



CSTAR

Canadian Surgical Technologies and Advanced Robotics London Health Sciences Centre



2018/19 Year in Review



Andrew Mes
Director



Dr. Christopher Schlachta
Medical Director

MESSAGE FROM DIRECTORS

CSTAR (Canadian Surgical Technologies & Advanced Robotics) has had an exciting year. We have made significant advances in our research, education and simulation programs supporting our mission to improve the quality and safety of patient care through interprofessional healthcare innovation.

Our focus at CSTAR is on ensuring that the services we offer are best-in-class and grounded in evidence based practice. This year CSTAR welcomed a number of new team members from whose expertise, enthusiasm and creativity we have already benefitted. We have assembled an amazing team at CSTAR, complementing what has always been a world class facility.

All of our work at CSTAR is predicated on the idea that through education discovery and innovation we can improve healthcare for LHSC and regional patients and their families. We are pleased to note numerous examples of interdisciplinary collaborations that have advanced the skills of clinicians this year. It has been a privilege to work with all our partners, both internal and external.

This year, our simulation program received full accreditation by both the Royal College of Physicians and Surgeons of Canada and re-accreditation by American College of Surgeons Division of Education. We are thrilled to achieve and maintain these distinctions as they speak to the quality of the programming being delivered at CSTAR, of which our learners, educators, faculty, and staff are all beneficiaries. We look to the near future when CSTAR will be granted Continuing Professional Development (CPD) provider status, and the ability to self-approve learning activities that we develop for the Royal College Maintenance of Certification Program. In addition, through the American College of Surgeons, we look forward to participating in multi-national, multi-institutional, collaborations such as the upcoming Advanced Modular Manikin project.

This year saw a revitalization of our education committee, with renewed focus on governance, accountability, and communication. It is our desire to leverage both American and Canadian accreditation standards as the underpinnings for all of our programming. Thank you to all of our colleagues who volunteer their time to help guide our work.

CSTAR's discovery agenda met the major milestone of completing our Ontario Research Fund (ORF) Research Excellence grant. This multi million dollar, multi institutional, multi disciplinary project began in 2010 and has led to many successful developments for CSTAR and our collaborators. As a result of this program, CSTAR has developed a number of novel simulation technologies, and initiated exciting research programs that will carry this work forward for years to come. In addition, we have enhanced our industry collaborations, in part, because many of our graduated CSTAR research students have gone on to work for cutting edge healthcare technology companies. Our research program continues to build local, national and international collaborations and we look forward to some major new initiatives, including a foray into artificial intelligence.

Thank you so much for taking the time to review our annual report. We do not take the time to celebrate achievements and reflect on accomplishments nearly often enough. This report provides us an opportunity to do both. We hope you will find it informative and share in our pride for this year's accomplishments.

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

VISION, MISSION, VALUES FOR CSTAR

OUR VISION is to be the leading, internationally recognized centre for advancement in surgical technology, research and education.



OUR MISSION is to improve the quality and safety of patient care through interprofessional healthcare innovation including research, simulation and education. As part of a teaching hospital. CSTAR collaborates with external and internal research and education partners to achieve this mission.

Meet The Team

Caddian Surgical Technologies and Advanced Robotics



TARA OKE

Coordinator



STEPHANIE AYRES

Simulation Consultant



MARIA QUIROZ

Learning Assistant



RACHEL DANIELS

Surgical Suite Associate



KAREN SIROEN

Surgical Suite Associate



SCOTT SUMPTER

Simulation Tech Consultant

CSTAR Education Committee

The CSTAR Education committee originated in 2014 and included representatives from the Schlich School of Medicine and Dentistry, Labatt Family School of Nursing, the Southwest LHIN, Nursing Scholarly Practice at LHSC and several industry representatives who had sponsored courses at CSTAR. The Director of Education from Simulation Canada, formerly SIM-one, a Canadian organization focused on simulation was also a member. This committee met on an annual basis until 2016 to review activities and financial performance, identify simulation/training opportunities that CSTAR could provide solutions for, and provide an effective view of the current market and what future directions are likely to be.

