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SAFETY BY DESIGN

It takes more than competent and caring physicians, nurses and medical staff to prevent medical errors. At St. Joseph's Hospital in Wisconsin, patient safety was built into the design itself.

Story by Kevin B. O'Reilly, Photos by Gallie Lipkin

"IT MAY NOT SEEM LIKE IT, BUT WE'RE actually pretty busy today," said Mike Murphy, RN, during a recent tour of St. Joseph's Hospital in West Bend, Wis.

He's right. The place doesn't seem busy. Compared with other hospitals, the 80-bed, \$55-million facility that opened in August 2005 seems most notable for what it lacks. There's no overhead paging system going off. Nurses and physicians aren't racing from room to room and floor to floor. They're not chatting loudly at a central station. Rolling carts don't make a racket on hard tile floors, and there's no harsh fluorescent lighting to sting the eyes and depress the spirit. In the rooms, there are no bickering patient roommates or cramped families.

That St. Joseph's, 40 miles north of Milwaukee, didn't sound busy was not a matter of chance but its designers' intention. Noise reduction was one of 12 patient-safety principles at the heart of what seems to be a new concept in health care construction.

Since the Institute of Medicine's 1999 report, "To Err is Human," estimated medical errors kill between 44,000 and 98,000 Americans each year in hospitals, physicians and other health care leaders have attacked the problem on multiple fronts, including stepping up investment in information technology and reporting errors to encourage system changes. But when it comes to incorporating patient-safety precepts into health care infrastructure design, St. Joseph's appears to be a pioneer.

St. Joseph's has sought to achieve safety by design by incorporating evidence accumulated by patient-safety experts, a new breed of health care architects, its own medical staff and techniques used in other high-risk fields.

"It was truly visionary," said Tim Flaherty, MD, a Neenah, Wis., radiologist and immediate past chair of the National Patient Safety Foundation. "I'm not familiar with another hospital that did it from the ground up, where before a shovelful of dirt was moved, [safety] designs were done."

SynergyHealth, which owns St. Joseph's, in 2002 committed to build a hospital to replace its 72-year-old facility, said John G. Reiling, who led the venture as CEO before leaving in January. As the process began, Chief Operating Officer Barbara L.



Robert Gibson, MD The ICU, emergency department, radiology and surgical units are adjacent, making it easier to move the most vulnerable patients, Dr. Gibson said. St. Joseph's maximizes natural light and minimizes noise to create a less stressful, and hopefully safer, environment.

Knutzen, RN, asked whether the new hospital's design could improve patient safety.

"I've been involved with building five new hospitals and hundreds of millions of dollars of remodeling in my career," Reiling said. "Nobody had ever asked that question before."

As Reiling, Knutzen and others at St. Joseph's pondered the notion of designing for safety, a new movement in health care construction known as evidence-based design was picking up steam. A 1998 literature search yielded about 80 articles examining health care design's effect on quality, safety and efficiency. Today there are more than 700 related citations, said Kirk Hamilton, an associate professor of archi-

ecture at Texas A&M University and co-author of a 2004 literature review.

The 2004 study concluded that the patient-safety evidence is strongest for the following health care design elements, and St. Joseph's has implemented all of them:

- Single-bed rooms. Because they are more open, it's possible to have different levels of care throughout a stay with a minimum number of error-inducing patient moves and handoffs. Single-bed rooms cut noise levels, lower hospital-acquired nosocomial infections, improve doctor-and nurse-patient communication, and make it easier for families to stay and keep watch.

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Reducing medication errors Linda Jansen, RN, scans a label using a new electronic medication administration record and bar coding system that alerts nurses attempting to give the wrong drug at the wrong time. Drawing on older technology, pneumatic tubes help quickly move materials around the hospital.



A PATIENT ROOM RE-EXAMINED

Simply the same

Standardization and simplification were the most important principles in designing the hospital. Down to gas nozzles on the headwall, which are in the same location in every room, St. Joseph's hopes reducing confusion will reduce errors.



1



2 Guarding against falls Nationally, there are 3.5 falls per 1,000 patient days. To reduce the risk, St. Joseph's has guardrails leading from the bed to the bathroom, located at the head of the bed, to shorten the walking distance.



ROOM SCHEMATIC COURTESY OF ST. JOSEPH'S HOSPITAL

3 Washing up Poor hand washing compliance is the No. 1 source of hospital-acquired infections. St. Joseph's placed a sink at every room entrance, in the patient's sight. A hospital-wide initiative told patients "it's OK to ask" health professionals if they had remembered to wash up.

