CREATING A MODEL FOR AN INSTRUCTIONAL GUIDE

FOR SURGICAL DEVICES DELIVERED ON A

PERSONAL DEVICE ASSISTANT (PDA)

APPROVED BY SUPERVISORY COMMITTEE

Kim Hoggatt Krumwiede, M.A., Associate Professor
Biomedical Communications Graduate Program

Richard P. Howdy, M.A.

Dr. John Schorge, Associate Professor UT Southwestern
Fellowship Director for the Gynecologic Oncology Division,
Department of Obstetrics and Gynecology

DEDICATION

I would like to thank the members of my Graduate Committee, Kim Krumwiede, and Richard Howdy for all their help and guidance though this process.

I would especially like to thank Dr. John Schorge, my content expert on this project, for all of his time, patience and humor.

Thank you to my family and friends for all the love and support throughout my life, especially though the last three years of my education.

CREATING A MODEL FOR AN INSTRUCTIONAL GUIDE FOR SURGICAL DEVICES DELIVERED ON A PERSONAL DEVICE ASSISTANT (PDA)

by

ERIN NICOLE FREDERIKSON

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CREATING A MODEL FOR AN INSTRUCTIONAL GUIDE
FOR SURGICAL DEVICES DELIVERED ON A PERSONAL DEVICE ASSISTANT
(PDA)

Erin Nicole Frederikson, M.A.
The University of Texas Southwestern Medical Center at Dallas, Graduation Year 2008

Supervising Professor: Kim Hoggatt Krumwiede, M.A.,

The goal of this thesis was to create a model for a Personal Digital Assistant (PDA) delivered instrument instructional guide that could utilize the information on demand capabilities of a PDA to better explain the dynamic process involved when using a surgical device. The surgical device for this model is an AutoSuture Premium Plus CEEA Single Use Stapler. The model could potentially serve as a portable instructional guide for review and understanding of the proper use of the Premium Plus CEEA Single

Use Stapler and a template for the creation of future surgical instrument guides to be delivered on a PDA.

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LIST OF DEFINITIONS

Adobe® Acrobat®- software program that is used to convert a document into a portable document file or a PDF

Adobe® After Effects CS3®- professional software designed for video editing and post production

Maxon 4D Cinema®- 3D animation software designed for modeling and animating 3D shapes and objects

Quicktime® – common video file format created by Apple Computer

CHAPTER ONE
Introduction

Thesis Research Problem

During surgery, a surgeon can be confronted with using new or unfamiliar surgical devices. Operating rooms often change the supplier of the instruments and even experienced practitioners who are very familiar with one brand of instruments may not be familiar with another company's brand of a similar instrument. Currently, many of the instructions that accompany these surgical devices are printed directions with small text. Surgeons must rely upon the small, printed instructions that accompany the surgical device. The surgeon or assisting personnel must not only try to read the tiny printed instructions, but they also have to translate static instructions into physical dynamic actions. This can be difficult for the surgeon and assisting personnel in the operating room, especially during a surgical procedure. Is it possible to create an animated instructional guide for a surgical instrument to be delivered on demand on a Personal Digital Assistant (PDA)?

Background

During the course of surgery, situations arise that require the use of unfamiliar surgical devices. Being confronted with new or unfamiliar surgical devices can be troublesome, especially because their proper use is vital to the success of the surgery.

When operating new and unfamiliar surgical devices, operating room personnel must often refer to the paper-printed instructions that accompany the device. These paper-printed instructions have small illustrations as well as small and often difficult to understand text. These instructions try to convey the dynamic procedures using the surgical devices through static text and illustrations.

The dynamic process of understanding how a surgical device is used can be improved by utilizing animation. There is no need for translation from static instructions when an animation is able to demonstrate the concepts and applications of a surgical device. Animation can visually show the features of a device and how to properly use the device in a surgical procedure.

PDA's have the ability to display short clips of animation. Only some operating rooms are equipped with DVD players or computers that could play animations via DVD or internet. However, many surgeons and surgical personnel have, and use, PDA's in their normal clinical operations. Employing the capabilities of a PDA could ensure the easy portability and accessibility of instructions, as well as ensuring the instrument instructions are delivered in a clear animated format.

The Premium Plus CEEA single use stapler, produced by Autosuture, is a circular end-to-end anastomosis stapler. The Premium Plus CEEA stapler is commonly used for end-to-end anastomosis of the colon and rectum and typically requires two

people to use it. One individual must break sterile field, while the other must remain sterile.

The end-to-end anastomosis of the colon and rectum is not a high frequency procedure in OBGYN surgeries, so a surgeon might not have the forewarning or opportunity to review how to use the Premium Plus CEEA stapler prior to surgery. The need to use this stapler might present itself in the middle of a surgical procedure. The surgeon might have had experience with the stapler but the rest of the surgical team has had no experience, or the surgeon may need to review how to use this device for accuracy and time efficiency.

Goals and Objectives

The goal for this thesis project was to create a model for an instructional guide, delivered on a PDA for on demand access, demonstrating the proper use of a surgical instrument device. The Premium Plus CEEA Stapler was chosen as the subject for the PDA delivered guide, which would serve as a model for the production of other surgical instrument guides to be delivered on a PDA for on demand instruction and demonstration.

To achieve this goal, many objectives had to be met. The first objective was to develop a survey to gauge how many medical students and residents already owned a PDA, their familiarity in using a PDA and their likes and dislikes when using a PDA.

The next objective was to take the information gathered from the preliminary survey along with the capabilities of a PDA and use it to develop a program to deliver the surgical instrument guide. After a program for delivery was discovered, story boards were created to outline the major steps involved in using a Premium Plus CEEA Stapler. Once the storyboards were reviewed and approved by Dr. Schorge and the other members of the thesis committee, a 3D model of the instrument was built using 4D Cinema. After Dr. Schorge approved the 3D model of the Premium Plus CEEA surgical stapler, that model along with the storyboards was used to create a set of five animations. The final objective was to put all five animations on a scan disk that was then inserted into a Palm TX PDA, which was given to a group of residents and medical students to view and evaluate by means of a secondary survey. The responses from the secondary survey would determine whether the final product met the goals and objectives set forth for this project.

Scope

The surgical instrument guide and its animations produced in this project target surgeons and operating room personal, specifically resident and medical students who are confronted with new surgical tools during their rotations. This PDA delivered instrument guide would allow for on-site, on demand learning of proper use of the Premium Plus CEEA Stapler.

Purpose

The model created for this project can serve three main purposes. First, it can be a portable training resource in the operating room for surgeons or operating room staff that would guide them through the steps necessary to use the Premium Plus CEEA Stapler. Second, it can serve as a quick review for surgeons or operating staff that have not used the Premium Plus CEEA Stapler in a while. Third, the PDA delivered guide can serve as a template for the creation of similar instructional guides for other surgical instruments and devices.

Limitations

This thesis project is limited to information regarding the proper use of Premium Plus CEEA Stapler designed specifically for the Palm TX PDA.

In this document I will review a literature search on the uses of PDA's. Then I will discuss the methodology of the production of the model followed by an evaluation of the model. In conclusion, I will discuss whether I was able to complete the objectives and meet the goal of this thesis. Also, I will reiterate the significance of this on demand project and possible areas for further research stemming from this thesis project.

CHAPTER TWO
Review of the Literature

The purpose of my literature review was to determine how PDAs are currently used in medical environments and to gain an understanding of the proper use of the Premium Plus CEEA stapler, the instrument chosen for this guide. There were several studies done on PDA use in medicine. I found many useful resources on PDAs in medical settings but none that specifically discussed creating a surgical instrument guide for a PDA.

The Premium Plus CEEA Single Use Stapler

The Premium Plus CEEA single use stapler, produced by Autosuture, is a circular end-to-end anastomosis stapler. The Premium Plus CEEA stapler is commonly used for end-to-end anastomosis of the colon and rectum. The Premium Plus CEEA stapler places two rows of staggered titanium staples; immediately after the staples have been employed, by squeezing the handles of the stapler a knife resects the excess tissue creating a circular anastomosis. The stapler consists of two main pieces; the anvil and the stapler. The anvil is put into position through the patient incision, while the stapler is usually inserted through the patients rectum and then into the colon to the site where

anastomosis needs to occur. When the stapler is inserted into the patient's rectum it and the individual operating that portion of the stapler must break the sterile field.[1]

The current instructions for the Premium Plus CEEA Single use stapler that accompany the instrument as well as a video found on Autosuture's website were used as reference for creating the on demand instrument guide and can be found at www.covidien.com/autosuture.

Studies on PDA's in Medicine

I found several studies conducted on using PDAs to search for information at the point of care. Clearly the portability of a PDA and its ability to access the internet can be extremely valuable given the growing amount of new medical information available, the increased expectations to follow guidelines, formulary restrictions and the time limitations places on physicians.[2] PDAs are being used for research data collection both by the doctors as well as by their patients. A preliminary study performed at New York Presbyterian Hospital, designed a Palm CIS (spell out first time) system to provide better access to needed patient information via wireless PDAs[3].

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[1] Autosuture ™ (online) http://www.covidien.com/autosuture/pagebuilder.aspx?topicID=7385&breadcrumbs= _Access 2008

[2] Fischer, Sandra MD, Steward, Thomas, MD et al. Handheld Computing in Medicine, Journal of the American Medical Informatics Association Volume 10 Number 2 Mar/ Apr 2003

[3] Chen, Elizabeth S., MPhil, Mendonca, Eneida et. al. Palm CIS: A Wireless Handheld Application for Satisfying Clinician Information Needs, Journal of the American Medical Informatics Association Volume 11 Number 1 Jan/ Feb 2004

Common Medical Programs for PDAs

PDAs already come with a variety of software pre-installed, including Microsoft Office products, PDF (write out the first time) reader, handwriting input, desktop synchronization, calculator and games.

Epocrates is PDA medical software for drug interaction, drug prices, dosing, disease and medical dictionary. There is an Epocrates prescription free application available as well as a complete suite of applications that can be downloaded onto a PDA. Epocrates also offers with its products, a subscription that includes continual free updates and medical news that occur when the PDA is hot synced.[4]

Ob Wheel is a free program. The program includes calculators for gestational age, Bishop Score and when a patient will reach a goal age.[5]

Programs

After considering available programs, I ultimately used three different computer programs to create the animations and put them on the PDA; Maxon Cinema 4D, AfterEffects and Palm Documents on the Go. The publisher's program manuals were used for all three programs, so that any technical issues that might arise during the development could be addressed.

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[4] Epocrates® (online) http://www.epocrates.com/products/deluxe/ Accessed 2007

[5] OB Wheel, (online) http://www.fppda.com/timobppc.htm (web page) Accessed 2007

Conclusion

Based on my literature review I found that PDAs are readily used in the medical profession and are an appropriate platform for the delivery of medical instrument instruction.

CHAPTER THREE
Methodology

Concept Development

The goal of this thesis project was to create a model for an instructional guide, delivered on a PDA for on demand access, demonstrating the proper use of a surgical instrument device. In order to accomplish this goal a series of objectives were developed. These objectives were used to determine the process for completing the model. After determining the audience preferences when using a PDA, as well as the limitation of PDAs, a program was chosen to deliver the instrument guide. Next, determinations were made about the necessary content and media for the PDA delivered surgical instrument guide, storyboards and models were created to include the necessary information for the guide. After the instrument guide was created, the animations were delivered to a Palm TX via a Scan Disk. Finally, a group of OB/Gyn, surgical residents evaluated the model, and their feedback was reviewed

Target Audience

Resident doctors and third and fourth year medical students were chosen as the primary audience for the PDA delivered surgical instrument guide.

Project Planning

In an initial meeting with John Schorge, M.D., the need for a PDA delivered surgical instrument guide that could be used in the operating room was established. In

subsequent meetings with Dr. Schorge and the other members of the thesis committee, we decided that the guide would be geared toward surgical residents of the OB/Gyn department. Dr. Schorge had final approval over how the current surgical instructions would be interpreted and turned into the final animation.

Pre-Project Survey

Before creating the model, a survey was sent out to members of the target audience to gauge how many of them currently have PDAs, what types of programs they currently run on their PDAs as well as what they liked and disliked about viewing information on their PDAs (see Appendix A). Surveys were sent out to all third and four year medical students, of the approximately four hundred medical students twenty-one responded (see Appendix B). The survey was also given to all the residents that attended Dr. Schorge's grand rounds on August 29, 2007; twenty-nine residents and medical students responded (see Appendix B). Based on all the individuals that responded to the survey, thirty-two of them indicated that they currently owned a PDA.

