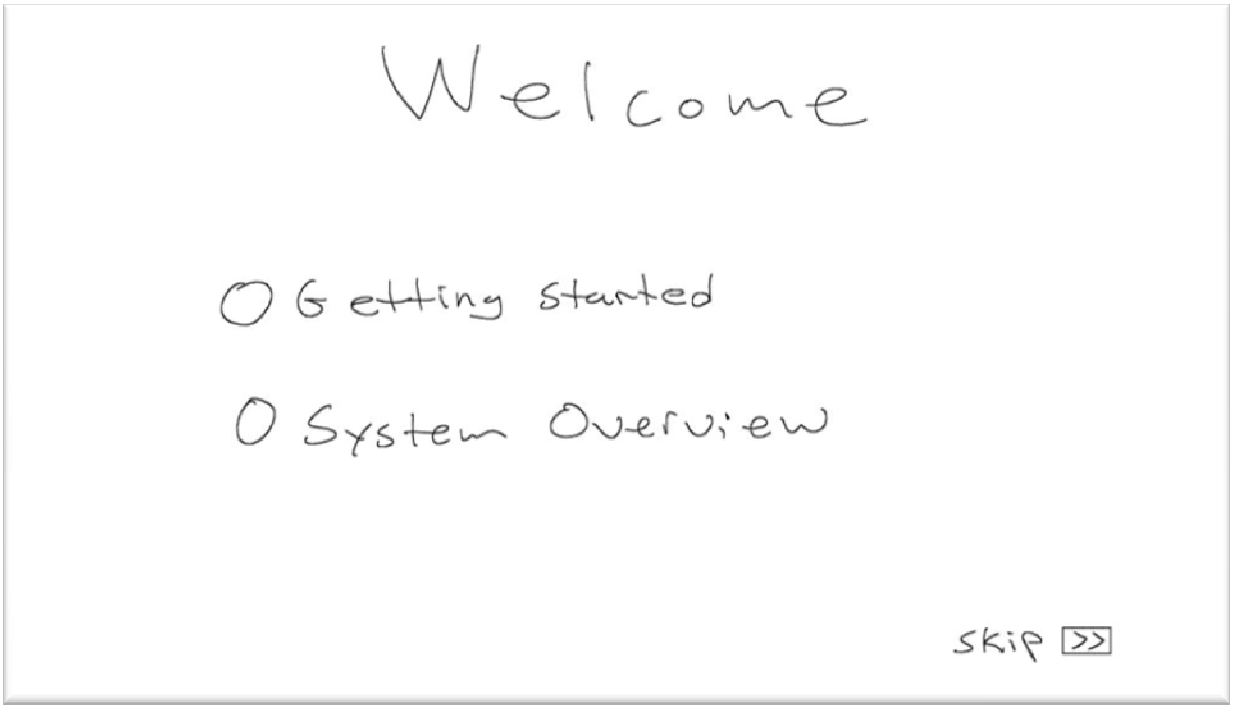

Von Willebrand Disease
1. What is Von Willebrand
2. Types
1. What is Von Willebrand Disease?
2. Types
Look this up!
Intro-
Infor-
Notes
Print
Email

