

Greening Asia's hospitals

Green design is an emerging trend in sustainable healthcare planning, particularly in Asia. *Radha Chitale* looks at the form, function and foliage of green hospitals

At Khoo Teck Puat Hospital (KTPH) in northern Singapore, "going green" is more than trendy design jargon.

Situated on a breezy 3.4 hectare plot facing a pond and adjacent to a large park, the 550 bed hospital, which opened fully in July, features over 4,000 m² of plants, a naturally ventilated public ward and is designed to run on one-third of the energy of a typical public hospital in the United States.

But green, or sustainable, design reaches further, leading architects and hospital administrators to reconsider how doctors and patients interact with their environment, with benefits for health, resource conservation and economics. KTPH is just the latest example of how going green is fast becoming a guiding principle in Asian healthcare.

Though not a new concept, the push for energy efficient buildings has gained momentum in recent years. About 30 percent of new buildings in the Asia-Pacific region could be green by 2015 as countries seek to conserve expensive resources such as land and oil and reduce operating costs, according to a 2008 report by research consultants Frost & Sullivan.

Hospitals, which consume about three times the energy of a commercial building, are prime candidates for green design.

"It's a building type like very few others," said Mr. William Roger, director of healthcare for the US-based architecture firm HOK, which has worked with several hospitals in Asia. "The lights are always on, so to speak, and that's just a terrific opportunity."

Fresh air saves energy

Air conditioning is one of the largest energy sinks for hospitals. North-south building orientation to avoid strong sunlight, vertical fins over façades to funnel wind inside, and horizontal slats over windows for sun and rain protection are some of the design features at KTPH that ventilate spaces without air conditioning.

Roof gardens on the outpatient clinics cool the building and supply the kitchens. And photovoltaic panels and solar thermal systems generate over 450,000 kilowatts of energy per year. The private wards, medical areas and administrative areas remain air conditioned.

"I'm convinced that the days of cheap energy will be coming to an end," said Mr. Teng Lit Liak, CEO of KTPH, adding that hospitals where he worked previously at times spent \$53 million annually on electric bills.

KTPH did not achieve the intended 50 percent natural ventilation throughout the hospital, but Liak said they achieved the majority of their energy and greenery goals, with the potential to improve, via an in-house microturbine, in the future.

"That provision has been made so that the moment the country runs a natural gas pipeline through this area... we would become a mini power station," he said.

Still, from a medical perspective, green design does not always have an obvious impact.

"I don't think green per se excites doctors," said Dr. Hong Huei Lee, CEO (designate) of Singapore's Parkway Novena

Hospital, a private hospital expected to be operational by 2012. "Most doctors just ask me, 'frankly, how is it going to affect my patient?'"

Green feels good

But research shows that many green features lend themselves to improved health.

A seminal 1984 study on patients recovering from abdominal surgery found that those with a nature view experienced less pain and had shorter hospital stays than patients with windows facing a brick wall. [*Science* 1984 Apr 27;224(4647):420-1]

Many other studies show that appropriate levels of light, noise and a sense of privacy help improve mood, sleep-wake cycles and reduce stress for patients, and minimize mistakes by staff.

"Doctors should be interested in green design, as it affects pain and the emotional well-being of their patients," said Professor Roger Ulrich, a fellow at the Center for Health Systems and Design at Texas A&M University, US, who authored the 1984 study.

Such evidence-based design was incorporated into Singapore's Jurong General Hospital, to be completed in 2014, resulting in fan-shaped wards with each bed angled against a private window.

"There is a shift in paradigm in the Asian mindset [suggesting] that a hospital is more than just a place for treatment," said Mr. Khai Toh, an architect at VOA Associates Incorporated. "A warm, inviting... environment with exposure to nature can promote healing and recovery."

Opportunities in Asia

Such attitude changes are one of several reasons Asia is in a unique position to take advantage of interest in green design.

Over the past decade, Korea, Japan, Hong Kong, Singapore, Indonesia and Malaysia have initiated green building councils and certification systems.

Government support for green projects creates incentives to build facilities that are expensive up-front, but promise to save costs eventually.

Comprehensive green design – to achieve a Platinum rating from Singapore's Green Mark building certification system, for example – can add about 15 percent to the several hundred million dollar price tag of a new hospital. An energy efficient building should return that expenditure within a decade and cost less over its 30-year-plus lifetime, experts say.

Parkway Novena Hospital achieved the Green Mark Gold rating with energy-saving design elements, but were granted an additional 1,447 m² of gross floor area from the Building and Construction Authority in Singapore after increasing efficiency and boosting their rating to Platinum. KTPH is also rated Green Mark Platinum.

"Every extra square foot translates to more clinical service area," Lee said.

Some countries may not be equipped to fully embrace green technology. Mr. Tommy Tan, government relations director for GE Healthcare, noted that in Vietnam for example, hospitals are more concerned with getting enough space and staff to care for patients.



Vertical fins and jalousies at KTPH funnel air into a building to cool it. Greenery encourages local wildlife onto hospital grounds.

"Green is not at the top of their mind," he said. "I can sense that they are not really there yet but they would want to be there soon."

Amidst such intense focus on the financial and environmental minutiae of green design, a fresh perspective on patient-centric care has emerged.

"Going green indirectly benefitted patients because it led to streamlining our workflow," said Associate Professor Kenneth Mak, head and senior consultant of surgery at KTPH.

He noted that grouping together services (such as cancer care) rather than departments (such as radiology) meant patients had to move around less.

"It did translate, unfortunately, into a little bit more work on our part... to make the process seamless for [patients]."

Calculated compromises between patient and doctor environment, everyday maintenance and building efficiency are part and parcel of building green hospitals. Ultimately, though, the goal is far simpler.

"It's not how the building looks from outside," Liak said. "It is how the patients

and doctors working in the ward feel when they look out the window and [the view has] some green leaves." **MI**



This 10-storey building houses the eight naturally ventilated public wards at KTPH.

Perspectives on green hospitals

“It makes sense that if you're providing a health system, you don't build an environment that's potentially toxic to the people who are using it.”

– Mr. William Roger, director of healthcare, HOK, San Francisco, US

“Any region that hasn't been adopting [green] activities or this style of saving energy has a great chance to implement this now. The Asia-Pacific region is most receptive to this.”

– Mr. Malek El Hussein, business development director, GE Healthcare, Dubai, UAE

“At least 65 percent of public hospitals in Singapore are naturally ventilated, though some are more comfortable than others... Anyone who wants to take on [the green] challenge will accept that they have more to do.”

– Ms. Ruby Lai, senior architecture consultant, CPG Consultants, Singapore

“The idea of a sealed box for infection control is a valid one, but then again... the ability of a naturally ventilated and well shaded [area] to heal is a proven one in so many of the subsidized hospitals.”

– Mr. Khai Toh, architect, VOA Associates Incorporated, Chicago, US

“We have to have self-confidence and respect for our traditional past... because a lot of our traditional housing concepts are actually very suitable for our environment. We just need to modernize it.”

– Mr. Teng Lit Liak, CEO, Khoo Teck Puat Hospital, Singapore