The preliminary survey also asked about what types of programs they currently ran on their PDAs. Based on the results given most individuals use there PDAs with only the Microsoft Office programs that come preinstalled as well as Epocrates, a pharmacology data base. The majority of those that answered the survey had never viewed a PDF on their PDA, or listened to audio that was not music.

The most common complaint from those that answered the survey, beyond the small screen size, was that they did not like having to scroll to read text and that they found maneuvering between programs difficult.

Choosing the PDA

To begin I had to decide what PDA I was going to purchase to design and test my instrument guide on. There were two main types of PDAs in use by the individuals that took the survey; seventeen owned a Palm and eight owned a Dell. In early spring of 2007 Dell spokeswomen Anne Camden said in an e-mail "The Axim X51 family is no longer being offered, and we have no plans for a follow-on product at this time."[6] I called Dell after reading this article to confirm that they no longer produced their own PDAs and was told that they had indeed stopped making the Axim X51 PDA but hand begun to offer PDAs with built in GPS which ranged in price from $340- $710. Based on the fact that Dell no longer produced the type of PDAs that the medical staff owned I began to look at Palm PDAs. Palm currently offers three types of PDAs; the Z22, the Tungsten E2 and the TX[7]. Of the seventeen individuals that owned a Palm, seven identified their Palm as the TX model, two identified their model as the Tungsten E2 and the rest either did not specify which model they owned, owned a model no longer in production or owned a Palm Smartphone. Based on this information I chose to design my instructional guide

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[6] CNET Networks. "Dell Axim X51," http://cnet.com.au/pdas/pdas/print.htm?TYPE=story&AT=339274770-239035588t Web page (accessed 2007)

[7] Palm. "Handheld Comparison Chart," http://www.palm.com/us/products/resources/comparison-handheld.html Web page (accessed 2007)

specifically on the Palm TX, as it appeared to be the most widely used PDA of those in my target audience.

Delivery Method

The main idea behind the PDA delivered instructional guide was to offer an easier to understand set of instructions for the Premium Plus CEEA Stapler at the point of care, i.e. in the operating room. AutoSuture, the maker of the stapler, already offers video on their website that shows how to use the Premium Plus CEEA Stapler. However, this video is quite lengthy, not always available on the website, due to glitches in the website and is not available in the operating room, leaving the paper printed instructions for reference. The PDA offers the ability to show video or animated instructions on demand, but the problem then becomes how do you get the information on the PDA?

The Palm TX offers both Wi-Fi and Bluetooth technology. Wi-Fi offers the ability to access the internet when within range of a wireless network. Bluetooth offers wireless connection to other Bluetooth enabled devices, making it possible to send text, images and animations directly to an individual PDA. Due to the fact that we could not ensure that an operating room would have access to a wireless network with which they could access the internet, or that they would have a system set up that would allow them to transfer information with Bluetooth technology, it was decided that it was best to deliver the instrument guide by other means.

After reviewing all the specs from currently available models of PDAs that were identified from my preliminary survey, all but one supported the SD memory card. The Palm Z22 did not offer an expansion slot. [8] Due to the fact that no one from the survey specifically identified their Palm as a Palm Z22, and because many Smartphones also support the SD memory card it was decided that the SD memory card would be the best delivery method given the target audience.

Creating the Guide

After reviewing the results from the preliminary survey I set out to develop a program that would run on the Palm TX that would limit the amount of scrolling the viewer was required to do and make the most of on-the-screen space available. It had already been established that the program would have to run off a SD memory card which immediately eliminated some option for programs.

Initially an Adobe Flash based program was proposed for the device guide. Flash would have allowed for a more interactive program, allowing the viewer to use menus to navigate the program and only view those areas that he or she wanted to look at.

Once using the wireless capabilities of a PDA were eliminated as an option for product dispersal, a Flash based program also had to be eliminated, because Flash programs can only run on the Palm TX if it is has been converted into a html document

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[8] Palm. "Handheld Comparison Chart," http://www.palm.com/us/products/resources/comparison-handheld.html Web page (accessed 2007)

and is viewed via the internet. The Palm TX does not support Flash documents and is unable to play html documents unless the html document is being hosted on the internet. A test Flash document and test html document were created, both employed the used of buttons which would have allowed the viewer to navigate between pages, neither was successfully loaded onto the PDA. I consulted with Palm support staff and was told that there was no current way to run Flash programs on their PDA.

An animated PDF was proposed next. Adobe Portable Document Format or PDF allows for viewable and printable information across any platform.[9] PDF Reader comes preinstalled on all but one PDA from the survey and ten of the individuals surveyed indicated that they had already viewed a PDF on their PDA. The fact the some of those surveyed had already viewed a PDF on their PDA made me believe that adding an animation to a format they were already familiar with would be a good way to introduce animation on a PDA to them. An animated PDF can be created from a standard PDF document. Using Adobe Acrobat, buttons can be added that allow the viewer to select and view movies that are in the Quick Time® file format. The idea was to put the original instructions that currently accompany the Premium Plus CEEA Stapler into a PDF format. This PDF would then be tagged which would allow for easier viewing of the text, making the necessity of scrolling and zooming of the PDF less likely. At the end of each step or collection of steps a button would be placed which would allow the viewer to watch an animation of the step they had just read. Using animated PDFs the developer can dictate how large the animation will play; in this case I asked the

[9] Adobe Acrobat Family, http://www.adobe.com/products/acrobat/adobepdf.html

animation to play full screen and close once the animation had been completed. Having the animation play full screen was done to allow for maximum use of the screen.

A test animated PDF was created and tested on a computer before being put on the SD memory card and inserted into the PDA. The PDA was able to read the PDF but did not recognize that buttons were added and thus did not play the Quick Time® files that were linked with those buttons. I consulted with support staff and found that at this time the Palm TX was unable to play animated PDFs.

A PowerPoint® presentation was the next program that was proposed as a delivery system for the Premium Plus CEEA Stapler instrument guide. PowerPoint® is one of the programs found in Microsoft Office, which comes preinstalled on all of the PDAs mentioned in this study. A PowerPoint® program would allow the viewer some interactivity. It was thought that the program would be designed with menus to allow the viewer to decide which parts of the instructions they wished to look at or they could simply go through the entire set of instructions sequentially. Most medical students and residents at some point in their training have used PowerPoint®. We believed the familiarity of PowerPoint would help viewers better understand how to navigate the program. It was also thought that creating a PowerPoint® document for the instructional guide might also help to show doctors that this could be a way for them to create and distribute information for a PDA, because they are already familiar with using PowerPoint® for their own presentations.

A test PowerPoint® document was created with QuickTime® movie files embedded within it. The test PowerPoint® was tested on a computer and found to work before it was transferred to the SD memory card and played on the PDA. When the program was played on the PDA I found that the buttons for navigation worked, but that the animations were unable to play and showed up as a still image on the first frame of the animation. After trying a couple different compressions on the QuickTime files and finding that it did not appear to be the file size that was affecting the animations ability to play I once again contacted Palm support. I discovered when conferring with Palm support that the Palm TX was unable to run one application inside of another. This meant that while the PowerPoint® application was running the PDA was unable to also play a QuickTime file because it had to access a different application.

Given the limitations of the PDA and our decision that a web delivered product was not applicable for this project, the best solution appeared to be a series of animations that would run on the PDA to accompany the paper printed instructions distributed by the device company along with the device. We considered having both animations as well as either a word document or a tagged PDF with the written instructions on the SD memory card. Having the written instructions on the SD memory card was ultimately eliminated because in order to see that a document was available the viewer must first open the application to see that the file exists. The thought was it would be easier for those using the guide to simply look at the printed instructions for the written text, as the printed instructions would have to be included with the stapler anyway, to ensure that directions would be provided if no PDA was available. We also concluded, based on the

preliminary survey that users did not like having to work back and forth between programs.

Storyboards

Information from the paper printed instructions as well as information available on the AutoSuture website[10] was used to create storyboards for the animations. The information was sorted into five main steps; Step1-Introduction, Step 2- Setup, Step3- Approximation, Step 4- Fire and Step 5- Removal.

I created storyboards for each of the five steps (Appendix C). These storyboards were then sent to Dr. Schorge for his approval. Dr. Schorge requested some additional information; the process of tying a purse string suture, be added to the storyboards. Once I had made all necessary changes to the storyboards I sat down with the other members of my thesis committee and discussed the use of text versus audio. We decided that text would be a better option than audio for the instructional guide, because not all PDAs have an external speaker and we didn't want to rely on the viewer having to carry earphones in order to hear the directions. Associated text was then added to the storyboards, (Appendix D). Once the storyboards were approved by both Dr. Schorge and other members of my thesis committee, I began building my models.

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[10] Autosuture ™ (online) http://www.covidien.com/autosuture/pagebuilder.aspx?topicID=7385&breadcrumbs= Access 2008

