

## Healthy design

**Stress and noise in cramped hospitals can make recovery slow for bed-bound patients. High turnover of nurses has also been blamed on the chaotic work environments in most hospitals. Michael McCarthy investigates how design can make hospital stays a far better experience.**

In the late 1980s, Craig Zimring's mother was hospitalised in a prestigious hospital, where she was assigned to a room with another seriously ill patient.

"She was in a great deal of pain as was the woman sharing her room", Zimring recalls, "and every time she fell asleep she was awakened by roommate calling out" or by visitors or by staff coming in and out of the room. The hospital was also noisy, Zimring says, and the nursing station was chaotic: crowded with nurses talking, doctors charting, and "flocks of medical students".

"We liked the quality of care we got, we liked the nurses, and we liked the doctors", says Zimring, now a professor of architecture and psychology at the Georgia Institute of Technology College of Architecture in Atlanta, Georgia, USA. "But it was very clear that the quality of care that my mother got was in spite of the physical setting rather than because of it."

For a young psychologist in the field of environmental psychology, a field which studies how our surroundings affect our behaviour and wellbeing, it was a "transformative experience", says Zimring.

In the report due out this August, entitled *The Role of the Physical Environment in the Hospital of the 21st Century: A Once-in-a-Lifetime Opportunity*, Zimring and Roger Ulrich, also a psychologist and a professor of architecture at Texas A&M University, argue that there are now 600 well done studies that show hospital design can significantly influence medical outcomes. The full report will be posted on the websites of the Center for Health Design ([www.healthdesign.org](http://www.healthdesign.org)) and the Robert Wood Johnson Foundation ([www.rwjf.org](http://www.rwjf.org)).

Zimring and Ulrich contend that most hospitals today are noisy, cheerless places that patients find cold and frightening. In addition, crowded, noisy, poorly thought out nursing stations and

other staff workspaces add to staff stress and increase the risk of medical errors, which cause an estimated 98 000 deaths in the USA alone. "Hospitals are unnecessarily stressful and dangerous places", Zimring says.

Simply finding your way around a hospital can be bewildering, Zimring points out. In a study he conducted in a 300-bed hospital in Atlanta he found the staff spent 4500 hours a year helping patients and visitors find their way. He calculated that staff time lost giving directions instead of doing their regular jobs cost the hospital US\$220 000 a year, more than what would be needed put up signs, maps, and information kiosks so people could find their own way.

Once admitted, there is a good chance you will be assigned to a room with other patients where you will have little privacy, where your sleep will be disturbed repeatedly through the night, and where you will have an increased risk of acquiring a nosocomial infection

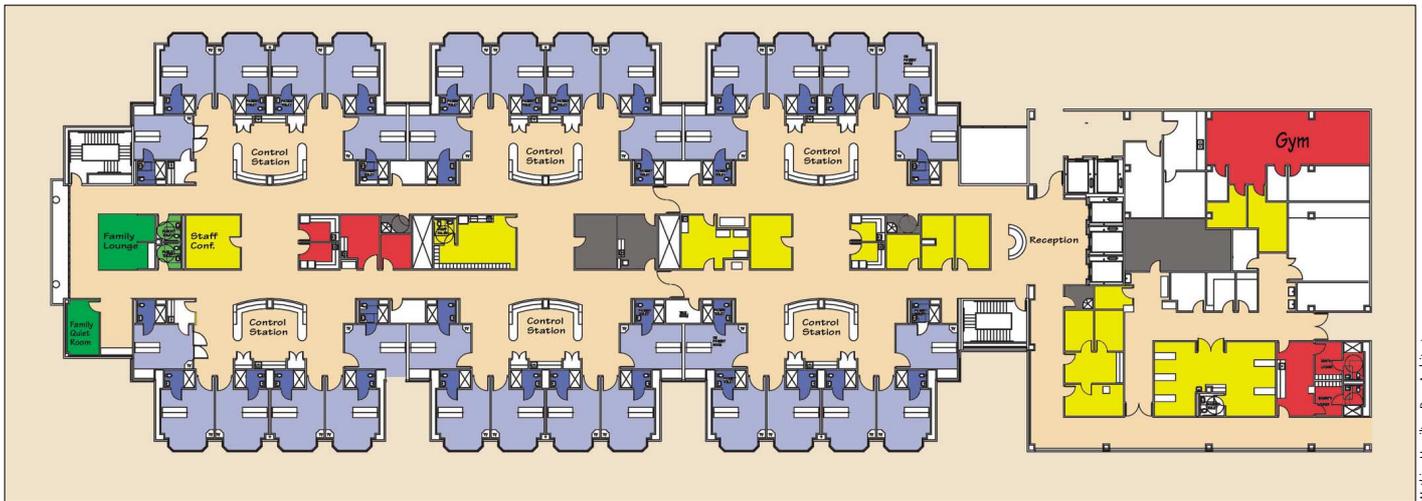
or be given the wrong medication, Zimring says.

