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Evidence-Based Design of a Patient-Safe Environment

Evidence-based design (EBD) is the process of basing decisions about the built environment on credible research to achieve the best possible outcomes. Healthcare leaders around the world are incorporating design elements into the built environment of new or renovated facilities that have demonstrated positive outcomes.

Just as medicine has increasingly moved toward evidence-based medicine—in which clinical choices are informed by research—healthcare design is increasingly guided by rigorous research linking the physical environment of hospitals to patient and staff outcomes and is moving toward EBD.

Ulrich and Zimring found strong links between physical environment and patient/ staff outcomes in four areas:

Improved Overall Patient Safety

- By affecting airborne and contact transmission routes, EBD demonstrates has strong impact on hospitalacquired infection rates;
- By affecting the medication delivery systems—from pharmacy to the bedside— the number of medication errors can be reduced;
- By producing a reduced rate of patients falls, even if without a clear evidence for the independent effectiveness of environmental modifications programmes; and
- By improving patient confidentiality and privacy, which leads to better patient safety and risk reduction.
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- Overall Improvement in Healthcare Quality
- Single-bed rooms have several advantages over double-bed rooms and open bays, including lower nosocomial infection rates, fewer patient transfers and associated medical errors, less noise, better patient privacy, and improved patient confidentiality; and
- Reduction in length of stay.
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- Staff Stress and Fatigue Reduction
- Environmental measures have a positive impact on staff health and safety; and
- Better workplace design has positive effects on staff effectiveness and satisfaction as well as error reduction

Patient Stress Reduction

- Through noise reduction, better patient sleep is among the positive effects;
- Through improving wayfinding systems, patients and their families can better navigate the facility; and
- Reduced depression through adopting appropriate, bright lighting systems.
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- Joint Commission International and EBD

Joint Commission International (JCI) has long recognised that design is an essential component of creating an environment for safety and quality. The increase of research in the field of healthcare design has significantly improved our understanding of the relationship between design and safety and now has the potential to inform decisions about approaches to design that are clinically and financially effective and that promote safety and quality. EBD is used to create healthcare environments that are therapeutic, supportive of family involvement, efficient for staff performance, and restorative for workers under stress.

The growing evidence for EBD is compelling enough that it is incumbent upon healthcare organisations to consider such evidence as they address the physical design of new construction or major renovation of facilities. It is critical that healthcare leaders become educated on the current research, applicable accreditation standards, new technology, and related industry practices and standards. In addition, during the planning and design phases, the health design process should also include methods for re-engineering current processes to achieve measurable improvements to quality and safety. Such re-engineering will prevent replication of ineffective processes in the new design.

Organisational Preparation

A successful design process should begin with the identification of the organisation's goals and needs. This first step of creating goals—also known as creating guiding principles— should be accomplished once the leadership team for the project has taken the following steps:

- **Evaluating What the Organisation Wants to Achieve in a New or Renovated Facility.** This can be accomplished by identifying issues that hinder safety and improved patient outcomes in the current facility. Often this information is collected through sessions that invite many stakeholders together to discuss their perspectives. The stakeholder groups should include physicians, employees, past patients and patient families, regulatory representatives, and key vendors such as technology vendors or major suppliers.

- **Evaluating Current Research.** Once information has been gathered regarding the current facility and what stakeholders would like to have in a future facility, leadership needs to be educated on the current research available to guide facility planning. JCI recommends that both EBD and standards-based design are important to consider.
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After that preparation, the project leadership team can develop the guiding principles for the construction or renovation project. The principles should be clearly defined by asking difficult questions, including the following:

- If patient and family involvement is a strategic goal, does the design allow space for such participation?
- If high performance in infection control is a goal, is there a process for assessing the extensive evidence related to material selection, such as air quality or waste management?
- Has the organisation reached a plateau in its progress towards eliminating falls, infections, or similar safety issues?
- Is there an opportunity to reduce staff and patient stress or risks through improved flow?
- How far does a patient have to be moved for particular diagnostic or treatment options and how many minutes does the transport take?