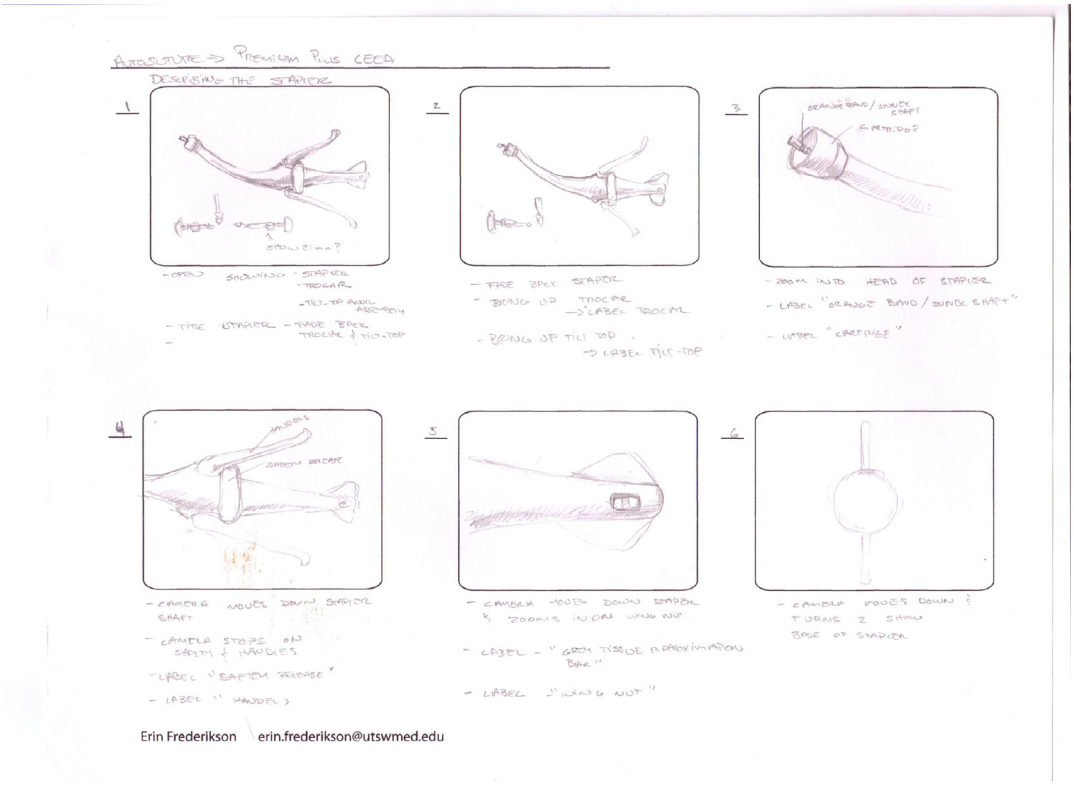


Figure 3-1. Scanned image of storyboard, Step 1, page 1

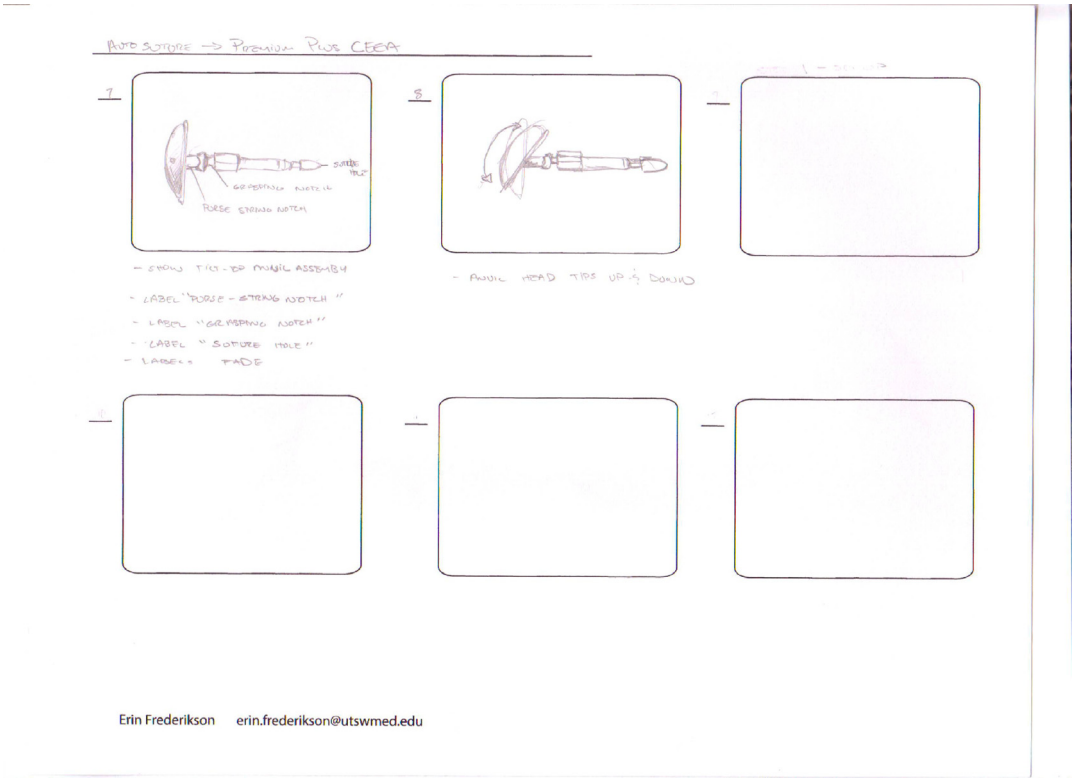


Figure 3-2. Scanned image of storyboard, Step 1, page 2

Building the Models

Based on the storyboards I began building the 3D models in Maxon 4D Cinema. Images of the Premium Plus CEEA Stapler from surgeries that I had attended as well as images found on the AutoSuture website were used as reference for building the 3D models of the stapler and anvil. Two tubes were also built that would be used as the proximal and distal ends of the colon.

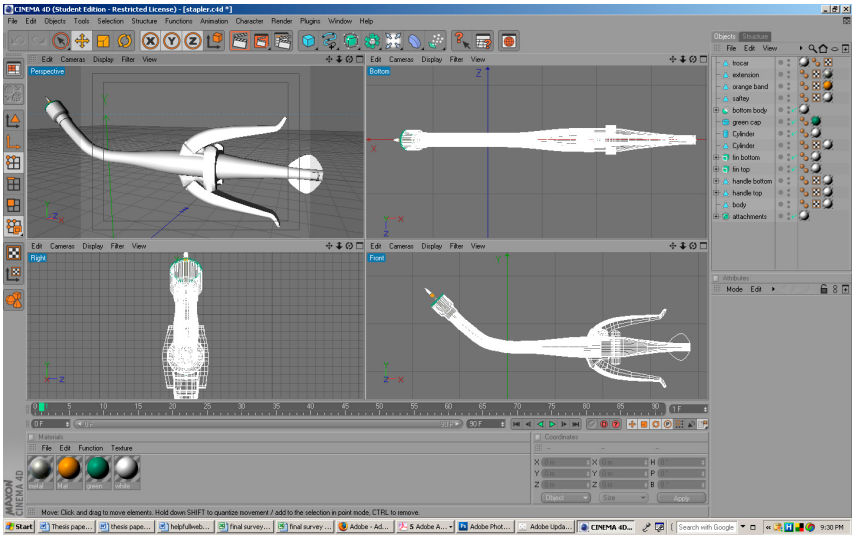


Figure 3-3. Maxon 4D Cinema Screenshot of Stapler Model

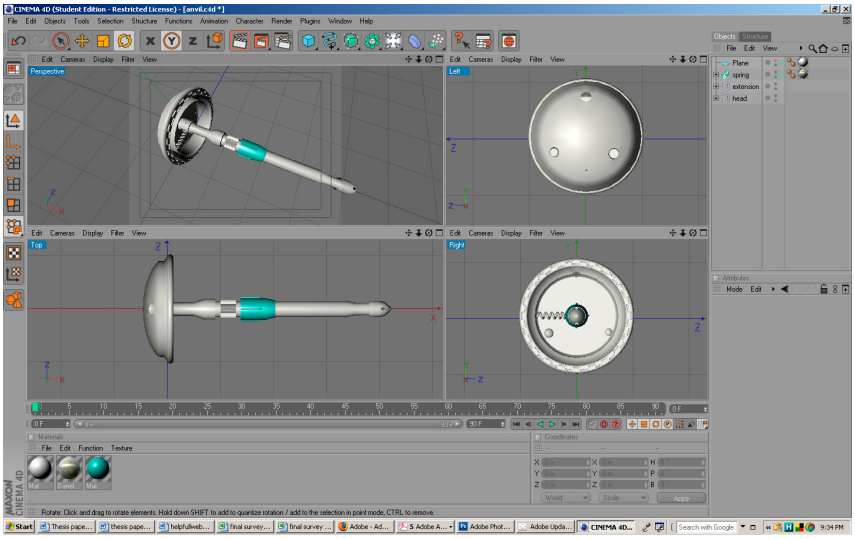


Figure 3-4. Maxon 4D Cinema Screenshot of Anvil model

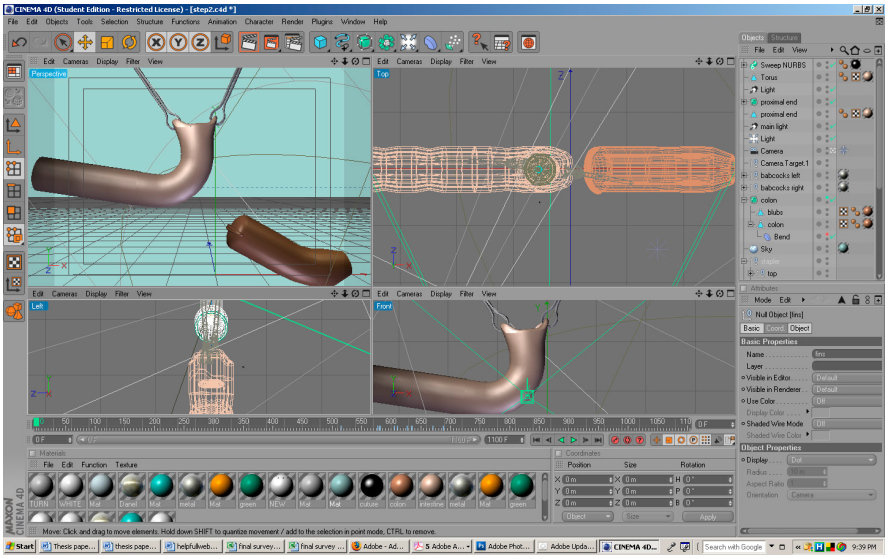


Figure 3-5. Maxon 4D Cinema Screenshot of colon model

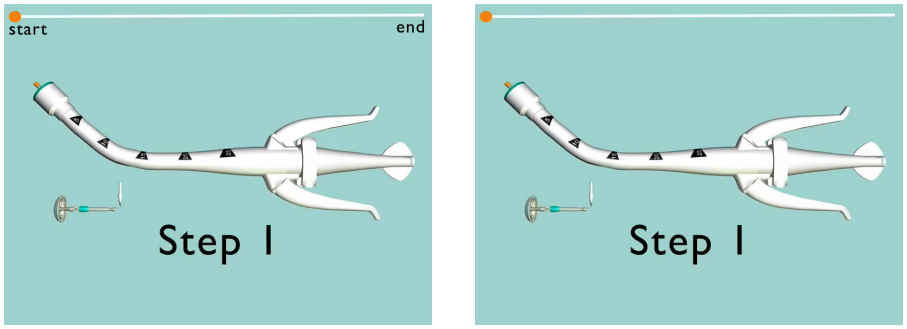
Animating

Step 1 - Introduction, was animated in 4D Cinema once the models were completed. The animation was exported from 4D Cinema as a QuickTime file with an alpha channel, without compression at a resolution of 800 x 600 pixels. Having the animations exported with an alpha channel allowed for easy compositing of different colored backgrounds, without the timely cost of re-rendering. The background color, labels and leader lines were added in AfterEffects® and the files were exported as QuickTime files with Sorenson 3 video compression and loaded onto the SD memory disk.

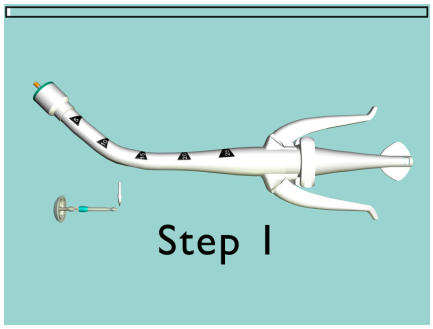
The background color was added in Adobe AfterEffects so that multiple colors could be tried and easily changed. I found that while a black background offered the

most contrast to the stapler, when viewed on a PDA the black background was so reflective that it became distracting and text became very difficult to read. A white background on the other hand was very easy to view on the PDA but made seeing the stapler which was also white difficult. Various shades or grey were tried as well but they too competed with the stapler, making it difficult to see. I ended up settling on a pale blue-grey, which did not reflect images when played on a PDA and still offered enough contrast to easily see the stapler.

I then took Step 1 to Dr. Schorge and the other members of my thesis committee for approval. We decided at this time that something would have to be added to the animation to show that it was playing. When viewing a movie on a PDA you are not able to pause, stop or scrub along the animation bar. If the viewer touched the screen while the animation is playing, in an effort to pause the animation, the animation will stop and the viewer is taken back to the menu page where they would have to begin all over again. Pauses had been created to allow the viewer time to read text, and with no navigation available on the PDA it was thought that adding a bar on the top of the screen would help let the viewer know the animation was still playing. Three different possibilities were designed for a progression bar that would appear at the top of each animation (Figure 3-4 a, b, c).



a b



c

Figure 3-6. Examples of progression bar.

Figures 3-6a and 3-6b both employed a dot that would travel across the screen as the animation played. After showing the animations containing the dot to an individual unfamiliar with the project it was decided that the dot gave the viewer the idea they should touch it. The dot also seemed to make viewer think that they could use it to scrub through the animation, to go back or to hurry through to different parts of the animation, which was not true. Due to these reasons it was decided that the bar used in figure 3.6c would work better as it mimicked the bar that computer users are accustomed to seeing

while they wait for documents or programs to load. It was also decided that the text used in figure 3.6a, i.e. start and stop was not necessary because it was redundant.

I continued animating steps two through five. Once all five of the animations were complete I once again met with my thesis committee to discuss each step individually. At this time we decided to adjusted the timing of the animations, because while the animations appeared slow enough on a computer monitor once they were placed on the PDA the timing did need to be adjusted and the length of time the text appeared needed to expand.

Evaluation

Once all changes had been done to the animations, I sat down with Dr. Schorge for a final review. When no further changes were discovered by either Dr. Schorge or the other members of my thesis committee I gave my PDA with the animations on the SD scan disk to Dr. Schorge's secretary along with a stack of surveys. The surveys were to evaluate the effectiveness of the animations, to determine whether the goals and objectives had been met, and if the residents actually thought this might be something they would use in surgery (Appendix E). The survey was created using a 5-point Likert scale ranging from Strongly Agree to Strongly Disagree. Nine statements were given that pertained to the goals and effectiveness of the animations; those who took the survey were asked to check the box that corresponded to their level of agreement with each statement. I also included three preliminary questions in order to ascertain whether or not they currently owned a PDA, their position and if they had ever used a Premium Plus

CEEA Stapler before. The survey was created in Microsoft Office and Adobe Illustrator. Spaces were also provided after each statement to allow for additional comments.

