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Patient Rooms Transition ‘Contemporary’ makes way for the ‘future’

Recent advances in lighting research, technology and control systems are creating new opportunities to use lighting in healthcare facilities to improve everyday experiences for patients, visitors and staff. Healthcare facilities design has undergone several transitions over the past 50 years, including the incorporation of more technology, the shift from an institutional appearance to a residential appearance, and the inclusion of biophilic elements. The Facilities Guidelines Institute defines the term environment of care as “those physical environment features in a health care facility that are created, structured, and maintained to support and enhance the delivery of health care”¹. Many attributes of the environment of care in existing hospital patient rooms, especially those built prior to 1990, reflect a focus on maximizing the efficiency of delivering medical care, sometimes without much attention to the impact of design on the experience of patients and guests.

Patient rooms in these older hospitals became a testament to technology and efficiency, sometimes resulting in spaces that were considered dehumanized and institutional. The lighting systems used during this period (which we refer to as “traditional environment of care” lighting, or TEC lighting) exhibit this focus on efficiency with simple luminaires

and controls, often failing to address today’s latest research on how light affects sleep, mood or everyday experience. Patient room lighting typically consists of a few fluorescent luminaires—sometimes just a single multi-functional luminaire—with simple on-off switching controls and no dimming capability.

SINCE THE MID-1980s, hospital design has moved into the contemporary environment of care with a recognition that, while the physical settings in a hospital must support effective delivery of care, the patient environment can be a tool in the healing process. Contemporary environment of care (CEC) lighting systems reflect this desire for more humanized spaces, often having separately controlled zones of luminaires associated with differing tasks and areas within the patient room, occasionally with dimming capabilities for at least one of the zones. CEC lighting systems sometimes include additional lighting for nighttime navigation, such as built-in wall nightlights. In both TEC and CEC lighting systems, the color characteristics of the lighting are static and limited by lamp selection. In recent years, LED sources have begun to replace the fluorescent and incandescent sources in these lighting systems.

The convergence of research, emphasizes on patient-centered



Varying the intensity and the spectrum of light provided is the next frontier

and evidence-based design, and advanced lighting systems is enabling a transition into what might be called the future environment of care (FEC). FEC focuses on the potential therapeutic and safety impacts of hospital design, emphasizing a positive experience for all occupants. FEC lighting supports a wider range of tasks and needs, providing the ability to independently vary the intensity and the spectrum of light provided throughout the patient room. This flexibility makes it easier to address nighttime navigation needs, enable control that is more user-friendly, and provide opportunities to explore a new set of research questions about the effects of lighting on patients, guests and staff. Roger Ulrich’s theory of supportive healthcare design² proposed three components for healthcare environments to promote wellness and better support dealing with patient stress:

1. A sense of control with respect to physical-social surroundings
 2. Access to social support
 3. Access to positive distractions in physical surroundings
- Tunable lighting systems offer new possibilities for providing a greater sense of control over the physical patient-room environment, and for providing positive distractions for patients and guests—two of the three elements of Ulrich’s theory.

PACIFIC NORTHWEST NATIONAL LABORATORY has been focused both on patient-room lighting and tunable lighting systems in healthcare environments, beginning with a survey of nurses in 2015. Quantitative and qualitative analyses of the nurse responses³ made it clear that for nurses working in TEC and CEC medical-surgical patient rooms, having better control of the lighting was a top priority. Past work also looked at tunable lighting in a behavioral health unit⁴, designed by the architect to meet circadian and biophilic design criteria. We are currently engaged in detailed field explorations of tunable lighting installations in a neonatal intensive care unit and in a behavioral health unit, with surveys revealing that staff generally view tunable lighting systems as an improvement, and with control data from these lighting systems providing unique insight into how these systems are being used by occupants, down to individual button presses. Additionally, we have been collaborating with the SimTigrate Design Lab at Georgia Tech to conduct several experiments assessing tunable lighting in a patient room mock-up there. Those experiments focus on exploring the differences between TEC, CEC and FEC lighting systems. This research includes answering such questions as whether introducing colored lighting onto a wall affects patient and nurse perception; whether all luminaires in the room need to match in CCT, or



TEC patient room showing a multi-function recessed luminaire above the bed. For many years, this was the only luminaire in the room. A later upgrade added the wall sconce luminaire for the guest area.



CEC patient room showing recessed round downlight luminaires for general room lighting, recessed linear luminaires over the bed for examinations, a wall-mounted linear luminaire for patient reading, and a wall sconce luminaire in the guest area.

Photos: Pacific Northwest National Laboratory

whether it's acceptable to intentionally vary CCT in different zones; how bright "too bright" is; and how blue "too blue" is.

Unlike what we found in our nurse surveys, we hope that in the patient room of the future, a nurse will not need to hold a flashlight to navigate around a patient room; will not have trouble seeing at the end of the bed; and will not experience visual difficulty finding a vein when starting an IV. The lighting will support the circadian rhythms of patient and caregivers, while also providing cues for wayfinding and cues to time of day. Lighting in future patient rooms will provide cleaning staff with the amount and distribution of light for thorough cleaning and disinfection. Data collected by the lighting system will be used to optimize the design of the system for caregivers and patients, and data will also be shared with electronic medical records systems and other building systems.

As we look to the future, we fully expect that healthcare designers and providers will continue to prioritize the delivery of better environments of care, and that advances in building technology will play an important part in those environments. We also expect to see more research providing a better understanding of how light can play a role in improving our wellbeing. Will innovations in patient room lighting help drive changes in healthcare design, or lag behind the design trends and scramble to catch up?

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