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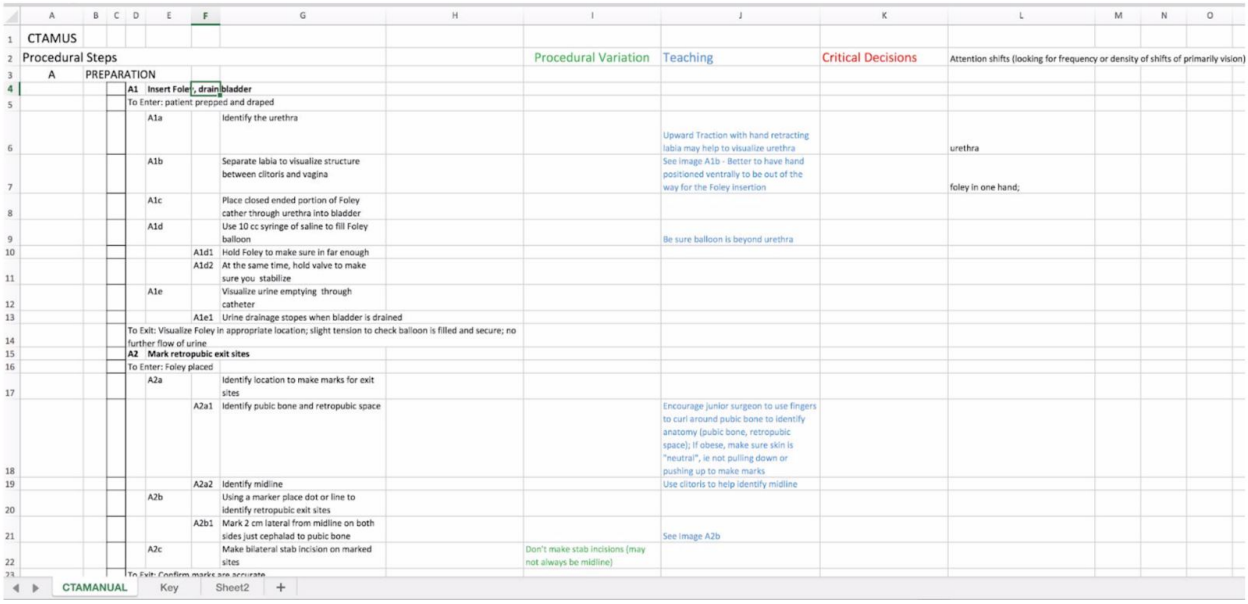
Final Report - Web Programs for Surgeons

1. Introduction

For this project, we were tasked with designing a web application for use by surgeons to assist in educating their fellow surgeons. After meeting with our client, we understood that the main goal was to design a simple interface that would allow surgeons to quickly navigate through the site and easily add information. Since it is for use by surgeons only, the application would require a login username and password to access anything. Our client suggested that the surgeons should be able to view all of the main and micro-steps on the same screen, as well as any tips or red flags involved in the surgical procedure. To accomplish this, we began our design with four main sections on the main screen, one for each section that the surgeon needs to see. There would also be another page to allow the user to search for a procedure from a master list of all procedures. Fig. 1 shows the old version of surgical instruction system.



1	CTAMUS														
2	Procedural Steps								Procedural Variation	Teaching	Critical Decisions	Attention shifts (looking for frequency or density of shifts of primarily vision)			
3	A	PREPARATION													
4			A1	Insert Foley, drain bladder											
5			To Enter: patient prepped and draped												
6				A1a		Identify the urethra				Upward Traction with hand retracting labia may help to visualize urethra		urethra			
7				A1b		Separate labia to visualize structure between clitoris and vagina				See image A1b - Better to have hand positioned ventrally to be out of the way for the Foley insertion		foley in one hand;			
8				A1c		Place closed ended portion of Foley cather through urethra into bladder									
9				A1d		Use 10 cc syringe of saline to fill Foley balloon				Be sure balloon is beyond urethra					
10					A1d1	Hold Foley to make sure in far enough									
11					A1d2	At the same time, hold valve to make sure you stabilize									
12				A1e		Visualize urine emptying through catheter									
13					A1e1	Urine drainage stopes when bladder is drained									
14			To Exit: Visualize Foley in appropriate location; slight tension to check balloon is filled and secure; no further flow of urine												
15			A2	Mark retropubic exit sites											
16			To Enter: Foley placed												
17				A2a		Identify location to make marks for exit sites									
18					A2a1	Identify pubic bone and retropubic space				Encourage junior surgeon to use fingers to curl around pubic bone to identify anatomy (pubic bone, retropubic space); If obese, make sure skin is "neutral", ie not pulling down or pushing up to make marks					
19					A2a2	Identify midline				Use clitoris to help identify midline					
20				A2b		Using a marker place dot or line to identify retropubic exit sites									
21					A2b1	Mark 2 cm lateral from midline on both sides just cephalad to pubic bone				See image A2b					
22				A2c		Make bilateral stab incision on marked sites			Don't make stab incisions (may not always be midline)						
23			To Exit: Confirm marks are accurate												

