Special event lighting paints the facade of The Children’s Hospital of Philadelphia with color, designed by The Lighting Practice.

The fast-expanding use of LEDs in the past decade has posed challenges for lighting design specialists to specify systems for hospitals that are sometimes several years from completion.

By Vilma Barr
OF ALL THE PRODUCTS needed to build new healthcare facilities or update existing ones, none has undergone the same changes in selection criteria that lighting has. While components like HVAC systems and building envelopes have been improved upon incrementally over time, lighting has been evolved by the growing use of LEDs (light-emitting diodes). This shift has changed the way architects, lighting designers, and healthcare facility decision-makers approach this specific piece of the building puzzle, evaluating the cost of lighting, buildings, and the quality of light that’s emitted and its effects on patients and staff.

Shifting from traditional fluorescent lighting to LED illumination in healthcare facilities indicate that LEDs offer an effective, versatile, and lasting alternative to traditional lighting solutions. Whether it’s a hospital, medical office, or a doctor’s office, LED lighting provides better visibility, a cooler color temperature, and lower energy consumption.

Above: For the University of Michigan’s new 12-story C.S. Mott Children’s Hospital & Von Voigtlander Women’s Hospital in Ann Arbor, Mich., color and white lighting integrates with the interior architecture to create a serene visual environment on the entry level. Designed by The Lighting Practice. Left: At Wayne State U., the St. John’s Mercy Medical Center in St. Louis, Mo., illuminated with LED lighting to create a relaxing experience for visitors. Designed by Francis Cauffman Architects. Opposite: An extensive update and expansion of the 148-year-old St. Michael’s Medical Center created a Breast Cancer Center where soft lighting from the circular overhead fixtures creates a visually balanced environment. Designed by Francis Cauffman Architects.
strategy for energy savings with fixtures rated to operate for 50,000 or more hours. The study also states that the visual quality of LED light is maintained over time as the color of the light output is measured by the color rendering index, or CRI, remains equal to that of the lamp when new. Other benefits include reduced maintenance because of the longer life of LEDs and disposal costs, and smaller physical size, offering flexibility in their use should the activities in the illuminated area be changed. LEDs can be dimmed through a control system that is installed with the fixtures. If more or less light output is required, once priced at a premium, supply is catching up with demand and the cost differential is narrowing.
With improvements to existing products and new LED options introduced regularly, how do lighting design consultants evaluate products to specify now for a hospital that may not be operational for years?

Growing at light speed

Just a few years ago, lighting specifications were based primarily on proven designs, says Holly Osek, senior associate at Fanchin Costantino Architects (Philadelphia). "Now, we review with healthcare facility managers each new product option under consideration, to evaluate not only energy-saving performance and light-output benefits but also how to integrate advanced technologies into the maintenance staff's established procedures," she says.

Jared Weimer, associate and lighting designer, and Heather Kline, senior lighting designer and project manager, at The Lighting Practice (Philadelphia) agree that hospitals place high priority on the maintainability and functionality of their lighting systems. And issues related to cost that once were a factor have diminished. "Four years ago, for a compact fluorescent fixture that cost $10, the LED equivalent was $40. Now, the cost for the same CFL might have risen to $15 or $20, while the LED is $25 and is dimmable. A CFL with a dimming ballast brings the cost up to nearly that of the LED," Weimer says.

And while there are fewer barriers to entry for the LED market, the product isn’t necessarily always the right choice. "We’ve gone into an initial planning meeting with a client who starts the conversation by saying, ‘We want LEDs everywhere. They understand that they can expect reduced energy charges and lower maintenance costs.‘ Weimer says. "But not all areas are prime candidates for LEDs, and some traditional technologies can still compete side-by-side. Studies show that the rated life of new fluorescent is more than 50,000 hours, making them viable for circulation and support spaces," he says.

Above: Colors, materials, and lighting can work together to soften the clinical nature of a healthcare facility. This nurses' station was part of the recent renovation at the Portland Shriners’ Hospital for Children. Designed by Carroll. Below: Circular ambient fixtures emphasize the playful geometry in the waiting area of the pediatric hybrid unit at Virtua Memorial Hospital in Gibbstown, N.J., part of a $95 million expansion project. Designed by Fanchin Costantino Architects.
Both Widmer and Kinney have found that the best way to plan lighting is to be aware of manufacturers’ detailed descriptions of the fixture or lamp and their rated performance, particularly what’s applicable three to four years down the road when the product may need to be reordered for replacement.