In fall of 2016, as part of our accreditation process with the Royal College of Physicians and Surgeons of Canada it was suggested that we move towards a committee that would provide strategic oversight to CSTAR simulation and CME programs and services, while upholding a focus on the promotion of quality, patient safety and inter-professional education. To meet this goal we recruited members from departments at LHSC engaged in simulation education, regional partners in simulation, and representatives from patient safety and inter-professional education and in 2017 the committee was reinstated with new membership. By bringing varied perspectives to the table, CSTAR benefits from a range of expertise, experiences and skills.

COMMITTEE MEMBERS

Dr. Christopher Schlachta – Chair, Medical Director, CSTAR

Ana Malbrecht – Educational Coordinator, Medicine

Dr. Brent Lanting – Division of Orthopedic Surgery

Dr. Jeff Yu – Simulation Lead Department of Medicine

Julia Marchesan – Director, Nursing and Allied Health Professional Practice

Dr. Julie Ann VanKoughnett – Program Director, Surgical Foundations

Dr. Richard Cherry – Associate Dean, Learning with Technology and Simulation, Schulich School of Medicine & Dentistry

Dr. Rob Leeper – In Situ Consultant, Department of Surgery

Rosilee Peto – Manager, Patient Safety and Accreditation

Stacey Wanlin – Research Manager, Fowler Kennedy Sports Medicine

Terri MacDougall – Education Coordinator, Surgery

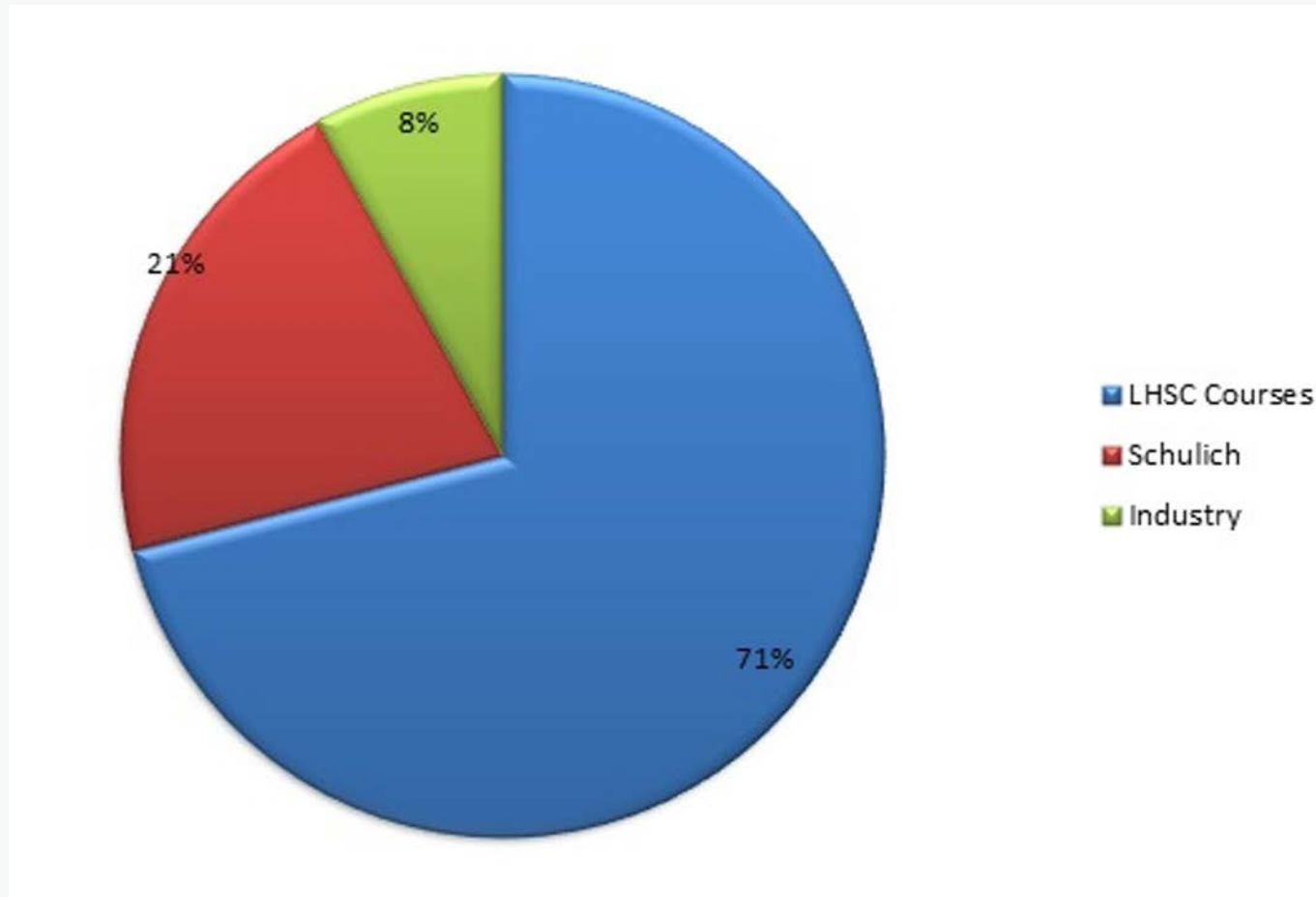
Andrew Mes – Director, CSTAR

Tara Oke – Coordinator, CSTAR

Stephanie Ayres – Simulation Consultant, CSTAR

CSTAR EDUCATION UTILIZATION

% of Annual Courses by Lead Organization

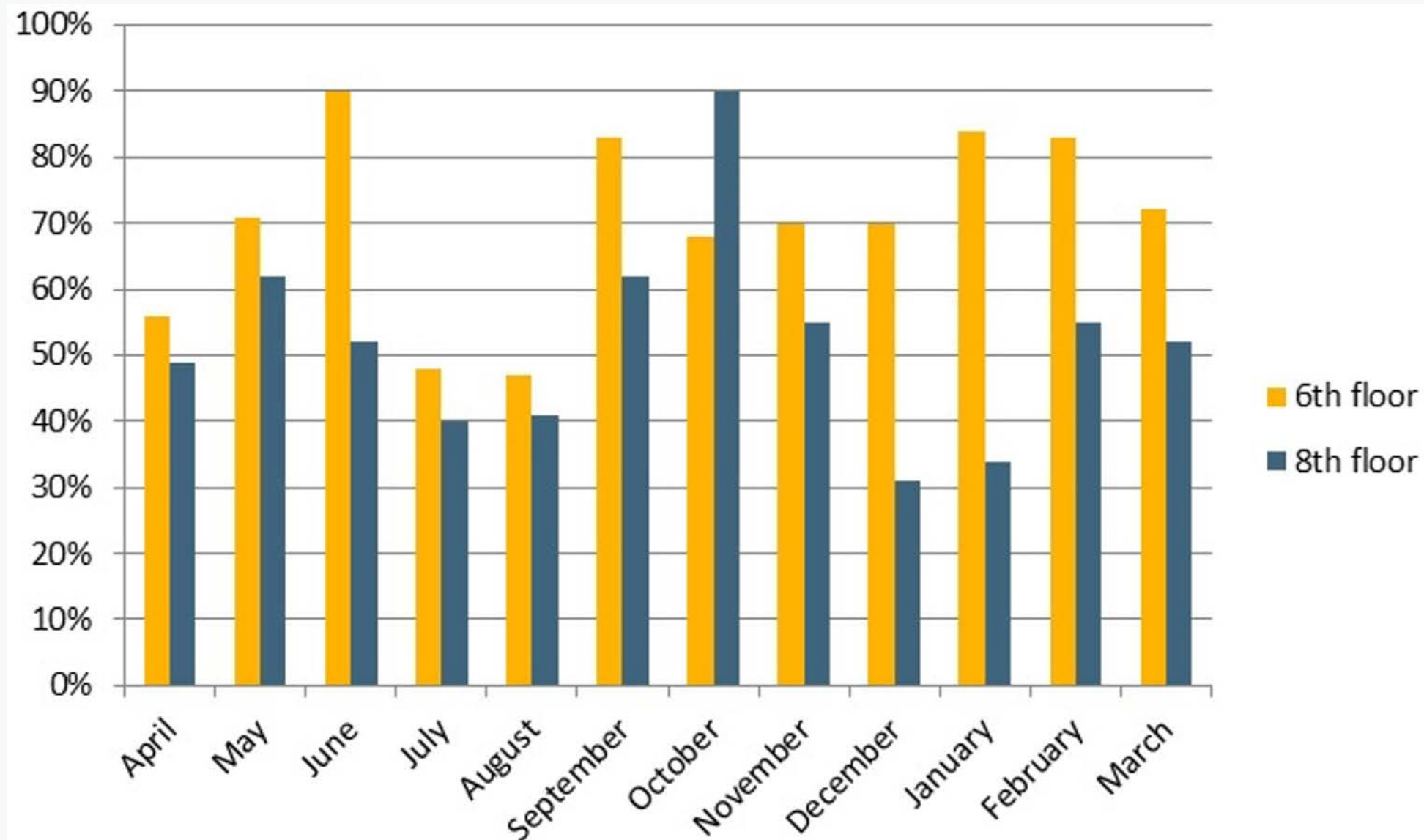


Number of Courses by Lead Organization

	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Year Total
LHSC	35	56	42	25	17	32	42	32	19	31	41	51	423