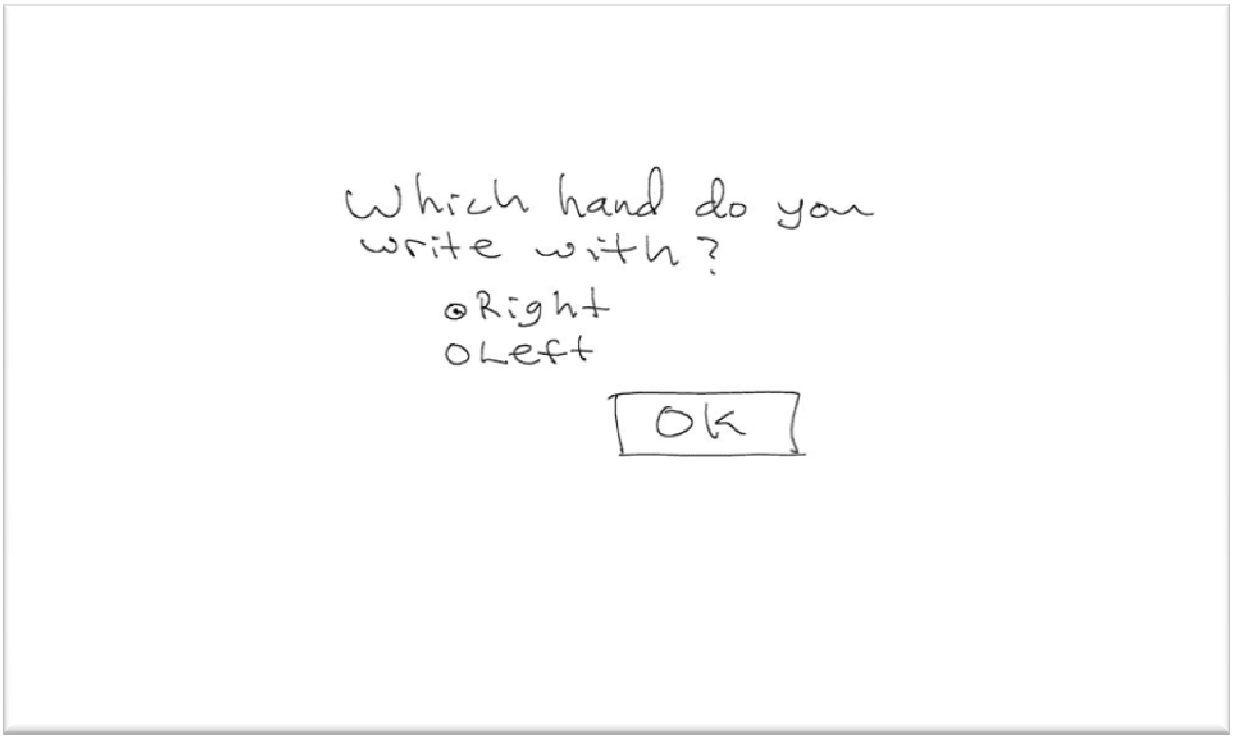

Notes
Intro-
Infor-
Notes
Print
Email
New page

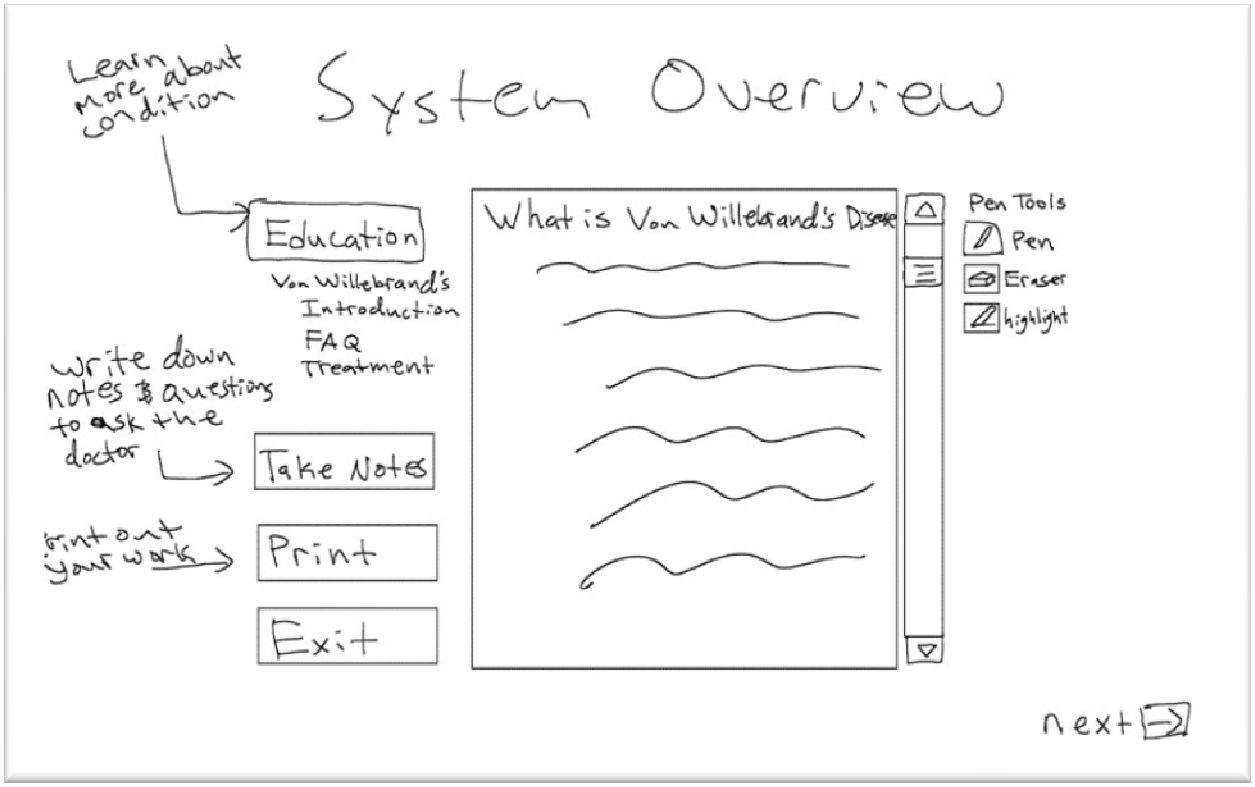

Email
please enter your email address
sue @ hotmail.com
sue @ hotmail.com
Select the articles you wish to email
Iron Willebrand
Bruising
