The health care debate is front and center as the U.S. wrestles with the expectations of medical availability and affordability in a publicly regulated, but capitalistic environment. What is the right balance between public good and enlightened self-interest? It may seem that the lighting community has no role to play, but our product and lighting design choices do impact patient care while reflecting facility goals.

Indeed, a more sustainable, tranquil and aesthetically pleasing physical environment can benefit all stakeholders in the health care sector—from patients and their families, to staff and hospital management.

So what are the hot buttons for health care owners? Although each facility has a different culture and target clientele, there are at least four significant across-the-board drivers that design decisions can help address: attracting patients; retaining staff in a declining work pool; improving patient outcomes; and improving financial performance.

Hospitals and medical networks compete for consumers, particularly in metropolitan areas. In our highly mobile society, instead of staying local, many will board a plane to a destination hospital such as the Mayo Clinic. Medical tourism (catering to foreign patients) can be a significant income boost to a facility. South Florida facilities, in particular, are focusing efforts on the Caribbean and Latin America. According to Deloitte & Touche, in 2008 approximately 400,000 people from foreign countries spent nearly $5 billion in U.S. facilities, and that number is expected to double in the next three years. An added bonus to the bottom line is that a significant amount of medical tourists pay for services in cash.

Just as patients are mobile, so is medical staff. Quality of environment and ease of providing patient comfort are both factors for attracting and retaining staff. Amenities, such as improved cafeteria facilities with ample access to daylight, address a staff's need to have areas of respite away from the stresses of the job. Patient rooms where the majority of the lighting is controllable from the patient bed reduce “nuisance” nurse calls, as well as giving patients a sense of control when everything else can feel out of their control.

Health care is dominating the news these days, but the hot-button issues extend beyond cost and coverage to the facilities, themselves.

BY LESLIE M. NORTH
Improving patient outcomes is all about helping people while improving profit. Speed of recovery equates to faster turnaround and conservation of resources. Design solutions that limit nosocomial infections (those contracted while in the hospital, such as MRSA) or reduce patient falls obviously aid recovery (or at least prevent it from being prolonged) but they also limit hospital liability. And anything which reduces liability and insurance premiums has strong financial incentive to implement.

What follows is a look at a number of ways healthcare facilities—aided by good lighting—can better serve patients and staff, both functionally and aesthetically.

1. MAKING A GRAND ENTRANCE

The front door of any space says a lot about the facility’s culture. Impressions of comfort, welcome, permanence, excellence and technical advancement all can be communicated upon first entering a facility. The idea is to create a lobby with immediate visual impact. This not only meets comfort expectations of patients, but also acts as a marketing cue to visitors who may have medical needs in the future. Many hospitals are opting for lobbies and amenities reflective of upscale hotels. Ball Memorial Hospital in Muncie, IN, for one, took the grand gesture approach to its new front entry. The design concept is that of a welcoming safe beacon in the night.

Another example of using lobby lighting design to help communicate philosophy is Advocate Lutheran General Hospital in Park Ridge, IL. Overall, the design is intended to convey cleanliness, calm and unassuming competence. A sculptural flock of doves is indirectly illuminated from the window wall which also provides downlight at the lounge seating. Respite and play are introduced via a color-changing LED interactive wall which engages occupants, particularly younger visitors. Its dormant state, a slow spectrum progression which transitions from bottom to top, provides a meditative view in the drop off/pickup waiting area. Incorporation of occupancy sensors within some of the niches allows for inquisitive discovery. When a hand is placed inside a niche, the occupancy sensor triggers the color-changing program to initiate a ripple-effect pattern originating with the niche triggered. Triggering of two niches results in an interference ripple pattern. With lack of triggering activity, the pattern eventually settles back to the dormant state.
2. HOSPITALITY IMAGE/INDUSTRIAL QUALITY

With a growing desire to provide a hotel-like ambience, there is a tendency by the uninhibited to simply install hospitality products into a hospital project. But hospitals are technically complex environments subject to rugged use. Patient room luminaires, particularly wall-mounted ones, can expect a lot of physical abuse such as impact from various equipment, most commonly IV poles. Head-wall luminaires with a flip-down exam feature should be designed to fall under their own weight, as staff is unlikely to move them into position delicately. And the most common misuse of a wall luminaire is to aid a patient in rising out of the bed.

Cleanliness and infection-control requirements are becoming a paramount concern. Most facilities now have one or more full-time staff dedicated to identifying, preventing and correcting potential contributors to secondary infections. Use of fully sealed-and-gasketed and cleanroom-rated luminaires to prevent air-borne contaminants with antimicrobial paints and lenses to limit germ growth is turning into common practice. This is particularly true in areas of greater patient susceptibility, such as surgery suites and ICU. But antimicrobial finishes do not prevent germs from multiplying in a dust medium. Construction detailing and luminaire selection need to promote ease of cleaning with easy wipe-down (think lens prisms facing inward, flat surface outward) and avoid nooks or planes which collect dust.