Schulich	11	12	10	12	5	10	11	14	9	7	12	9	122
Industry	1	3	5	6	7	7	4	7	0	5	1	0	46
Monthly total	47	71	57	43	29	49	57	53	28	43	54	60	591

CSTAR SIMULATION AND LABORATORY SPACE UTILIZATION

*based on a 5 day week, 8 hours per day



CSTAR 6th floor includes the 2 Simulation Rooms, Skills Lab, Kirkley Meeting Room, and Advanced Learning Suite

CSTAR 8th floor includes the Acute and Chronic Laboratories



Accreditation



Simulation programs accredited by the Royal College of Physicians and Surgeons of Canada enjoy international recognition thanks to a rigorous peer review process that measures their ability to meet the highest standards in administration, education and ethics.

To become accredited, simulation programs must demonstrate adherence to accreditation standards within each of the following domains: mission statement and governance, infrastructure, education, research, patient safety and the health care system.

CSTAR has been accredited with RCPSC since January 1, 2017, at which time we were granted a 3 year accreditation expiring on December 31, 2019. In December 2018 we submitted an interim report with highlighted improvements we had made in the areas we were partially compliant. Based on the advances we had made we were granted a full accreditation and received a 2-year extension until December 31, 2021. We have also applied for Limited CPD Provider Status which will enable us to accredit our own courses for Section 1 and Section 3 Continuing Professional Development credits.

ACTIVITIES IMPLEMENTED AS PART OF ACCREDITATION:

- Created an Operating Principles and Procedures manual which is posted on the CSTAR website
- Implemented Instructor Training in Simulation and Debriefing for Clinical Educators
- Implemented a process for collecting the following information from every course:
 - Needs assessment and how this is used to design the learning;
 - Learning objectives;