Notes
Email them
Intro-
Infor-
Notes
Print
Email

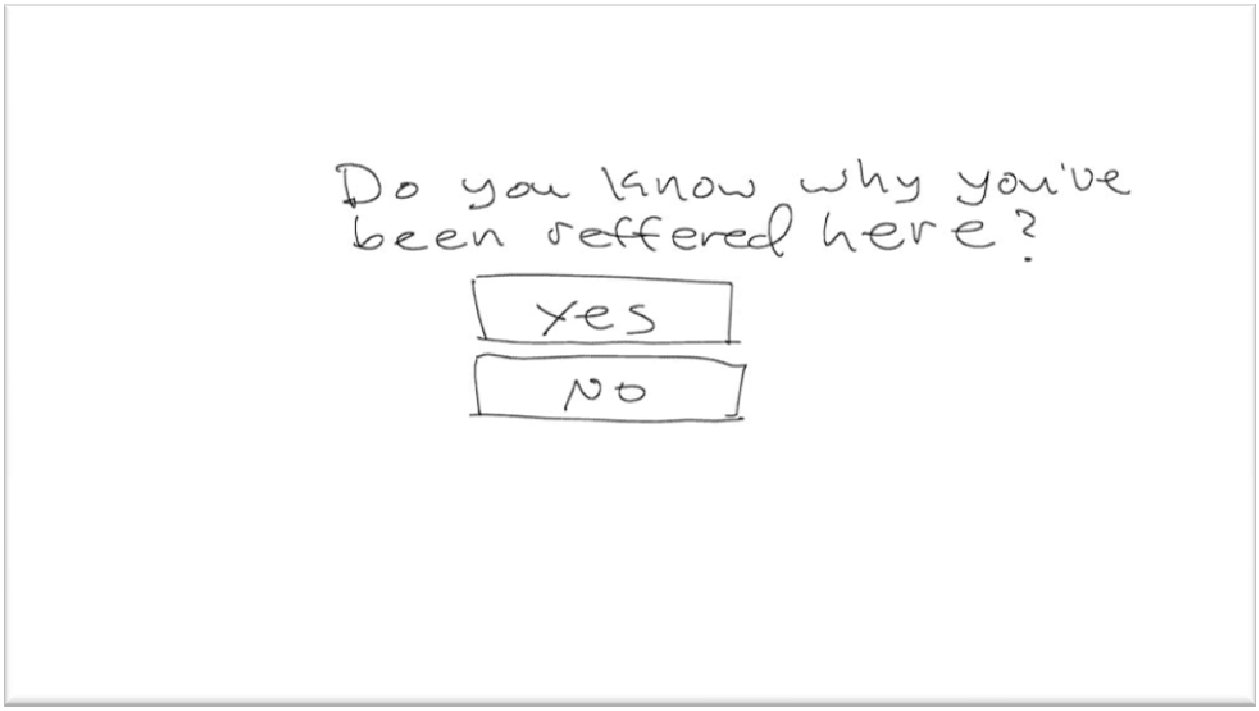

Print Queue
Select the articles you wish to print
Von Willebrand
Bruising
Notes
Other Articles...
Information
Blood Clotting
Print
Intro-
Information
Notes
Print
Email

