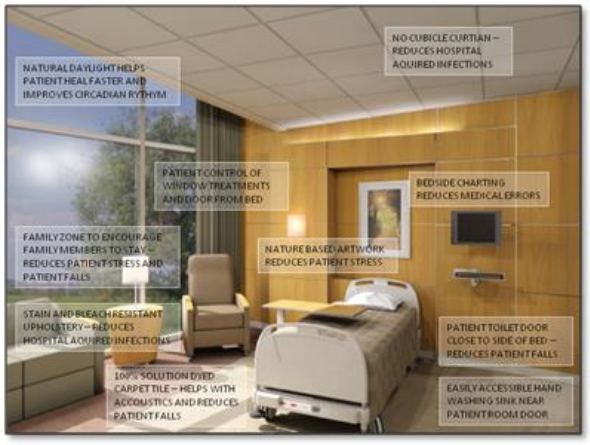
Ten Commandments in Hospital Design

By **RWPL** *Healthcare*

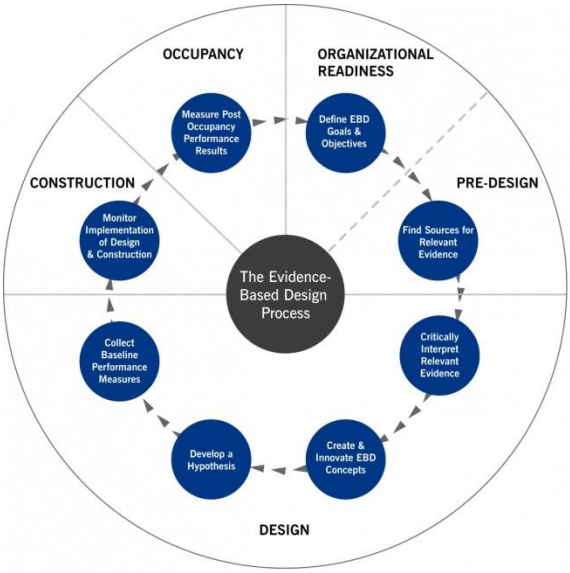
RWPL Healthcare is the hospital design Consortium of Rukshan Widyalankara (Pvt) Ltd. The Consortium has years of experience in the design of Hospitals and related buildings.

Hospitals are expensive to build and complex to manage. The design of a new hospital provides an opportunity to rethink hospital design, and especially to consider how improved design can help reduce staff stress, fatigue, increase effectiveness in delivering care, improve patient safety, reduce patient and family stress, and improve overall healthcare quality.

Visiting a hospital is dangerous and stressful for patients, as well as others. Hospital-acquired infections & Medical errors are among the leading causes of death, each killing more people than automobile accidents, breast cancer, or AIDS. Healthcare today harms too frequently and routinely fails to deliver its potential benefits; it not only influences patients but impacts the staff.



Healthcare design is increasingly moving towards 'evidence-based design', the research linking the physical environment of hospitals to patients and staff outcomes. We have listed ten very important evidence-based-design criteria all new hospitals should follow for the benefit of patients, visitors and staff, and particularly those interested in gaining international accreditation.



10 Hazard Vulnerability Analysis in designs.

At least in the developed world, Hospitals are required to conduct and review Hazard Vulnerability Analysis (HVA). The purpose of HVA is to evaluate the ability of the hospital to provide medical care for the patients and staff in the event of an emergency or disaster. HVA could manifest in several ways- Explosives, Violence against employees, Cyclones, Floods caused by rupture of a water line or rainfall, Fire, Failures of electrical supply, Information Systems, HVAC System, Water

Service, Phone Service etc., Medical Gas or Vacuum Failure, Disease Outbreak by Infections, Mass Casualty Incident, or Exposure to Hazardous materials.

Likelihood of occurrence	Consequence: 1 Insignificant (First aid only)	2 Minor (Medical attention)	3 Moderate (Increased medical attention)	4 Major (Severe health crisis)	5 Extreme (Severe injury or death)
1 Rare	1	2	3	4	5
2 Unlikely	2	4	6	8	10
3 Possible	3	6	9	12	15
4 Likely	4	8	12	16	20
5 Almost certain	5	10	15	20	25

Legend: Low Medium High

This analysis is then used for prioritizing refurbishment projects related to hospital's emergency preparedness. In doing so, the consequences of a possible event can be minimized.

9 Lines of sight to Patients.

As frontline caregivers, nurses play a critical role when it comes to patient safety. Improving the visibility of patients to nursing staff is central to the design of the patient care units and this means that hospitals must be designed to provide optimal lines of sight between nurses and patients. Easy access to patient areas in the event of a medical emergency can save lives.

Nursing alcoves located directly outside patient rooms, along with specially designed privacy windows, will allow nurses to look in on patients without disturbing them if they are resting or visiting with family and friends. And these decentralized stations mean that nurses are only steps away from the patients they are caring for.