CTAMANUAL | Key | Sheet2 | +

Fig. 1 Old Surgical Instruction System

2. User Studies

We start to conduct the user studies by making the first interview with clients. The Interview Questions are as listed.

1.When is the system used?

During surgeries and while teaching/collaborating, it shows that the major tasks of our system are to show information during the course and the surgeries and allow surgeons to edit this information.

2. Which Task is integral for functionality?

All, Everything has to be accessible within two clicks. It indicates that every task of the system is indispensable, and are all common. The main purpose of our design is to make the system as simple as possible.

3. Who can access the system, just surgeons or other health stakeholders too?

Only surgeons. It indicates that all the users who can log in to our systems can edit the information.

4.Rank most important to least - Teaching Tips, Procedural Variation, and Critical Decisions.

Teaching Tips is the most important, other two not so much. It helps us to decide how the layout of our main page should be and how we should show our different information.

As we began to draft our design, we quickly realized that four sections full of information would be crowded and potentially difficult to read. Luckily, after meeting again with our client, she decided that she no longer wanted to include red flags. So, now we were left with three main columns for our screen, making it much easier to design. We started with a basic structure which included three scrollable columns of equal size on the main screen. We also wanted to add functionality to allow the user to quickly add steps to any of the lists on the screen. To do this, we planned to add a "+" icon underneath each item that the user can click. We also decided to add a search bar on this page so that the user would be able to search for other procedures directly from this page without needing to return to the main search screen first.

After working with our design for some time, we met again with our client as well as surgeons who would potentially be a user for our system. The surgeons suggested that we make the "tips" the main portion of the interface, as that is what the users would mainly be focusing on. The surgeons also said that they only needed to use this application for one procedure specifically. Since we had assumed that their main focus would be on either the steps or microsteps of the procedure, we needed to make changes to the design of our main page columns. To account for this, we changed the sizes of the columns to draw attention to the "tips"

section by making its portion biggest (half the size of the page) while leaving the other two sections to take up the other half of the page together. Also, although the surgeons currently intend to use this for only one procedure, we still planned to include functionality for the addition of more procedures, as that was still our clients' intention.

3. Task Analysis

By applying the hierarchical task analysis to user experience, there are three main tasks for us to complete: Identifying users' primary goals, detailing the steps users must perform to accomplish their goals and optimizing these procedures.

Identifying users' primary goals: Surgeons can add//edit steps, teaching tips, critical decisions, and procedural variations they use when teaching specific steps in specific operations with a web-based editable system.

Detailing the steps users must perform to accomplish their goals: The tasks are separated to following instructions during surgery and adding/editing content relevant to various surgeries.

Optimizing these procedures: We will consider some functional supplement based on the ideas of clients.

4. Final Design

Based on our task analysis, we will implement the final design. Our final design includes a login screen, search page, and procedure page. After logging in to the site, you are taken to the search page which allows you to find the procedure you would like to view. Once you click on the procedure, you are taken to the procedure page where you are able to view/edit all of the main steps, micro steps and tips for that procedure. Originally we intended to have two user types (user and administrator) so that the tips could be reviewed by someone before being posted

to the site. However, the client and users suggested this was unnecessary since the site is private and not available to the public to add incorrect information. We also discussed potentially adding a rating system, so that any added information could be rated as either good or bad by other users. Unfortunately we were unable to include this functionality in our design in time, but it is something that should be added to this project in the future.

The first screen the user will see is the login screen. In this screen they are prompted to either login using their username and password or register for an account. While designing this page was simple (just a form and logo), our main challenge was to make this page functional. After successfully logging in, the user is brought to the search procedures page. We decided to add a search bar on the top of the screen so that the user can easily search for a specific procedure they are looking for. However, some users may want to look through the whole list of procedures. Therefore, the list of all procedures can be traversed via scrolling down the page. It can also be searched by an alphabet menu at the bottom of the screen. This would be helpful for users who do not know how to spell the specific procedure they are looking for in the top search box, while still narrowing their options and making the search faster. Additionally, this page contains a "+Surgery" button in the navigation bar to allow the user to add an entire procedure. Although the users of this system are currently only looking to add to one specific procedure, this will allow them to add more procedures in the future.

