

# CSTAR Annual Report

2020-2021



# CSTAR's Vision and Mission

## Our Vision

CSTAR will be a leading, internationally recognized centre for healthcare innovation.

## Our Mission

CSTAR improves the quality and safety of patient care by:

Providing a safe environment for the development of health care providers with a focus on interprofessional education, simulation and training

Advancing research into computer assisted surgical technology through the application of robotics and artificial intelligence

Building value through collaborative development and delivery of accredited simulation programming

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# CSTAR Annual Report 2020-2021



# Message from the Directors

What a year. Where to start?

The team at CSTAR began this fiscal year adjusting to the global COVID-19 pandemic and learning on the fly. The vast majority of our scheduled courses were cancelled as a result of the need to protect everyone from potential infection. Even during periods of low community virus transmission, we were only able to allow a few learners into CSTAR, governed by the need to maintain physical distancing and staff communities. Many of our staff were redeployed to other areas of the hospital, and at times CSTAR was closed completely.

Despite the pandemic, CSTAR remained productive and resilient. In the pages that follow, we highlight some of our successes and the innovative solutions our team and partners were able to deliver. We're very proud of all that was accomplished, and hope you find the information interesting.

All of that however, is preamble to what is most important. And that is our need to say thank-you to so many.



# Message from Directors (cont.)

Thank-you to our incredible staff and team at CSTAR. You remained positive and resilient despite the most difficult of circumstances. Despite challenges at work, at home, and against the backdrop of a global health crisis the likes of which none of us has experienced, you showed up with the best of yourselves. Your commitment to CSTAR, to our partners and to the organization we serve has been exemplary. You should be incredibly proud.

Thank-you to our clinicians and academic partners across the city. The pandemic impacted you most of all, and you continued to focus on care delivery, education and quality improvement. While your CSTAR courses were cancelled, truncated and moved to virtual, you rose to the challenge and innovated. Your spirit and partnership is what makes CSTAR great, and your commitment to our patients is an inspiration.

As we move through what remains of the pandemic we are encouraged by vaccination rates and an eventual return to a new normal. While things will never be exactly as they were, we are encouraged that the upcoming year will include more people returning to CSTAR. We will retain the things we have learned and developed, and we look forward to new innovations and opportunities.

Thank-you for your continued support and interest in the work we do at CSTAR.

Andrew Mes, Director CSTAR  
Christopher Schlachta, Medical Director, CSTAR



# Accreditation



## Preparing for RCPSC Re-accreditation

Starting in the fall of 2019, the CSTAR team was busy preparing our submission for re-accreditation with the Royal College of Physicians and Surgeons of Canada. The accreditation application includes information on our mission, vision and goals; policies and procedures; leadership and governance; facilities; instructor and staff development; educational processes; and research activities. It is a comprehensive assessment of our centre and an opportunity to showcase the progress we have made in the last five years. We completed our application two days early but unfortunately due to a technical problem in the software we were not able to have the satisfaction of clicking on the submit button! The next step in the process is a virtual site visit that will take place in May or June of 2021. We will be able to take the information and learning from this process and apply it to our re-accreditation with the American College of Surgeons in 2022.

Thank you to everyone who supplied information to support and enhance our application, we feel it was a strong submission and look forward to receiving our results.



AMERICAN COLLEGE OF SURGEONS

*Inspiring Quality:  
Highest Standards, Better Outcomes*

100+years

# The CSTAR Team



- ▶ Dr. Christopher Schlachta, Medical Director
- ▶ Andrew Mes, Director
- ▶ Tara Oke, Coordinator
- ▶ Stephanie Ayres, Simulation Consultant
- ▶ Rachel Daniels, Surgical Suite Associate
- ▶ Maria Quiroz, Learning Assistant
- ▶ Meghan Lightfoot, Administrative Assistant
- ▶ Karen Siroen, Surgical Suite Associate
- ▶ Scott Sumpter, Simulation Tech Consultant

# CSTAR Education Committees

## Quality and Educational Excellence Subcommittee

In January 2021 we introduced the Quality and Educational Excellence Subcommittee with a focus on identifying strategies for improvement to ensure that programs offered at CSTAR meet the standards for accreditation.

### Membership

- ▶ Karen Burnett, Clinical Educator UH OR
- ▶ Ian Dashnay, Clinical Educator ICU
- ▶ Amy Domingues, Clinical Educator MBCU/ Gyne
- ▶ Dr. Mary Fotheringham, Emergency Physician
- ▶ Camilo Jaramillo, Clinical Educator UH ED
- ▶ Samantha Larose, RN CNS
- ▶ Elizabeth McGowan, Clinical Educator UH Periop
- ▶ Rebecca Park, Clinical Educator CCTC
- ▶ Dr. Sonja Payne, Anesthesiologist
- ▶ Leanne Scott, Clinical Educator General Surgery
- ▶ Dr. Peter Wang, Paediatric Urologist
- ▶ Tim Winterburn, Respiratory Therapist



## Education Advisory Committee

- Dr. Christopher Schlachta, Medical Director, CSTAR, Consultant, General Surgery
- Dr. Richard Cherry, Associate Dean, Learning with Technology & Simulation, Consultant, Anesthesia
- Dr. Jeff Yu, Consultant, General Internal Medicine
- Ana Malbrecht, Educational Coordinator Medicine
- Dr. Robert Leeper, Consultant, Critical Care and General Surgery, In situ
- Dr. Mary Fotheringham, Simulation Director, Consultant, Emergency Medicine
- Dr. Marie Eve Lebel, Simulation Lead, Consultant, Orthopedic Surgery
- Dr. Brent Lanting, Consultant, Orthopedic Surgery
- Terri MacDougall, Education Coordinator Surgery
- Dr. Julie Ann VanKoughnett, Program Director, Consultant, General Surgery
- Stacey Wanlin, Research Manager, Fowler Kennedy Sports Medicine Clinic
- Belinda Gougoulas, Coordinator Respiratory Therapy
- Donna McAnallen, Manager Nursing Professional Practice
- Kayley Perfetto, Patient Safety Specialist
- Andrew Mes, Director CSTAR
- Tara Oke, Coordinator CSTAR
- Stephanie Ayres, Simulation Consultant CSTAR
- Maria Quiroz, Learning Assistant CSTAR

# CSTAR's Early Response to Covid-19

The Covid-19 pandemic has made a profound impact across all industries and businesses requiring significant and fluid changes as we all continue to navigate the pandemic course. Healthcare continues to be challenged as Covid-19 has rapidly evolved, with variants of concern, several waves within our communities and increased Covid-19 cases entering hospital doors. During the course of the pandemic, CSTAR continued to provide educational events with changes to our delivery and capacity.