CHAPTER FOUR
Results

Survey Development

A completed version of the model was loaded onto a Palm TX that was then given to Dr. Schorge for review by the current Gynecologic Oncology surgical residents at St. Paul Hospital, Dallas, Texas. A survey was created that accompanied the PDA (See Appendix E). The survey included three questions regarding the user's position, ownership of a PDA and use of the Premium Plus CEEA Single Use Stapler. The survey also consisted of nine statements about the surgical instrument guide. Seven of the nine statements where created using a 5-point Likert scale ranging from Strongly Agree (SG) to Strongly Disagree (SD). The residents were asked to indicate their level of agreement with each statement by checking the appropriate box. Additionally there were two statements that the residents were asked to respond to by checking the box for yes, no or maybe. After each statement the residents were given an opportunity to add additional comments. Finally, at the end of the survey participants were asked for comments on specific changes to improve the animations. The survey was created in Adobe Illustrator and was printed out so participants could check boxes and fill out spaces that were left for additional comments.

Survey Distribution

The survey was given to Dr. John Schorge of the Gynecology department at St. Paul Hospital. Dr. Schorge distributed the PDA and the surveys to his surgical residents and fifteen individuals responded (See Appendix F).

Survey Results

Of the fifteen individuals that responded, three where surgical fellows, eight where residents, one was a medical student and three did not give their current position. This was a favorable sampling because the participants had differing degrees of experience with the Premium Plus CEEA Stapler. The surveys were collected and evaluated. A graph was created compiling data from the entire survey to show the overall response to the model (Figure #.) SA means strongly agree, A means Agree, N means Neutral, D means Disagree, and SD means Strongly Disagree.

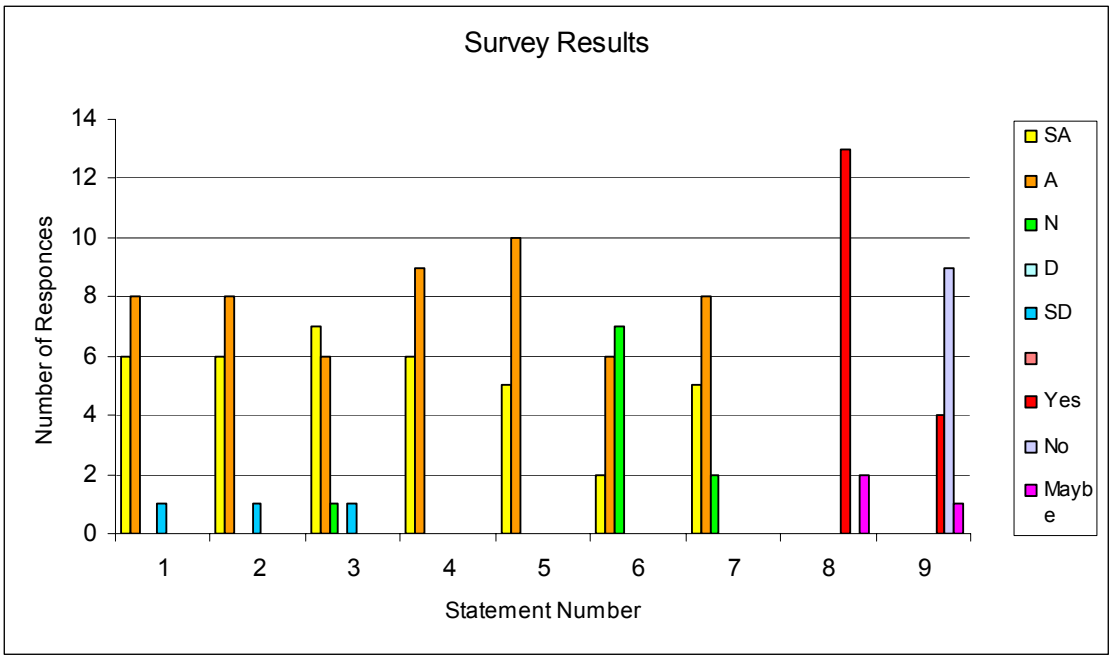


Figure 4-1. Summary of survey results

List of Statements

1. *The animations are a good reference for preparing to use the Premium Plus CEEA Single Use Stapler.*
2. *The animations are a good resource for learning and reviewing the procedure.*
3. *The navigations is clear and easy to use.*
4. *The animations are clear and to understand.*
5. *The text is useful and accurate.*
6. *After viewing these animations you would feel comfortable using the Premium Plus CEEA single use stapler.*

7. *A complete library of animations on surgical instruments, such as the Premium Plus CEEA Single Use Stapler available for a PDA, would be useful for understanding instrument use before or during surgery.*
8. *Would you watch these animations to prepare for surgery?*
9. *Would you watch these animations while in surgery?*

Evaluation of Responses

Statement 1: The animations are a good reference for preparing to use the Premium Plus CEEA Single Use Stapler.

6 Strongly Agreed, 8 Agreed, 1 Strongly Disagreed.

This statement was about the effectiveness of the model as a training guide. Overall the responses were positive, which means that a majority of the respondents believe that the resource would be an effective tool for preparing to use the Premium Plus CEEA Single Use Stapler.

Statement 2: The animations are a good resource for learning and reviewing the procedure.

6 Strongly Agreed, 8 Agreed, 1 Strongly Disagreed.

The overall strong response indicates that all but one of the respondents found the program to be an effective resource for learning the review.

Statement 3: The navigation is clear and easy to use.

7 Strongly Agreed, 6 Agreed, 1 Neutral, 1 Disagreed

All but one of the respondents indicated that the navigation of the model was clear and easy to use, no additional responses were given.

Statement 4: The animations are clear and easy to understand.

6 Strongly Agreed, 9 Agreed

It can be concluded based on the positive response of all individuals surveyed that the animations were clear and easy to understand.

Comments:

Participants 2 - "Steps 4 and 5 could show more detail re: mechanism to enhance understanding"

Statement 5: The text is useful and accurate.

5 Strongly Agreed, 10 Agreed

It can be concluded from the unanimous positive response to this statement that the text is useful and accurate.

Statement 6: After viewing these animations you would feel comfortable using the Premium Plus CEEA Single Use Stapler.

2 Strongly Agreed, 6 Agreed, 7 Neutral

It can be concluded from the positive response that the participants would have felt comfortable using the Premium Plus CEEA Surgical Stapler, after viewing these animations. One of the participants that selected neutral for their response indicated that

they already knew how to use the stapler. Two other participants indicated that they would like to view the animations a few more times, and that they would need the stapler in hand before feeling comfortable, but that the animations were a good start.

Comments:

Participant 1 - "I would not feel comfortable until actually using it with my hands. Animation is a great start."

Participant 8 - "Would need to view the animation a few more times"

Participant 14 - "Already knew how to use"

Statement 7: A complete library of animations on surgical instruments, such as the Premium Plus CEEA Single Use Stapler available for a PDA, would be useful for understanding instrument use before or during the surgery.

5 Strongly Agree, 8 Agree, 2 Neutral

Base on the overall positive response given by those surveyed, one could conclude that they would find a library of animations on surgical instruments designed to play on PDA useful for understanding the instrument prior to or during surgery.

Comments:

Participant 5 - "Before only"

Participant 13 - I am not sure how many people use PDAs in this capacity; perhaps we will increase as they become less expensive."

Statement 8: Would you watch these animations to prepare for surgery?

13 Yes, 2 Maybe

It cab be concluded by the overall positive response that the individuals surveyed would watch these animations in preparation for surgery.

Comments:

Participants 2 - “Faster progression through slides would enhance usability”

Statement 9: Would you watch these animations while in surgery?

4 Yes, 9 No, 1 Maybe

Based on the overall negative response to question nine it can be concluded that most of the individuals surveyed would not watch these animations while in surgery.

Comments:

Participants 2 - “I would prefer to be more familiar prior to surgery so watching video during surgery is not necessary “

Participants 6 - “I would want to be prepared prior to surgery”

Participants 7 - “Not practical”

Participant 8 - “The speed of the video is slow for real time application intra-op.”

Participant 9 - “Shorter, more concise version for OR”

Participant 13 - “If it was faster, it may be feasible to use”

It is possible here that many of the respondents thought they would know they would be using the device during surgery and therefore have time to review. A better question might have been “If you were not familiar with a device or had not used it in a long time period, and then had to use this device unexpectedly in surgery, would you watch or have someone from your surgical staff watch these instructional videos during

surgery?" The response might have been the same, but we would be more clear on what they were saying no to.

Additional Comments:

Participant 8 - "Recommend a control bar with pause/play/rewind options."

Participant 9 - "Lag time in between movement is too long and can be shortened to improve overall time"

Participants 13 - "During the approximation step (I think it describes turning until green is near the grey bar.) It is very easy to see the green, but not as easy to see the gray"

Participant 15 - "have ability to speed up or rewind?"

CHAPTER FIVE
Conclusions and Recommendations

Project Summary

The thesis research problem that this project attempted to solve was whether it was possible to create an on demand animated instructional guide for surgical instruments to be delivered on a Personal Digital Assistant (PDA) . The goal of this thesis project was to create a model for an instructional guide, delivered on a PDA for on demand access, demonstrating the proper use of a surgical instrument device. The Premium Plus Circular End-to-End Anastomosising Single Use Stapler was chosen as the subject for this model and served as a model for the production of future surgical instrument instructional guides.

The Premium Plus CEEA Stapler was chosen as the topic for the PDA delivered guide, which would serve as a model for the production of other on demand surgical instrument guides to be delivered on a PDA.

To achieve this goal, many objectives had to be met. The first objective was to develop a survey to gauge how many medical students and residents already owned a PDA, their familiarity in using a PDA and their likes and dislikes when using a PDA. The next objective was to take the information gathered from the preliminary survey along with the capabilities of a PDA and use it to develop a program to deliver the

surgical instrument guide. After a program for delivery was discovered, story boards were created to outline the major steps involved in using a Premium Plus CEEA Stapler. Once the storyboards were reviewed and approved by Dr. Schorge and the other members of the thesis committee, a 3D model of the instrument was built using 4D Cinema. After Dr. Schorge approved the 3D model of the Premium Plus CEEA Surgical Stapler, that model along with the storyboards was used to create a set of five animations. The final objective was to put all five animations on a scan disk that was then inserted into a Palm TX PDA, which was given to a group of residents and medical students to view and evaluate with the help of a secondary survey. The responses from the secondary survey would determine whether the final product met the objectives set forth for this project.

Discussion

Several different programs for delivery of the instrument instructional guide on a PDA were tested during the creation of the model. The desire to create a surgical instrument guide that could be viewed on an already available product, a PDA, forced many concessions to be made. Other file types such as flash or an animated PDF probably would have been better programs to use from a user standpoint. They would have allowed for more interactivity with the viewer, which would have ultimately saved time by allowing the viewer to look at only what they felt was necessary. The limitations of a PDA ultimately ended up choosing the end program that was used for the model. The PDA's inability to play Flash or to run movie files within other programs made it impossible to create any type of interface that would allow for that type of interactivity.

Breaking the animations up into a set of five movies with descriptive titles was done in the hopes that it would allow the viewer a little bit more freedom than having to watch the animation completely from beginning to end. Creating the animations with five separate steps seems to have had limited success as most of the negative comments had to do with the overall length of the animations being to long. In addition, respondents requested that the animations be made shorter and more concise if they are to be used in an operating room.

It is possible that the length of time that the text appears could be shortened. Due to the fact that the text is appearing on a smaller screen than most people are used to viewing and because the viewer is not able to pause the animation, I felt it was better to make the timing of the text a little longer than risk that a viewer might miss some of the information.

There were also suggestions from those who took the secondary survey to add a control bar to the animation which would allow the viewer to stop/rewind/fast forward/replay. This is a very good suggestion, but adding a control bar is not possible on the Palm TX at this time.

