Reimagining Medical Workspaces Through On-Site Observations and Bodystorming

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INTRODUCTION

Clinicians in acute care hospitals experience highly stressful situations daily. They work long, variable hours, complete complex technical tasks, and must also be emotionally engaged with patients and families to meet the caring demands of this profession, which can lead to burnout. In response to these challenges, a multi-disciplinary team from Virginia Tech collaborated with Steelcase to study the impact of medical workspaces on the clinician experience and how those workspaces could be improved to reduce some of the sources of burnout. The team sought to identify conditions that could either aid or hinder clinician workflow and affect burnout rate, then based on interviews and in-situ ethnographic studies, generated design concepts for nurse stations, both centralized and mobile. Using digital and physical full-scale prototypes, we enacted clinical care scenarios to seek feedback and reflect on the design.

BURNOUT AND WORKFLOW

Clinician burnout is prevalent in healthcare environments, such as intensive care units (ICU).[1] Sources of burnout in the ICU include discrepancies in job demands, overload in responsibility, and interpersonal conflicts[2] leading to over 25% of ICU registered nurses and respiratory therapists scoring high on emotional exhaustion.[3] Interventions that address burnout are often directed at training individual clinicians on coping skills (e.g., meditation training). Organization-directed interventions, such as improvements to work schedules, teamwork training, or a reduction in non-value-added tasks have also been used to reduce burnout.[4]

ICU teams are multidisciplinary and require that all clinicians bring their professional expertise to the decision-making process. This process, however, requires that each team member is endowed with a shared situational awareness of the patient's status and plan of care. Therefore, clinical care in the ICU necessitates an environment that facilitates team's communication and proper workflow for uninterrupted, private, and confidential decision making. Team members work together at three levels: cooperation, where team members accomplish tasks; information sharing, where team members communicate among each other; and at the cognitive cooperation level, where team members learn from each other and solve new problems.[5] Communication breakdowns happen when transfer of mutual knowledge fails and when crucial personnel are left out of the conversation and decision-making process.[6] Thus, the ICU environment should be designed so that it improves communication, teamwork, and workflow, thereby reducing some of the catalysts for burnout.

Figure 1. ICU floor at the Carilion Memorial Hospital. Photo: Thomas Martin.

PROJECT

Figure 2.Preparing for a bodystorming session with projection mapping at Carilion clinican simulation center. Image: Aki Ishida.

METHOD

To understand how these three levels of team communication are linked to the design of work environment and information flow, we examined both routine and acute work tasks and spaces by conducting interviews and on-site observation of clinicians at the ICUs at the Carilion Memorial Hospital (Figure 1).

The complexity of medical workspaces, involving mental health, human-factors, information sharing, and design, required a multi-disciplinary team that could cross-examine problems through multiple lenses. This design research team brought together depth and breadth of expertise, facilities, and technologies from a research university and affiliated clinics. Furthermore, we constructed full scale prototypes and, in a simulated clinical environment, enacted interactions between humans, information, furniture, and devices (Figure 2). This process enabled better understanding of communication challenges through the user's perspectives.

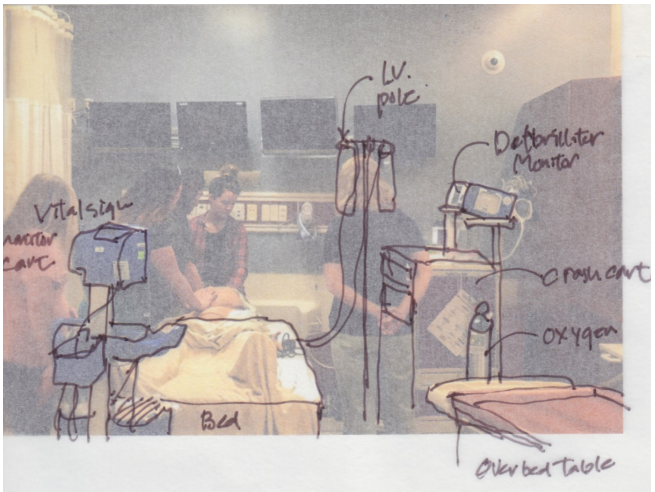

Figure 3. Drawing possible items of obstruction in a Code Blue training scene at the simulation center.

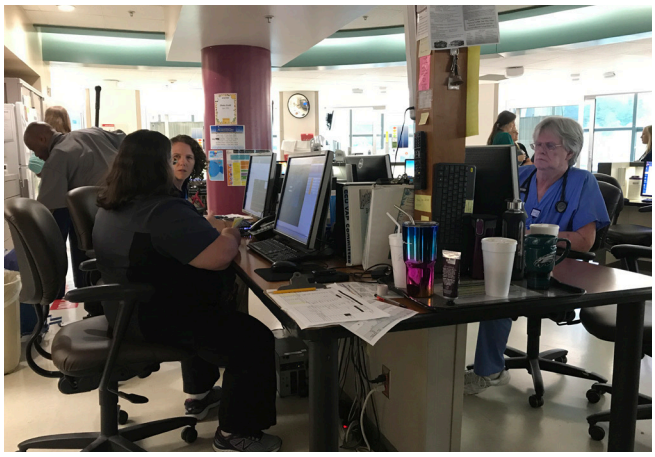

Figure 4. At a centralized nurses station on an ICU floor, finding a workstation at which to concentrate on detailed tasks is often a challenge. Image: Aki Ishida.