Early in the pandemic, CSTAR staff worked with various areas to conduct in situ simulations related to Covid-19 changes in practice. These learning opportunities enabled staff to develop confidence in their practice and their teams as the pandemic spread throughout our communities. Redeployment of more than half of CSTAR staff occurred to other areas in the hospital including public and staff screening at entrances, Occupational Health for staff N95 fittings and cardiac care. The remaining staff continued to support scaled-back educational events.

CSTAR in collaboration with Infection Prevention and Control (IPAC) and Occupational Health and Safety Services (OHSS) took measures to ensure the safety and well-being of our staff and customers while enabling courses to continue their educational goals. The measures taken included reduced room capacity to allow for social distancing, appropriate personal protective equipment (PPE) and providing clear paths to enter and exit the facility. CSTAR respected hospital cohorting and communities to enable continuing education.

CSTAR also prepared to potentially house patients as part of an effort to optimize space in non-traditional locations. Staff started by documenting the required equipment associated with transferring to inpatient care. CSTAR acquired chairs, overbed tables, and WOW carts; and requests were made for patient beds, code carts and monitoring equipment. Overall, CSTAR was willing and able to house patients in the event of a worse case scenario. As the pandemic continued and the government created lock downs to slow the progress of Covid-19, hospitals across the province worked together to shift non-traditional areas into patient care and CSTAR was not needed to fill the gap.

After 6 months, the CSTAR team returned to full complement and worked together to establish new virtual options to continue educational opportunities across both sites during the cohorting and communities phase. One of these innovative events was showcased in the May 2021 Edition of Hospital News.

Attention then shifted to decrease in person educational events to reduce the spread. Covid-19 outbreaks in the hospital setting affecting both patients and staff continued for several months at the end of 2020 which were followed by provincial lockdowns in 2021. This impact was greatly felt by CSTAR staff and resulted in the cancellation of many courses and events to prevent the spread of the virus.

CSTAR continues to collaborate with hospital groups to promote educational events with the health and well-being of LHSC and CSTAR staff in mind. CSTAR is committed to providing continued high-quality services to our customers, we are proud to be able to achieve these priorities even in these difficult circumstances.

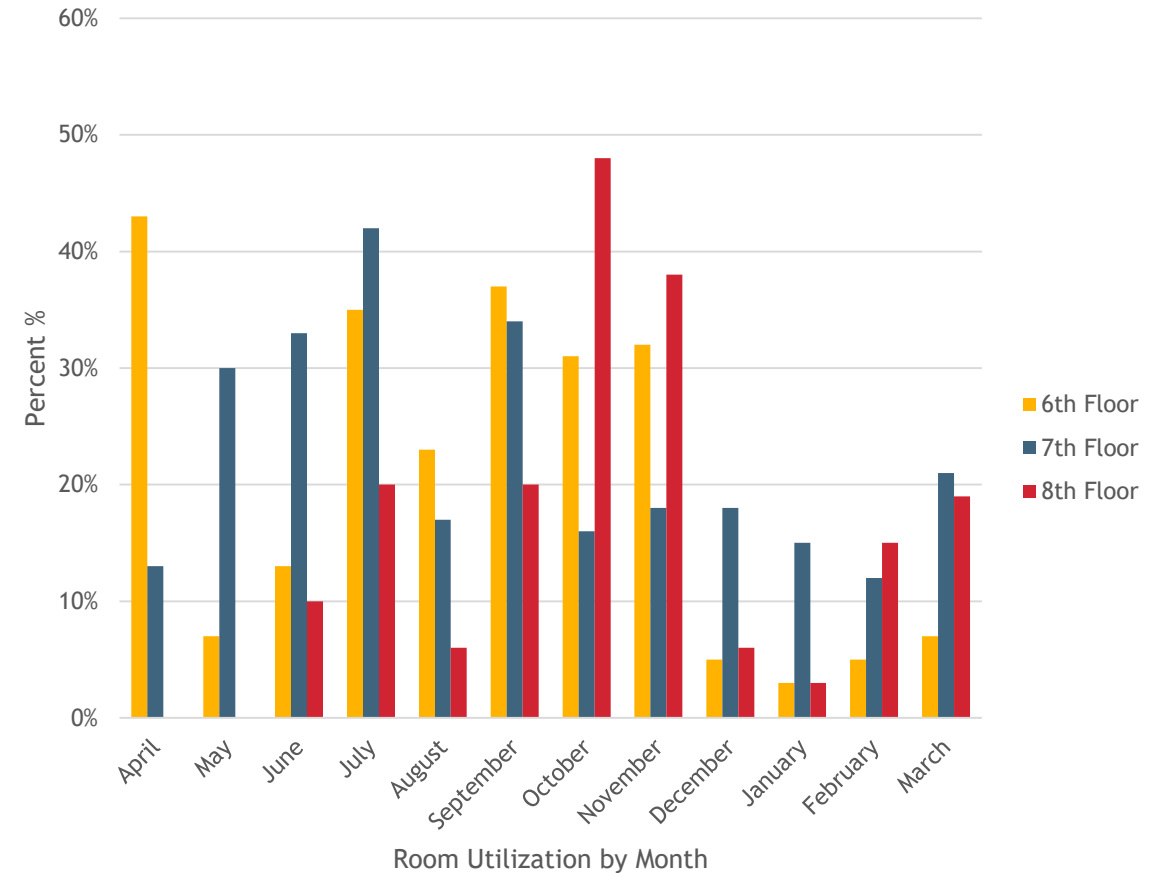
# CSTAR Facility Utilization

In the months of May to September our usage of the 7<sup>th</sup> floor meeting rooms increased as we moved to hosting virtual learning. In the fall we were able to open our simulation and lab spaces but had to close them again in December due to organizational outbreaks followed by a provincial lockdown.

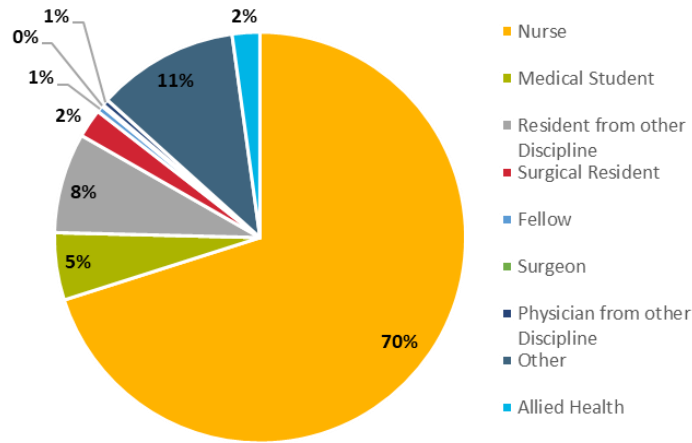
We continue to work closely with Infection Prevention and Control to ensure we are keeping our staff and customers safe throughout the pandemic.