Design 4

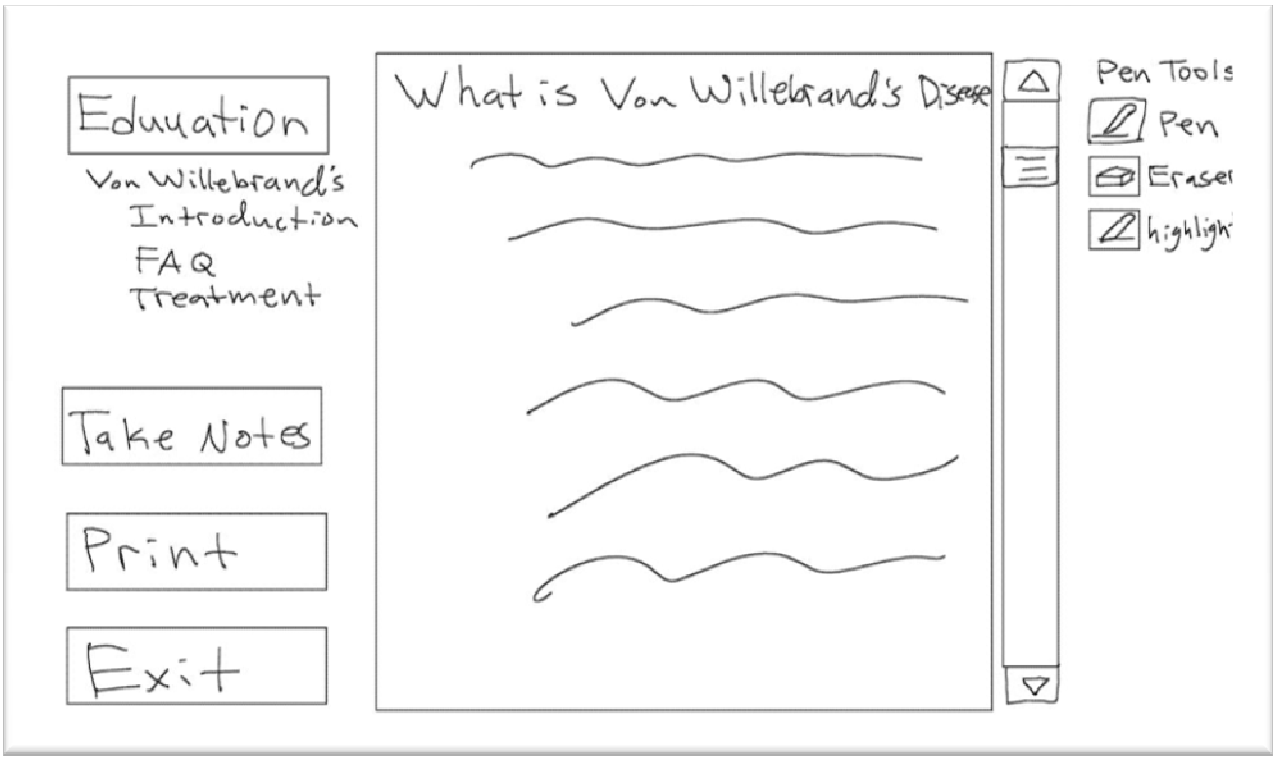

Welcome
Getting started
System Overview
skip >>

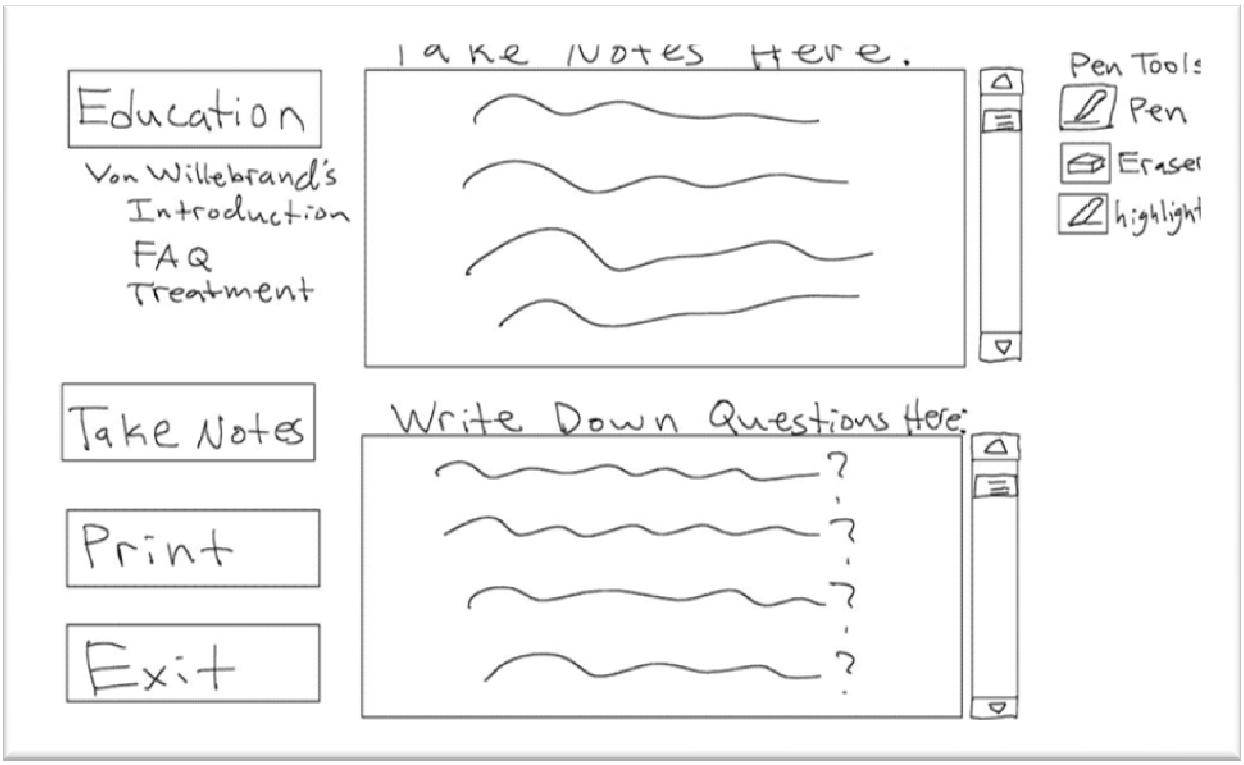

Which hand do you write with?
Right
Left
Ok

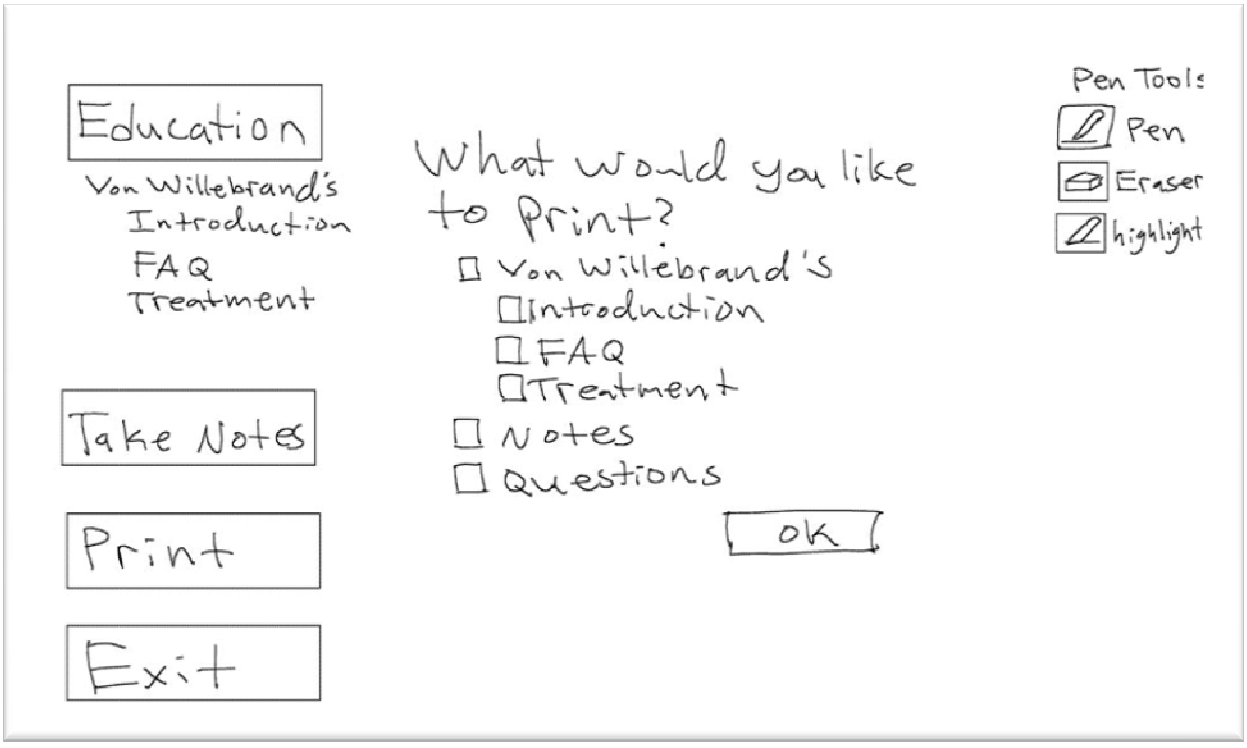

Learn more about condition
System Overview