The goal for this thesis project was to create a model for an instructional guide, delivered on a PDA for on demand access, demonstrating the proper use of a surgical instrument device. A surgical instrument guide for the Premium Plus CEEA Stapler, was created and played on the PDA which met most of the previous state goal. The

individuals that evaluated the instrument guide seemed to find the animations clear and easy to understand. Thirteen of the people asked, indicated that they would use this guide to prepare for surgery; the other two responds said that they might use this instrument guide to prepare for surgery. When asked if a complete library of surgical instrument guides should be created for a PDA, six strongly agreed with that statement, eight agreed with it and two individuals remained neutral. These kinds of responses to the secondary survey cause me to believe that people did like viewing the instrument instructional guide as animations on a PDA, the surprise was that people did not seem to think they would use this instrument guide for its intended purpose, as an on demand instrument guide to be used in the operating room. Based on the response of question nine from the secondary survey, I do not believe this goal has been fully achieved. Nine of the fifteen participants indicated that they would not use the surgical instrument guide in the operating room. Many indicated that they would prefer to be more prepared for surgery, prior to entering the operating room. Ideally I think anyone would want to be completely prepared for any type of surgery; but I do not think that always being prepared is a completely feasible option. Operating rooms are often change supplies of surgical instrument and even experienced practitioners might have difficulty operating the same type of instrument from a different supplier. I'm not sure that responds of the survey fully understood that this was an on demand instrument guide, meaning that if you were not able to prepare for surgery by learning about the instrument use, would you if when in the operating room and confronted with an instrument that you didn't know how to use, like to use the PDA delivered instrument guide?

Other participants stated that the length of the animations made them impractical to use during surgery. I still believe that having the option of viewing a 3D animation of an instrument's use on a PDA over the traditional printed instructions will better show the dynamic process of instrument use.

I believe that making the program more interactive would ease the learning and operation of the surgical instrument guide making the on demand instrument guide more time efficient and there for making it feasible to use in an operating room setting.

Suggestions for Further Research

This project sought to create a surgical instrument guide to be delivered on a PDA. Overall the comments about the on demand instrument guide were positive; the purposed use the instrument guide in the operating room for on-site on demand learning was not met. For future research, I would recommend that an additional questionnaire be sent out to respondents of my secondary survey, clarify that this instrument guide is meant to be used when you were unable to prepare for surgery prior to entering the operating room, for what ever reason. Additionally, I would recommend designing a more interactive surgical instrument guide, when the technology on PDA's allows for it. Right now so few programs are available to run on a PDA, in the future I suspect that this will change as PDA's will have to compete more and more with Smart Phones and the iPhone. Having a more interactive program, which would allow viewers to scrub through animations to view and pause on only the items that they need clarifications would

greatly improve the usability of this instrument guide and would be a good area for further research.

APPENDIX A
PRE-PROJECT SURVEY

Creating a Model for an Instructional Guide for Surgical Devices Delivered on a PDA

My name is Erin Frederikson; I am a medical illustration student who worked on the Williams Gynecology textbook with Dr. Schorge. I am currently working on the Williams Obstetrics book as well as my thesis with Dr. Schorge. I would very much value your input on the following questions, which pertain to my thesis. If you have any questions please call me at 406-360-3418.

What is your current position?

Do you currently own a PDA (personal digital assistant)?

If so what kind of PDA do you have?

In what context do you use your PDA?

Do you feel comfortable downloading information to your PDA?

Have you ever viewed a PDF on your PDA?

What types of programs are currently on your PDA?

Have you ever listened to audio with your PDA?

If so did you feel audio was helpful?

Have you ever viewed any type of an animation on your PDA?

If so where they 2-d or 3-d animations?

Did you feel one worked better than the other?

Why?

What don't you like about viewing information on a PDA?

Please include any additional comments,

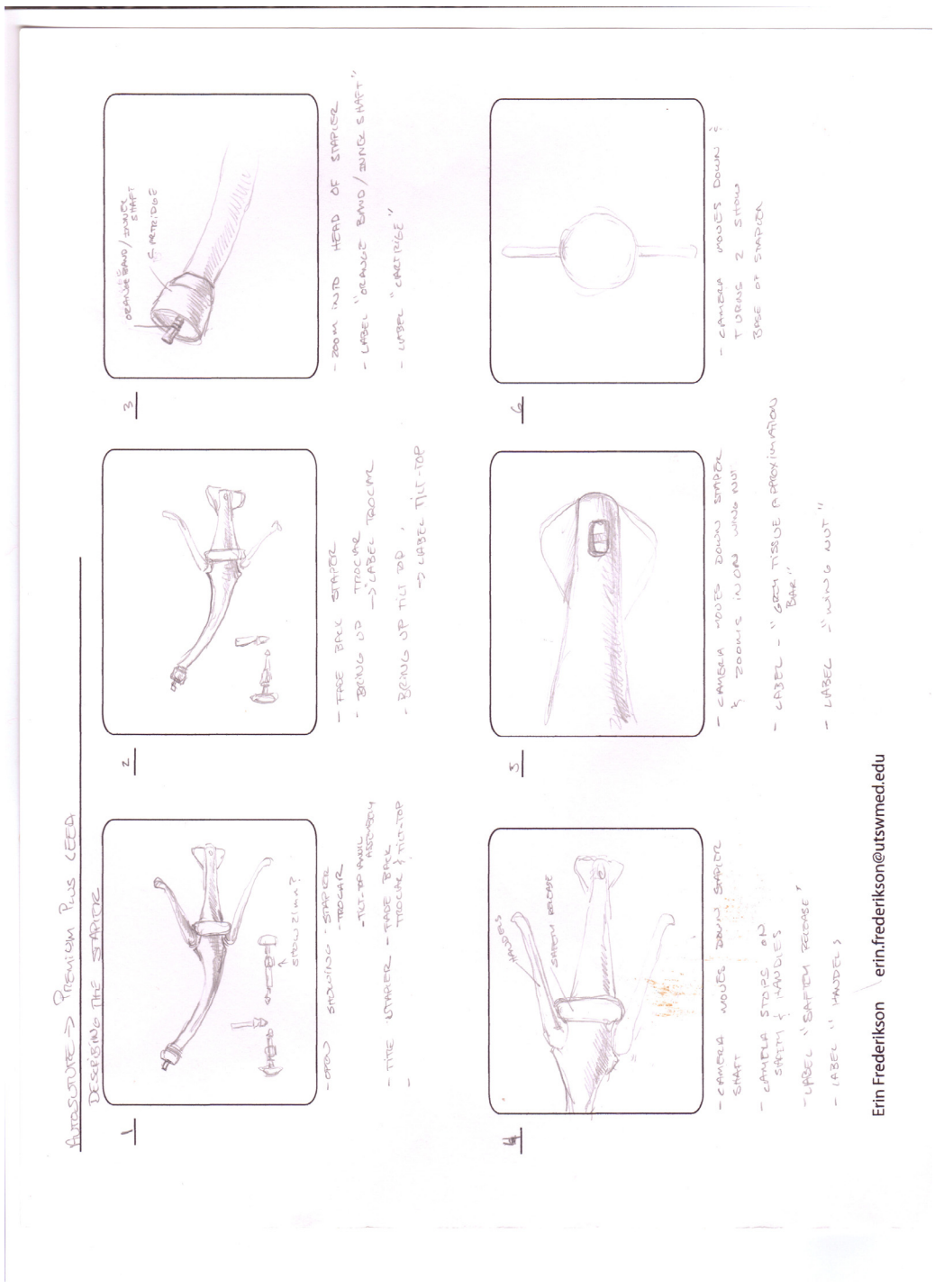
APPENDIX B
Summary of Result from Pre-Project Survey

Occupation	Has a PDA	Type	Context	Comfort downloading	Viewed PDF	Programs	Audio	Audio Helpful	Viewed Animation	2-d 3-d	Better?	What they don't like
4th year Medical	yes	Dell axim x51	medical info. Epocrates, drug info	yes	no	Epocrates, Spanish/English medical dictionary	yes	no opinion	no	na	na	occasionally interface is hard to navigate
3rd year Medical	yes	Palm E2	School	yes	no	Epocrates, Diagnosaurus, solitare	no	na	no	na	na	doesn't like to scroll to read
3rd year Medical	yes	Palm TX	Drug database	yes	no	Microsoft office, epocrates, ekg program	yes	sure	yes	2-d	no answer	web page is not resized to fit the screen, other programs font sizes not easy on eyes
4th year Medical,medical research, manager of MR Topspin Inc.	no	na	na	na	na	na	na	na	na	na	na	Initial learning process on use of the PDA (i.e. no taskbar to switch between programs).
4th year Medical	yes	Dell axim x51	Drug database Epocrates, Eponyms, Diagnosaurus, microsoft office	yes, music	na	no	na	na	na	na	na	
4th year medical	yes	Palm pilot	Medical reference, Schedule, to do lists and games	yes	no	Epocrates, merck manual, griffin's 5 minute consult, stedman's medical dictionary, monopoly game	no	na	no	na	na	
4th year medical	yes	Palm one	Lexi comp, drug info, med calculator	yes	no	Epocrates, Lexicomp, eponyms, med calc.	no	na	no	na	na	poor quality graphics
3rd year Medical	no	na	na	na	na	na	na	na	na	na	na	na
4th year medical	yes	Palm	scheduling and pharmacopedia	yes	no	epocrates	yes	yes	no	na	na	
4th year medical	no	na	na	na	na	na	na	na	na	na	na	
4th year medical	yes	Dell axim x51	medications, play games, e-mail	no	no	Word, Explorer	no	na	no	na	na	I just don't know how to
3rd year Medical	yes	Palm Tungsten E2	hospital	yes	no	Epocrates, Diagnosaurus	no	na	no	na	na	
3rd year Medical	no	na	na	na	na	na	na	na	na	na	na	na
4th year medical	yes	integrated PDA/Phone- zv6700	Medical programs, scheduler, entertainment	yes	yes	Medical Abbreviations, Medical Eponyms, OB Wheel, Internet Explorer, Foxit PDF Reader, MobiPocket, PHM RegEdit,	yes	songs	video	video		small screen

3rd year Medical	yes	Dell axim x51	medical info., mostly drugs, play games	yes	no	Windows Media Player, Epocrates	yes	music	no			Hard to maneuver between programs.	was awesome. I listened to Goljan Audio in the car and walking from garage to car to study for step 1. Its surprising
3rd year Medical	yes	Smartphone	making calls and internet	yes	yes	Just what it came with. I haven't gotten around to installing epocrates	yes	yes	no	na	na	Slow download speed	
4th year medical	yes	Dell axim x51	Medical info and general organization	yes	yes	software), real player, adobe reader, iSilo, medical eponyms	yes	yes	video	na	na	nicely into the screen with adobe unless you are scrolling. With iSilo the	
4th year medical	no	na	na	na	na	na	na	na	na	na	na	na	
4th year medical	yes	Dell axim x51	Epocrates, Merck Medicus, Calendar	yes	no	Epocrates, Merck Medicus, Calendar	yes	no	no	na	na	Having to scroll up and down at the same time.	
4th year medical	yes	Palm tx	home, hospital and clinic- look up drugs and treatments	sometimes	yes	Epocrates; other than that, the standard stuff that comes on a PDA	not really	no	not really	na	na	Screen size can be limiting; also, amount of memory	
	yes	Palm Treo	Phone/ Epocrates	yes	no	eppocrate and abx guide	no	na	no	na	na	screen very small	
R2	Yes	Treo 680	preg wheel, program	yes	yes	merck, whell, isiilo, apocrates, Med cal	no	na	no	na	na	crash and small screen	
R3	yes	Windows based	reference	yes	no	5 min consults, drug reference	no	na	no	na	na	information requireing scrolling	
PGY3	yes	clio	for games	no	no	games	no	na	yes	na	na	na	
resident	no	no	no										
R4	no												
MS4	yes	dell	not much	no	no	Epocrates, Merck Manual	no	na	no	na	na	na	
MS4	yes	hp	pharmacology	no	no	Epocrates	no	na	no	na	na	small	
MS4	yes	palm	personal and school	yes	yes	Epocrates, Inforetriever, shots 2006	yes	na	no	na	na	might be difficult to read	