Overall, our capacity throughout the year was below 50%, a significant decrease from previous years.

### CSTAR Simulation and Laboratory Space Utilization by Month



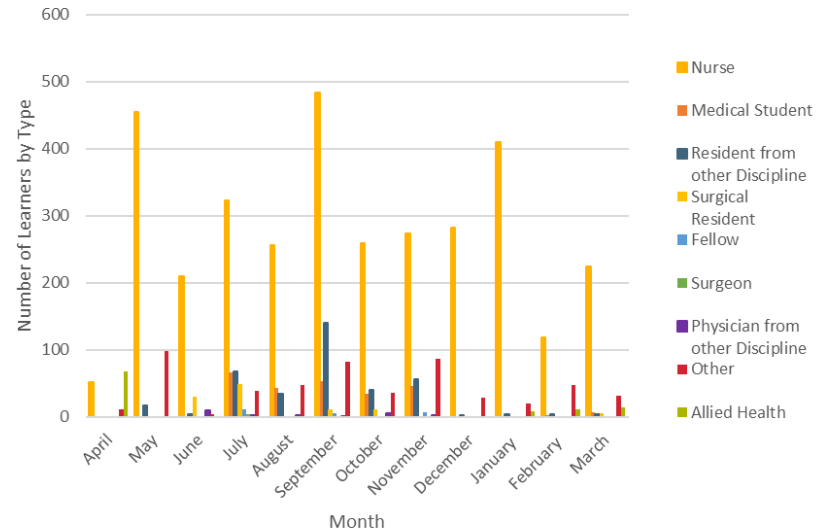
**Learner Type Based on 2020-2021 Fiscal Year**



\*These numbers reflect virtual and in-person training. Nursing and PSW (Other) Orientations were primarily virtual.

By switching to a virtual format, CSTAR was able to continue Nursing and PSW orientations and accommodate higher numbers of learners than in previous years.

**Total Number of Learners each Month by Type**



# Learners at CSTAR



# Central Nursing / Personal Support Worker Orientation Goes Virtual

*The pandemic pushes CSTAR's boundaries from in person teaching to the virtual realm.*

For the last 8 years, CSTAR has hosted LHSC's Central Nursing Orientation. Every Registered Nurse and Registered Practical Nurse commencing their practice at LHSC have attended the week-long interactive training session at CSTAR that includes didactic sessions, skills training, and simulations. Starting in 2019, Personal Support Workers joined to make the first combined Central Nursing and PSW Orientation.

Central orientation sessions had historically been attended by large cohorts that would go on to support LHSC's 34 clinical programs. The novel coronavirus posed an almost insurmountable challenge - new physical distancing measures made in-person training sessions impossible to execute. LHSC had a mandate to continue to provide education and patient care using a virtual format wherever possible. CSTAR staff began work, in collaboration with Professional Practice, to keep this vital training going. By the first week of May, content had been optimized for virtual learning, CSTAR staff had figured out the nuances of the WebEx Training platform and trained instructors for their first didactic session. Agility and a long-standing partnership with Nursing Professional Practice made the first fully virtual orientation session a success. Over the months of the pandemic, we continued to train new instructors and collaborate to make improvements to the orientation session incorporating feedback from the learners.

In the last year, 640 RNs, RPNs, and PSWs completed virtual central orientation and commenced their practice at LHSC.

# HEALTH SCIENCE EDUCATIONAL SIMULATION

Along with the Covid-19 pandemic came the unique challenge dealing with a temporary shift from primarily providing in-person educational experiences, to facilitating the same excellent learning that is expected of CSTAR, in a virtual setting.

Our Simulation Technician, Scott Sumpter, moved from repairing manikins and AV setups to the role of film producer. With the assistance of the clinical educators and subject matter experts, CSTAR was able to create over 40 high quality professional looking videos. This enabled nurses and other professions to learn important material while also remaining safe. Feedback from participants continually reinforced the importance of including videos to enhance the learning experience.

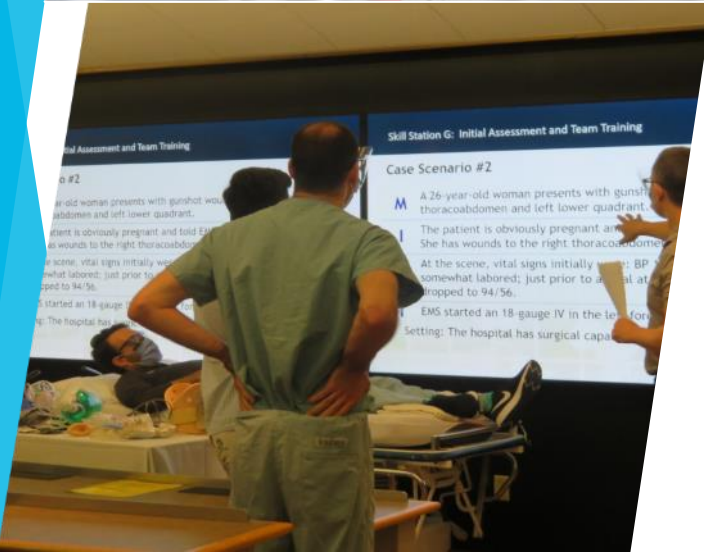
The videos also facilitated the hospital's effort to contend with Covid-19 by allowing re-deployed personnel to refresh their knowledge and help provide the confidence required to step into unfamiliar shoes.

# Carrying On - Working With Covid-19 Restrictions

## Advanced Trauma Life Support ®

In 2020, CSTAR hosted five Advanced Trauma Life Support ® courses. This program was developed by the American College of Surgeons (ACS) Committee on Trauma (COT) and was first introduced in Canada in 1981.

The Advanced Trauma Life Support ® program teaches a systematic and concise approach to the care of the trauma patient by providing a safe and reliable method of immediate evaluation and treatment. The program focuses on treating the greatest threat in life first. It demonstrates how to assess a patient's condition, resuscitate and stabilize the patient, and determine if his or her needs exceed a facility's capacity. The course presents doctors and other qualified healthcare providers with knowledge and techniques that are comprehensive and easily adapted to fit their needs.





Due to Covid-19, this course moved to a Hybrid model, which allowed students to do online modules prior to the course and attend in person for the skills portion. Students were placed into small groups and rotated through sessions maintaining social distancing and wearing appropriate PPE as required

The following were comments from participants:

- ▶ “Very useful! Alleviated uncertainty w/ trauma” - September 2020
- ▶ “I enjoyed the modules/online learning as an addition to in person courses. Different methods of learning reinforce the principles of the course.” - November 2020
- ▶ “Excellent course, thank you for all of your hard work to deliver this essential course during these challenging times.” - November 2020





# Carrying On - Working With Covid-19 Restrictions

## Internal Medicine Ultrasound

Internal Medicine residents value the hands-on practice of procedural skills, vascular access, and point-of-care ultrasound in the simulation lab. To maximize the educational impact, these workshops are designed with a flipped classroom approach. Before arriving at the workshops, residents learn hours of didactic material through an online curriculum so they can spend as much time as possible in the simulation lab “getting their hands dirty” (often literally with ultrasound gel).