Education
Von Willebrand's
Introduction
FAQ
Treatment
write down notes & questions to ask the doctor
Take Notes
print out your work
Print
Exit
What is Von Willebrand's Disease
Pen Tools
Pen
Eraser
highlight
next

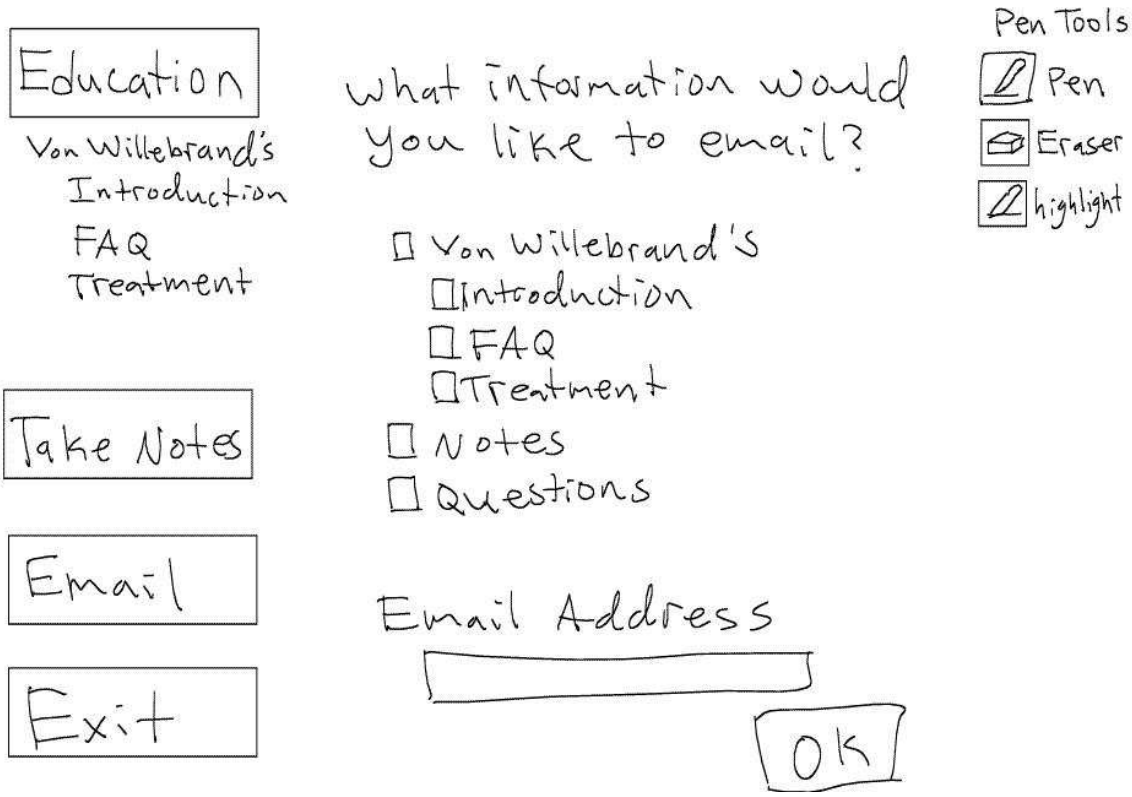

Do you know why you've been reffered here?
yes
no


Check the following reasons for your visit:
von willebrand's Disease
Hemophilia
Lukemia
other/don't know
ok


Education
Von Willebrand's
Introduction
FAQ
Treatment
Take Notes
Print
Exit
What is Von Willebrand's Disease
Pen Tools
Pen
Eraser
highlight