 - Simulation scenarios;
 - Sign-in sheets with learner roles identified; and
 - Completed course evaluations
- Include discussions on performance feedback for learners and/or evaluation of competency as part of planning meetings
- Reviewing all course evaluations as part of planning meetings and debrief courses

AREAS TO FOCUS ON FOR FUTURE:

- Looking to implement a process for peer assessment of instructors using the DASH
- Increase the focus on interprofessional development
- Program evaluation - identifying measurable goals for CSTAR and reporting these goals
- Identifying opportunities to assess and evaluate health systems using simulation with a focus on improving quality and/or patient safety

Accreditation

The American College of Surgeons Accredited Education Institutes (ACS-AEI) educate and train practicing surgeons, surgical residents, medical students, and members of the surgical team using simulation-based education.

Launched in 2005, the program outlines standards for how surgical education and training should be offered at Accredited Education Institutes, the goal is to promote patient safety through the use of simulation, to develop new education and technologies identify best practices, and promote research and collaboration among institutes.

CSTAR currently has accreditation with the American College of Surgeons until December 31, 2022. We are one of only three Canadian centres to maintain accreditation with ACS.

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Celebrating our Successes- New Courses

ADVANCES AND BEST PRACTICES IN UPPER EXTREMITY NERVE REPAIR

On November 1, 2018, CSTAR hosted the Advances and Best Practices in Upper Extremity Nerve Repair course. This workshop was the first of its kind in Canada and focused on the anatomic dissection of peripheral nerves and reconstruction using allografts, which is a new technology.