8 Separating Vehicular Traffic.

Separating the Emergency Department (ED) vehicular traffic from rest of the traffic or pedestrian paths is a key to safety. ED is generally planned at the front most area or at the first seen entrance of the building. In most instances Ambulances are driven at high speed carrying trauma patents and where ambulance routes conflict with pedestrian pathways, accidents within the hospital premises have occurred. Children have become victims in many an instance where the visitor parking area conflicts with Ambulance driveway.

7 Adequate Staff Support areas – Clean & dirty Utility areas.

Soiled utility rooms (or sluice rooms) are a necessity for every hospital to enhance the level of care resulting in greater infection

control. Patients are highly exposed to contagion, and Microorganisms that may be completely harmless to healthy people can, in care environments cause serious infections among people with lowered immunity. Bacteria, viruses and fungi are found everywhere and can be transmitted from one individual to another by items that are inadequately cleaned or handled. Well-designed soiled utility rooms are the key to prevent the spread of infections.

A washer disinfector that combats cross infection, simply and effectively

The reduction of the risk of infection can provide great cost savings to any facility and hospital.

6 Adequate Isolation Rooms.

One critically important way that evidence-based design improves safety is by reducing risk from hospital-acquired infections. Transmission of infection to patients occurs through two general routes: airborne and contact and the design affects both airborne and contact transmission routes. The infection rates are lower if the air quality is good and patients are in single-bed rather than multi-bed rooms, which is only available in private sector hospitals.

The air circulations and ventilation play decisive roles in affecting concentrations of pathogens such as fungal spores and thereby the infection rates. Type of air filter, direction of airflow and air pressure, air changes per hour in room, humidity, and ventilation system cleaning and maintenance have a bearing on the air quality and infection rates.

Battery of Isolation Rooms

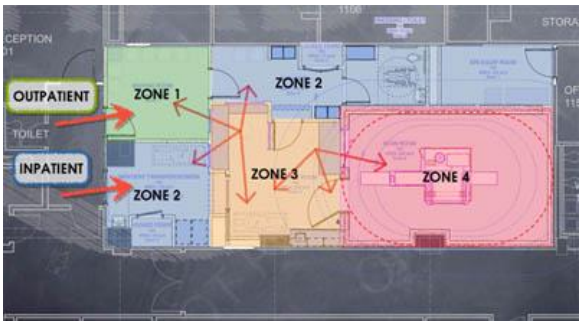
The SARS & Birds Flu outbreaks in recent times highlighted the shortcomings of preventing infections both for patients and healthcare workers. These are transmitted by droplets that can be airborne over limited areas. The pervasiveness in our hospitals of multi-bed spaces in emergency departments and ICUs, together with the scarcity of isolation rooms with negative air pressure, severely hindered treatment and control measures. An outbreak of Ebola can have disastrous consequences in Sri Lanka.

5 The Four MRI Safety Zones.

The MRI contains a very powerful magnet and this magnet is always active all day & night even when the machine isn't scanning. The magnetic field cannot be seen, smelled or heard, but it is always present. The magnet attracts all Ferro (iron)-magnetic objects, including Implants in patients or staff, objects in pockets, tools and equipment and such objects can become powerful projectiles causing serious injury. It will even pull heavy items (such as stretchers oxygen cylinders, chairs, and beds) into the scanner. Therefore, tools and patient-care equipment that are specially designed for use in the MRI suite are made without ferrous material and they are clearly labeled.

For safety The MRI suite is divided into 4 zones. ZONE 1 is all areas that are freely accessible to the general public and it is typically outside of the MR environment itself and is the area through which patients and all hospital personnel access the MR suite. ZONE 2 is buffer between Zone One and the more restrictive zones 3 and 4 where Patients and other personnel are able to move throughout this area.

ZONE 3 is for non MR safe equipment that can result in serious injury or death if accidentally moved closer or into zone 4. Hospital personnel are not to move freely through this zone. The most critical ZONE 4 is the MR suite itself. No person before screening should enter this zone under any circumstances. Zone 4 is strictly the area within the walls of the MR scanner room, sometimes called the magnet room.



A very compact (and efficient) 4-Zone MRI suite plan

There have been documented cases where patients have been killed in the MRI suite and hence it is important to take safeguards.

4 Auditory Privacy.

Confidentiality, Auditory and visual privacy for patients in multi bed spaces is also a priority issue in light of physicians and nurses very frequently breach patient confidentiality by talking in spaces where they are overhead by others. The resultant withholding of information has implications for health professionals' ability to diagnose and treat patients appropriately.

Patients prefer a choice of setting for serious discussions where confidentiality is maintained and knowing they could be overheard constrained information disclosure. While some enjoyed shared rooms, overhearing another person's health issues can cause unnecessary distress.

Privacy is a perception, a courtesy, a right, a promise, and should be a practice. It is realized through a dynamic partnership between evidence-based design and function, and between the built environment and those who use it that will best improve the chances of protecting information and individuals.

Fewer hospitals respect dignity and privacy of the old

Unwanted Noise is another factor- apart from worsening sleep, there is strong evidence that noise increases stress in adult patients, heightening blood pressure and heart rate. WHO guidelines for background noise in patient rooms are 35 dB, with nighttime peaks in wards not to exceed 40 dB. In reality, the noise levels fall in far higher ranges such as 45 dB to 68 dB, with peaks frequently exceeding 85 dB to 90 dB.

