SYNOPSIS

KEY POINT SUMMARY

OBJECTIVES

Human Factors and SFS methods were integrated to inform healthcare executives about whether to maintain or replace a passageway between two healthcare buildings in Canada.

Applying Human Factors and Systems S imulation Methods to Inform a Multimillion-Dollar Healthcare Decision

Dubé, M., Martel, J., Kumagai, J., Suddes, M., Cullen, J., Laberge, J. 2024 | HERD: Health Environments Research & Design Journal, Pages in press

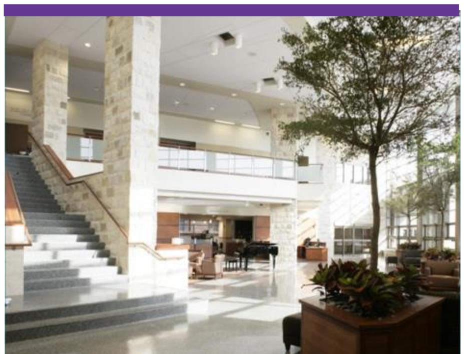
Key Concepts/Context

The integration of human factors (HF) and systems-focused simulation (SFS) to inform design decisions is an underutilized strategy. Specifically, using simulation with a human factors lens can help teams assess the implications of design decisions in a safe and low-risk environment. This case study demonstrates how the combination of HF and SFS can be used to inform high-dollar design decisions.

Methods

The executive team of a large Canadian acute care facility gave evaluators (two HF specialists, a simulation consultant, and critical care staff) a one-month timeline to conduct an objective assessment of the current passageway before deciding whether to build a new one. Assessment objectives included 1) using current flow to estimate future flow, 2) simulating the transport of a bariatric bed passing a standard bed, 3) simulating a situation where a bariatric bed turned around, and 4) conducting a failure mode and effects analysis (FEMA).

Assessing current flow involved observing movement of equipment, patients and companions, staff, students, and other facility visitors. Based on the observed movement patterns, the team developed the two scenarios to reflect the presence of approximately 20 people moving through the passage at any given time. During the first scenario, volunteers (nurses, respiratory therapists, management, porters, and security) simulated the transport of a weighted (370lb) bariatric bed passing a standard bed during typical traffic flow. The second simulation involved the deterioration of a bariatric patient (370lb) and required the transport team to turn the bariatric bed around within the passage during typical traffic flow. The team conducted debriefing sessions after each scenario using the PEARLS for Systems Integration (PSI) debriefing framework. The PSI framework helped the debrief facilitators identify systems issues and safety threats. Flow observations and



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debriefing materials were combined and analyzed using failure, mode, and effects analysis (FMEA) to identify safety risks relative to the existing passageway. Each identified failure mode was assigned a risk priority number (RPN) that accounted for probability of failure occurrence, severity of the failure if it occurred, and the effectiveness of current mitigation strategies.

Findings

Of the eight failure modes noted, the highest three are highlighted here. The top failure mode was the potential for the route to be blocked by equipment or people (PRN 150), which would delay care and services impacting the safety of patients and the public. The next failure mode was obstruction of the route due to the current infrastructure or other fixtures (PRN 120), resulting in compromised intravenous lines and tripping hazards impacting the safety of patients and staff. The third highest rated failure mode was an inability to call for help (PRN 80), resulting in a delay to patient care impacting patients, staff, and the public. Other failure modes identified included difficulty turning the bed in a confined space (PRN 64), a noted inability for staff to provide care in a cramped space (PRN 60), loss of power to automated beds (PRN 54), bystanders being exposed to trauma if a code were to occur (PRN 48), lack of patient privacy (PRN 48), and the potential for collision with people or equipment (PRN 36). Based on these findings, decision-makers unanimously determined that the current passage was unsafe and that a new passageway was needed.

Limitations

Limitations included the physician representative being called away during the simulation such that their input was missing from the process and that due to the short timeline, only two simulations were conducted. Given these limitations, the team determined that scenarios with the highest stakes and most important topics had been evaluated. The last limitation noted was the lack of real-time baseline data against which to evaluate simulated time delays.

Design Implications

While this article includes recommendations to improve safety when designing connecting passages between two buildings, the primary recommendations refer to the integration of HF and SFS approaches to inform high-cost design decision