The program was a combination of lecture, laboratory demonstration and case reviews. New and novel reconstructive techniques in peripheral nerve surgery were highlighted in the laboratory demonstrations as well as opportunities for hands-on practice by the delegates.

The faculty included Douglas Ross, MD, Tom Miller, MD, and Christopher Doherty, MD from the Schulich School of Medicine and Dentistry as well Fraser Leversedge, MD, Chair of Plastic Surgery, Duke University School of Medicine; and Orlando Merced- O'Neill, RN, CTBS from AxoGen, Inc.

There were 27 participants, including surgeons, fellows and residents from hospitals and medical schools across Canada. The plan is to make this an annual event with the second course planned for November 14, 2019.



Celebrating our Successes- New Courses

INSTRUCTOR DEVELOPMENT

In February 2019 CSTAR launched a simulation educator development program. Participants were Clinical Educators who had varied levels of experience in simulation, with some coming from departments having well-established simulation programs and others looking to enhance their existing programs.

Day one focused on simulation modalities and their uses for education; components to effective educational program design- including needs analysis, learning objectives and evaluation; and designing simulation scenarios.

On the second day the focus was on delivering effective simulation programs and creating a safe environment for learners. A model for debriefing was presented and learners had opportunities to practice and obtain feedback from their peers

Overall the participants found the session very valuable with skills that were transferable to many situations and many were surprised to realize how much effort goes into a well-planned scenario and debrief. The next time we offer the course it will include more time to practice skills such as debriefing and creating scenarios.

Our goal for 2019/20 is to offer training for all faculty who run simulation programs at CSTAR. We are currently working in collaboration with The Schulich School of Medicine and Dentistry at Western University to develop an interprofessional program for faculty development in simulation.



CSTAR RECOGNIZED FOR RESIDENT TRAINING IN ENDOSCOPIC SURGERY

On May 1, 2008, CSTAR welcomed eighteen, Canadian, General Surgery, junior residents for a two-day workshop in basic endoscopy and laparoscopic surgery. This workshop was in collaboration with the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) and supported by an unrestricted grant from Ethicon. Ten years later, at the 2018 SAGES annual meeting in Seattle, Washington, CSTAR and Ethicon were both recognized for their ongoing contribution to resident training as together with SAGES, CSTAR celebrated their twenty-fifth resident workshop.

Over the last decade, CSTAR has hosted over four hundred General Surgery residents representing every General Surgery training program in the country. These programs have consisted of: eleven (11) workshops in basic endoscopy and laparoscopic surgery, eight (8) workshops in advanced laparoscopic colon and rectal surgery and six (6) workshops in advanced upper gastrointestinal and bariatric surgery.

Faculty instructors for these workshops have included some of the most accomplished leaders in the field of endoscopic surgery from Canada and the United States. Several trainees have identified the "CSTAR laparoscopic courses" as a significant motivator in choosing their career path, with workshop attendees twice as likely to join SAGES and choose a career in minimally invasive and endoscopic surgery.

In the fall of 2018, CSTAR offered two more resident workshops and received support from Ethicon to support a further two additional programs in 2019. This will allow the total number of trainees who have learned from these workshops to exceed five hundred.



EMERGENCIES IN OTOLARYNGOLOGY

7TH ANNUAL HEAD AND NECK SURGERY BOOTCAMP

Emergencies in Otolaryngology – Head and Neck Surgery Bootcamp was started in 2012 due to a need identified by the Program director and planning committee. They recalled how it felt the first time they had to deal with an emergency and wanted to prepare residents at Western University to be more confident in handling emergencies. Originally a one-day course, it was expanded in 2018 to add an extra half day based on feedback from participants requesting more time for skills practice and simulation.

Organized by Drs. Kathy Roth and Kevin Fung, the target audience is PGY1 Otolaryngology residents from LHSC, across Canada and from the USA. In 2018 there were 42 participants from 11 medical schools in Canada and 2 in the USA; and 21 faculty members, 10 from Schulich School of Medicine and Dentistry and 11 visiting faculty.

