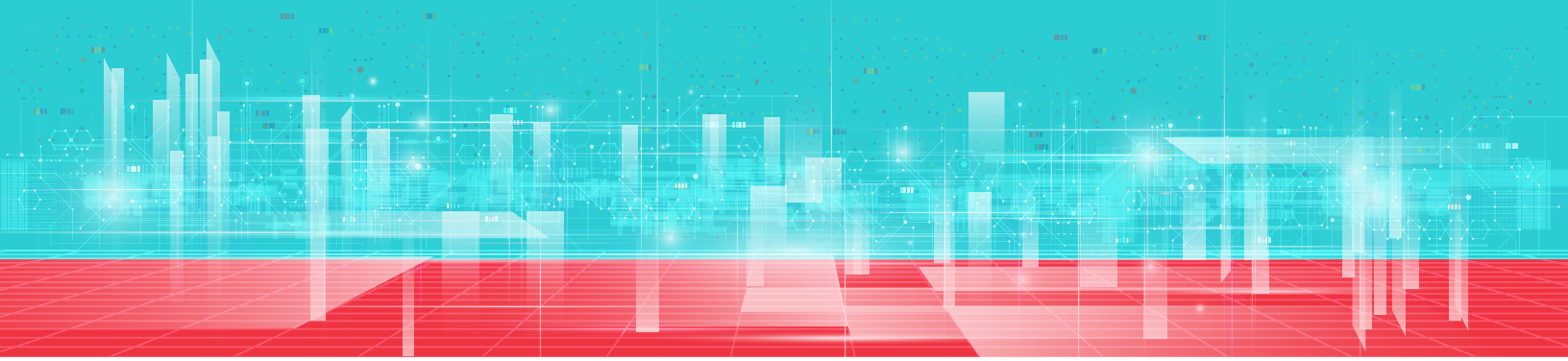
FROM MANNEQUIN TO METAVERSE:
Advancing experiential health care training



At the beginning of the pandemic, Providence Health Care's (PHC) clinicians at St. Paul's Hospital faced a growing problem. Patients were arriving daily with severe breathing difficulties, many needing breathing assistance from a procedure to insert a tube into the throat, called intubation. Adding to the complexity, many of the patients were frail and infectious with COVID-19. Soon, the trained clinicians couldn't keep pace with the demand for this life-saving procedure. They turned to medical simulation, using a "smart" mannequin to train additional health providers to become expert at the skill — learning in full personal protective equipment.

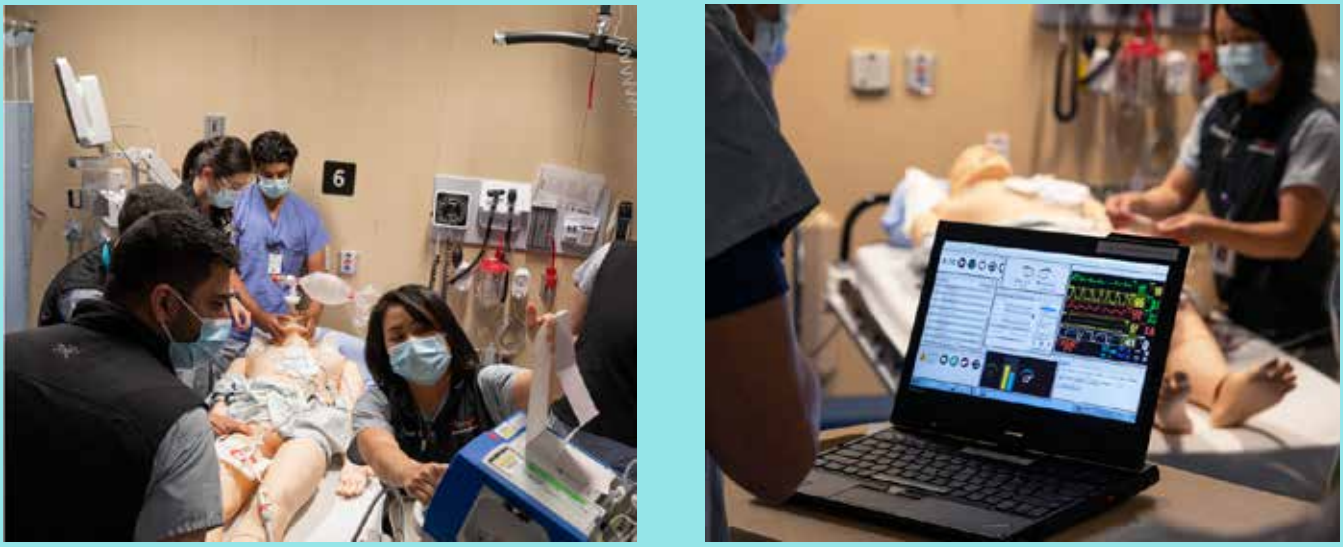
A protracted emergency like COVID-19, laid bare the need for expanded capacity and options for experiential training across the health care system. This became evident in central hubs like Vancouver, but also exposed the critical need to create remote experiential learning opportunities, particularly for under-served areas such as rural towns and villages and Indigenous communities.