The decibel scale is logarithmic; each 10 dB increase represents approximately a doubling in the perceived sound level. A 60 dB sound, accordingly, is perceived as roughly four times as loud as a 40 dB sound. Medical equipment and staff voices often produce 70 dB to 75 dB levels measured at the patient's head, which is the noise level in a busy restaurant.

Design interventions for reducing noise in hospital settings include: providing single-bed rather than multi-bed rooms, installing high-performance, sound-absorbing ceilings, sound-absorbing flooring, use of noiseless paging and alarms etc.

Higher sound levels are more critical for Infants in NICUs where higher noise levels decrease oxygen saturation (increasing need for oxygen support therapy), elevate blood pressure, increase heart and respiration rate, and worsen sleep.

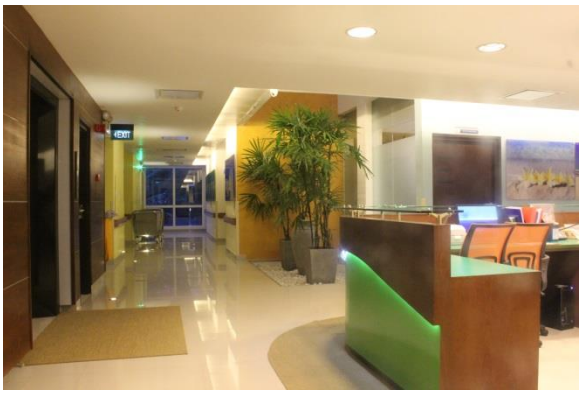
3 Construction Site Cleanliness.

Construction and renovation activities in Hospitals can be major sources of airborne infection outbreaks due to dust or particulate generation. It is essential to close all ventilation and air ducts before construction commences and seal all probable inlets of dust. Effective prevention or control measures during construction and renovation activities include, for example, portable HEPA filters, installing barriers between the patient care and construction areas, negative air pressure in construction/renovation areas, and sealing patient windows. All control measures must be employed in conjunction with other.

2 Increase Patient Satisfaction with Good Architecture.

There is strong evidence that design that makes the environment more comfortable, aesthetically pleasing, and informative, relieve stress among patients and increases satisfaction with the quality of care provided. There is also evidence that daylight and morning sunlight reduces length of hospital stay, reduce the intake of pain medication and depression in patients. Patients in brighter, eastern rooms (exposed to direct sunlight in the morning) had shorter hospital stay than patients in west-

facing rooms. Using light for creating good architecture is a relatively inexpensive intervention that has shown to yield positive results.



Daylight in the Hospital Interior makes pleasant spaces and provides Orientation to Patients

There is also evidence that viewing nature gives greater pain tolerance by diverting patients from focusing on their pain or distress. Patients have reported less pain looking at a ceiling-mounted nature scene rather than a blank ceiling, and taking a virtual reality nature walk while in bed (through a forest with bird sounds) have reduced anxiety and distress. Nurses and other healthcare workers also use gardens for achieving pleasant escape and recuperation from stress while increasing patient and family satisfaction with overall quality of care. No doubt they will report positive mood change and reduced stress.

Nature Art in Hospital Corridor

Nature can also improve outcomes even in patients with dementia, including Alzheimer's disease. For such patients, hospital gardens not only provide restorative or calming nature views, but can also reduce stress by providing opportunities for positive escape and sense of control within stressful clinical settings. Predominant planting of trees that emanate Phytocide, which significantly inhibits bacterial growth, are proven to kill germs and impart healing solar-vitamin radiations of life to the cells they come in contact with.

Landscaped Terrace with Accessibility for Patients and Visitors

Similar to nature, patients respond positively to representational nature art, though many react negatively to chaotic abstract art that were ambiguous, surreal that could be interpreted in multiple ways. A good way finding system is another and is not just about better signage or colored lines on floors.

Children's' Art by well-known Artist Sybil Wettesinghe at the Lady Ridgeway Children's Hospital Operating Suite

It has been reported that patients seeing good architecture had stronger intentions to use the

hospital again and would recommend the hospital to others.

1 Clinical Sinks.

Believe it or not, hand washing is considered No. 1 and highest in the order of priorities of hospital designs. Strict hand hygiene measures are the gold standard for reducing infections associated with healthcare.

Providing numerous, easily accessible alcohol-based dispensers or hand washing sinks can increase hand washing compliance and thereby reduce contact contamination.

Technologically Advanced Scrub Sink

In the developed world, hospitals increasingly use electronic sensors, thermal imaging and video cameras to monitor hand hygiene, and some issue badges that wirelessly record the use of hand hygiene stations before entering a patient room.

Most patients wouldn't dare to ask their doctor to wash hands. But with growing concerns about antibiotic-resistant germs, it's more critical than ever. It's a simple enough request, but for patients and families who feel vulnerable, scared or uncomfortable in a hospital, the subject can be too intimidating to even bring up with a doctor or nurse: Have you washed your hands?

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