Using task trainers, residents can practice ultrasound guided thoracentesis; paracentesis; jugular vein and arterial line placements; and peripheral intravenous access. Standardized patients are engaged so that residents can practice ultrasound imaging of relevant anatomy; demonstrate a normal lung ultrasound exam; and interpret normal lung ultrasound findings.





When the Vascular Access Program scheduled in May 2020 had to be canceled due to the pandemic, the team collaborated with CSTAR staff to ensure residents had access to this essential training. With careful planning and collaboration, the Vascular Access program was rescheduled to August and Ultrasound Procedures continued as scheduled in September.

In order to meet the social distancing guidelines for CSTAR established by Infection Control and Occupational Health, students were assigned to groups of 4 or 5; used proper PPE and cleaning protocols; rotated through the stations without mixing with other groups; and attended lectures in a large auditorium.



# Celebrating Our Success - New Courses

## **Emergency Department Simulation Programs Return to CSTAR**

*The emergency medicine simulation program is back at CSTAR after 4 years.*

This year, CSTAR has had the pleasure of once again hosting simulation sessions for ED residents and clerks. These simulation sessions use a team-based approach to familiarize and train participants in effective recognition and management of common presentations to the ED. Each simulation is followed by a debrief where learners are encouraged to reflect on their performance; receive and provide feedback to others; and identify how they will apply their learning in the clinical setting.

### **Medical Clerks**

In their first year of clerkship, third year medical students come to CSTAR during their ED rotation. Here, they face cases such as VT/VF, PEA arrest, and even non-obvious lacerations. Paired with creative moulage, the use of SimMan3G, RescuscAnne, and basic equipment, they are able to get an introduction to practice in the ED. Clerks also learn about leadership and effective use of resources as they each take point on a different scenario

### **Emergency Residents**

Meanwhile, ED residents encounter simulations of advanced emergency medicine presentations. At each session, they run through new high-stress scenarios such as a STEMI, eclampsia, and beta blocker overdose. The unique advantage of simulating these cases in a low-risk, psychologically safe setting is that errors can be allowed to unfold, enabling learners to deal with potentially disastrous consequences, without danger to patients. Under the observation of an experienced ED physician, residents are able to work through a differential, define a treatment plan, treat, and reflect on the patient encounter.

Both groups were impacted by Covid-19 restrictions, having to cancel sessions at CSTAR or include only staff who were assigned to University Hospital at different points throughout the year.

# Celebrating Our Success - CSTAR Website

## Improvements to Our Website

With the continued reliance on virtual resources due to the pandemic, we spent time this year updating our website to make it more accessible and user friendly for our clients. The About Us section highlights the three complementary sides to our purpose: Surgical Technology, Simulation/Education, and Research; as well as our new Vision and Mission; and Annual Reports.

For those who are interested in booking our space, we created a section called “What we Offer” that outlines the services, facilities and equipment available at CSTAR. Our booking process, and policies and procedures are also clearly identified. We also have a section dedicated to in situ simulation as we continue to grow this aspect of our service.

To meet the needs of individuals who are novice or intermediate simulation instructors, we created a repository of online materials to support the design and delivery of simulation sessions. Accessed on our website under the Education section, the Toolkit for Simulation Instructors includes tools and articles relevant to each step of the process from determining the need through to evaluation and assessment. There is also a link to the Healthcare Simulation Dictionary and information on training programs including our in-house faculty development.

We also looked to increase our social media presence this year by posting during Healthcare Simulation Week and working with Corporate Communications to write an article showcasing our virtual simulation option. These can all be accessed under the News and Events section of the website.

We will continue to make improvements to our website and welcome feedback and suggestions.





# Celebrating Our Success - Innovation for Virtual Simulation

Before the pandemic, virtual simulation was at its nascency - a novelty discussed at simulation conferences as an interesting option for the future. That changed with Covid-19. With the pandemic in full swing, room capacities reduced, provincial restrictions on in-person gatherings, and the consequent cancellation of simulation sessions at CSTAR, virtual (or hybrid) simulations became a viable and needed option to continue healthcare education. CSTAR's own simulation technical consultant, Scott Sumpter, jumped to action to create a platform that would allow simulation to continue.

The platform allows for two-way communication between the instructor and the participants through a video communication app. Once participants are given a prebrief by their instructor, they can choose roles within the team and begin the scenario. The platform allows participants to view multiple video feeds of the simulation room including their patient (a high-fidelity simulator), a patient monitor, any labs or imaging ordered, and a POCUS if requested. All of these features are controlled by CSTAR staff and can be updated and called up with just a few clicks of the mouse. Meanwhile, participants can tell the instructor which actions to perform and see the real time effects of their orders on the simulated patient.

Already, there is demand for this platform in the fall of 2021. We will continue to encourage other CSTAR users to take advantage of this platform to increase simulation offerings and improve accessibility for participants. This innovative approach to simulation is opening doors for CSTAR to partner with regional, national, and international groups to provide healthcare simulation training. For now, this platform will continue to help with access to simulation during the pandemic.