THE OPPORTUNITIES OF EXPERIENTIAL, IMMERSIVE TRAINING

Of course, medically-oriented experiential and simulation learning techniques are not new. Almost a century ago, the founder of the Mayo Clinic, William J. Mayo said "There is no excuse today for the surgeon to learn on the patient." With that comment, Dr. Mayo was referring to the need for safe, repetitive training environments that don't put patients at risk. **Experiential training opportunities, including simulation training, have been shown to not only allow for safe-to-fail practice, but also increase confidence and empathy of medical professionals.**

> **There is no excuse today for the surgeon to learn on the patient.**
>
> **William J. Mayo,** founder of the Mayo Clinic

Today when we refer to medical experiential training, it might include the surgical cadaver training from Mayo's day as well as high-tech human-like mannequins who can "breathe" and react with vital signs, movements and sounds. These newer mannequins create exceptionally realistic scenarios, allowing for training on everything from team communication to intubation to surgical procedures. While effective, mannequins are also expensive and finite, in that they are static in a physical room and must be "booked" and used by clinicians and students in one location, in rotation. Learners in distant or isolated communities can only hope to watch such training via video feeds, with no real option for hands-on participation.



Simulation at St. Paul's Hospital, June 2022

Over the last decade, Canadian health care and health education have seen the experiential learning landscape change beyond recognition. It has been spurred by two things — the incredible innovation in the sector as well as the COVID-19 pandemic which has underscored the need for decentralized training opportunities.

Digital training options in particular have emerged as infinitely extensible and configurable tools that are not limited to one, centralized location. Extended reality (XR) technology allows learners to train in 3-D virtual environments — they can move around, manipulate objects in their environment as well as talk to and collaborate with others. They might don virtual reality (VR) headsets and practice the same surgical procedure over and over again. Or they might use augmented reality technology (AR) which creates a virtual layer of visual information on top of an actual, lived environment.

As computers, modeling, and graphics have improved, so too have the immersive technologies' ability to recreate realistic environments and scenarios. Furthermore, as networking capacity and speed have improved, a clinician avatar at St. Paul's Hospital, might be working alongside an avatar of a colleague in Prince Rupert, another at the Mayo Clinic and another in Paris or Harare. Or one colleague from each place. Just like 3D, multi-player video games, these medical professionals can talk to one another, discuss the procedure, take turns, ask questions — truly learn through hands-on experience, repetition and collaboration.

Next, we will be stepping into the metaverse where further advances in extended reality will see the use of patient holograms in infinitely customizable scenarios used for virtual training. Learners from anywhere can reach for, and grab a holographic stethoscope, listen to a holographic patient's lungs, and diagnose and treat them for pneumonia or COPD or COVID-19.

