

CSA Z8000: Building for health and safety in our health care facilities



Canadians need safe healing spaces

The toll from hospital-acquired infections (HAIs) in Canada is staggering. Each year about 220,000 Canadians will get an HAI and 8,000 will die from these infections, according to the Public Health Agency of Canada (PHAC, 2013).

In addition to the terrible human cost, these deaths also place an ongoing financial burden on the Canadian health care system.

The sad reality is that many of those infections, and subsequent deaths can be traced to the environment where care is delivered.

A series of research studies have uncovered some of the poor design features that can contribute to higher rates of infections – an insufficient number of hand hygiene sinks (or their locations), lack of dedicated patient isolation rooms, and materials or surfaces that are not conducive to cleaning.¹

¹ Infection Prevention And Control In Healthcare Facility And Design (CSA Group 2018)



By the early 2000s, a perfect storm was brewing. The factors at play included mounting evidence of rising infection rates, the disappearance of dated provincial guidelines, and rising capital spending on health care facilities.

CSA Group had been hearing the chorus of disapproval and recognized the opportunity to lead the way and help create safer healing spaces.

The biggest problem, as identified by the key stakeholders, was the lack of a national standard.

A national standard for infection prevention and control becomes a necessity

The need for a national standard took on new urgency in 2003 when hospitals were suddenly confronted with a new and frighteningly contagious disease: SARS. Public pressure had been building, but overnight, SARS brought the necessity of standards for better infection prevention and control to the forefront.

“A lot of our requirements around infection prevention and control we learned through SARS and became the seed document for CSA Group Z8000,” says Niagara Health Chief Planning Officer, Cliff Harvey. Along with his colleague Mike Keen, Chief Planning Officer at Unity Health in Toronto, Cliff was one of the early contributors

to the standard when he was working as an architect for the provincial government.

Design of health care environment is critical to reducing hospital-acquired infections

Research had proven that a health care environment’s design is a critical step in helping to reduce the incidence of HAIs.

The Canadian Standards Association took the next logical step and with input from expert stakeholders and regulators, created the standard CSA Z8000, *Canadian health care facilities* in 2011.

As it was written, the standard applied to:

- inpatient, outpatient, or combined hospitals;
- facilities providing outpatient diagnosis and treatment services;
- specialty inpatient centres; and
- residential care facilities.

The arrival of the standard was a momentous event for anyone working in hospital design and construction. They now had a comprehensive, nationally-recognized baseline that would hopefully help improve the safety and well-being of staff and patients in health care facilities.

At the same time, the arrival of CSA Z8000 was a fortuitous event. “When SARS hit, there were standards around mechanical and electrical systems, but there was no standard for the way hospitals were designed,” says Cliff Harvey.

Planners like Cliff and Mike were often left to their own devices, which meant there was no consistency in design and construction of health care facilities across the country. “We were doing our own thing and nothing was coordinated or organized,” says Cliff.

What those early planners hadn’t anticipated was the extent of resistance to the standard and reluctance to implement its recommendations.

The new standard combines requirements and guidelines for more flexibility in implementation

Not everyone was prepared to wholeheartedly embrace all the suggestions laid out in the standard. There were a variety of reasons for this – product availability, uncertainty about their impact, and, at the top of the list, capital costs.

Bryan Darrell, Senior Director with the Department of Transportation and Infrastructure Renewal in the Nova Scotia government, was definitely not an early adopter.

“I have to admit that in the beginning I was opposed to Z8000,” he says. “I saw it as being an Ontario project, suitable for a densely populated environment.”

He worried that following the standard in a smaller province like Nova Scotia would result in hospitals not getting built. “The money was not there to build them to standard,” he says.

Mike Keen says Bryan’s response was more the norm than the exception. “People would say, ‘We’ll do 80% and 20% of it we won’t do,’” he says.

Despite his early hesitation, Bryan soon realized that *not everything in the standard* was meant to be followed to the letter. “What we’ve learned is that there is a certain flexibility with Z8000, and that it should be considered more as a guideline,” he says. “That’s what we aim for and if anything, we try and exceed.”

As it turns out, questioning the standard and its limits, is a regular occurrence.



In their role as CSA Z8000 authors and informal ‘standard bearers,’ Mike Keen and Cliff Harvey are constantly fielding questions from people who feel like they can’t quite fit in with the standard guidelines.

“The standard has some very clear-cut requirements, and they’re usually tested and true,” says Cliff, “but then there’s also some flexibility. Part of it is designed with principles in mind.”

The two planners took those principles and created a framework called OASIS. Broken down it focusses on: *Operations, Accessibility, Safety and security, Infection control, and Sustainability.*

While the standard sets out a baseline of best practices, every facility is unique and has its own set of challenges. No one knows that more than Mike.

He’s been conversant with the standard from the beginning, but there were a few headaches when he oversaw a massive renovation and rebuild of his own facility, St. Michael’s Hospital.

“We were working with an existing footprint block in downtown Toronto and had very little freedom,” he says. “Sometimes even with the best of intentions, you’re applying every clause of the standard, but you might have two that are divergent and can’t be done at the same time.”

Being able to go back to OASIS kept things in perspective. In spite of conflicting requirements, Mike knew he could make adjustments and still stay true to the principles of the standard.

Ongoing improvements to the standard reflect changes in the health care system

One of the many revelations that came out of SARS was the necessity of segregating patients and having single patient rooms.

"We also learned that hand-washing is really important for infection prevention and control, and this started to dictate the design of sinks in hospitals," says Cliff Harvey. There was growing awareness that not only were sinks in facilities few and far between, but the way they were designed was problematic.

Like many of the positive changes created by CSA Z8000, the design of hospital sinks was a bad news story before becoming a good one.

