

AT HOME IN HOSPITAL

Optimizing the patient care environment to enhance health outcomes, improve operational efficiency

By Barry Hunt



One learns a lot after working in healthcare for 40 years. Important things like there is never enough time, budget or staff to achieve objectives, and change is hard. But change does happen, eventually. Hospital design has come a long way. Single-patient rooms are now a standard across Canada for new builds. Bigger spaces, better materials and thoughtful designs to improve healing and patient outcomes are being implemented.

There is still a long way to go, though. New broader, bigger, strategic thinking is required to ensure a bright and sustainable future for hospitals. Items once thought too expensive or lavish are anything but when

viewed in the light of challenges faced today in productivity, throughput, bed availability, nursing shortages and hallway medicine. It's not that hospitals can't afford to do things better now. It has become apparent they can't afford not to.

For example, while it may cost \$5 billion to build a new hospital today, it could cost \$50 billion to operate that hospital for the next 30 years. One per cent additional capital spending upfront specifically targeted to optimize the patient care environment could result in improved operational efficiency of 10 per cent. That would produce an astounding return-on-investment of 10,000 per cent — a goal worth pursuing.

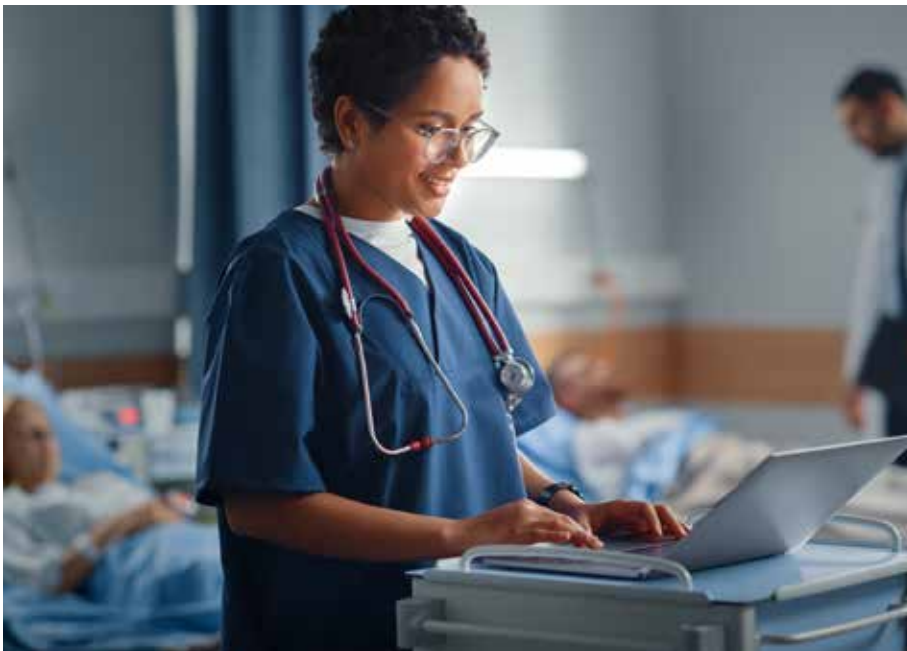
Technology is key. It may sound like science fiction now but robots, artificial intelligence (AI) and automation will perform a lot of monitoring, delivery and assistance tasks in hospitals in future to improve safety, comfort and convenience for both patients and staff. To enable this future, hospitals must provide fast, secure Wi-Fi, Bluetooth and LoRaWan, as well as the supporting infrastructure to conveniently and efficiently power and charge devices, including wireless inductive charging.

Nurses are simply overwhelmed these days and every unnecessary interruption takes away from their valuable time. In most healthcare facilities, non-ambulatory patients

must page busy nurses to perform simple tasks like turning on a light or adjusting a thermostat, something that could be done bedside with an app, remote control device or voice command. Nurses are asked to fetch warm blankets or bring a glass of water, both of which could be performed by a humanoid robot. And they are required to chart everything into a workstation they push from room to room, manually recording items like medications, patient activity and vital signs. Again, undertakings that could be handled or at least assisted by sensors and AI. Plug and play integration of data from medical devices has been a yet unachieved goal despite decades of effort. AI offers the promise to fast track and standardize data integration from different devices from different models from different manufacturers.

Hospital acquired infections (HAIs) affect patients and staff, leading to both bed and nursing shortages. With the onset of COVID, the HAI problem has gotten significantly worse. One-third to half of monthly COVID patients in Canadian hospitals are reported by the Public Health Agency of Canada to have acquired the virus while in hospital. And the mortality rate of HAI-COVID can be as high as 10 per cent or more.