Once the user chooses the procedure they would like to view, they are brought to the procedure's main page. This page includes the three columns for each of the three sections as well as a search bar. On this page, the user can view all of the information about the procedure and they can add information to the page. There is a small "+" icon under each step or tip which

should alert the user that they can add to that portion. When the user clicks on this button, a pop-up immediately shows, allowing the user to type their comment and submit it to the page. This page also allows the user to search for other procedures so that they are not forced to take more steps than necessary by going back to the search page. Rather than making each column scrollable, the user can click on a main step to auto-scroll to that step's microsteps. Also, while they scroll through microsteps, the main step will remain highlighted to remind them which step they are looking at. When the user clicks on a microstep, the tips for that microstep show on the tip side of the screen. This will help the users save time if they are looking for a specific step or if they want to add to a specific part of the procedure. Keeping the three portions connected reduces the cognitive load for the user because they do not have to remember which step they are looking at. They can still scroll using the page's scrollbar to see all of the main steps.

The main idea of the system follows the "MVC" design pattern, which is based on front-end browsers programmed with HTML5, CSS and JavaScript and Back-end design with Javascript, MySQL and PHP.

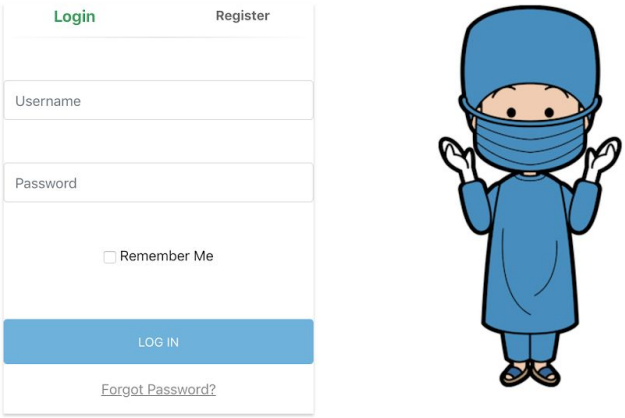


Fig. 2 The login page

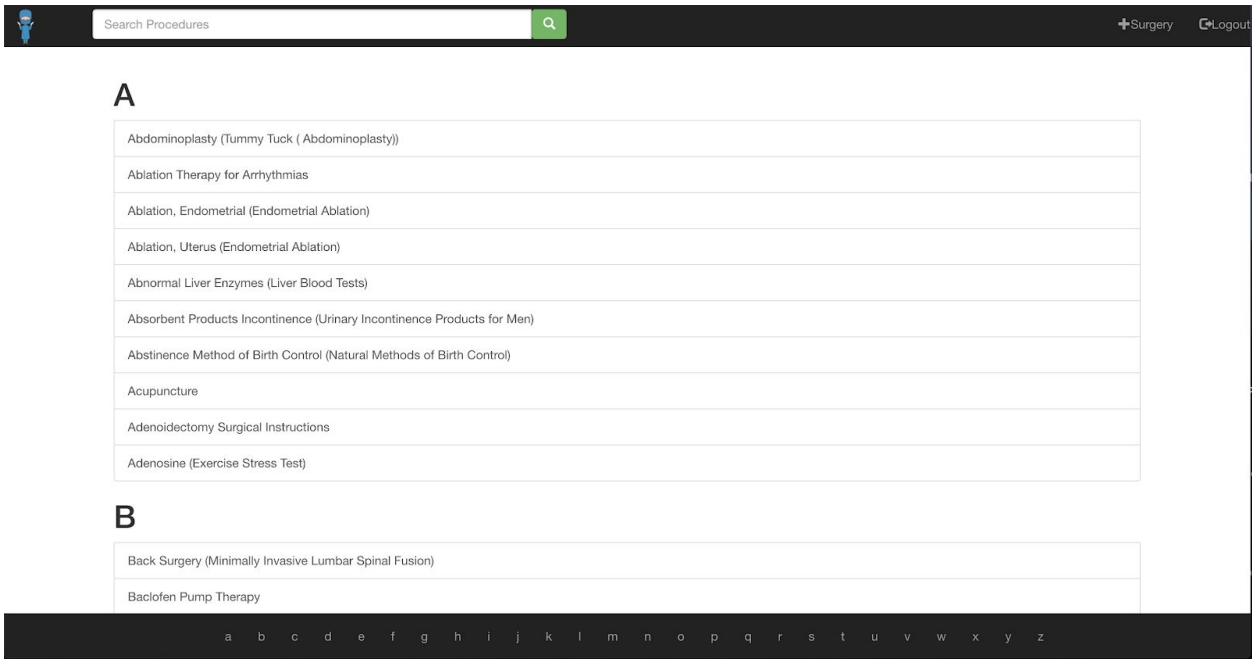


Fig. 3 The Procedure page

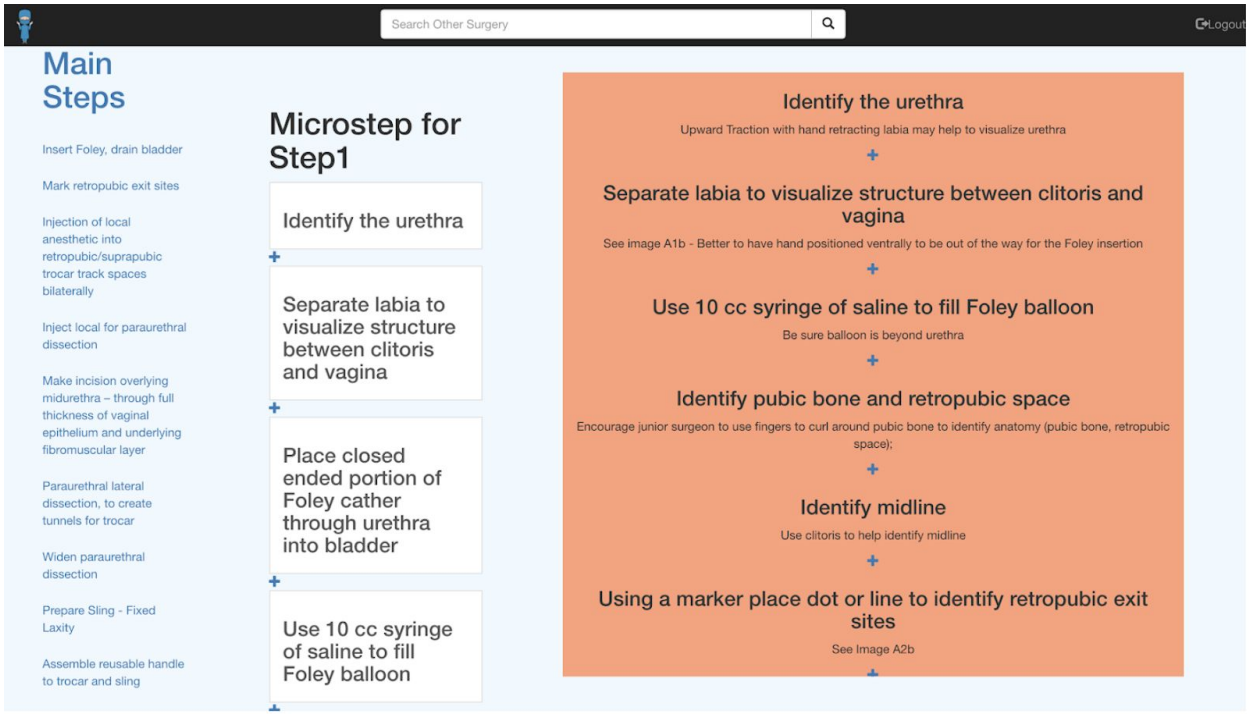


Fig. 4 The index page

5. Conclusions

In general, we kept an easily identifiable navigation bar at the top of each screen after the login page. We kept a home and logout button in the top right/left corners of the navigation bar on each page so that the user knows how to navigate through the application. For example, if they are on a procedure's main page, they should always be able to click "Logout" to logout of their account and return to the login screen. The navigation bar also always includes a search bar which allows the user to search for procedures from any screen without returning to the list of all procedures.

6. Future improvements and Challenges

Our main challenge with this project was that it was more time consuming than expected to start the web application from scratch. Since we had to develop both the back-end functionality and front-end design, there was a lot of work involved in making sure that everything worked correctly while maintaining a good design. Additionally, our design changed each time we met with users, so we were constantly re-drafting and implementing new designs to reflect their needs. Since they wanted tips to be the largest section, we had to compromise the visual appeal of our design since the tips portion seems to take up too much space while containing the least amount of information. However, we were able to compromise with the users in order to make an interface that met their goals within our time constraints.