The design planning process can identify safety goals, such as reduction of infections, falls, or other adverse events, as well as build improvement into the design of the facility by making decisions informed by health design evidence.

To optimise opportunities for improvement through EBD, an organisation should assess its current compliance with JCI standards and the International Patient Safety Goals. Using JCI requirements helps organisations develop a knowledge framework that leads the assessment process, priority identification, and stakeholders' involvement.

JCI standards do not specify what a safe environment entails. Instead, the standards are written in a manner that gives organisations latitude to determine the risks by developing programmes that are best for them and that provide a safer environment for patients and caregivers. For example, what works for a psychiatric unit might not work for an emergency department housing a patient at risk for suicide.

JCI standards on Facility Management and Safety (FMS) clearly address the design considerations that impact safety and quality, but other standards and the International Patient Safety Goals should also guide design decisions. For example, Medication Management and Use (MMU) standards related to the preparation, storage and security of medications can be addressed through design. Hand hygiene, reduced falls, and reduced suicide risks are clear example of opportunities for improvement through design.

The design planning process can identify safety goals, such as reduction of infections and falls or other, and build improvement into the design of the facility by making decisions informed by health design evidence.

Setting Priorities for Incorporating EBD

In an effective design process, it is critical to identify potential risks proactively and to use a consistent process when setting long-term and short-term priorities. JCI encourages identifying high-risk and high-volume issues for improvement. Specific instances depend on the particular setting, but they include previously mentioned examples—falls, infections, and suicide, to name three—in which design can be a factor in developing a complete and effective solution. There might also be "quick fixes" that can be immediately addressed at low cost, such as improved lighting and installing hand-sanitation dispensers. Other priorities might be issues linked to strategic goals for moving the hospital forward technologically in the next three to five years, such using technologies for automating the medication delivery process.

The resources available for constructing or renovating facilities are often limited, so the return on investments is an important consideration in making design decisions. The evidence for return on investment for different design strategies is growing and there is guidance for many key design issues.

The Process of Incorporating EBD

The process of incorporating EBD includes analysis, synthesis, and application. Analysis starts with gathering information from current operations to identify opportunities for improving safety and quality through better design. Tools like failure mode and effects analysis (FMEA), root cause analysis (RCA), lean management, and cause and effect diagrams can be used. Another effective tool is the EBD review checklist developed by the MHS, which is based on a set of questions for identifying main problems and a list of principles with attached EBD responses and appropriate features.

Synthesis includes grouping data to find information relevant for setting priorities and decision making. Information must be organised and assessed with honesty, candor, and transparency. This is best done when individuals at all levels of the organisation, as well as patients and their families, are engaged in the process. Physicians and staff should be interviewed so that their point of view is incorporated by the design team; this point of view is critical for the success of the project.

Finally, the application portion of the process empowers work groups and organisational leaders to decide which information is most relevant to their particular organisation and how it should be applied to the design scheme. The results of these steps are often referred to as elements or features of the facility design. The elements are assigned to a guiding principle or goal as a means to accomplish the principle. Understanding systems is very important at this point to evaluate how one element might impact other aspects of the organisation, what trade-offs may be necessary to accomplish the principles, and whether the impacts, costs, and trade-offs are acceptable.

Conclusion

Health design is a relatively new field and we are just beginning to see its potential. In the foreseeable future, the science of physical design that supports safe, highquality healthcare delivery will be state of the art. The sharing of related evidence, returns on investments, and best practices will advance. Increasingly we will come to expect more from design; thus we will achieve greater efficiency and healthier and safer environment for patients and staff.

The potential to improve healthcare quality and safety through an informed EBD process is real and significant. EBD is consistent with JCI's emphasis on making informed decisions about safety and quality of care. Further, JCI accreditation standards and EBD are consistent in both their goals and preferred processes. An organisation seeking to improve its qualityand accreditation-related efforts should strongly consider both EBD and accreditation tools and requirements as critical supports in planning for safe design.

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