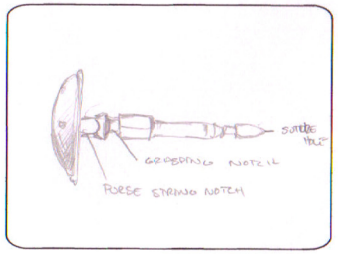
Fellow	yes	Palm Tungsten x	Primarliy medical reference	yes	yes	epocrates, sanford guide, MGHCC	no	na	no	no	no	
Gyn Onc Fellow	no	na										
R1	no											
Resident Y2	no											
PGY-1	yes	Palm	Epocrates- RX, Calendar	yes	no	Epocrates	no	na	no	na	na	Small Screen
R3	no											
RGY 4	no											
PGY-3	yes	Palm	work only	yes	yes	Epocrates, Microsoft my ho	no	na	no	na	na	
MS4	yes	Palm	Epocrates	yes	yes	Epocrates	no	na	no	na	na	too slow, small screen
R4	no											
PGY 4	no											
R4	no											
R4	yes	Treo 680	web, phone, camera	some what	I don't kn	Epocrates, Med cal, OB wh	no	na	yes	2d	na	if file too big takes too long
PGY-2	yes	Dell axim v51	Scheduling, contacts	yes	yes	up to date	yes	yes	yes	2d	2d> 3d	limited viewing area
R3	yes	don't know	not anymore	yes	no	drug info/ prescription info	no	na	no	na	na	
R1	yes	Palm	Scaraunen, Drug Dc	no	no	micromedex, 5- Minute Clin	no	na	no	na	na	to small to view clearly
Resident	no	na	na									
PGY 2	no											
R 2	yes	HP Pocket PC	Pesonal Scheduling	yes	no	windows office	no	na	no	na	na	nothing
3rd year resident	yes	Sony Clie	pharmacotherapy	no	no	epocrates	no	na	no	na	na	nothing- I'm not very compu

APPENDIX C
Storyboards



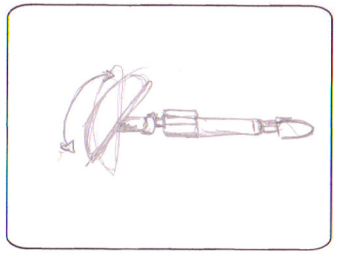
AUTO SUTURE → PREMIUM PLUS CEEA

1



- SHOW TILT-DOWN ANVIL ASSEMBLY
- LABEL "PURSE-STRING NOTCH"
- LABEL "GRASPING NOTCH"
- LABEL "SUTURE HOLE"
- LABELS FADE

8



- ANVIL HEAD TIPS UP & DOWN

9

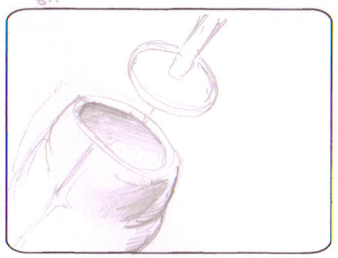
2

3

Erin Frederikson erin.frederikson@utswmed.edu

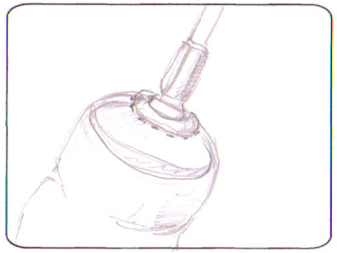
AUTO SUTURE ⇒ PROXIMUM PLUS CEEA - STEP 1 - SETUP

1



- ANVIL MOVES DOWN & TO THE LEFT INTO THE OPEN LUMEN OF INTESTINE

2

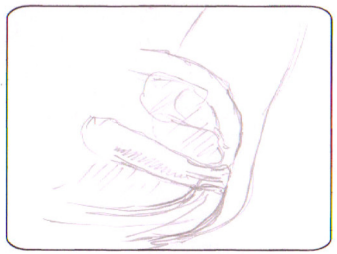


- TIGHTEN ? PURSE STRINGS

- ASK SURGEON ABOUT PURSE STRINGS

* Look into after effects

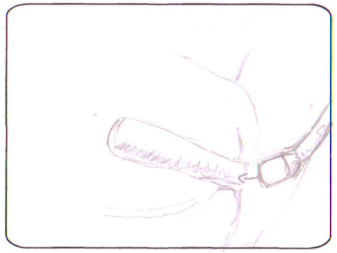
3



- HAVE COLON IN SD - CROSS SECTION AS IMAGE

- NOT SURE IF WE WANT 2 SHOW CROSS SECTION?

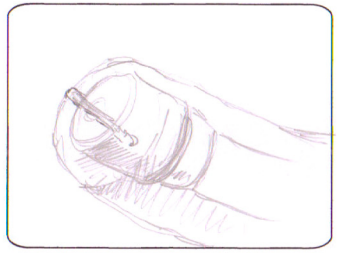
4



- INSERT → HEAD OF STAPLER INTO ANUS

- AND MOVE STAPLER HEAD TO TOP OF COLON

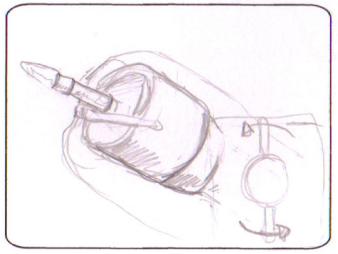
5



- ZOOM IN TO TOP OF TRANSVERSE COLON - SHOWING STAPLER HEAD IN POSITION.

-

6



- WHITE TROCANTAK TWISTS & PIERCES THROUGH THE COLON

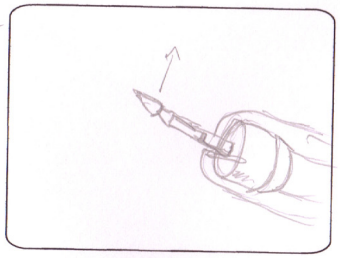
- AS INSET OPEN IN BOTTOM RIGHT - SHOWING BASE OF STAPLER TURNING COUNTER CLOCKWISE

- MAY SHOW ARROWS

Erin Frederikson erin.frederikson@utswmed.edu

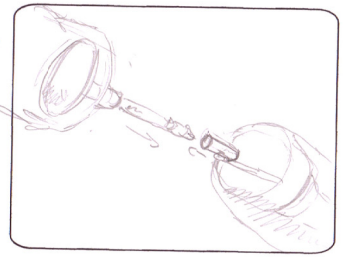
AUTO SUTURE → PREVIOUS CCEA - STEP 1 - SETUP

7



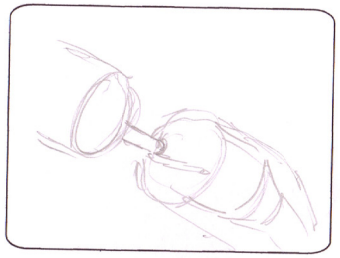
- INSET CLOSES
- ZOOM OUT ON COLON
- WHITE TOPCAP IS REMOVED

8



- 2 ENDS MOVE TOWARDS CENTER STAGE
- THE SHAFT OF THE ANVIL LINES UP AND ENTERS THE INNER SHAFT OF THE STAPLER

9



- PIECES SNAP TOGETHER
- SOUND ? -

—

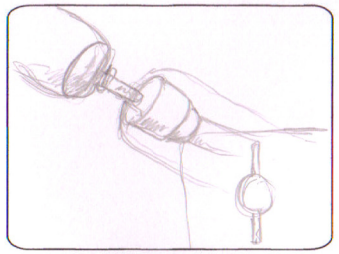
—

—

Erin Frederikson erin.frederikson@utswmed.edu

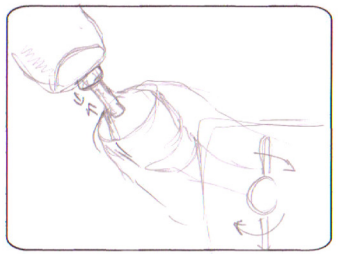
AUTO SUTURE → PREMIUM PLUS CEEA STEP 2 → CLOSE

10



- INSET OPENS BOTTOM RIGHT SHOWING BASE OF STAPLER

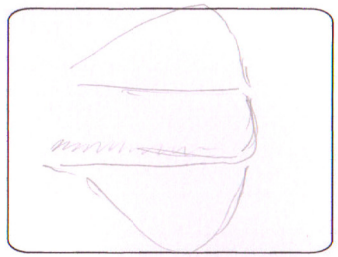
11



- INSET BEGINS TO TURN CLOCK WISE AS THE 2 STAPLER PIECES MOVE CLOSER 2 EACH OTHER

12

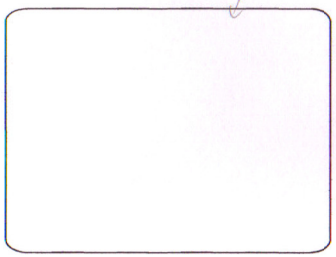
GET IMAGE OF SIDE



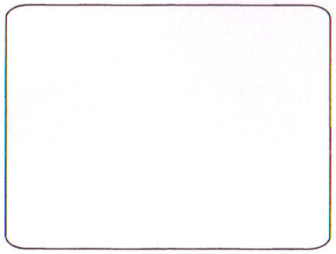
INSET OPEN LARGE AND CAMERA MOVES TO THE SIDE OF STAPER

13

NEED IMAGE



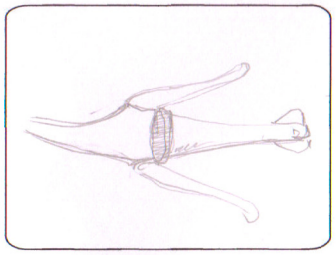
WHEN KNOBS STOP MOVING AS GREEN LINE → LINES UP WITH GREY INDICATOR



Erin Frederikson erin.frederikson@utswmed.edu

AUTOSUTURE → PREMIUM PLUS CEEA – FIRE

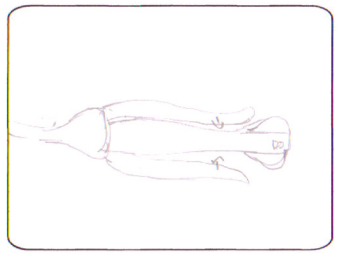
1



CAMERA ZOOMS OUT A BIT

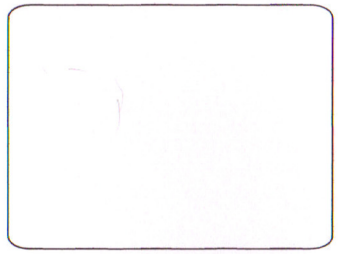
- SAFTEY RELEASE IS PRESSED IN

2



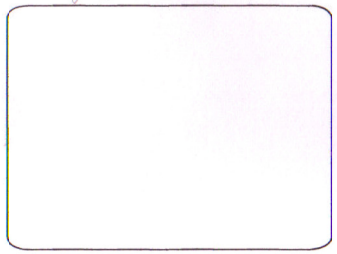
- HANDLES PRESS ALL THE WAY IN

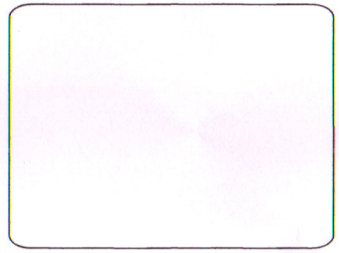
3



- STAPLER FADES BACK

V WITH KIM



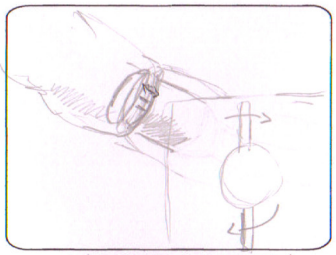


YES 3 SHOW THE STAPLING PART & CUTTING

Erin Frederikson erin.frederikson@utswmed.edu

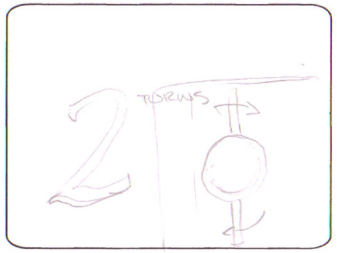
PURSE STRING → PREMIUM PLUS CEEA – OPEN

1



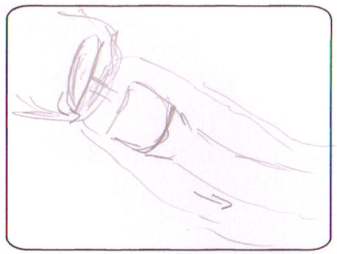
- ANVIL & STAPLER – SEPERATE A BIT
- INSET OPENS 2 SHOW BASE OF STAPLER

2



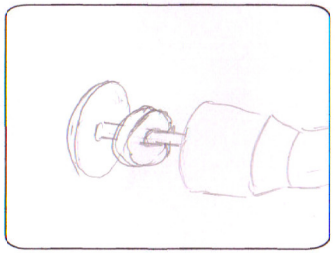
- WING NUTS TURNS CLOCK WISE 2 COMPLETE TURNS
- LABEL – "2 TURNS"

