Concrete versus COVID-19: How the built environment can limit the spread of disease

On a recent road trip I had occasion to use a rest-stop washroom. As I washed my hands I noted the instructions above the sink encouraging hand washing to prevent influenza and other infectious diseases, and then I turned to leave. To exit the washroom I had to pull on the handle of a heavy metal door. Being familiar with the saying that the doorknob is the second-dirtiest part of the washroom, I pondered my options for a germ-free exit.

I quickly discounted the window; it was too high. Instead, I resolved to use local materials to escape. As there were no paper towels, I used toilet paper to make a glove with which to grab the door handle. I pulled the door open—wide enough to allow me to exit with a graceful pirouette—and carried on my way. As I drove away I wondered about the slow adoption of new building standards that eliminate the touching of shared surfaces.

Awareness of the role that urban design plays in disease prevention is hardly new. Famously, in 1854 English physician John Snow demonstrated that an outbreak of cholera in London was attributable to water drawn from a single well. At the time, sewage was carried in street gutters or pits scattered around residential areas, leading to fecal contamination of drinking water.

The subsequent adoption of piping systems that brought clean water directly into houses is recognized as a landmark example of how proper urban design can reduce contagion. Similarly, an important tool in the fight against tuberculosis was the provision of adequate indoor ventilation.[1]

Reduction of infectious diseases is not the only health benefit that can be achieved with proper design of living spaces and communities. Urban design can be used to promote active transportation, access to shade, opportunities for social interaction, clean air, and many other benefits.

While much of the progress in preventing infections has come from providing clean air and water, the role of fomites (objects that are touched by multiple people) is another factor. In some instances, the role of fomites is clear: we don't reuse needles or tongue depressors because of the obvious risk of transmitting disease. There are a host of pathogens that can be deposited on surfaces, then transmitted to whoever else touches that surface. *E. Coli*, *Streptococcus*, MRSA, yeast, norovirus, and influenza are all examples. When it comes to colds and flu, however, the role of fomites is somewhat less clear.[2]

Although studies have demonstrated the ability to recover viruses from surfaces (especially nonporous surfaces) days after initial deposition,[3] the recovery of viral nucleic acid does not necessarily mean that those surfaces are a significant source of transmission, and good ventilation, personal spacing, and hand washing may be the mainstay of preventive measures. Nevertheless, given the evolving state of understanding of the role that touched surfaces play in the spread of COVID-19 (let alone the other pathogens that are present), policies that promote environmental hygiene are thought to be justified.[4]

It is fair to ask whether we have done enough in our buildings to limit the risks posed by everyday objects. Doorknobs, light switches, toilet handles, faucet knobs are all unbiquitous, but are they necessary?

Researchers in Singapore studied COVID-19 patients' living spaces and found that the virus was present on toilets, sinks, door handles, and light switches.[5]

Doorknobs, light switches, toilet handles, faucet knobs are all unbiquitous, but are they necessary?

Current events will place more focus on opportunities to design washrooms and other living spaces in ways that reduce surface contacts. Motion-sensing light switches, doors that swing outward on exit, self-flushing toilets, pedal-operated sinks, and sensor-triggered hand dryers are all options that offer ways to make the built environment a bigger ally in the reduction of disease. ■

—Lloyd Oppel, MD

This article is the opinion of the Environmental Health Committee, a subcommittee of Doctors of BC's Council on Health Promotion, and is not necessarily the opinion of Doctors of BC. This article has not been peer reviewed by the BCMJ *Editorial Board.*

References

1. Duhl LJ, Sanchez AK. Healthy cities and the city planning process: A background document on links between health and urban planning. World Health Organization. 1999. Accessed 31 March 2020. https://apps.who.int/iris/handle/10665/108252.
2. Stephens B, Azimi P, Thoemmes MS, et al. Microbial exchange via fomites and implications for human health. Curr Pollution Rep 2019;5:198-213.
3. van Doremalen N, Bushmaker T, Morris DH, et al. Aerosol and surface stability of SARS-CoV-2 as compared with SARS-CoV-1. N Engl J Med 2020. doi: 10.1056/NEJMc2004973.
4. Bin SY, Heo JY, Song MS, et al. Environmental contamination and viral shedding in MERS patients during MERS-CoV outbreak in South Korea. Clin Infect Dis 2016;62:755-760.
5. Ong SWX, Tan YK, Chia PY, et al. Air, surface environmental, and personal protective equipment contamination by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) From a symptomatic patient. JAMA 2020. doi: 10.1001/jama.2020.3227.