Learning objectives were established based on needs identified by faculty from their personal experience; resident feedback; and literature review. The overall course objectives are that the learner will be able to:

- Recognize and triage typical otorhinolaryngology (ORL) emergencies
- Demonstrate the ability to perform specific basic ORL emergency management skills
- Communicate effectively as a team member or leader in an emergency situation

With over 75% of the total education time dedicated to interactive learning, participants rotate through multiple stations including both skills practice and simulation. Feedback from participants has been very positive.

Research is also an important element of this simulation-based course with several research papers published that add to the emerging body of scholarly work in simulation.



"The technical skills and simulation training was fantastic. However, the most important takeaway from the boot camp was a general confidence to manage nearly any on-call issue without the need to first troubleshoot on patients themselves."

"I genuinely enjoyed the experience overall. I have been to a few workshops internationally in otolaryngology and I felt this one was the best I have been at so far. The take on emergencies was clinically relevant to residents from what we would be seeing on call in the middle of the night."

CNO CELEBRATES 5TH YEAR WITH SIMULATION COMPONENT

"Great entry to starting clinical practice, solid overview to feel competent and great refreshers."

All newly hired nurses spend 20 hours in CSTAR as part of their Central Nursing Orientation. Using a combination of high-fidelity manikins and task trainers participants rotate through 15 different stations to practice skills and learn about LHSC processes for delivering excellent patient care.

Highlights of some of the stations include:

- Completing a head to toe assessment for a patient admission using SIMMan 3G, a high fidelity manikin capable of simulating realistic pulses; and heart, lung and abdominal sounds
- Using task trainers to practice inserting and caring for PICC and Central Lines; Chest tubes and providing Oxygen therapy
- Unwitnessed fall simulation and practice with patient lifts
- Simulated CODE BLUE using a high-fidelity manikin, able to provide in-the-moment feedback on resuscitation skills
- Wound and ostomy care using simulated wounds and task trainers



"Code blue in real life is a scary thought but this mock code was extremely beneficial and eased my mind"

"Practicing PICC line dressings step by step was awesome"

Feedback from participants is very positive; they appreciate the variety of methods for learning and practicing skills, and the "hands-on non-judgmental, supportive, positive environment." The most common constructive feedback is that they would like more time for hands on practice, especially when the groups are larger. CSTAR staff collaborate with Clinical Educators to identify ongoing areas for improvement with the goal of creating an exceptional experience for all learners.,

"Great hands-on learning, fantastic critical thinking practices and good knowledgeable educators"

Celebrating our Partnerships

WESTERN SUMMER SURGERY SCHOOL

In its 4th year of being hosted at CSTAR, the Western Interprofessional Summer Surgery School is a collaboration between the Schulich School of Medicine and Dentistry, Western School of Nursing, Fanshawe College Respiratory Therapy program and CSTAR,

Students from the medicine and nursing programs at Western are invited to participate with the goal of gaining exposure to life in the operating room before selecting clerkship electives, placements or CARMS matching. The students attend three days of interprofessional education sessions followed by a full day of skills practice with simulated skills stations and a mock surgery lab at CSTAR,

"The most important thing I learned this week at the program is teamwork and communication between the interprofessional teams. Knowing everyone's roles contributed to an effective and successful learning experience."

Objectives for the simulation day at CSTAR were to implement and apply the knowledge and skills learned over the previous days during a mock OR experience and to work with the interprofessional team to successfully complete the mock surgery under the supervision of a surgeon and operating room nurse.

Feedback from the course has been very positive. Eighty-five percent of students reported that the experience has changed their vision of the surgery related disciplines. For many it solidified their decision to pursue surgery as a career; however some realized it is not the career for them.

When asked to state the most important thing they learned, many students commented on the benefit of learning skills such as suturing, knot tying, intubation and IV insertion. This was an opportunity to learn new techniques that they would not have had the chance to learn in their program. The strongest theme was that participating in the program provided a better understanding of the roles and responsibilities of the surgical team.

"Each individual in the OR plays an integral role that contributes to a successful experience, procedure, and outcome."