According to Kinney, detailed performance specifications will include the fixture’s initial and/or maintained lumens output, CRI, testing verification, beamform, color temperature, voltage, power, and warranty at the time of installation. “Between the time of specification and purchase of the luminaries, advancements in technology may mean the installed fixture is slightly different,” Kinney says. “The performance must still be the same, but the power draw will typically decrease.” Because of rapid advancements in lighting technology, future versions of the same lighting equipment could produce a comparable light output using less energy.

At the outset of a project, Widmer says that healthcare administrators want to learn the parameters of the financial commitments for lighting. Responses to three of the most frequently asked questions include:

- The lighting/electrical budget is typically about 8-10 percent of the overall construction budget and the lighting fixtures are about 1-1.5 percent of the overall budget.
- Lighting equipment is typically between 3 and 10 percent of construction cost for hospitals.
Complete lighting design services—design, specification, coordinating and controls, construction documentation and detail, construction administration—can range from 0.25-0.5 percent of total construction costs.

Lighting and human health
Beyond functionality and performance, Michael White, senior lighting designer at Schuler Shook Global, says lighting design can play a role in human health. “In addition to designing for the visual system, we must also develop lighting solutions that address the needs of the circadian system,” he says. “While the implications of this expansion are broad, the current focus is on patients in long-term care, who typically spend their days indoors under relatively low light levels.”

The best approach, White suggests, is to manage the 24-hour lighted environment to deliver stimulus during the day and darkness at night to restore and maintain a stable circadian rhythm. “To deliver the needed environment we must control the intensity, duration, and color of the light, while also meeting the classic requirements of illumination, sustainability, maintenance issues, and budget.”

White also believes that dimmable LED downlights will become the standard of the future as output increases and the cost drops. White cites improvements in fluorescent linear light sources with ratings at more than 80,000 hours for the products coming onto the market. And hospital administrators are likely to take notice, looking to provide patients more control over their environment.

“When we were pricing out the lighting options for the Golisano Children’s Hospital at the University of Rochester, we were advised that they were willing to invest more in patient space lighting because the dimming control capability of LEDs adds to a patient’s feeling of comfort,” says White.

Quality of light and color go a long way, too, White adds. “An idea to consider is a day room space with enough brightness to be measured by the circadian system. There’s great promise with LED sourcing—more lumens per-watt to provide the light levels suggested without increasing the cost. When designing a new facility, dimmable lighting is an important consideration to answer the need for more light,” says White.

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**Evaluation-based design**

For New York Presbyterian Hospital (NY-P) in New York, HDR Inc. is providing architectural and design services, including lighting design, for eight buildings in its system. "The facilities staff at NY-P recognized the need to be proactive to resolve current lighting issues and design for the future," says Karen Murphy, lighting designer for HDR (Princeton, N.J.). To meet this objective, she embarked on a tour of all five campuses of NY-P. Accompanied by NY-P project managers, operations directors, and electrical managers, she spoke with patients, medical staff, visitors, and housekeeping personnel. She observed lighting solutions that worked and others that were in need of improvement for standard room types, specialty areas, and public areas. Murphy and her team also created a “lighting show” to exhibit options for the three use categories. They gathered more than 200 futures, grouped them by application, and created evaluation forms. Over a two-day period, staff from all five campuses visited the Morgan Stanley Children’s Hospital, where laboratory stations were set up with operating fixtures. The lighting designers demonstrated products on display and explained their benefits for potential NY-P use.

The design team instituted a system to evaluate the responses. “Electrical staff members were partial to ease of access and replacement,” Murphy reports. “Aesthetics ranked high with the medical and support staff. We assigned more weight for the final selection of fixtures to the electrical staff. Medical staff were given preference in their responses to the color temperature and color rendering for the final lamp selection as well as the examination lights.” Murphy says.

Included in the lighting guidelines developed for NY-P are specifications to be used on all projects to ensure uniform training for the technical and maintenance staff, covering controls and servicing of new illumination systems.