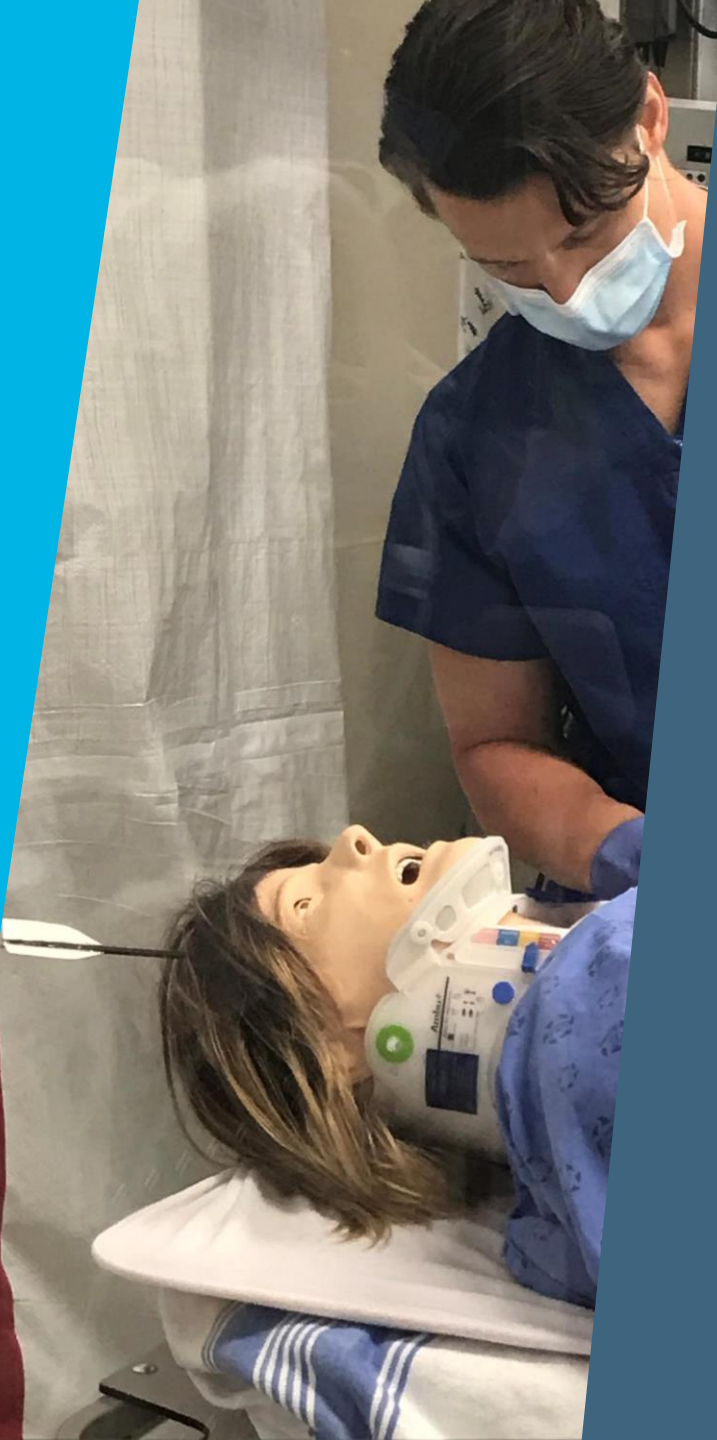
# Preparing Clinical Environments Through In Situ Simulation

CSTAR has partnered with physicians and clinical educators in several clinical areas to offer in situ simulations, taking place in the actual patient care setting. The focus for most of this year was on testing and troubleshooting Covid-19 practices to ensure staff safety is maintained while providing excellent patient care.

## Emergency Department Negative Pressure Rooms

Working with Drs. Julie Kim and Chantal Forristal, as well as emergency department nursing leadership and Clinical Educators, we used in-situ simulation to evaluate the newly renovated negative pressure Resuscitation room at University Hospital and negative pressure Trauma Bay at Victoria Hospital. Reports were provided to local leadership identifying the latent safety threats and recommendations.

The initial sessions were conducted in November 2020 and the plan was to repeat the simulations in January 2021 to test out the recommended changes and identify further opportunities for improvement. The follow-up was delayed due to the provincial lock down orders and cohorting of staff at LHSC sites due to outbreaks. In speaking with the team from the ED, one example of a recommendation that has been implemented is uncovering a portion of the window in the Trauma Bay to allow for improved communication from outside to inside the room and vice versa.



## Trauma Bay In Situ Simulation

In April and June 2020, we partnered with the trauma team at Victoria hospital, led by Dr. Rob Leeper, to conduct simulations of the trauma bay at Victoria Hospital to test the system's ability to care for suspected Covid-19 positive trauma patients. Among the key learnings from these simulations were the availability and accessibility of PPE; the need for thoughtful adaptations to the number and type of providers involved in the trauma team in order to minimize the number of providers exposed to Aerosol Generating Medical Procedures (AGMPs); and procedures for safely transporting a trauma patient to the operating room.

Several latent safety threats were identified with corresponding recommendations for each in a report that was shared with area leadership. One modification from April was to create framed in walls to form a barrier around the space where trauma AGMPs would occur, which would decrease contamination of equipment and supplies, promote a more defined entrance and exit from the space and help to facilitate post-resuscitation decontamination. This very material change occurred quickly and demonstrated both the power of in situ simulation to detect safety threats, as well as the responsiveness of our organization to help rectify them.

We conducted a follow-up scenario in the trauma bay eight weeks later to test out the recommended changes and added into the scenario a transfer to CT prior to the Operating Room. Members from the newly established Airway team participated in the simulation. Additional issues, such as entry and exit from the "hot zone" and location of supplies were identified and recommendations were made to ED leadership.



## PACU Re-Intubation of a Covid-19+ Patient Simulation

In September 2020, CSTAR partnered with Dr. Sonja Payne and Elizabeth McGowan (Nurse Educator) to offer in situ simulation in the Post Anesthesia Care Unit at University Hospital focused on preparing nurses for working with airway emergencies involving aerosol generating procedures with Covid-19 precautions. The scenario, involving the re-intubation of a Covid-19 positive patient, was conducted three times to allow all staff working on the unit that day to participate.

During each debrief staff had a chance to review relevant anesthesia equipment and protocols. The in situ simulation, not only allowed PACU staff to gain familiarity with safety protocols but also to adapt and revise these protocols once they were trialed in the clinical environment. One of the challenges identified during the simulation was the need for isolation of the patient in the PACU, to protect other patients and staff from potential infectious exposure, with recommendations to inform others around them that the procedure was happening; wear proper PPE; close the curtains; put signs on the entrance to the PACU; and have someone at the door to stop entry during the procedure. Another challenge was locating the Covid-19 checklist, it was determined that the educator would put one on the bulletin board for staff to review and put copies with the ambu bags and intubation box for easy access during a procedure. Equipment was another focus of the debrief, including the location of the specialized equipment (e.g., videolaryngoscopy and viral/bacterial filters) and rationale for their use. It was identified that this information would need to be effectively disseminated to all staff who work in the PACU.

Staff reported that the in situ training was a valuable learning experience, highlighting the focus on proper PPE; being able to anticipate what equipment would be needed and have it ready; and learning the proper sequence of events and how to attach the required equipment as key learning points.





## Mock Code Blue Simulations

CSTAR continues to partner with the Resuscitation Committee to run mock code blue sessions designed to test the system to identify any challenges related to space, equipment, wayfinding, knowledge gaps, crisis resource management, etc. After each mock code, a report is provided to local leadership as well as to the resuscitation committee so that identified issues can be resolved. In April and May 2020, we conducted mock codes to test out the Covid-19 procedures that had been put in place and make recommendations for changes.

One of the challenges was identifying staff with all the PPE on so a suggestion was made to use nametags to identify each role. Another challenge was locating the bags of PPE. By the May session, totes full of individually packaged PPE were available on the crash cart for the specified number of staff that should be in the room. Nametags with roles identified were available and it was recommended that these be placed at an entry point so that staff could access them, or to have a dedicated person at the entrance to hand them out. Having them at the PPE cart was very congested and difficult for one person to track who was in attendance and hand out nametags.