CSTAR WRAPS UP MAJOR SIMULATION GRANT

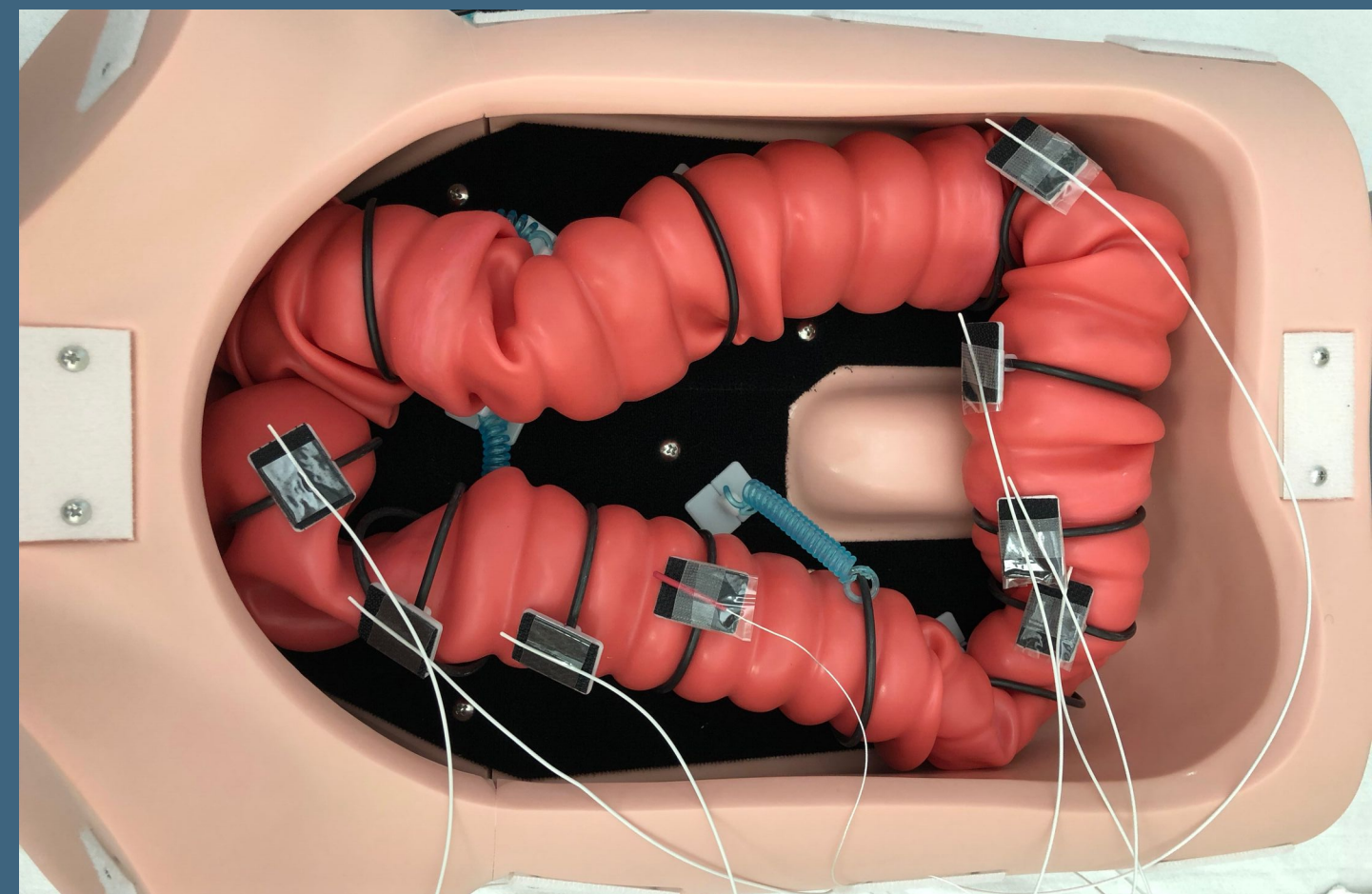
In 2011, CSTAR was awarded \$3,226,951 from Ontario Research Fund – Research Excellence program for the application entitled "Effective Systems for Procedure Specific Healthcare Simulation." CSTAR Medical Director, Dr. Christopher Schlachta, served as Principal Investigator for this \$9.7 million research and development collaboration that included CSTAR, Lawson Health Research Institute, Robarts Research Institute, St. Michael's Hospital, Western University Faculty of Engineering, the Schulich School of Medicine and Dentistry and the Centre for Education Research and Innovation.

