INTRODUCTION

The goal of this research was to model the operating room (OR) environment as an information system that unifies the different roles of the surgical team members with a common goal. This model will be used to inform designs of integrated information displays to support team work and decision-making. The display is meant to decrease mental workload and therefore the potential for human error in the operating room.

METHODS

Research approach: A work domain analysis of the operating room with the surgical team, surgical equipment and patient as the three major sources of information. Observations of information flow between the three sources of information were performed in the hospital OR.

Location: Cambridge Health Alliance, Cambridge, MA.

Data collection:

Preliminary task analyses of surgical procedures were performed to aid observation (Figure 1). During surgery observation, further details were recorded that pertained to efficiency of OR operations and communication between OR members. All interactions that occurred between these components of the operating room were recorded, organized, and later analyzed.

In Figure 2, a map of the typical operating room set-up was generated to provide a better understanding of the physical workspace of the members of the surgical team.

Figure 3. Outline of information review by step and user

Figure 4. Diagram Prototype

Figure 5. Isolation and Mobilization of Descending Colon

Figure 6. Creation of Circular Stapled Anastomosis

Data analysis:

- Traced the course of the surgery in terms of equipment used. For each individual piece of equipment in the OR, a list was compiled of when and by whom the instrument was used, its function, how it was used, and what information was needed to use the instrument, and what information the instrument provided.
- Categorized the interactions based on the perspective of each individual member of the surgical team (Figure 3). This method mapped information flow in the OR to describe what information each person needed, as well as if and how this information was obtained.
- Verification and validation of information flow map with OR staff (nurse, anesthesiologist, surgeon).

RESULTS & DISCUSSION

Figure 4 depicts a generic information map of a surgery, grouping information by member of the surgical team. This template creates a way to organize the information overlaps for each step of a procedure. It is possible to break these steps up into smaller actions for visualizing minute details of the information flow, or use broad tasks to view the complete picture. Figures 5 and 6 include example data for a sigmoid colectomy.

Future work:

Continuing work will involve more studies of different procedures to delineate common interactions, including crisis scenarios. Also, more interviews with the members of the surgical team will be conducted to validate the information model, and to supplement the information needed for real-time decisions. In addition to providing more in-depth information, this will enable the development of a more specific timeline for the mapping.