It will also likely be noisy because sounds from the nursing station, alarms, overhead pages, and rattling supply carts echo down the halls. The racket can be terrific. A study at the prestigious Midwestern medical centre found the noise level at a bedside near a nursing station during the 7 am shift change hit 113 decibels (dB), the equivalent noise level generated by a jackhammer. A portable X-ray machine generates 92 dB, the equivalent of the noise of a truck roaring past you at 50 miles an hour. Background noise levels in a hospital typically run between 65–80 dB with peaks hitting 85–90 dB. These levels, says Ulrich, are "ludicrously higher" than the 35 dB background level recommended by the WHO guidelines for hospital bedrooms.

You might get some quiet if you moved down the hall away from the nursing station, but once there, the chances are you are likely to see less of



Design experts claim single-patient rooms would have a substantial impact on hospital outcomes



Watkins Hamilton Ross Architects

Decentralisation of work stations, as shown in this floor plan, helps nurses interact more closely with patients

your nurse. Because most hospital floors are organised around a central nursing station where charts, orders, medications, and often supplies are concentrated in one place, nurses spend most of their time away walking up and down the halls “hunting and gathering” says Ann Hendrich, vice president of clinical excellence for Ascension Health in St Louis, Montana, the largest non-profit health system in the USA. Hendrich has done time-motion studies of health-care workers and, like Zimring and Ulrich, is an advocate of evidence-based design. “Nurses travel miles a day in search of the next bit of stuff they need for care”, she says. In one study, Hendrich and her colleagues used video cameras to track how nurses spent their day and found that on average nurses spent only about 30–40 minutes of their shifts actually giving care at the bedside.

The noise, the chaotic work environment, and the lack of patient contact, all contribute to the high nurse turnover rates that plague US hospitals, says Leonard Berry, a professor of marketing at Texas A&M University in College Station, Texas who studies health care as a service industry. “We don’t have a nursing shortage, we have a shortage of nurses willing to work in hospitals”, Berry says.

The one design improvement that would have the greatest impact on hospital outcomes, Zimring and Ulrich say, would be replacing multi-patient rooms with single ones. Patients in single rooms are more comfortable, sleep

better, and contract fewer nosocomial infections. They also are less likely to fall and injure themselves in part because family and friends spend more time with patients in private rooms and therefore are around to assist them getting in and out of bed. The evidence for single rooms is so strong, argues Zimring, “that we can now convincingly say that we need not build anything but single-room hospitals in the USA ever again”.

The evidence also supports making patient rooms capable of handling more severe cases, say Ulrich and Zimring. Such “variable acuity rooms” are, for example, equipped so ventilators and other critical-care equipment can be brought in to tide a patient over through a crisis. Variable acuity rooms greatly reduce the need for transfers, during which a great many medical errors occur. “When transfers occur lots and lots of things go wrong”, says Ulrich.

Decentralised floor plans that allow nurses work from stations placed closer to their patients have also been shown to improve care and staff satisfaction. Nurses are able to spend more time caring for patients and are able to respond more quickly when patients call for help.

Research shows that even little touches can have a substantial impact, Ulrich says. Patients, for example, feel and do better if the hospital offers pleasant distractions such as soothing artwork on the walls, windows that offer views of nature, and places to visit such as gardens and lounges.

The additional cost of such design changes are well worth the money, says Derek Parker, an architect and director of the firm Anshen&Allen, and a member of the Center for Health Design’s board of directors. Parker calculates that building a 300-bed hospital with larger, variable-acuity single rooms, decentralised nursing stations, and other elements recommended by proponents of evidence-based design would add \$12 million to the \$240 million that such a facility typically costs to build in the USA today—an increase of roughly 5%. A sum that “would make any CEO nervous”, Parker says, but one that can be recouped in the first year by improved staff performance and the reduction of expenses due to such things as patient falls, which typically cost \$10 000 each, patient transfers, which typically cost \$500–\$700 each, as well as hospital-acquired infections and medical errors. In addition, revenues are likely to climb as new patients are drawn to the attractive new facility. The benefits are so great, Parker concludes, that hospitals that don’t adopt evidence-based design will not be competitive.

Through thoughtful design, hospitals can be made both more pleasant and safer for both patients and staff, says Ulrich. “We not talking about building the Ritz Carlton”, he says, “We’re talking about smarter design based on evidence. We’re not just talking about buildings that look nice or are posh but buildings that are really more effective.”

Michael McCarthy