INTERACTIVE SURGICAL DEPICTION FOR THE ELECTRONIC MEDICAL RECORD

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ABSTRACT
With the transition to electronic medical record (EMR) technology, traditional paper charts are seldom used and less accessible to clinicians. In the past, written documentation of operations were frequently supplemented by a sketch by the surgeon. This thesis explores the design of a digital interactive tool to enable surgeons to quickly and accurately document the patient’s post-procedural anatomy in an image. This tool is unique in that it presents a preexisting 3D model which the user may split, remove, and reconnect to represent changes to the patient’s gastrointestinal (GI) tract. Throughout the project, I focused on designing and defining the minimum viable product (MVP). The concept of the MVP allowed us to define the scope of the initial tool with only the features necessary to be introduced to the clinical setting.

INTRODUCTION
Problem Statement
In 2009, use of EMR technology was mandated and widely implemented. Surgeons who routinely included drawings with post-operative reports of operations were frequently required to complete on-site documentation by the surgeon. This loss is particularly significant in complex and reoperative surgical cases.

Solution
The author set out to design a digital interactive tool enabling surgeons to create a 3D visual depiction of post-operative anatomy. This documentation tool will enhance communication among the entire care team.

Audience
- Image creators (GI surgeons)
- Image readers (surgeons, nurses, endoscopists, diagnostic and interventional radiologists, student and trainees, patients)

Objectives and Scope
- Research: competitors, user interviews, customer discovery
- Design minimum viable product (GI surgery)
- Implement the tool and integrate with EMR
- Pilot study at Johns Hopkins Hospital (JHH)

RESULTS AND DISCUSSION
Designing the Anatomical Model
A 3D model (Fig. 3) was created for the purposes of planning, testing materials and textures, and communicating requirements to programmers. Although this model is static, it was useful to discover potential challenges in implementing a manipulatable model. It also provided a means to demonstrate the program’s capabilities in business pitches and grant applications.

Defining In-Program Functions
The functions of the tool, determined with stakeholder feedback in mind, fall into four categories: manipulation of the model, adding assets and annotations to the model, camera control and navigation, and completion of the image. Comprehensive feature lists were created and shared with programmers as the main guidelines for development.

User Interface Design (UI) and User Experience Considerations
Function wireframes were created to design the UI (Fig. 4) in the wish of keeping it as minimal as possible. The interface includes a toolbar with all tools to alter the model, and a camera view and an accordion menu which can be expanded to see details about the case and annotations added to the model.

ACKNOWLEDGMENTS

This project would not have been possible without the expertise and support of my team:
- Corinne Sandone, MA, CNM, FAMI, Faculty advisor
- Associate Professor and Interim Director, Department of Art as Applied to Medicine, Johns Hopkins University School of Medicine
- David T. Efron, MD, FACS, Preceptor
- Professor of Surgery, Chief of the Division of Adult Care Surgery, Director of Adult Trauma Services, Department of Surgery, Johns Hopkins University School of Medicine
- Lukas Marka, MBA, Business Consultant

“A bad drawing on a napkin is better than reading the post-op note”
- JHH Interventional Radiologist

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