Take Notes Here.
Education
Von Willebrand's
Introduction
FAQ
Treatment
Pen Tools
Pen
Eraser
highlight
Take Notes
Write Down Questions Here:
Print
Exit


Education
Von Willebrand's
Introduction
FAQ
Treatment
What would you like to print?
Von Willebrand's
Introduction
FAQ
Treatment
Notes
Questions
ok
Pen Tools
Pen
Eraser
highlight
Take Notes
Print
Exit


Education
Von Willebrand's
Introduction
FAQ
Treatment
Take Notes
Email
Exit
What information would you like to email?
Von Willebrand's
Introduction
FAQ
Treatment
Notes
Questions
Email Address
OK
Pen Tools
Pen
Eraser
highlight

APPENDIX D – LIST OF QUESTIONS FROM RESEARCH

Introduction

- Who we are
- Describe Project
- Looking for feedback and reactions to initial ideas
- REMINDER: you did not design interfaces. All technical problems can be solved.
- Please think aloud and explain your thought process
- Please point with a pen where you are looking.
- Feel free to refer to other interfaces as we move forward in the discussion.

Please look for:

- Where would you go for information on VWB?
- How would you expect this to act (after being shown interface)
- Where would you go to print ? To Email?
- How would you expect this to act (after being shown interface)
- Where would you go to take notes?
- How would you expect this to act (after being shown interface)
- Please explain where you would go to write questions and answers and your expectations from the system.
- What else would you expect this system to do?
- Could you point out some of the aspects you particularly liked or disliked from the various interfaces and explain your reasoning?
- Do you have any other thoughts you would like to share about what we have shown you today?

APPENDIX E – FUNCTIONING PROTOTYPE TASK

Introduction

We are researchers at Carnegie Mellon University working to develop an application to educate patients and families about the Hematology and Oncology Clinic as well as the reason to your visit. From our initial research, we developed an interface that provides various levels of information and note taking. We intend that the product will be used in both the waiting room and as you continue through your consult with the doctor. If you would, please follow the task sheet we have and go through the interface. Please think aloud as you go through the system. Though you may ask questions as you go through the system, we will not answer any questions until the end.

Tutorial

This is a tablet pc system; you can use the pen just like a mouse. If you hover the pen tip over the screen you can move the cursor around. Tapping the pen on the screen is the same as clicking a mouse button. Additionally, this is simply a prototype. The final application will be on a system roughly the same size as the window we are showing you on screen.

Start Printing Here

Tasks

Read through the tutorial. Please read out loud to yourself and express any thoughts concerning the system.

Select the following reasons for your visit: Von Willebrand's Disease, Abnormal Bruising, Nose Bleeds.

Find statistics about how many people are affected by von Willebrand Disease.

Make a note of that information in the notes function. Highlight the notes since they are important.

Find information article about Abnormal Bruising

Find information and take notes about the causes of bruises.

Print the articles on von Willebrand Disease, Bruising, and your Notes.

APPENDIX F – RESEARCH NOTES

APRIL1 – HI FIDELITY 1 TESTING

DR. G

- Tested on ultra mobile device
- "This is heavy though"
- mouse highlight popup native to system is distracting
- font very small

USER 015

- mother, used device
- came with husband and daughter

TASKS

- didn't follow task directly
- first visit, doesn't know a lot about VWB
- confused on how to find treatment options: navigation within CSS
- increasingly gained confidence as went through system – was able to correctly go to the top of the page to find the right anchor
- Unsure how to go back to topics. searches around and ultimately finds topics. once finds this the issue is gone though.
- "I'm not too good with computers"
- initially expresses desire for new pages of notes. then finds how to extend the notes page and is happy. "Oh! I can just page down!"
- Print – some confusion in expressing wants. first states want specific category, then states good to get everything regardless. "Well, it wouldn't hurt to have everything"
- Print – had trouble with the checkboxes (might be because of the highlight)
- Article side is intimidating and long – dont know how to edit since data comes from hospital

IMPLICATIONS

- Need to reevaluate CSS navigation – fixed top navigation? make the "back to top" link look more button like and less hyperlink like?

