Intelligent Healthcare Facilities – What does it take to get there?

The components of a healthcare infrastructure are fairly self-explanatory. The interactions between them though are potentially complex. In an intelligent healthcare system, the infrastructure has attached or built-in components which are able to collect and transmit information to and from a central computer or agent to trigger controlling devices or alert other help agents. This will enhance interactions between one or more individual components.

An intelligent hospital has the capability to detect any potential problems ranging from equipment malfunctions to assault on a staff or patient. Its benefits could be categorized into 5 main types.

5 key benefits of an Intelligent Healthcare Infrastructure

1. Patient Benefits
   - Patient Safety
   - Patient Satisfaction

Patient Safety

According to World Health Organisation’s (WHO) estimates in 2014, as many as 1 in 10 patients are harmed by medical errors while receiving hospital care in developed countries. Of every 100 hospitalized patients at any given time, 7 in developed and 10 in developing countries will acquire health care-associated infections.

These medical errors and preventable adverse events can be mitigated by using integrated security technology including access control and alarm systems to ensure that security and other personnel can be alerted to violent or other adverse events happening anywhere onsite. A common dashboard from which multiple areas can be observed will also enhance overall security.

Patient Satisfaction

Temperature, humidity and solar blind control can alter room conditions which can in turn reduce patients’ need for pain or sleep medication. Such monitoring and automatic adjustments of the air or light will lower infection risks and aid recovery.

2. Staff Benefits
   - Time Savings
   - Fewer Adverse Events

Staff Benefits

A study at Saint Francis Medical Centre in Illinois, United States, revealed that nurses could save 22% of their time if calls for assistance can be channelled to a suitable alternative such as a nursing aide. The time saved can be used for more critical duties or events.

Other studies at San Antonio Community Hospital, California, showed that deploying infrastructure intelligence in hospitals can cut average patient stay by 10 to 30% while MRSA infection control can be brought down by 4%. Patients can get discharged earlier and medical staff will have fewer adverse events to deal with.
Organization Benefits

Hospitals can reap cost savings and higher productivity from intelligent installations such as converged voice communications technology, electronic transmission, and viewing of x-ray images and electronic stock ordering at Emergency department. A study done at Nottingham University Hospital ED UK showed that a breakeven was possible by the 14th month.

Eco Benefits

A growing number of hospitals are being designed to meet Green Standards with about 50% of green certification being tied to energy and water savings.

Australia has always been a frontrunner in creating green designs and infrastructure. New Royal Adelaide Hospital is touted as South Australia’s greenest hospital with rooftop rainwater and stormwater recycling and solar boosted hot water.

Melbourne’s Royal Children’s Hospital is also on its way to becoming Australia’s greenest hospital, contributing 45% less GHG (greenhouse gas) emissions than traditional Australian hospitals.

Green designs conserve resources and ensure a healthier world for future generations.

Social Benefits

As a first step in a WHO project in collaboration with Health Care Without Harm (HCWH), WHO identified 7 ways in which the health sector can contribute towards a climate-friendly world.

These 7 steps are:

- Energy Efficiency
- Green Design
- Alternative (renewable) Energy
- Accessibility and Transportation Efficiency
- Waste Reduction and Recycling
- Water Conservation
- Food Sustainability

The Meyer Children’s Hospital in Florence, Italy, was built with a “building energy management system” and light tubes that create natural light throughout the building. It is encouraging to know that young patients can recuperate in intelligent eco-friendly buildings and grow up aware of the difference these buildings make. Intelligent healthcare infrastructure contributes in many ways to a sustainable future for our younger generations.
What does an Intelligent Hospital Look Like?

The intelligent hospital was initially conceived with the overarching goal to create a hospital using smart technologies in all areas, ranging from the emergency room, operating rooms (ORs), intensive or acute care areas (ICUs), treatment areas such as radiology to central supply and pharmacy.

It may be helpful to look at an intelligent hospital’s components by looking at the frameworks of two intelligent system suppliers to hospitals.

Schneider Electric’s components of an intelligent healthcare and security infrastructure (from its July 2011 White Paper) are:

- Enterprise-wide Security
- First Responders
- 3rd Party Data Exchange
- Regulatory Compliance
- Intrusion Detection
- Fire Safety
- Energy Management
- Building Management
- Power Management
- Integrated Control Platform

Schneider Electric advocates incorporating defences, barriers, and safeguards into building management systems, security, and IT support systems. Schneider Electric believes that automating these systems can minimize preventable adverse events that stem from failure to keep to protocols or from unexpected system failures.

Microsoft also provides end-to-end solutions through its Windows Embedded Intelligent System suite. Apparently, it ensures a tighter level of integration between the device, back-end servers and databases, and even cloud services. Since 2006, the University of Colorado Hospital has been using the Wyse thin clients which run on Windows XP Embedded operating system to ensure its staff can access health IT data quickly and securely with a familiar and easy-to-use interface.

Technology is an integral part of a hospital’s intelligent system. It involves sensors, network connectivity and software to monitor and analyse complex systems. Sensors collect operational details and give real-time inputs on current situations. Network connectivity allows information to flow between systems, other sensors, and healthcare staff. Software analysis gives insight into problems and suggestions on how to improve conditions over time.