Patients and staff can be shielded from exposure to pathogens in air, water and surfaces with technology. Eliminating environmental transmission of disease may reduce average length of stay by 20 per cent or more, freeing up the same percentage of hospital beds. Displacement ventilation can safely remove warm exhaled aerosols that rise to the ceiling in the thermal plume. Upper air ultraviolet (UV) disinfection can improve patient room air exchanges from six per hour to 50 or 100 equivalent air changes per hour. AutoUV can virtually eliminate the risk of exposure to pathogenic bioaerosols liberated from toilets, showers and drains in bathrooms. FarUV can greatly reduce the risk of exposure to airborne pathogens in elevators, waiting rooms and other occupied spaces. Self-disinfecting sinks dispensing reactive oxygen species (ROS) water can remove the risk of waterborne and drain-borne pathogens found in slimy biofilms, while eliminating clogged sinks. And self-disinfecting surfaces that include copper or copper ions can rapidly disinfect high-touch surfaces like over-bed tables, bed rails and door handles 24-7.



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Patients and staff can both be protected from the harmful health effects of inhaling cleaning and disinfecting chemicals by switching to non-toxic alternatives like electrolyzed water, ROS water or ozonated water. As an added benefit, these products are generally safe for use, food-safe, environmentally friendly, less expensive and more effective against biofilms. They can also safely be used bedside by the patient, family or support persons as a supplement to staff cleaning and disinfection.

Patients can speed healing with daily doses of sunshine or, alternatively, penetrating infrared and near-infrared technology designed to improve vascular flow, cell signalling and defence, and cellular production of ROS — the body’s self-manufactured disinfectant.

Does all this sound like science fiction?

Maybe so, but many of these ideas have already been tested in healthcare settings for years or adopted in other sectors.

According to MadeinCa.ca, a website that compiles smart home technology statistics in Canada, three-quarters of homes already have at least one smart home device installed and the number of devices is expected to triple over the next five years. Ninety-two per cent of Canadians have smartphones that could serve as a familiar interface for patients if provided an easily downloadable app. For example, some hotels now use a QR code to lead patrons to download an app that allows remote control of room lighting and thermostat controls. Amazon’s virtual assistant technology Alexa may be provided as an information and communication interface to facilitate room service, reservations and checkout.

There is no shortage of innovation that can be adopted by hospitals but there is also no scarcity of challenges to implementation. Healthcare is a big ship that resists change. Upper air UV was first shown to be preventive against transmission of airborne disease in schools in the 1930s, but still isn’t in wide-

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spread use in hospitals. Copper was registered as a biocide in 2008. Since then, hundreds of studies have shown the metal's effectiveness in continuously disinfecting surfaces in healthcare settings. Yet most hospitals have not adopted this simple approach to keeping surfaces safe. AutoUV, invented in Canada, has been available for a decade now. Numerous studies have shown its ability to rapidly and effectively disinfect both air and surfaces. And while well-recognized and supported by the Ministry of Health in Ontario, and regionally throughout the country, the supply of AutoUV to healthcare has been interrupted for more than three years by a new requirement from Health Canada's Pest Management Regulatory Agency to register UV devices prior to sale. Self-disinfecting ROS water sinks, also created in Canada, have been commercially available since 2016. Third-party laboratory tests have been further augmented by almost a decade of real-world application. Self-disinfecting sinks have found success regionally but, despite the disturbing trend of rapidly rising high mortality sink-related disease transmission in hospitals, are not yet promoted as a national standard of care. FarUV, a more recently developed technology designed to be used in occupied areas, has demonstrated efficacy and safety when employed in spaces with good ventilation. However, it will likely require more time and study before widespread adoption, notwithstanding the promise of efficiently providing airborne protection equivalent to between 100 and 1,000 air changes per hour. And, of course, FarUV devices will first need to be registered by Canada's pesticide regulator, a process that could take several years.

Overcoming the headwinds of change is both the challenge and opportunity for anyone working in the hospital infrastructure field, including facility managers, engineers, architects, ministries of health and others. Change means facing the unknown, taking a stand and sometimes pushing the envelope or going out on a limb to do the right thing. In the words of a well-known, recently retired leader in healthcare facility management who was asked why he pushed so hard in his career to do things right: "Someday my family and I are going to need this hospital." That day is coming for everyone. ■

Barry Hunt is co-founder of the Coalition for Healthcare Acquired Infection Reduction, retired from an industry career developing solutions for healthcare and an active volunteer contributor to CSA standards and other organizations.