3



- STAPLER & ANVIL ARE PULLED OUT TO THE RIGHT
- ANVIL TIPS AS IT CROSSES ANVIL STOMOSIS

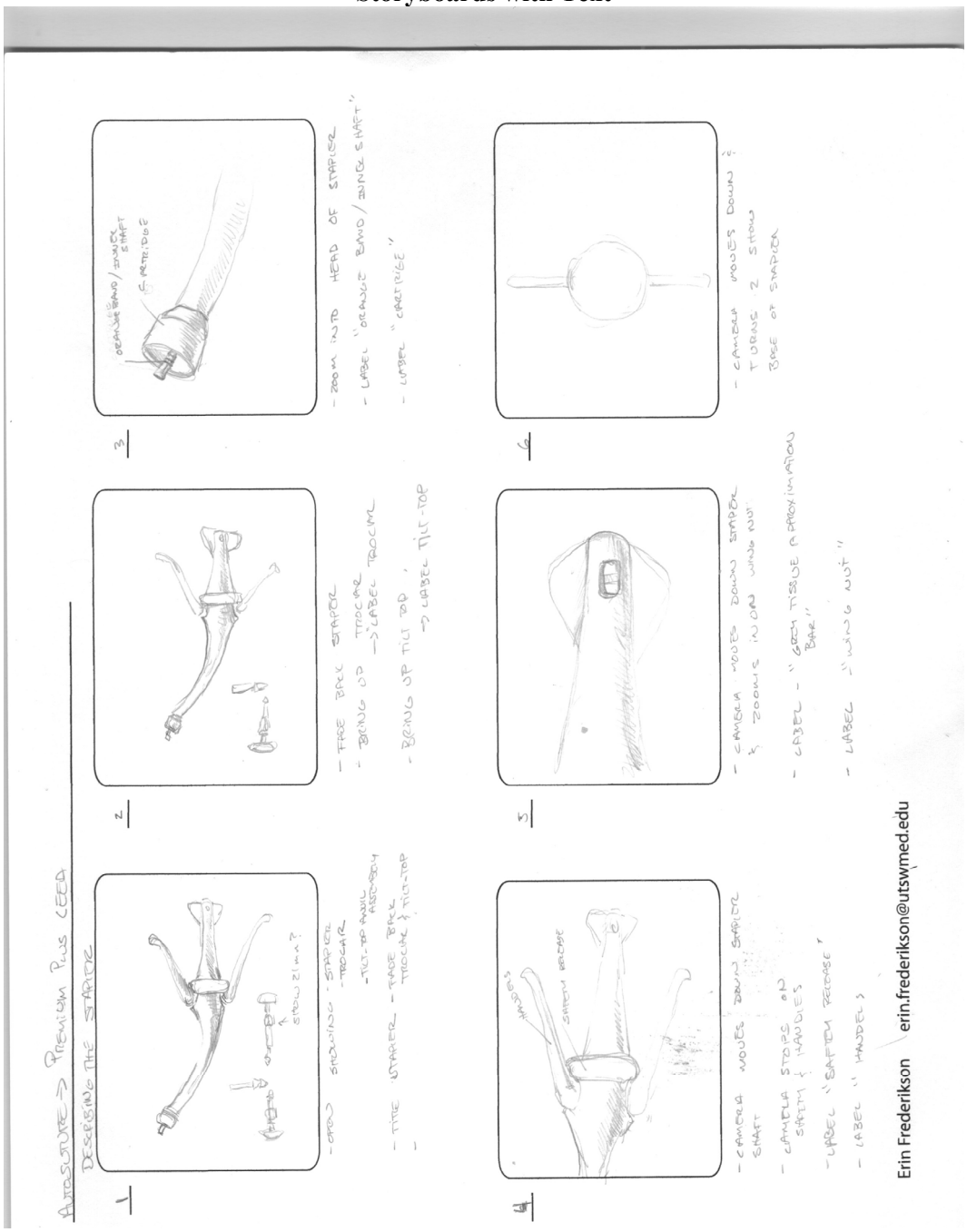
4



- ANVIL & STAPLER NO LONGER IN BOWL
- CAMERA CIRCLES AROUND 2 SHOW COMPLETE TISSUE DONUTS.

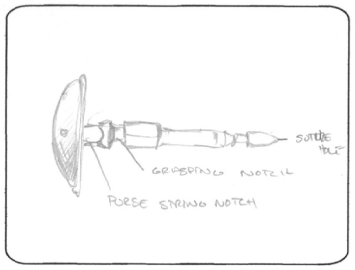
Erin Frederikson erin.frederikson@utswmed.edu

APPENDIX D
Storyboards with Text



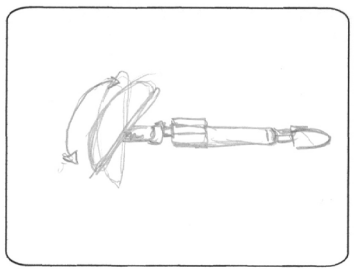
AUTO SUTURE → PREMIUM PLUS CEEA

7



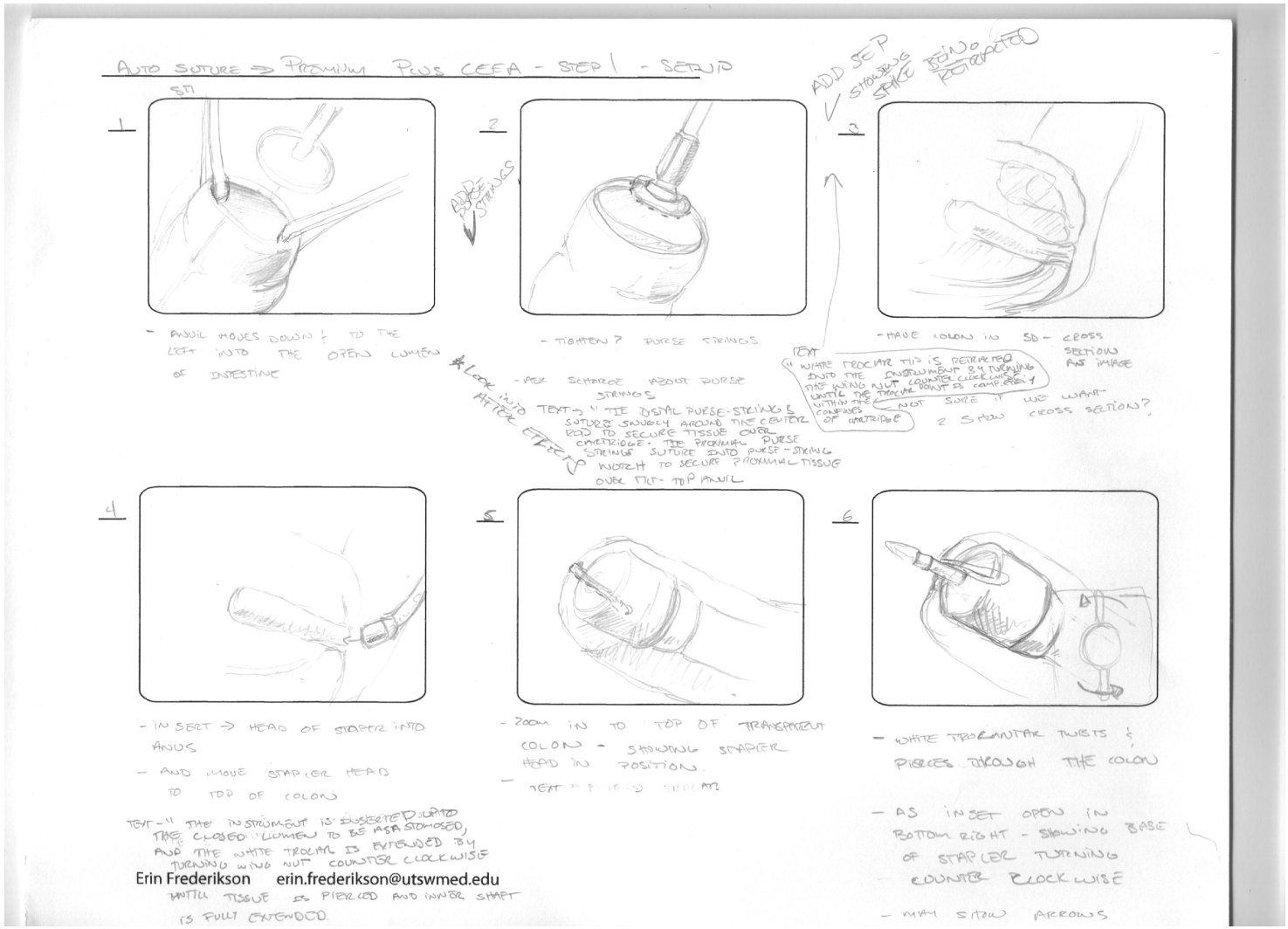
- SHOW TILT-UP ANVIL ASSEMBLY
- LABEL "PURSE-STRING NOTCH"
- LABEL "GRASPING NOTCH"
- LABEL "SUTURE HOLE"
- LABELS FADE

8



- ANVIL HEAD TIPS UP & DOWN

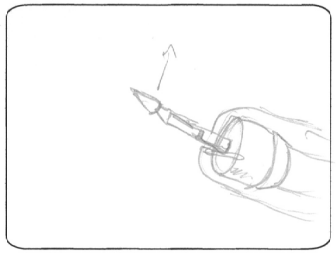
Erin Frederikson erin.frederikson@utswmed.edu



Erin Frederikson erin.frederikson@utswmed.edu

AUTO SUTURE → PROVIEW CECA - STEP 1 - SETUP

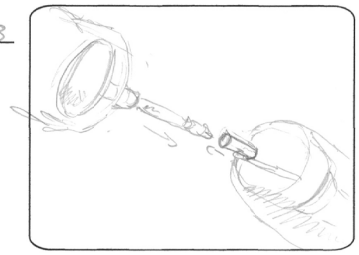
7



- IN SET CLOSES
- ZOOM OUT ON COLON
- WHITE TROCAR IS REMOVED

TEXT - " REMOVE WHITE TROCAR POINT.

8

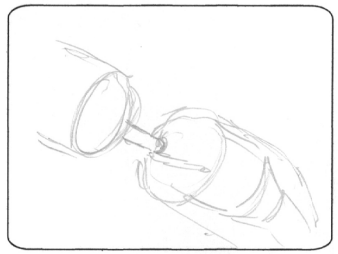


- 2 ENDS MOVE TOWARDS CENTER STAGE
- THE SHAFT OF THE ANVIL LINES UP AND ENTERS THE INNER SHAFT OF THE STAPLER

TEXT - " HOLD THE ANVIL ASSEMBLY AT THE GRASPING NOTCH WITH AN ENDO BABCOCK + INSTRUMENT CLAMP "→ ? DO WE WANT THIS

"MATE THE ANVIL ASSEMBLY TO THE INNER SHAFT BY PUSHING FIRMLY UNTIL ANVIL ASSEMBLY CLICKS INTO ITS FULLY SEATED POSITION.