After patient adverse events were reported from ICU infections, a hospital in Ontario, Canada took a closer look. During the course of their study, they discovered that staff were washing their hands beside where they were working with sterile equipment in the ICU. The bacteria was being passed to the sterile equipment that was then used on the patients.

"The hospital brought this forward deliberately so people could learn from it. We did, and now the drain is offset and there is a 3 ft. splash zone around the sinks," says Cliff.

Many subsequent adjustments to the standard have happened the same way – through learned experience. And the planners are grateful for those who step forward. "Everyone who is involved in hospital design and planning contributes to the changes, not just the committee," says Cliff.

Research also plays a big role in ongoing improvements to the standard and those changes also reflect changes in the health care system.

For example, when revisions were being made to the standard, leading to the second edition of CSA Z8000 in 2018, they looked at ambulatory care. "The issue was, if



you have a quick procedure, do you need to have it in an operating room?" says Cliff.

"The ambulatory care section in the latest standard was updated to accommodate more procedures, so you don't have to build an OR just to be able to do a simple procedure."

The feedback is continuous and will at some point be incorporated into a third edition, expected sometime within the next two years.

The acceptance and compliance grow as the standard's benefits become clear

In Nova Scotia, Bryan Darrell has seen that within government and health care facilities, acceptance of the need for change in health care facility design and construction is an evolutionary process. "In the beginning, people were not ready to pick up on it," he says. "It was considered an unwarranted expense."

But as people started to see the benefits of the standard, interest and compliance has snowballed over time.

Bryan appreciates that it encourages them to think proactively. "That's one of the beauties about Z8000," he says. "It forces us to build in the right features from the start *and* anticipate what we might need in the future."

The province is currently engaged in several large health care building projects – including four hospitals and long-term care facilities in Cape Breton. Bryan says CSA Z8000 is playing a key role in the design and construction of these facilities.



As the standard gathered momentum in acceptance and awareness, the big question for CSA Group was, was it working? The answer is a resounding yes. “It opened people’s eyes to new ideas around health care design and how important that design was in improving patient outcomes,” says Mike Keen.

Research study confirms the impact of design elements on clinical outcomes

When it was published in 2011, the standard included features that challenged accepted design practices at the time, including:

- the requirement for single patient rooms (and separate washrooms in the exceptional cases where a room is shared);
- one washroom with a sink and toilet per patient with the exception of patients who will not use a toilet (in those cases, there would be provisions for disposal);
- the requirement for deeper and better designed hand hygiene sinks.

Those three design features were singled out for a CSA Group research study done after the standard had been in place for seven years.

The goal of the research was to determine whether health care facilities with these features have seen a decrease in HAI rates, specifically on CDI (Clostridium difficile infection) and MRSA (Methicillin-resistant Staphylococcus aureus) infection rates.

There was only a modest increase in hand-washing compliance rates – the study authors concluded that hand hygiene compliance rates are strongly impacted by the unique facility and unit culture.

But the results around HAIs were much more conclusive – an average 54.6% reduction in new C. Difficile infection rates and average 49.6 % reduction in new MRSA infection rates.

“These results confirm that design elements are having a dramatic impact on clinical outcomes,” said Mike Keen.

With CSA Z8000’s guidance, health care building project continue during the pandemic

While COVID-19 stopped us in our tracks in so many respects, many health care building projects continued during the pandemic – and for that, the planners give credit to CSA Z8000.

“We opened this new St. Mike’s building last year in the summer, right in the middle of COVID,” says Mike. The new structure has 100 new single patient rooms, including 35 brand new single patient, ICU critical care beds. For clinical staff, being able to properly care for patients during COVID in rooms specifically designed for proper infection prevention and control, provided relief during a highly stressful time.

“Our good outcomes could definitely be tied to the standard,” says Mike. “We saw the benefits on the

patient care side, with the ability to care for COVID and suspected COVID patients.”

Cliff, who is in the middle of his own \$1 billion building project in Niagara, uses the 80-20 rule. “The standard is one of the reasons we’ve been able to keep our milestones and keep the project moving through COVID,” he says. “With 80% as the standard, the risk is being managed, so I can focus my time on the 20% – what’s emerging and what needs to change.”

For Cliff and Mike and Bryan – and anyone developing a new health care facility – the standard has made their lives a lot easier.

CSA Z8000 will continue to evolve to help reduce risk and make health care facilities safer

While the standard is voluntary, most is now considered best practice. The majority of health care architects and engineers follow it and advise their clients to follow it as well.

“Design and construction of health care facilities is very individual facility-based, organization-based,” says Mike Keen. “In some of the smaller hospitals, you do one of these every 50 years.

One of the things the standard does, he says, is give all health care facilities a common starting point.

Bryan Darrell admits the learning curve for acceptance of CSA Z8000 is steeper for some than others. “I was around at the start of Z8000 and actually in some cases fought it, and in other cases championed it,” he says. “I appreciate the fact that people did not listen to me early in the game and pushed ahead with it.”

As a sign of just how far they’ve come, an infection control specialist now sits on the Nova Scotia project teams. “As recently as 10 or 12 years ago, we wouldn’t have had an infection control person on the design team sitting at the table. But now we do. And it’s an integral part of the process,” says Bryan.

For the standard’s authors, there is amazement and pride at how far it’s come since the early drafts developed in early 2000s. “The consensus-based process with the committee members, the evidence we include, the public review, events occurring – notably COVID – it all affects the evolution of the standard,” says Mike Keen.

Arriving at this advanced point with the standard is a sign of the rigour that has gone into it.

The people who use the standard know they’re getting a quality document that is making the best use of limited resources, while helping to reduce risk and make our health care facilities safer.

“Z8000 has had two editions, and it’s been going for ten years. I look forward to what it looks like in another ten years,” says Mike.