USING A SYSTEMS APPROACH TO DESIGNING A SAFER AND MORE ERGONOMIC OPERATING ROOM

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BACKGROUND
The incidence of adverse events such as surgical site infections and surgical errors is a huge problem in the operating room (OR) due to the highly vulnerable state of the patient and the complex interactions required between providers of different disciplines and a range of equipment, technology and the physical space where care is provided. Clemson University and the Medical University of South Carolina have been awarded a 4-year grant from the Agency for Healthcare Research and Quality to develop a learning lab focused on patient safety in the OR. This learning lab, titled “Revisiting Improved Patient Care through Human-Centered Design in the OR (RIPCHD.OR)” is a multidisciplinary initiative involving architects, human factors experts, industrial engineers, nurses and anesthesiologists. The goal of this paper was to develop a systems approach for observing and analyzing the OR work system and to describe how this systems approach was used to analyze operating rooms environments, finally leading to the development of design guidelines for designing operating rooms.

METHODOLOGY
An in-depth literature review was conducted to develop and refine a systems approach for studying the OR work system. The OR work system (people, tasks, technology, built environment, processes) was then studied through analysis of video clips of 35 surgeries in three different departments (general, orthopedic and pediatric). Additionally, three case studies were conducted to understand alternate approaches and best practices in OR system design. Finally, design guidelines were created to help translate research findings into the design of a prototype OR.

IMPLICATIONS
A systems approach provides a rigorous multi-dimensional approach for researching and designing a complex environment such as an operating room. This is a more holistic approach to designing healthcare facilities that allows for a deep understanding of the complex interplay between people, tasks, processes, technology and the built environment.

FINDINGS
Findings: Using a systems approach yielded rich insights about the tasks and activities of key stakeholders, the locations of people, objects and equipment, space needs during different phases of surgery and also the inter-dependencies and relationships between key players in the OR. The operating room needs to be flexible and adaptable to meet current and future needs. Key areas of consideration include the amount and location of storage, the number and location of zones in the OR to optimize flows and the need to promote situational awareness among team members for optimal communication.

What are the different types of flow disturbances and frequency that occur during observed surgeries?

- Circulating nurse makes trips to all different parts of the OR, though she spends the maximum time at the circulating nurse desk and interacting with the scrub nurse.
- Anesthesia storage is primarily used by anesthesia personnel while general storage is accessed by all team members, though primarily the circulating nurse.
- The number of door openings and duration are proportionate to the length of the surgery. However, this does not seem to hold true for some of the pediatric surgeries observed.
- Some surgeries had a large number of clean core door openings.
- Layout-related disturbances were the most frequently observed SDs in all observed surgeries.
- High number of SDs observed in the shorter pediatric surgeries. Also duration of door openings higher in those surgeries, linked with room size and design.
- Proportion of disturbances as a proportion of surgery time very high in the smaller OR in main;

PROJECT FRAMEWORK

WORK SYSTEM

OUTCOMES

PROJECTS

DISCOVERY

DESIGN CONCEPTS

DESIGN MOK UPS

GESTURE FUNCTIONS MAPPING

VIDEO CAPTURE