Lighting designers also need to be aware of electrical issues that impact a hospital. Surgical, ICU and telemetry spaces may require electromagnetic and radio frequency interference (EMI/RFI) shielding in order to limit electrical interference issues. The problem with EMI/RFI issues is that they can be difficult to pin down and replicate. The U.S.
Food and Drug Administration (FDA) collects reports of problems via its MedWatch program. The FDA also worked with the Association for the Advancement of Medical Instrumentation (AAMI) to provide guidance on medical device electromagnetic compatibility. But since fluorescent lamps run on electronic ballasts and are electromagnetic emitters not receivers, what can a designer rely on as an insurance policy that his design won’t cause a problem?

Until a health care-specific standard is created and readily adopted, the default standard being used is Military Specification 461 (latest version is Mil Spec 461F) which focuses on military transportation craft such as submarines. Of the many levels of testing within Mil Spec 461, a requirement to meet CE-102-1 for conducted emissions and RE-102-4 for radiated emissions appears to be the most applicable to hospital structures without being ridiculously stringent.

Magnetic Resonance Imaging (MRI) spaces are another area where an understanding of electrical properties is useful. An MRI machine is essentially a huge magnet and therefore MRI spaces require non-magnetic construction. This is typically thought of as non-ferrous construction; however, it also means use of non-magnetic electrical distribution, which in essence means direct current (DC) since alternating current (AC) produces magnetic fields. Although a facility may install all-aluminum housing construction, if it uses a fluorescent or compact fluorescent lamp, there will be problems. Many facilities are looking toward LED lighting solutions for MRI spaces since non-ferrous and DC distribution is a natural fit to many LED systems.

In addition to surgery and MRI spaces, there are many other specialty requirements for different use spaces. Most of these criteria can be found in ANSI/IESNA RP-29-06, “Lighting for Hospitals and Health Care Facilities” and the AIA “Guidelines for Design and Construction of Health Care Facilities,” the 2010 version of which is anticipated this January/February.

3. DO NO HARM

The discovery of intrinsically photosensitive retinal ganglion cells (ipRGCs) and our ongoing understanding of the human circadian cycle as it relates to human health is cause for excitement in both the lighting and medical communities. Since ipRGCs are particularly responsive to blue-shifted light, the dumbed-down recipe of lighting for good human health (that is reinforcing the body’s natural healing chemistry) amounts to high-intensity white light with a strong blue component during the day and a dark non-blue component at night. This has led to the use of amber (non-blue) night lights. Brightness promotes alertness while darkness facilitates quality sleep; coupled together in a regular diurnal rhythm, they allow the body’s complex chemistry to function at its best. This is
borne out by studies showing that significant access to daylight in patient rooms results in a lower pain experience, fewer deaths and a faster recovery period.

But the hospital population is not limited to patients and that leads to an ethical dilemma yet to be resolved. A 24/7 facility needs to be concerned with staff alertness. Shift work errors across industries are statistically higher during the night shift. This can be mitigated by increasing staff alertness by establishing brightly illuminated areas away from patients. But by imitating day-like conditions during the night in order to provide safer care for the patient, we may be endangering the long-term health of the staff. An increased incidence of breast cancer in night-shift nurses compared to day-shift nurses is one finding cited to emphasize the hazards of exposure to light at night. In order to positively address the health of one population, must we sacrifice the other?

Do we need to rethink how we design? General functional lighting is traditionally thought of as use-related independent of time-of-day used. Advances in technology are giving designers new tools with which to experiment with variable color components and time-of-day controls, but with new features come greater requirements for a deeper understanding of space use, occupant needs and commissioned programming. So in our zeal to do well, it would be wise to step back and evaluate whether in fact our designs are doing no harm.

4. MAKING THE CASE

Evidence-based design is about applying the scientific method to design questions with the anticipated results being measurable relative to health care drivers. Faster recovery times, lower staff turnover rates, higher Press Ganey patient satisfaction scores, fewer patient falls and pain medication requirements are all quantifiable results which can be compared before and after construction. Unlike research experiments in the laboratory, real-world situations designed by practitioners are impossible to get down to a single isolated variable; therefore, evidence-based design conclusions, although reasonable, can suffer from a lack of vigilance in collecting data.

We can make some practical informed decisions from the data, and The Center for Health Design via The Pebble Project has aided in collecting and publishing examples that in turn influence the industry. Some of the results that impact lighting design are:

- **Move to single patient room design.** By moving away from multiple patient rooms, designers have more flexibility with the overall lighting ambient without needing to be concerned with patient-to-patient light trespass.
- **Incorporation of family-area spaces within the patient room.** This means that there are three distinct occupant groups with three distinct lighting and control needs within the patient room: patient, staff and family.
- **Providing access to nature.** This is an argument for views, not just daylight.
- **Installing bariatric ceiling lifts.** This reduces staff injuries, but can be a coordination issue with ceiling luminaire placement.
- **Providing access to sunlight (daylight).** For example, bipolar depressed inpatients in east-facing rooms stayed an average of 5.67 days less than those in west-facing rooms and CICU female patients stayed an average of one day less when housed in a sunny room.
- **Provide areas of respite for staff.** An invitation for creative solutions.

As stated earlier, if a design solution can be shown to positively affect drivers, then funding of that solution is much easier. In an economy of doing more with less, each investment must show value.

**DIAGNOSIS**

So what does the future hold? My short answer is hope. Hope for energy-effective solutions that function. Hope for functional designs that inspire. Hope for financing of those designs based on empirical data. But most of all, hope for spaces that facilitate optimal and compassionate healing.

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