9



- PIECES SNAP TOGETHER
- SOUND ? -
- AUDIBLE CLICK

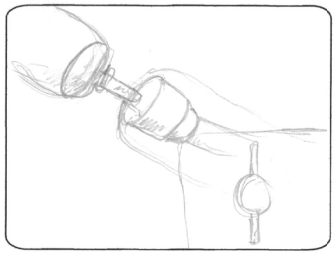
TEXT

-"VISUALLY INSPECT THE INNER SHAFT TO ENSURE THAT COLORED PLASTIC PORTION OF ANVIL ASSEMBLY IS DIRECTLY AGAINST THE ORANGE BAND ON THE INNER SHAFT"

Erin Frederikson erin.frederikson@utswmed.edu

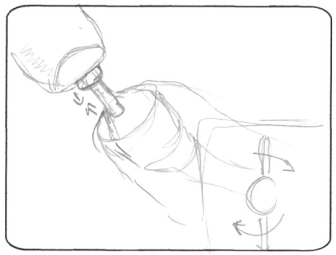
AUTO SUTURE → PREMIUM PLUS CEEA STEP 2 → CLOSE

10



- INSET OPENS BOTTOM RIGHT SHOWING BASE OF STAPLER

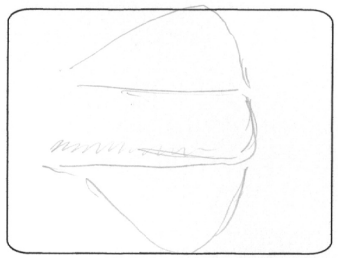
11



- INSET BEGINS TO TURN CLOCK WISE AS THE 2 STAPLER PIECES MOVE CLOSER 2 EACH OTHER

12

↓ GET IMAGE OF SIDE



INSET OPEN LARGE AND CAMERA MOVES TO THE SIDE OF STAPER

TEXT

- " TO APPROXIMATE THE TISSUE TO CLOSE THE SPACE BETWEEN CARTRIDGE AND TILT-TOP ANVIL TURN WING NUT CLOCK WISE UNTIL GREEN BAR LOCATED ON THE TISSUE APPROXIMATION" NEED IMAGE

13

INDICATOR IS ALIGNED WITH GREY APPROXIMATION BAR.

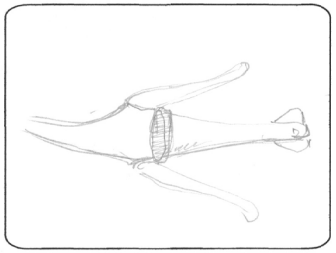
WING NUTS STOP MOVING AS GREEN LINE → LINES UP WITH GREY INDICATOR

- TEXT " IT IS NOT NECESSARY TO HAVE THE ENTIRE GREEN BAR ALIGNED, BUT SAFETY MAY NOT RELEASE IF NO PORTION OF THE GREEN BAR IS ALIGNED WITH APPROXIMATION BAR.

Erin Frederikson erin.frederikson@utswmed.edu

AUTOSUTURE → PREMIUM PLUS CEEA (FIRE)

1



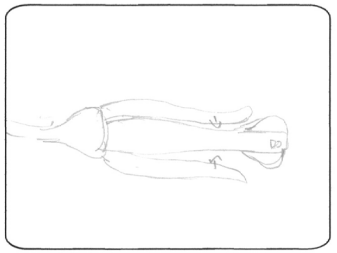
CAMERA ZOOMS OUT A BIT

- SAFTEY RELEASE IS PRESSED IN

- TEXT " TO FIRE ON STRAIGHT, PRESS THE SAFETY RELEASE & SIMULTANEOUSLY SQUEEZE THE HANDLES FIRMLY AS FAR AS THEY WILL GO.

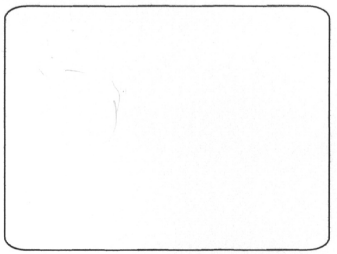
V WITH KIM

2



- HANDLES PRESS ALL THE WAY IN

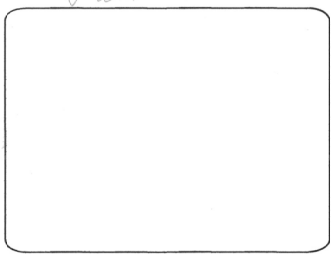
3



- STAPLER FADES BACK

- TEXT " FAILURE TO FULLY SQUEEZE THE HANDLES MAY RESULT IN AN UNACCEPTABLE STAPLE FORMATION OR AN INCOMPLETE KNIFE CUT.

—



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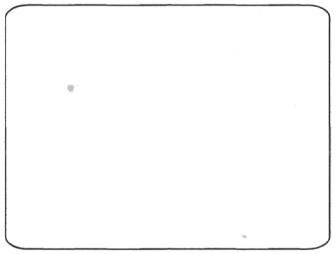

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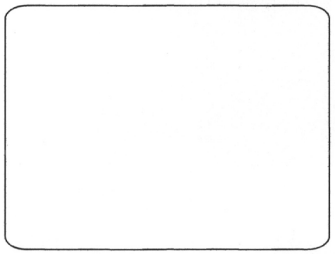
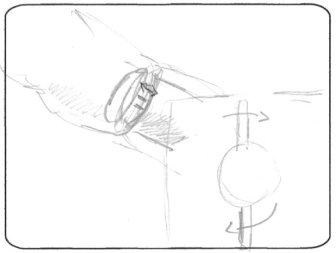


YES 3 SHOW THE STAPLING PART & CUTTING

Erin Frederikson erin.frederikson@utswmed.edu

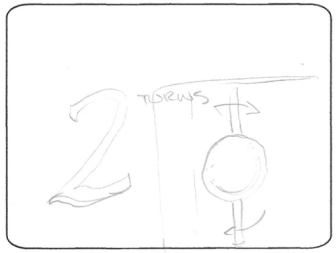
AUTO SUTURE → PROXIMA PLUS CEEA – REMOVAL OPEN

1



- ANVIL & STAPLER – SEPERATE A BIT
- INSET OPENS 2 SHOW
- TEXT – BASE OF STAPLER "I CREATE SPACE BETWEEN CARTRIDGE & ANVIL BY TURNING THE WING NUT COUNTER CLOCKWISE A MINIMUM OF 2 FULL TURNS"

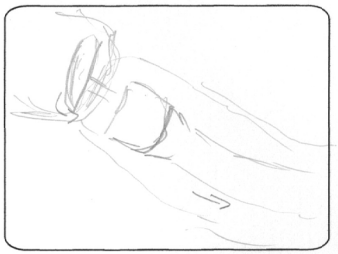
2



- WING NUTS TURNS CLOCK WISE 2 COMPLETE TURNS
- LABEL – "2 TURNS"

TEXT "DO NOT TURN WING NUT MORE THAN TWO FULL TURNS, AS THIS WILL ALLOW THE ANVIL ASSEMBLY TO SEPERATE FROM INSTRUMENT"

3



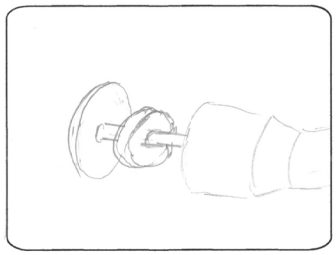
- STAPLER & ANVIL ARE PULLED OUT TO THE RIGHT
- ANVIL TIPS AS IT CROSSES ANA STOMOSIS

TEXT "OPENING THE WING NUT 2 FULL TURNS WILL ALLOW THE ANVIL TO TILT FOR EASY REMOVAL THROUGH ANASTOMOSIS. GENTLY REMOVE THE INSTRUMENT"

- INSPECT STAPLE LINE FOR HEMOSTASIS

ADD STEP. PULLING STAPLER OUT – ROTATING GENTLY

4



- ANVIL & STAPLER NO LONGER IN BOWL
- CAMERA CIRCLES AROUND 2 SHOW COMPLETE TISSUE DONUTS.

TEXT – "INSPECT TISSUE SPECIMENS TO ENSURE THAT ALL TISSUE LAYERS HAVE BEEN INCORPORATED IN ANASTOMOSIS.

– "TURNING THE WING NUT COUNTERCLOCKWISE DIRECTION WILL CAUSE THE SHAFT TO EXTEND, PERMITTING INSPECTION OF TISSUE SPECIMENS"

Erin Frederikson erin.frederikson@utswmed.edu

APPENDIX E
Questionnaire

Please watch movies; Step 1, Step 2- Setup, Step3- Approximation, Step4- Fire and Step 5- Removal, on the PDA.

Review the following statements and select the square that corresponds to your level of agreement with the statement to the left. The animations were designed to demonstrate proper use of the Premium Plus CEEA single use stapler delivered on a PDA.

Additional comments may be added after each statement.

Do you currently own a PDA?
What is your current Position?
Have you ever used the Premium Plus CEEA single use stapler before?

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. The animations are a good reference for preparing to use the Premium Plus CEEA Single Use Stapler Comments:	☐	☐	☐	☐	☐
2. The animations are a good resource for learning and reviewing the procedure. Comments:	☐	☐	☐	☐	☐
3. The navigation is clear and easy to use Comments:	☐	☐	☐	☐	☐
4. The animations are clear and easy to understand. Comments:	☐	☐	☐	☐	☐

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
5. The text is useful and accurate Comments:	☐	☐	☐	☐	☐
6. After viewing these animations you would feel comfortable using the Premium Plus CEEA single use stapler. Comments:	☐	☐	☐	☐	☐
7. A complete library of animations on surgical instruments, such as the Premium Plus CEEA Single use stapler available for a PDA, would be useful for understanding instrument use before or during surgery Comments:	☐	☐	☐	☐	☐
			Yes	No	Maybe
8. Would you watch these animations to prepare for surgery? If no, why not, and what improvement could be added that would make this a useful tool before surgery?			☐	☐	☐
9. Would you watch these animations while in surgery? If no, why not, and what improvement could be added that would make this a useful tool during surgery?			☐	☐	☐

What specific changes would you suggest to improve the animations:

APPENDIX F
Questionnaire Summary of Results

yes	ms3	no	agree	agree	agree	agree- steps 4 and 5 could show more detail re: mechanism to enhance understanding	agree	neutral	agree	maybe- faster progression through slides would enhance usability	no	I would prefer to be more familiar prior to surgery so watching video during surgery is not necessary
no	PGY 2	no	strongly agree	agree	agree	agree	stronlgy agree	neutral	strongly agree	yes	yes	
yes	pgy 2	no	agree	agree	agree	agree	agree	neutral	agree	yes	no	
no	resident 2nd year	yes	strongly agree	strongly agree	strongly agree	strongly agree	stronlgy agree	strongly agree	neutral- before only	yes	no	
no	R3	no	agree	agree	stronlgy agree	agree	agree	neutral	agree	yes	no- I would want to prepare prior to surgery	
no	R3	no	agree	agree	agree	agree	agree	agree	agree	yes	no- not practical	
yes	PGY 2	no	agree	agree	neutral	agree	agree	agree	agree	yes	no- the speed of the video is slow for realtime application intraop	recommend a control bar w/ pause, play, rewind options
yes	PGY 4, resident	no	agree	agree	strongly agree	strongly agree	agree	agree	strongly agree	yes	no- shorter, more concise version for the or	lag time in between movement, is too long and can be shortedned to improve overall time
na	na	na	agree	stronlgy agree	agree	agree	agree	neutral	agree	yes	yes	
na	na	na	stronly disagree	strongly disagree	stronlgy disagree	agree	agree	agree	agree	yes	no	
na	na	na	stronlgy agree	strongly agree	stronlgy agree	strongly agree	strongly agree	strongly agree	stronlgy agree	yes	yes	
no	fellow	yes	strongly agree	stronlgy agree	stronlgy agree	stronlgy agree	strongly agree	agree	neutral- I am not sure how many people use PDA's in this capacity perhaps use will increase as they become less expensive	yes	no- if it was faster, it may be feasible to use in the or	during the approximation step (I think) it describes turning until the green is near the grey bar. It is very easy to see the green but not as easy to see the gray
no	fellow	yes	agree	agree	agree	agree	agree	already knew how to use	agree	maybe- faster progression through slides would enhance usability	no	
yes	fellow	yes	strongly agree	strongly agree	strongly agree	strongly agree	strongly agree	agree	strongly agree	yes	maybe	have ability to speed up or rewind

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VITAE

Erin Nicole Frederikson was born in Lewistown, Montana on April 12, 1980 to John and Micki Frederikson. She attended Target Range Grade School and Big Sky High School in Missoula, Montana, graduating in 1998. She attended the University of Montana, in Missoula where she received her B.A. in Biology spring 2003. She then took art classes at the University of Montana fall 2003 and transferred to the University of Wisconsin in Madison spring 2004 to continue the art program. In May of 2005 she enrolled in the Biomedical Communications Graduate Program at the University Of Texas Southwestern Medical Center in Dallas, Texas where she received her M.A. in May 2008. She is currently working at Nucleus Medical Art in Kennesaw, Georgia.

Permanent Address: 2842 Cressington Bend NW
Kennesaw, GA 30144