Our goal is to have monthly mock codes at alternating sites, we were not able to achieve this during the pandemic but hope to return to this model in the coming year.



## Non-trauma Covid-19 action team simulations

From August to September, we conducted several in situ simulations, as part of a research study with Dr. Rob Leeper, in the Operating room, Medical Surgical Intensive Care Unit and Cardiac Surgery Recovery Unit at University Hospital. All these simulations had a component of crisis and key patient handovers, and all involved suspected or confirmed Covid-19 patients. In each case an initial simulation was conducted, time to key activities was measured and recommendations were shared with leadership. The intention is to do a follow up simulation to test if the recommendations have been followed. We were able to follow up with the Operating Room in November, but due to further Covid-19 restrictions had to delay the follow up with the other two units with plans to resume when restrictions are lifted.

CSTAR continues to work on expanding our in situ simulation offerings, if you are interested in bringing in situ simulation to your area contact [Stephanie Ayres at stephanie.ayres@lhsc.on.ca](mailto:stephanie.ayres@lhsc.on.ca).





# Covid-19 Restrictions - Impact to Residents

The closures and ongoing restrictions to CSTAR in this past year had a major impact to learners. Many courses that are normally conducted at CSTAR, with a hands-on simulation or skills component, had to be canceled or switched to virtual learning.

**Residents** in Anesthesia, Critical Care, Surgery and Emergency Medicine attend multiple programs at CSTAR throughout the year. CSTAR also supports a remote ACLS simulation scenario with Cardiology, led by the Cardiology Fellow and Respiratory Therapy Educator, that helps to prepare residents to lead Codes for Cardiac Arrest. These programs were all impacted by Covid-19, most were canceled and some continued, when possible, with only those residents cohorted to University Hospital in attendance.

Dr. Rob Leeper, who conducts simulations for residents in surgery and intensive care medicine, feels that Covid-19 has impacted learners in a very practical way.

“We just simply haven’t been able to deliver the kind of content we would like and haven’t been able to support our learners in the ways we normally would.”

With surgery the impact was mitigated by the fact that their simulations are more intensive and offered less frequently. They were able to work creatively to offer two full days of simulation during breaks in the pandemic by altering the team structure, dividing resources across two sites and recruiting help from an additional simulation centre.

On the ICU side it was a different story. Over the 12 months of the academic year, they were only able to deliver a third of the usual compliment of junior and senior level simulations. Due to hospital outbreaks and forced cohorting of staff, there was very limited opportunity for residents and faculty from Victoria Hospital to attend even these reduced sessions.

“It’s had a really negative impact on our trainee’s ability to function and feel confident during crisis” says Leeper. “We really rely on an opportunity to run some ‘crisis sims’ with our trainees so that they are prepared to manage urgent, high stakes scenarios with a manikin BEFORE they must manage these scenarios in real life.”

Another key program for residents is the Surgical Foundations program which consists of a series of practical training opportunities at CSTAR. Several attempts were made to schedule these sessions throughout the year, accounting for the restrictions due to Covid-19, but each instance was canceled due either to institutional outbreaks, ongoing cohorting or provincial lockdowns.

While the didactic components of the course were converted to virtual workshops and talks, the loss of in person lab experiences in CSTAR certainly impacted the course. Residents were largely unable to receive hands on, low stakes, simulation-based teaching from faculty and senior residents, which are the sessions most highly valued and rated by the junior surgical residents.



# Covid-19 Restrictions - Impact to Medical Students

**Medical Students** normally attend CSTAR for a half day of simulation at the beginning of their rotations in anesthesia, emergency and general medicine.

The goal of these sessions is to give clerks an opportunity to gain skills and build confidence in managing acute medical situations and in performing skilled procedures. They are also given exposure to using a team approach in managing acute medical scenarios.

Due to Covid-19 many of these sessions were canceled or only attended by students who were located at University Hospital. This is a lost opportunity for the students as they will not be able to make up these sessions in the future.





#### Resident Programs impacted by Covid-19:

- 21 Anesthesia Resident sessions
  - 4 Critical Care Junior Resident sessions
  - 5 Critical Care Senior Resident sessions
  - 3 Emergency Department Resident sessions
  - PGY1 Surgical Foundations Program
  - 12 CCU Code Blue Training sessions
- 

#### Medical Student Programs impacted by Covid-19:

- 18 instances of Anesthesia Bootcamp
- 6 Emergency Department Clerk sessions
- 12 Medicine Clerk skills and simulation sessions
- Surgery Clerkship Orientation



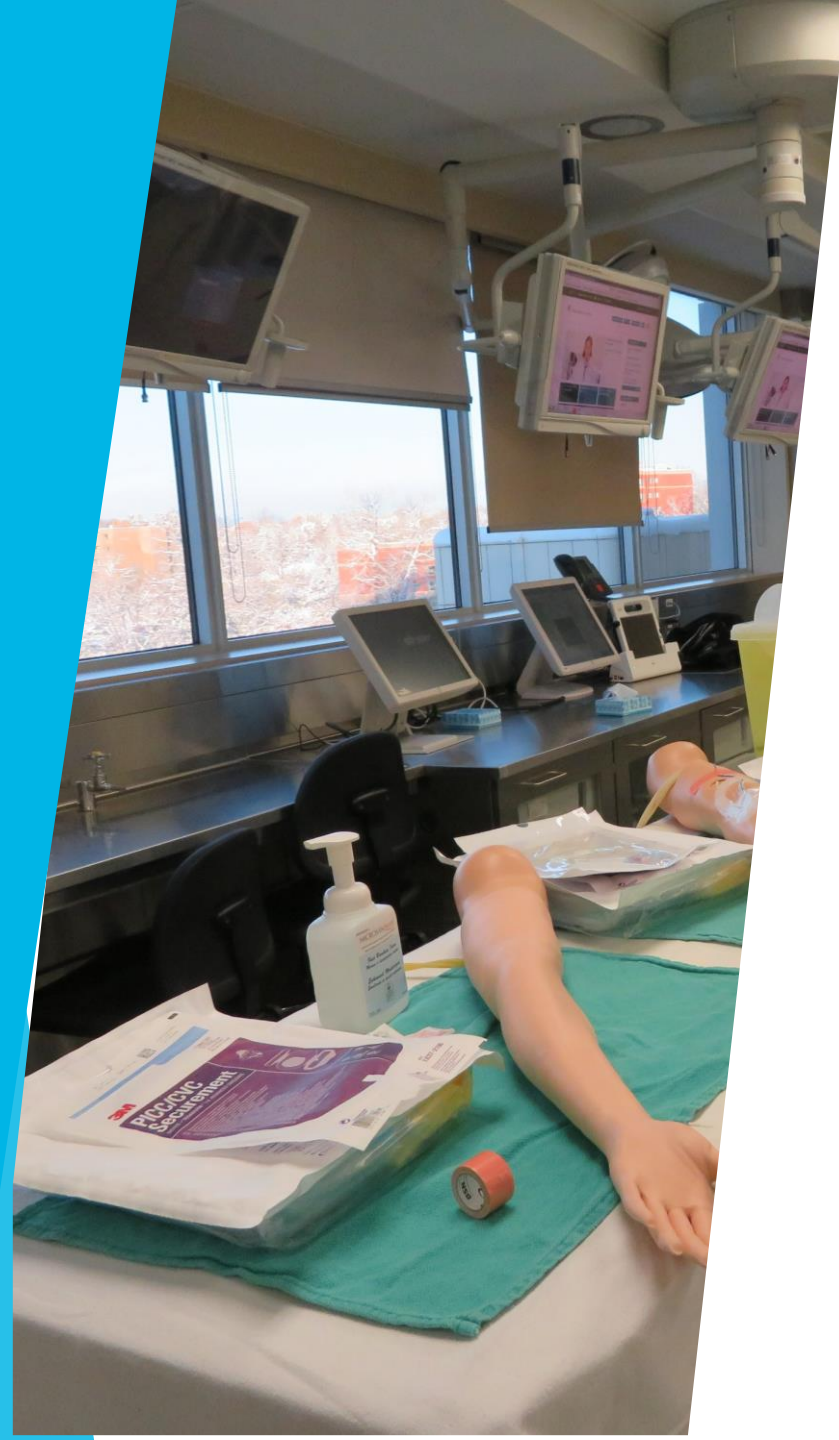
# Covid-19 Restrictions - Impact to Nurses & PSWs

