SYNOPSIS

KEY POINT SUMMARY

OBJECTIVES

This systematic literature review examined a range of research publications focused on the environmental design of ICUs (2005-2020) and provided current and future evidence-based design and research priorities.

Intensive care unit built environments: A comprehensive literature review (2005–2020)

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Key Concepts/Context

ICUs have been extensively studied regarding the role of the built environment in issues of patient safety and infection control, patient-staff outcomes, and the interventional role of the physical environment. The results of this comprehensive literature review (2005-2020) demonstrate an increase in design of single-bed ICUs, increase in the engagement of families in the ICU experience, acknowledgement of improving caregiver well-being, performance through designing staff amenities, increased attention to the therapeutic role of exposure to nature and lighting, and increased pandemic concerns related to containment of the COVID-19 virus.

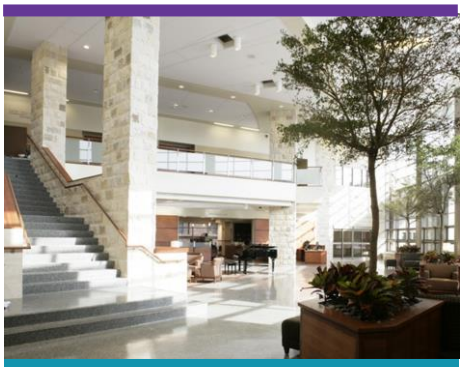
Methods

The research is focused on the systematic literature review of published, peer-reviewed quantitative and qualitative publications between 2005 – February 2021, using databases such as: JSTOR, Google Scholar, EBSCO, ScienceDirect, PsychINFO, MEDLINE, Ovid, ProQuest, PubMed, Web of Science, Science Digest, and NIH Public Access. Four steps were applied to consolidate the key words and reach the target articles:

1) The first set of key words was chosen to search publications that investigated patient and staff outcomes, such as infection control, stress, COVID-19, and respiratory disease.

2) The second set of key words investigated physical environment design such as ICU unit layout, therapeutic gardens, acuity adaptability, and nursing station design.

3) The third set of key words investigated related issues such as staff productivity, family-centered care, nature, views, and telemedicine.



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4) And the fourth set of key words investigated sustainable healthcare infrastructure and carbon neutrality.

135 sources were consolidated, and the publications were screened based on three types of sources: 1) empirical studies; 2) qualitative studies; and 3) theoretical publications. Non-peer-reviewed white articles, reports, guidelines, and books were excluded in the screening process. The final compendium was structured in nine categories that best represented the most pressing issues related to the built environment of ICUs.

Findings

Evaluation of databases resulted in the identification of 135 research studies that fit the inclusion criteria. The studies were classified into nine categories:

1) Studies that explored engagement with nature and outdoor views. Studies in this category were particularly concerned with discussing the impacts of exposure to nature and representation of nature in the inpatient ICUs on stress-reduction outcomes.

2) Studies that discussed understanding the implications of providing accommodations for the presence of families in the ICUs and their input on ICU design and amenities.

3) Physical layout, spatial configuration, and amenities of ICUs (e.g., nurse station design and ICU layout, travel distances, single vs. semi-private patient room designs, staff-patient line of sight, etc.).

4) Design considerations regarding mitigating environmental noise in ICUs and reducing the negative impacts of excessive noise on involuntary distractions and potential negative impacts on patients and staff health.

5) Considerations regarding utilization of natural and artificial lighting in ICU environments and the impacts of ambient lighting on patient outcomes.

6) Infection control and environmental consideration regarding patient safety in the ICUs.

7) Disaster mitigation response (including in the case of COVID-19 global pandemic) and design and construction of portable critical care field hospitals.

8) Ecological sustainability (i.e., reducing carbon emissions and biohazardous waste) and resiliency of ICUs.

9) Recent trends and the future of ICU designs in light of new technologies, designing for acuity adaptability, and the ICU of the future.

Limitations

The authors encouraged in-depth research on the health benefits of engagement with art, nature, multi-sensory stimuli, and biophilia and salutogenic designs that bring ecological sustainability concerns to the front. In addition, investigating the role of technological advances such as robotics and 'smart ICUs' are encouraged. They also discussed that the research focus on mitigating medical errors and improving the experiences of patients and caregivers in the ICUs will continue to grow.

The authors concur that fast-paced technological innovations require urgent research attention to shed light on the implications of technological advances for the design of future ICUs.

Design Implications

This comprehensive review of literature highlighted the healing impact of incorporating views of nature, outdoor views, and natural and artificial lighting, as well as the therapeutic impact of incorporating spaces for families in the design of ICUs. The literature also highlighted the general trend in acceptance of all-private-room ICUs and emphasized noise reduction strategies in the ICUs as an important environmental intervention that will help towards eliminating it as a stress source.

And Also...

The authors included information about all 135 final articles and the nine content categories in Tables 1 and 2.