ICU of the future - redesigning the ICU environment

Initiative Type

Redesign

Status

Plan

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26 May 2023

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https://clinicalexcellence.qld.gov.au/improvement-exchange/icu-future-redesigning-icu-environment

Summary

The “Intensive Care Unit (ICU) of the Future” project is a Queensland-led, international, patient-centred, multi-disciplinary and intersectoral project. Using co-design to incorporate the patient’s needs, the project team has redesigned and rebuilt two ICU bedspaces at the The Prince Charles Hospital (TPCH). There are many factors in the ICU that are not modifiable but the environment stood out for this team as one of the things that can be modified to improve the patients' experience

and recovery. Innovative changes to technology and a modified environmental design were some of the changes that made the existing ICU bedspace fit for purpose. Environment aspects addressed in this project included lighting solutions, noise reduction and solutions to reduce social isolation and improve patient engagement. The bedspaces have now been rebuilt and patients are being admitted to them. All this was done to reshape the ICU experience, so patients thrive, not just survive. The ICU of the Future project is expected to significantly improve the patient and family experience, shorten patient length of stay, reduce the incidence of delirium, reduce common post-ICU neurocognitive sequelae, including depression, anxiety, cognitive impairment, PTSD, decrease hospital costs, increase ICU bed availability, and help patients return to work and have a better quality of life. By creating a quieter and improved workspace, we also anticipate that the project will improve the ability for staff to perform clinical duties, increase work satisfaction, and reduce burnout and turnover, leading to retention of senior staff and attracting the best and brightest new staff.

Key dates

Jul 2021

May 2023

Implementation sites

The Prince Charles Hospital

Partnerships

Health Foundation,

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Aim

This pioneering and ambitious innovation project aims to demonstrate how optimising the ICU environment will enable best practice care and lead to improved patient outcomes and experiences.

Benefits

Improvements in medical care and technology have contributed to an overall reduction in ICU mortality over the last 10 to 15 years. Emerging research is also demonstrating that the physical, sensory and psychosocial environments, such as excessive noise and poor lighting of the traditional ICU, can lead to problems during and after an ICU admission. These problems include delirium, depression, anxiety and cognitive changes. An improved ICU bedspace can therefore be used as a healing tool.

Background

The vast majority of patients survive their ICU admission; however, the quality of survival is commonly suboptimal with a substantial proportion experiencing cognitive, physical, mental and/or psychological dysfunction and significant disability severely affecting the quality of life of the patient and their family. Emerging evidence suggests that the current bedspace environment contributes to these preventable adverse outcomes.

Solutions Implemented

- moving alarms away from patients’ head where possible to minimise audible pollution
- acoustic panels capable of noise absorption while maintaining infection control
- equipment reconfigured and moved to be less distracting and support clinical efficiencies
- state-of-the-art beds for improved comfort and connectivity
- circadian lighting solution to help support natural sleep patterns and improve circadian

rhythms
- virtual windows and skylights to improve views in the two windowless rooms
- improved patient engagement and distraction through a patient entertainment system
- architecturally designed to feel less clinical

Evaluation and Results

The acoustic environment was formally tested before and after implementation by an acoustic consultant. The reverberation time has been reduced from 0.6 - 0.8 seconds prior to implementation to 0.3 seconds after, demonstrating a large increase in sound absorption. Also, blocking of externally created sound entering the bedspaces have been improved from 0 dB pre implementation to 21 dB post implementation, significantly blocking out noise created externally (for example from the nurses' station or other surrounding bedspaces). Reducing the number of unnecessary alarms: Pre-implementation there were 600,000 monitor alarms per month in the ICU, which equated to 968 alarms per bed per day (one new monitor alarm every 90 second per bedspace). 95% of these alarms were not actioned. Post implementation we have now reduced this to 110,000 monitor alarms, which equates to 182 alarms per bed per day (one new monitor alarm every 450 seconds (7.5 min) per bedspace). We have managed to reduce the percentage of nonactionable alarms to approximately 60%. This equates to almost six million alarms less per year in our ICU. An independent health economic evaluation has been completed, demonstrating an expected large societal economic benefit of over $200,000 per annum. This is mainly obtained by a reduced negative impact on patients' long- term health and wellbeing, increased hospital efficiency and resource utilisation, and avoided costs of informal care for patients' families and friends acting as care givers post return to community. This evaluation indicates that the total costs associated with the ICU bedspace upgrade, including technological upgrades, design, and building costs, will be financially recovered in third and fourth year of operation. The findings of the project are relevant to ICUs in Queensland, nationally and worldwide, with many of the modules or solutions also applicable to other wards, such as excessive noise, number of alarms and suboptimal lighting.

Lessons Learnt

Key lessons include the importance of including patients and their families in the design of ICU bedspaces to ensure we understand their experience and problems as well as possible. Similarly, the importance of ensuring all clinical stakeholders have an opportunity to provide feedback and engage with the design process cannot be overstated. Challenging the status quo can be difficult for not only clinicians but also architects, designers and builders who are used to working within “minimum standards” and strict building codes.