BEYOND TRAINING

Newer 3-D and immersive technologies have already been shown to improve access, costs, and even effectiveness of training. But these technologies also have the potential to improve care itself. Using the recent separation of conjoined twins as an example, surgical teams demonstrated that they can now conceive of, plan and practice complex procedures and surgeries that were previously considered impossible. **So more than just the practice and training itself, these technologies have and will drive forward improved care and save lives around the world.**

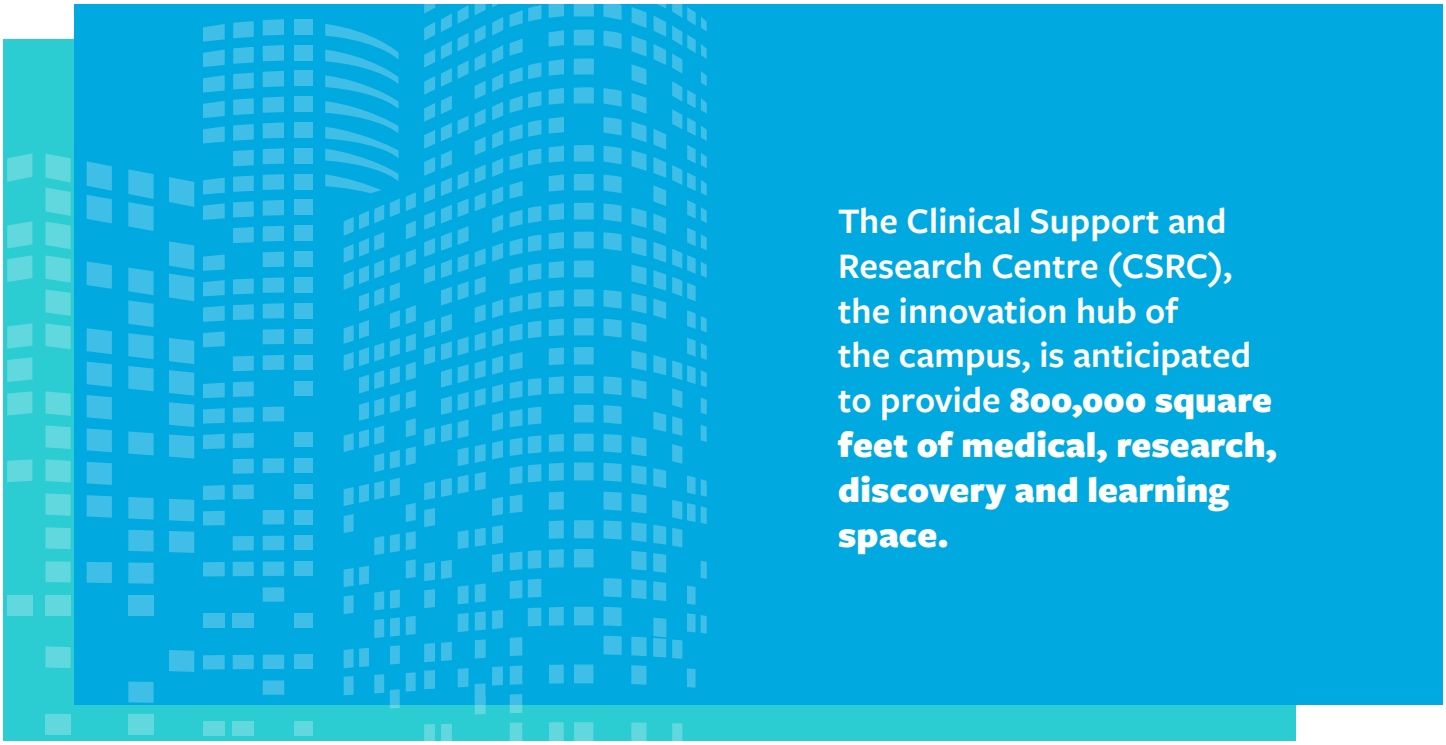
Another potential game-changer is the integration of "haptics" — technologies that can create the experience of touch — into virtual environments. **Adding a sense of touch to previously visual-only interfaces like telehealth and video conferencing,** supercharge a professional's ability to diagnose and treat patients from a distance, overcoming many of the limitations we experience today.

