



KEY POINT SUMMARY

OBJECTIVES

This study aims to explore the relationship between physical layouts and task switching within anaesthesia workspaces, and then to use the data collected to design and evaluate different workspace layouts.

Observational study of anaesthesia workflow to evaluate physical workspace design and layout

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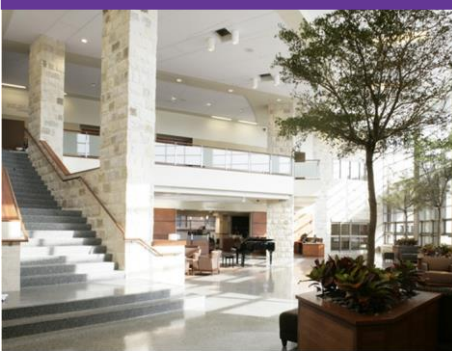
Key Concepts/Context

Most published research concerning operating theatre (OT) design addresses issues related to the overall OT rather than specific workspaces within the OT. Anaesthesia workspaces, which are defined as the areas where anaesthesia providers perform their work, are often cluttered due to small sizes and other limitations. This study informs designers how evidence-based design strategies and contemporary OT technologies might benefit anaesthesia workspaces and workflows specifically.

Methods

This was an observational study in which video data were analyzed to assess the amount of time anaesthesia providers spent on individual tasks during their maintenance phase. The maintenance phase was identified by the fastening and unfastening of surgical draping, which created a reliable visual cue. Each video was recorded from four different cameras, took place in the same OT, featured the same anaesthesia workspace layouts, and all featured one anaesthesia provider performing tasks during the maintenance phase. A total of six videos of six separate surgeries were analyzed by two researchers, who noted specific tasks including interaction with visual displays, electronic medical record (EMR) interaction, preparation and retrieval of supplies, interactions with infusion pumps, handoffs, absences from the workspace, and non-medical tasks. The videos observed were all filmed within a 700-bed academic hospital.

The researchers then paired specific tasks performed from the beginning to the end of the maintenance phase to examine the direction and frequency of task switching. This allowed the researchers to visualize how anaesthesia provider workflows related to the physical layout of their workspace in the OT, as well as the frequency with which certain task pairs were performed.



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The resulting data were used to generate three theoretical workspace designs where the relationship of anaesthesia workflow and workspace layout could be evaluated. These theoretical workspaces focused on decreasing the distance between task pairs that were performed frequently, as well as orienting tasks towards patient displays and the patient.

Findings

The observed surgeries lasted for an average duration of 65.98 minutes, with the shortest maintenance phase lasting 36.92 minutes and the longest lasting 91.57 minutes. Tasks that required most of the anaesthesia provider's time included direct patient interactions (30% of total maintenance duration), EMR accessing (26.6%), and visual display tasks (18.6%). Instances of anaesthesia provider absence and short handoffs had negligible impact on overall task flows. The least frequently performed tasks included retrieving supplies (4.4% of total maintenance duration), working with infusion pumps (4.7%), preparing supplies (7%), and performing non-medical tasks (8.2%). In all surgeries, a task switch occurred every 6.39 seconds. A total of 46.7% of the maintenance duration was spent on tasks that required the provider to disengage and turn away from the patient, meaning the providers were only able to face the patient roughly half the time.

Among the three alternative theoretical workspaces generated by the researchers, one labeled "Layout D" proved to be the most effective in orienting the anaesthesia provider's tasks towards the patient and reducing the number of opportunities for the provider to disengage and turn away. The primary distinguishing features of Layout D include a display that integrates the EMR with patient displays, as well as an extra working surface attached to the anaesthesia cart.

Limitations

The authors note that this study focuses on the task patterns of one anaesthesia provider, yet there is often more than one provider active during surgical cases. All data were gathered from the same OT layout; further studies could benefit from observing providers within several different layouts. Other stimuli that may impact task switching, such as auditory alarms or visual distractions, were not factored into this study.

Design Implications

Giving anaesthesia providers an expanded workspace (ideally attached to their anaesthesia cart) and designing a display system that incorporates both EMR access and patient displays could help keep providers oriented towards the patient during their tasks.



And Also...

The authors provided detailed renderings of various anaesthesia workspace layouts which include linear movement plots; these can be helpful for visualizing this study's outcomes and recommendations.

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