**Nurses and Personal Support Workers** attend three days of simulation at CSTAR as part of their orientation, covering practical topics such as Baxter pumps, venipuncture, restraints, chest tubes, code blue and crash carts. From April 2020 through to March 2021 these orientations were conducted virtually - causing the new hires to miss out on the hands-on components that are so vital to their preparation.

Unit specific orientations which are normally held at CSTAR switched to virtual delivery as well, which resulted in an increased load on the unit educators who needed to find opportunities for practice and certification of the new nurses. Also impacted were the annual skills fairs for Critical Care, Emergency, Clinical Neurosciences and the Critical Care Outreach Team.

According to Tim Winterburn, Respiratory Therapy Educator, “these annual sessions have every critical care Registered Nurse and Respiratory Therapist from both VIC and UH utilize the CSTAR facilities for education and recertification.”

Learners reported that although they appreciated the efforts to provide virtual learning, they need hands-on opportunities to feel confident in procedural skills.



# Covid-19 Restrictions - Impact to Annual Courses

CSTAR also hosts many **annual courses**, attended by residents and physicians from across Canada and the United States. In the current year only one of those programs was able to continue at CSTAR, with only local residents and faculty in attendance. For Dr. Brent Lanting, an Orthopedic Surgeon at University Hospital, the closure of CSTAR led to several lost opportunities to share his knowledge in a unique method of hip surgery.

“I have the privilege of teaching the direct anterior approach to community surgeons over the years. CSTAR has provided excellent and thorough support for these learning events. Unfortunately, as cadaveric learning events have not been possible at CSTAR, I have had multiple requests from surgeons to come to LHSC and learn the approach but have not been able to support these events. This has resulted in these surgeons having to postpone or forgo the development of surgical skills to improve the care of patients in their respective communities. While in some cases this can occur after CSTAR opens once again, in some cases there was a unique time period in which this was/is possible that may unfortunately never be possible again.”

Annual Courses that were canceled or not able to book:

- Advanced Airway Course
- CREATE - Course for Residents in Advanced Therapeutic Endoscopy
- Western Surgery Flexible Endoscopy Boot Camp Training Course
- Neurosurgery Rookie Bootcamp
- Team Trauma Course
- Peripheral Nerve Reconstruction
- SAGES - Advanced Laparoscopic Colorectal Surgery
- SAGES - Advanced Laparoscopic Upper GI and Bariatric Surgery
- Advanced Trauma Life Support (ATLS) - April 2020 and Feb 2021
- Direct Anterior Approach Total Hip Arthroplasty Spectrum of Care: Primary to Revision
- Emergencies in Otolaryngology



# Covid 19- Impact to Research at CSTAR



Dr. Rajni Patel,  
Research Director

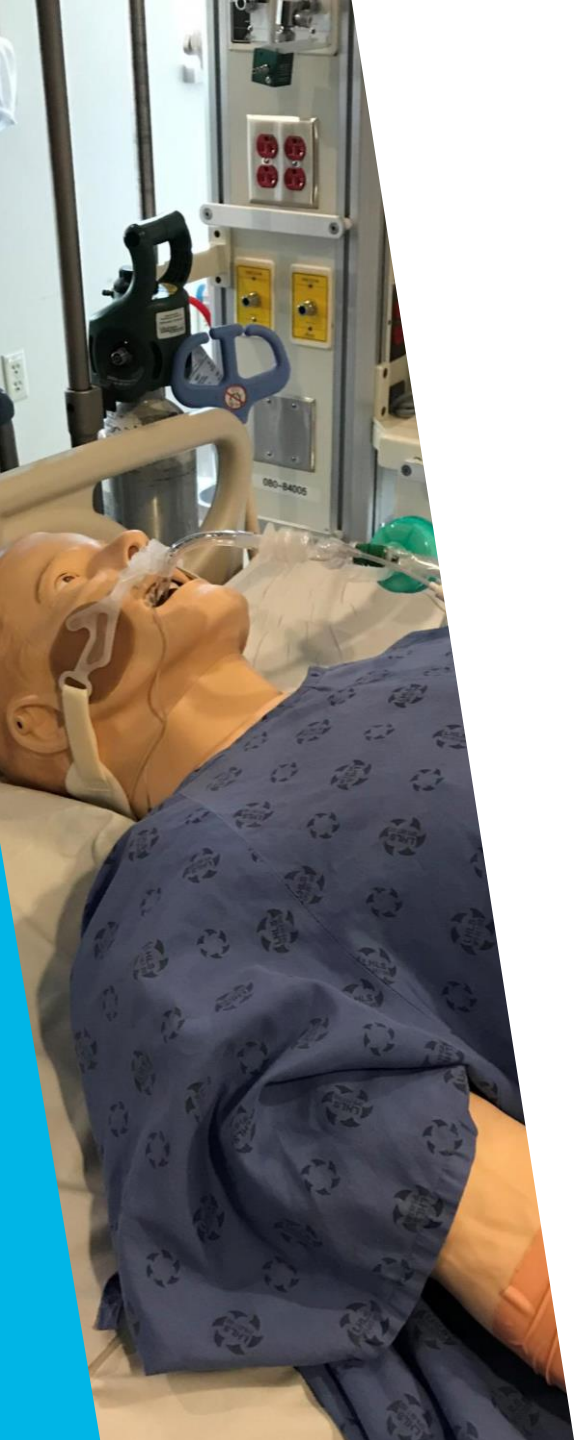
CSTAR operates a collaborative research program between LHSC, Lawson Health Research Institute and Medical & Engineering departments at Western University.