USER 016

- very little technological knowledge
- "I really don't understand computers"
- "I don't even know how to turn it on" – talking about computers
- 16 year old patient
- quit tasks part way through, very uncomfortable

USER 017

- 17 year old daughter
- tested mother – computer knowledge minimal. asked daughter for help a lot
- "something like this would be very helpfull"
- "gotta help me here" (whispering to daughter)
- hesitant to write in interface
- daughter is curious if closing and reopening the notes keeps the ink in the system (the "X" button). pleased that it does
- mother liked the ability to see notes in full screen
- tries to hit check buttons exactly on the square
- "I think that's a great idea"

IMPLICATIONS

- support for image based buttons

USER 018

- tested on tablet
- father, owns laptop
- tries to hit check buttons exactly on the square
- kept accidentally right clicking
- tries to hit down arrow exactly on scrollbar
- didnt realize when moved between articles and went through so fast didnt see topics. even commented on his oversight
- repeatedly said "I'm lost" while looking for the nosebleeds section
- finds print easily
- couldn't find topics button

IMPLICATIONS

- support for image based buttons
- need to make things obvious in frazzled and concerned state (?)
- need to make "topics"/information button clearer or more visible

USER 019

- mother tested system. 3 year old daughter and father; multiple visits
- unsure of task
- sound of glee when find section notes
- very easy finding topics button
- slow in following task
- easy to find information
- back to top button for article was overlooked. scrolled up and down a lot
- distracted by own purpose in coming to clinic (i.e, they were there for nosebleeds and they wanted to keep reading about it)

- comment on system “kinda nifty”

IMPLICATIONS

- back to top button should be more button like, less hyperlink anchor like. Or just more visible.

TUTORIAL NOTES

- how to write, and other pen tools
- how to go back
- how to select print options
- ability to close notes and retain informatoin
- topics button visible?

- NOTE: how come the scrollbar for notes looks different from scrollbar on info? it was different with the umpc

APRIL15 – HI FIDELITY 2 TESTING

USER 20

(jason and david)

- father, minimal education, familiar with technology and of what a tablet PC is.
- generally uses computer for billpay only, once a day
- in the intro, he only selected abnormal bruising so he couldn’t do anything with VWB
- he realized that he wasn’t even in the right section, and he wanted to go back to select VWB, but he can’t (IMPLICATION: allow this in help?)
- used the “Back to Top”, “Back to Topics” correctly
- wrote down terms he didn’t know in the notes; wrote down a lot of notes and was very comprehensive because he read through all the sections
- “I never was a note-taker…”
- he was really drawn into it, and spent a lot of time reading the info
- he used the down arrow correctly to get another blank line for notes, but he did not use the arrow icon to add a lot of space (he was always at the bottom edge of the notes)
- NOTE: scroll bar for the notes covers some of his notes, so we’ll need to change that
- used highlighter well
- “The only thing is, it needs to give me more space” (IMPLICATION: this should be described in the tutorial)
- he tries to copy and paste text from the info page
- prints everything correctly
- thought that the arrow in the notes screen would scroll the information page, not the notes; he didn’t map it correctly to just the notes screen

- IMPLICATIONS

- make the notes section more visually separate from the article
- re-design the new page button for the notes
- possible readdition of original design ideas – dictionary, copy and past, etc
- need a method to return to the "select reasons why here" section

USER 21

(keisha and david)

- User confused between the tutorial screenshots and the system
-

- IMPLICATIONS

- need to make the images in the help section less refined. clear that they are not clickable

USER 22

(keisha and david)

- Tech – minimal, every day but just for email
- Tasks: user selects topics easily
- Help selection: looks around for the notes section for a bit, possible difficulty finding it at first
- Confuses screenshots with interface, "Need to make it bigger, I can't read that"
- Clicks and tries to interact with screenshot
- Topics – trouble clicking with pen
- No problem writing notes
- Print – don't select any article
- Comments: Pretty much everything, after I got the hang of it, was self explanatory"
- Why did they click on the screen shot? "Because it popped up right there I thought I could just hit him"

- IMPLICATIONS

- need to make images in help section less refined, clear that not clickable

ADDITIONAL IMPLICATIONS

- add additional stroke to the pen tools when selected, increase range of overlay in various states
- change bg of buttons from white to blue gradient to gradient between the two blues
- *

Note Title 4/15/2008

ecchymosis - bruise

minor light skin color blue or purple

some pain initially or delayed

scale 0-5 0 low 5 high

color changes over time eventually turning to yellow some changes due to breakdown in in hemoglobin.

2-3 moderate to severe powerful blow - any to head can cause coma and severe bleading. Cause internal damage to organs.