Using Radio-Frequency Identification (RFID) technology, intelligent systems can track people and assets. Hospital administrators can harness this tracking information to optimize resources and run hospitals more efficiently. Meanwhile, patients receive better care. Intelligent components, large or small, serve all healthcare stakeholders.

Examples of smaller intelligent components servicing healthcare:

- Smart IV pumps connected to an intelligent system can extract data from or contribute data to electronic medication administration records (EMAR) so the doses administered get entered into the patient’s medical history instantly.
- Portable and even embeddable devices can monitor blood pressure, glucose and cholesterol levels, and even red blood cell count. This data can be recorded, analysed and delivered to healthcare practitioners to prompt action.
- Wearable health and lifestyle devices like FitBit and Nike Fuel are now able to collect and transit data to a computer system or other mobile devices. Patients can be kept abreast of their own conditions while doctors can receive alerts when the patient’s condition warrants medical treatment.

Honeywell’s EBI brings building, security and life safety management systems onto a single platform and integrates it with business enterprise systems – finance, human resources, supply chain and electronic patient records – to help provide timely data exchange and organizational agility. Integrated technologies can serve as a powerful ‘eye’ during adverse events, accelerating response times and mitigating risk.
5 Roadblocks to Building Intelligent Healthcare Systems in APAC

The road to building intelligent healthcare systems in the Asia Pacific is a long and arduous one, simply because healthcare itself is not as developed in this region (minus Japan, Australia and South Korea) compared to Europe or the USA.

Under-investment in Healthcare IT (HIT)

Under-investment in healthcare IT is prevalent in APAC where the two most populous nations, China and India, have yet to catch up with their European and American counterparts on HIT initiatives.

Global non-profit organization Unite for Sight shared that when designing and implementing new health technology in the developing world, it is important to address factors such as appropriateness, feasibility and indirect benefits.

Appropriateness refers to the affordability, robustness and adjustability of the technology to health care settings in developing countries, as well as the social, cultural and political appropriateness. Feasibility questions whether the time frame needed to develop and deploy can fall within 5 to 10 years. Indirect benefits include environmental improvement and income generation which will have indirect, positive effects on health. Can intelligent designs be appropriate, feasible and offer indirect benefits?

Non-communicable diseases (NCDs) are the leading causes of death and disability in APAC. (NCDs are principally cardiovascular diseases, cancer, diabetes and chronic respiratory diseases.)

WHO informed that 80% of all deaths in this region were due to NCDs. NCD deaths are expected to rise by 15% between 2010 and 2020 (to 44 million deaths globally, with the highest numbers forecast in the Western Pacific (12.3 million deaths) and South-East Asia (10.4 million deaths) regions.

Intelligent HIT will definitely help to serve ageing populations and populations with increasing NCD events by improving remote access to healthcare information through technology, integrating healthcare services and bringing healthcare workers as well as patients onto a common integrated platform. However, the barriers are that people dependent on healthcare systems are increasing at a rapid pace. Can infrastructure change as quickly to meet demands? Speed is the essence.

Conclusion

Challenges exist. But the rewards abound. Most recently, Chang Gung Memorial Hospital in Taiwan attained top green certification for its efforts to transform its hospital into a world-class green building.

The award, Leadership in Energy and Environmental Design – Healthcare (LEED-HC) Platinum recognition) is the first awarded to an Asian hospital and the second to be awarded in the world for healthcare.

Increasing Demand for Healthcare

According to the United Nations ESCAP, the APAC region is currently home to over half of the world’s elderly population. The number of older persons in the region is expected to triple from 438 million in 2010 to more than 1.26 billion by 2050. By then, almost two thirds of the world’s older persons will be living in the Asia-Pacific.

Ageing populations will place heavier demands on healthcare systems. So will more occurrences of chronic diseases.

Production of high-quality health workers with the required skills must rise to meet population health needs. For intelligent HIT to become successful, it is absolutely essential to have the correct types of highly-trained healthcare personnel harness the full benefits of intelligent systems.

Smart Intelligence

In developing countries, most of the infrastructure for health research exists in the public sector. For a health technology to be appropriate, feasible, and driven by public health goals, the private sector should partner the public sector to co-create research projects. C. K. Prahalad wrote in “The Fortune at the Bottom of the Pyramid” that some manufacturers in developing countries pursue a business model in which they specialize in high-volume, low-margin production, which leads to low-cost products making healthcare affordable and accessible in these countries.

Rising affluence with increasing healthcare costs in countries such as China and Indonesia have raised expectations of healthcare. Healthcare operators will have to find more efficient and effective ways of delivering healthcare.

Intelligent patient medical records provides a way of delivering better care, optimizing human resources and making medical diagnosis more timely and reliable.

Yet again, can healthcare systems play catch-up with changing expectations? Timeframes are shrinking – fast.

Labour Shortage

WHO reported that the Asia Pacific suffered from imbalances in health worker skills, quality and density. Shortages are especially serious in South Asian countries. The problem is compounded by insufficient salaries, incentives and supervision affect performance, motivation and retention of health workers.

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