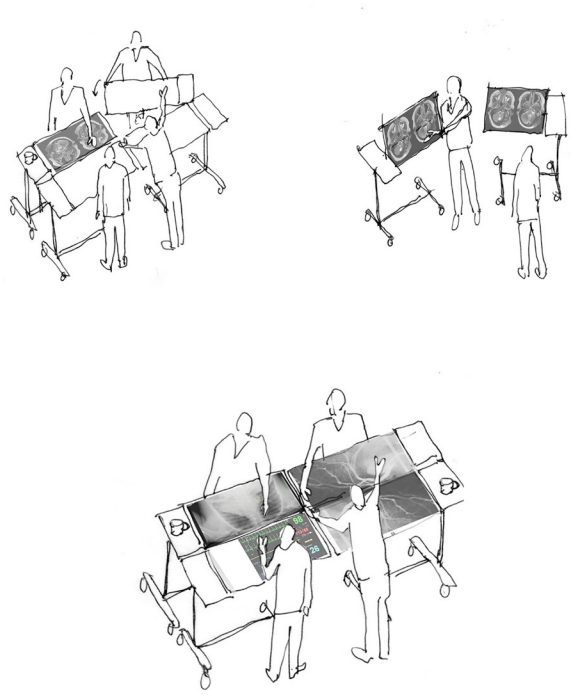

Figure 6. Sketches showing how the overbed sidetables can be used for huddling and information sharing by clinicians.

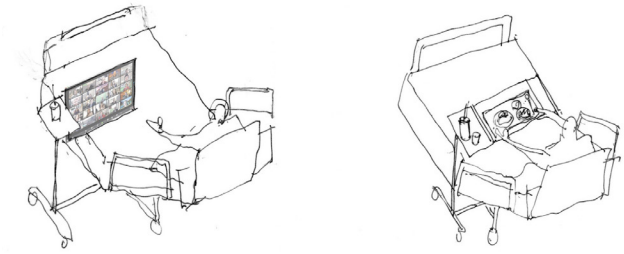

Figure 5. Sketches showing how an overbed sidetable can be used for eating or zooming with family or clinicians from the bed.

RESULTS AND REFLECTION

Through interviews and in-situ observation, we identified obstructions in communication and workflow. A PhD student in Industrial/Organizational Psychology conducted sixteen hours of observations, and eight hours of interviews with twenty people who have a voice in making design decisions in the hospital, including Medical Doctors, Vice President of Facilities, Infection Preventionist, and Nurse Practitioning Administrator. Furthermore, designers shadowed clinicians through their workday. In addition to asking questions and listening to them describe their tasks and challenges, they sketched and photographed pain points in workflow (Figure 3).

We found that clinicians have challenges finding space to huddle and display shared information effectively, and to find an open workstation for charting (documenting patient care) at the central nurses station (Figure 4). Both of these challenges can result in communication breakdown and contribute to stress and burnout. Based on these findings, we conceptualized an overbed side table, a piece of furniture found in every ICU room, that integrates display technologies for information sharing between clinicians and with patients (Figure 5). Clinicians would use this to chart or huddle in the patient room, hallway, or near the centralized nurse station (Figure 6).

During the concept design phase, we enacted clinical scenarios using full-scale prototypes of mobile nurse stations. They built digital models and physical mockups of the concepts, then tested and iterated through "bodystorming"–a brainstorming process that involves enacting with prototypes to understand the experience of others,[7] cutting and taping foamcore quickly based on interpretation of feedback. We also used projection mapping, a technique which enables projection of images and videos onto any surface. With this technology, a mapped display screen on the foamcore nurse station mockup could quickly shift from a zoom screen to a telemedicine interface (Figure 7).

At the Carilion Clinic Center for Simulation, we played out various scenarios in which the proposed mobile nurse station could be used, in a patient room with a hospital bed, monitors, clinicians,

and other equipment—all of which clinicians must manage while caring for the patient (Figure 9). For example, by enacting a huddle with projection mapping, one can assess whether the information displayed on the table is comfortably read in a two- or a three-person meeting (Figure 8), and if the display becomes an obstruction in the ICU. Putting aside preconception and enacting scenarios helps designers understand problems and solutions from the clinicians' point of view.