Additionally, **recent research into immersive learning options has shown some important benefits for the healthcare of underserved patient populations.** For example, virtual reality (VR) has been shown to encourage empathy between individuals, which can diminish both conscious or unconscious biases including racism and discrimination. **Practitioners cultivating empathy for the life experience of an Indigenous person living in rural BC or a senior living with chronic pain outside of a major centre**, will only make our health system better and our population — including those living in isolated communities — healthier.

Further advances in extended reality will see the use of patient holograms in infinitely customizable scenarios used for virtual training.

TOMORROW, TODAY: INTERDISCIPLINARY, INNOVATION SPACE AT ST. PAUL'S HOSPITAL

The development of the new St. Paul's Hospital and health campus offers an unprecedented opportunity to explore a variety of innovations in the health care field, ultimately advancing patient care and outcomes. Set to open in 2027, this campus will foster unique collaborations, bringing together interdisciplinary health teams as well as academics, private industry, patients, and community. Temporarily called **the Clinical Support and Research Centre (CSRC), the innovation hub of the campus, is anticipated to provide 800,000 square feet of medical, research, discovery and learning space.** It will have wet and dry laboratories for Providence Research's extensive research community, physician offices and clinical practices, and an Innovation Centre filled with collaboration spaces to promote creative conversations and spontaneous ideas. There will also be room for private tenants from the medical and scientific industry and symbiotic partners. **It will be connected with a sky bridge and public plaza to the new St. Paul's Hospital** on the Jim Pattison Medical Campus, reinforcing the invaluable connection of research and learning to the hospital environment.



The Clinical Support and Research Centre (CSRC), the innovation hub of the campus, is anticipated to provide 800,000 square feet of medical, research, discovery and learning space.

A TECHNOLOGY-ENABLED EXPERIENTIAL TRAINING CENTRE

Within the CSRC, **we will build an ambitious and futuristic experiential training centre.** Education spaces will include **human-cadaver labs, mannequin-patient rooms** with adjacent **observation and feedback rooms,** and a **dedicated extended reality (XR) space for the development and use of VR, AR, holographic and future technologies** that benefit learners, no matter where they reside.

THIS EXPERIENTIAL TRAINING CENTRE WILL BE USED FOR THREE PURPOSES:

EDUCATION	**The centre will prioritize the ongoing experiential training** of physicians, nurses, allied health personnel, first responders, as well as students, medical residents, fellows and other post-graduate trainees. With advanced video-streaming and XR capabilities, and with the participation of partners, **Providence and St. Paul's Hospital will extend these experiences to learners across the province and around the world.**
RESEARCH	**Advancing the use of immersive training technologies and procedures will be a priority**, with ongoing research and academic investigation into improving learning and retention of medical skills.
INNOVATION	As part of Vancouver's high-tech community and just adjacent to Vancouver's "Creative District," **we will provide space for innovators to prototype and test new methods that will advance technology-enabled experiential training**. From global networks to technology advances to graphic interfaces to virtual environments, we will become an ideal "sandbox" to push forward the best training possibilities and make them available to students and clinicians, BC and Canada-wide.

PARTNERS IN THE COMMUNITY

Beyond the now-achievable advances outlined, the future of experiential learning is an exciting expanse of possibilities. **Innovators, investors and philanthropists alike have the opportunity to build on these advances to shape this sector and make a consequential global contribution.**

With respect to the overall Clinical Support and Research Centre, **Providence expects to select a development partner by early 2023.** Construction on the first two CSRC buildings is set to start by early 2024 with a goal to align its opening as close as possible to the hospital. The development partner will lease the land from Providence, and select their own designer, builder, and tenants.

To bring this future to life, **we want to work with a variety of allies including commercial partners, philanthropic donors, creative and technology partners** in education or industry, as well as other digital and experiential training experts and simulation centres.

TO LEARN MORE, CONTACT:

Jeanne MacLeod, MD, CCFP (EM)
Emergency Physician, St Paul's Hospital
and Mount Saint Joseph Hospital
Co-Lead, Simulation Resource Education Team,
Providence Health Care
jmacleod@providencehealth.bc.ca

MISSION:
FORWARD
2019
2026
PROVIDENCE HEALTH CARE
STRATEGIC PLAN

Providence
HEALTH CARE
How you want to be treated.

Published: September 2022