CSTAR provides an environment that enables meaningful collaboration of researchers, engineers and surgery clinicians who, collectively, identify solutions to current and future challenges in surgical care.

## Impact of COVID-19 on Research in the Engineering Lab at CSTAR

The restrictions imposed on access to CSTAR and in particular to the research labs at CSTAR, have affected research productivity to some extent. Much of the research work in the Engineering group at CSTAR is based on the use or development of advanced robotic and other equipment at CSTAR and collaboration involving engineering and clinical researchers. As a result, the limit placed on the number of people in the lab at any given time to ensure social distancing has affected some of this collaborative work. The situation has improved over the last couple of months since all the researchers in the Engineering group have received their vaccinations.

During the earlier part of the pandemic, most of the researchers in the Engineering group focused on those aspects of their projects which were computer based (mainly focusing on applications of machine learning or extensive simulations). This enabled them to continue much of their research work at home. Research meetings were conducted via Zoom.



### Impact of Covid-19 to Education Research at CSTAR

Many research programs were shut down completely during Covid-19, with only those working on essential research allowed in the facility.

Dr. Marie Eve LeBel is engaged in multiple research projects studying how trainees learn, with a focus on surgical education and simulation. According to LeBel “COVID-19 has been horrible for me as I lost almost all my data for one project, another one was not able to start as planned, and I could not recruit and complete my data collection for another project”. All of her research was essentially on hold for the entire year.

Dr. Rob Leeper’s research involves in situ testing, training, and re-testing of action teams in their natural (“in situ”) work environments using simulation. For Leeper, “ it has been incredibly frustrating and has had such a negative impact on both learners and staff because they have not been able to access the empowering benefits of in situ simulation. My project focuses on readiness and our ongoing quality of care under Covid-19 precautions. It is frustrating and disappointing that the pandemic itself is blocking our efforts to better prepare and provide ongoing quality improvement for our pandemic response.” Dr. Leeper remains hopeful and optimistic that vaccines will rescue us from this sometime in the next year, as for the time being “we are just holding on”.

# Current Research Projects (2020-2021)

**R.V. Patel** (PI), C.M. Schlachta, and J. Hawel, , Intuitive Surgical Technology Grant: Design, Evaluation and Validation of a Novel Sensorized Training Colonoscopy Device, 2020-2022.

The goal of this project is to develop a force sensorized sleeve for a colonoscope for real-time feedback of force transmission along its entire length and use of the information together with position profiles in a training and skills assessment system for colonoscopy.

J. Jagadeesan (PI, Harvard), **R.V. Patel**, and 3 others, National Institutes of Health (NIH, USA) - RO1: Academic-Industrial Partnerships for Translation of Medical Technologies: Robot-Assisted 3D ICE Catheter for Cardiac Ablation, 2020-2025.

The objective of this research is to develop a novel robotic manipulator, a steerable ICE (intracardiac echocardiography) catheter, and machine learning and control algorithms to manipulate the ICE catheter and monitor the created lesions in real-time.

J. Jagadeesan (PI, Harvard), **R.V. Patel** and D. Sacco, National Institutes of Health (USA), NIH-RO1: Image-registered, Hand-held, Concentric Tube Robot for Percutaneous Treatment of Calculi, 2019-2024.

The objective of this research is to develop robotic technology for the Percutaneous Nephrolithotomy (PCNL) procedure that can access the entire renal calculus through a single insertion port with accurate guidance and minimal complications.

**R.V. Patel**, NSERC Discovery Grant: Design and Control of Robotic Systems and Devices for Medical Applications, 2019-2024.

This research program is aimed at developing advanced robotic and intelligent systems for the next generation of minimally invasive medical interventions based on recent developments in continuum robotics, machine learning, and “smart” actuation and sensing technologies, coupled with advances in haptics and teleoperation.

# Publications (2020-2021)

J.D. Hawel, **R.V. Patel**, T. Peters, K. Wanis, A. Naidu, R. Xu, A.I. Elnahas, N.A. Alkhamesi, C.M. Schlachta, "Force Application during Colonoscopy as a Marker of Competence: Development of a Novel Training Device," *Surgical Endoscopy*, 2021; accepted for publication.

N. Feizi, M. Tavakoli, **R.V. Patel**, S.F. Atashzar, "Robotics and AI for Teleoperation, Tele-Assessment, and Tele-Training for Surgery in the Era of COVID-19: Existing Challenges, and Future Vision," *Frontiers in Robotics and AI*, April 2021, vol. 8, article 610677, 9 pages. <https://doi.org/10.3389/frobt.2021.610677>.

N. Feizi, S. Thudi, **R.V. Patel**, S.F. Atashzar, "Time-Domain Passivity-Based Controller with an Optimal Two-Channel Lawrence Telerobotic Architecture." *2021 IEEE Robotics and Automation Conference (ICRA2021)*, Xi'an, China, May 31 - June 4, 2021.

C. Nicholson-Smith, V. Mehrabi, S. F. Atashzar and **R.V. Patel**, "A Multi-Functional Lower- and Upper-Limb Stroke Rehabilitation Robot," in *IEEE Trans. on Medical Robotics and Bionics*, vol. 2, no. 4, pp. 549-552, Nov. 2020, doi: 10.1109/TMRB.2020.3034497.

M. Khosravi, S. F. Atashzar, G. Gilmore, M. S. Jog and **R.V. Patel** "Intraoperative Localization of STN During DBS Surgery Using a Data-Driven Model," *IEEE Journal of Translational Engineering in Health and Medicine*, vol. 8, pp. 1-9, 2020, Art no. 2500309, doi: 10.1109/JTEHM.2020.2969152.

S. Shahtalebi (visiting PhD student), S.F. Atashzar, O. Samotus, **R.V. Patel**, M. Jog and A. Mohammadi, "PHTNet: Characterization and Deep Mining of Involuntary Pathological Hand Tremor using Recurrent Neural Network Models," *Scientific Reports*. (2020) 10:2195; 19 pages.

L. Wang, F. Pedrosa, **R.V. Patel**, "Eccentric-Tube Robot (ETR) Modeling and Validation," *8th IEEE RAS/EMBS International Conference on Biomedical Robotics and Biomechatronics (BioRob 2020)*, New York, NY, Nov.29 - Dec 1, 2020.



Thank you for  
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