CONCLUSION

The project examined interrelations between occupational problems–stress and burnout, variety of clinical tasks, workers, and the design of spaces and products. As one medical doctor said in response to the design sketches, the bedside table that also functions as a display "could be used to alleviate the workflow of clinicians when it comes to checking in with the patient. This could revolutionize how rounding is conceptualized and make it more efficient," and subsequently reduce burnout. By designing a work environment that increases situational awareness and ease and accuracy of information sharing, we began to suggest ways to reimagine medical workspaces and positively impact clinicians' daily work experiences.

ENDNOTES

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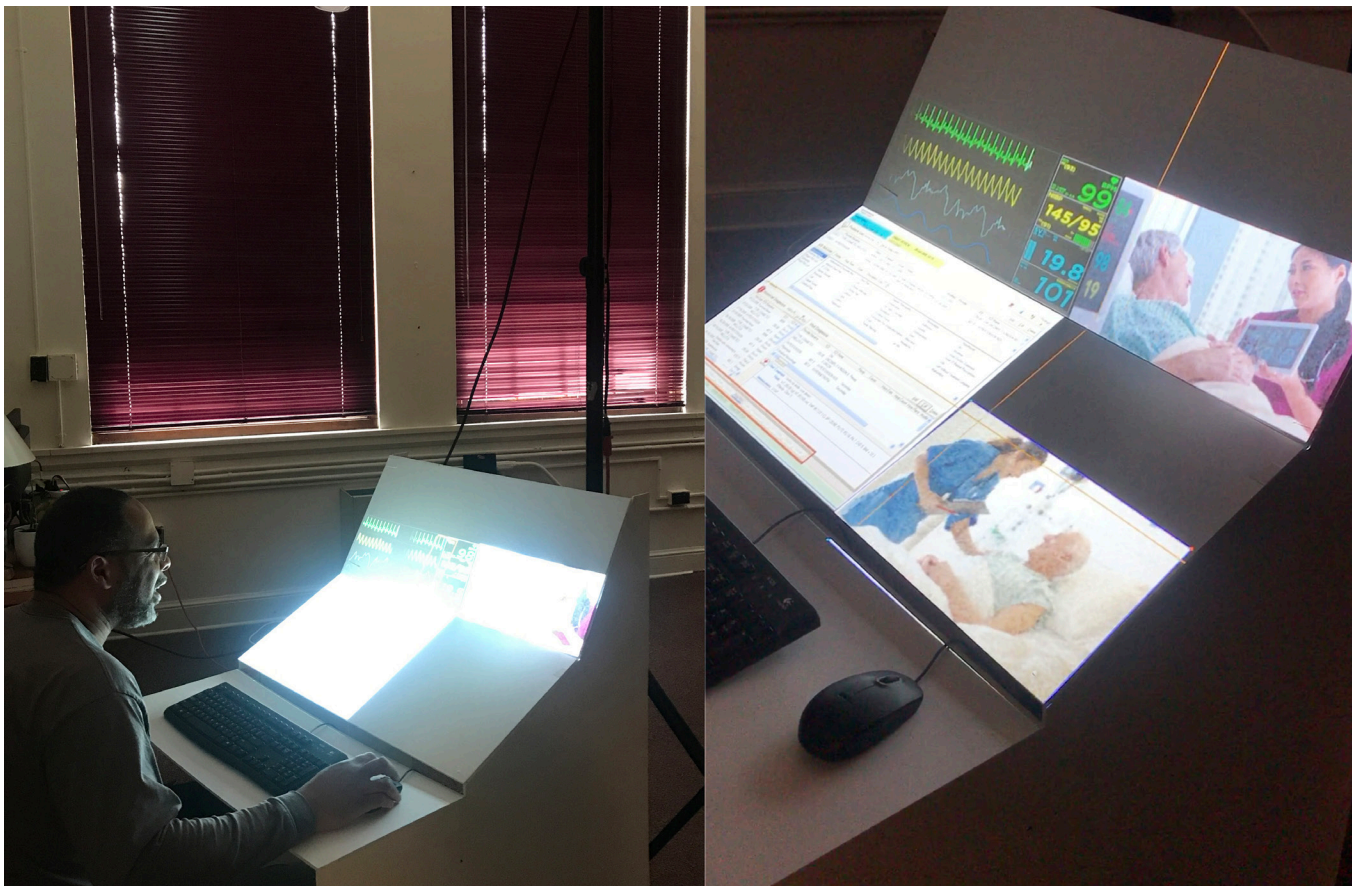

Figure 7. Projection mapping on full-scale mockup of nurse's station. Sizes and types of information displayed can easily be altered on the spot.. Photo: Aki Ishida.

Figure 8. Bodystorming a huddle with three clinicians. Photo: David Franusich

Figure 9. Bodystorming in a simulated ICU patient room with team members, bed, monitors, and other equipment. Clinicans and patient share information on an overbed sidetable. Photo: David Franusich.