4 Safety lounge Every room features a couch that easily folds out into a mini-bed, so loved ones can stay the night and keep an eye on patients. Studies show that having family present can reduce patient falls and medication errors while speeding up recovery time.

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- Reduced noise levels. This can be achieved with sound-absorbing ceilings, floors and wireless paging systems. A 2004 *Occupational and Environmental Medicine* study found that coronary intensive care unit nurses working at lower noise levels felt less fatigued, and were more attentive to and better understood by patients.

- Improved ventilation. The use of high-efficiency particulate arresting filters and appropriate pressurization can reduce infection rates.

- Natural and full-spectrum lighting. This can reduce staff fatigue and improve morale and performance, reducing medical error risks.

- Decentralized ward layouts. Placing nurses' stations next to patients' rooms reduces staff walking and fatigue, increases time with patients and improves medication supply and charting activities.

Designing pioneers

"I THINK IT'S TERRIFIC," HAMILTON SAID OF the new St. Joseph's. "They're doing unusual things that are certainly worth studying." For example, when the St. Joseph's Facility Design Advisory Council was presented with architectural blueprints, patient rooms were placed back to back, as in most hospitals, to save on construction costs by sharing electricity and plumbing.

"Standardization was a big part of our concern," said Paula Doyle, an ICU nurse at St. Joseph's who served on the council. "We wanted every headwall on the same side of the room so that gases, suction and all of that would be located in the same place in every single room."

Though the architects said it would be more expensive, the council opted for the "same-handed" approach employed in other high-risk industries based on principles that stress simplification and standardization as ways to reduce human error. In the end, the same-handed approach was cheaper, Doyle said, because once the room template was devised, the job was tantamount to constructing pre-fab housing.

"What's interesting about [the same-handed idea] is that we don't know if that's right or not," Hamilton said. "We know it's good in air-

planes and nuclear power plants and other high-risk environments, but this is an untested hypothesis."

Still, Hamilton says, as many as a dozen hospitals, including Cedars-Sinai's new 11-level critical care tower in Los Angeles, have followed St. Joseph's lead and are building same-handed rooms even though safety advantages have yet to be conclusively demonstrated.

"It is unusual to find the degree of standardization that St. Joseph's has accomplished," said Rick Croteau, MD, executive director of patient safety initiatives at the Joint Commission on the Accreditation of Healthcare Organizations. "That sort of standardization in all aspects of health care could probably do more than anything else to improve safety."

Dr. Croteau, a retired surgeon, helped develop the engineering approach known as Failure Mode and Effects Analysis during his time as a NASA rocket scientist. St. Joseph officials used FMEA at each stage of the design process to evaluate proposed design solutions.

As part of a \$1.5 million Agency for Healthcare Research Quality research grant, over the next year and a half, St. Joseph's will be tracking patient safety, quality and efficiency to examine the effect of the design and the implementation of a new IT system. Reiling, the principal investigator on the study, said he's confident the design will help boost safety outcomes but warned it will be impossible to isolate its impact relative to changes in IT and work processes.

Oh, so quiet

ROBERT GIBSON, MD, FOR ONE, IS LARGELY pleased with the new hospital's design. An internist at the SynergyHealth-owned West Bend Clinic, Dr. Gibson makes rounds every day and



5 Close at hand Michael Sarnovski, RN, works in an alcove that's a part of each patient room. Charts, computer records and the nurse server are there, improving access to information and supplies, while maximizing time spent with patients.

says the charting alcoves adjacent to patients' rooms where records are available have made it easier for him to concentrate on each patient.

"The computer is right there before you enter the room," Dr. Gibson said. "I can easily review what's already been done." Before, "I had to go to the nursing station and go through files to see what paper labs had been generated and filed."

Then, it was common for Dr. Gibson to be interrupted by questions from a nurse or physician. "That train of thought would get lost," he said. Now, "I think better. I'm closer to the patient, and I can just ask a question directly while I'm sitting 5 feet away."

Yet, with everyone spread out across the hospital, Dr. Gibson laments a loss of camaraderie among physicians and nurses. "Up on the floors, it's quiet," he said. "Almost too quiet."

Then again, he added, the "curbside consult" has its downsides, too, allowing for informal and perhaps uninformed advice from colleagues. Fully focusing on and being with the patient is a great way to improve safety.

"Your main 'distraction' should be what the patient is telling you," Dr. Gibson said. ♦