Thank you to our highly accomplished project leaders Drs. Richard Cherry, Syra Christancho, Sandrine deRibaupierre, Roy Eagleson, Aaron Fenster, Teodor Grantcharov, Marie-Eve LeBel, Lorelei Lingard, Terry Peters, Rajni Patel (CSTAR Engineering Director) and many students and collaborating researchers they brought to bear on their work. A special thank you to Janette Wallace and Johanne Langford for managing this project.

Our industry partners included: CIMTEC Medical Inc, Digital Extremes, Ethicon, Karl Storz Endoscopy, NDI, Neocord, Perfint, Quanser, Shelley Medical Imaging Technologies, Sense Graphics, Smith & Nephew, Styker, and Ultrasonix.

As of our final report, this initiative trained thirty-four undergraduate students, sixty-six graduate students, twenty-six post doctoral students and engaged sixty additional personnel including programmers, research technicians, research assistants and others. One hundred fifty-six peer-reviewed, scientific, manuscripts were published

Some of the CSTAR technologies and ongoing research initiatives that have arisen from this grant include: sensorized instruments for endoscopic and arthroscopic surgery training with novel metrics for skills assessment, a novel laparoscopic surgery desktop trainer with procedure specific simulation modules , and a sensorized simulator for colonoscopy training.



CSTAR Research Report 2018-19



Dr. Rajni Patel
CSTAR Engineering Director

In recognition of his research productivity and contributions in the area of medical robotics and the international recognition his work has received, Dr. Patel's Tier-1 Canada Research Chair was renewed for another seven years from July 1, 2018.

New Research Grants

- Advanced Robotics and Control. Tier-1 Canada Research Chair. RV Patel. \$1,400,000. 2018-25
- A Multimodal Interface for Neurorehabilitation of Movement Disorders. NSERC Research Tools and Instruments – Category 1 grant: PI – RV Patel. \$100,607. 2018-19

Ongoing Research Grants

- Minimally-invasive Surgery and Therapy. Canada Foundation for Innovation. PI – T Peters (RV Patel, CM Schlachta – co-investigators). \$6,782,283 (CF \$2,712,913). 2017-19
- Aging Gracefully across Environments using Technology to Support Wellness, Engagement and Long Life (AGE-WELL). Network of Centres of Excellence. PI – A Mihalidis (RV Patel – co-investigator). \$36,586,335 (\$717,990 local share). 2015-2020
- Design and Control of Robotic Systems and Devices for Medical Applications. NSERC Discovery Grant. PI – RV Patel. \$490,000. 2012-19
- Evaluation of Robotic Surgery on the Mental Workload and Cognitive Performance of Surgical Trainees Compared with Laparoscopy. Department of Surgery: Resident Research Grant. PI – E Lau (CM Schlachta – supervisor). \$5,000. 2016-18
- Effective Systems for Procedure Specific Healthcare Simulation. Ontario Research Fund – Research Excellence. PI – CM Schlachta. \$9,680,853 (ORF \$3,226,951). 2011-18

Journal Manuscripts

1. Bogen E, Schlachta CM, Ponsky T. White Paper: Technology for Surgical Telementoring –SAGES Project 6 Technology Working Group. *Surgical Endoscopy*. 2019;33(3):684-90
2. Szmulewicz A, Wanis KN, Gripper A, Angriman F, Hawel J, Elnahas A, Alkhamesi NA, Schlachta CM. Mental Health Quality of Life after Bariatric Surgery: A Systematic Review and Meta-analysis of Randomized Clinical Trials. *Clinical Obesity*. 9(1):e12290, 2019 Feb.
3. Hilsden R, Khan N, Vogt K, Schlachta CM. Staplers vs. loop ligature: A cost analysis from the hospital payer perspective. *Surgical Endoscopy*. Online January 2, 2019
4. Shahtalebi S, Atashzar SF, Patel RV, Mohammadi A. HMFP-DBRNN: Real-time Hand Motion Filtering and Prediction via Deep Bidirectional RNN. *IEEE Robotics and Automation Letters*; accepted, Jan. 1, 2019.
5. Shahtalebi A, Atashzar SF, Patel RV, Mohammadi A. WAKE: Wavelet decomposition coupled with adaptive Kalman filtering for pathological tremor extraction. *Biomedical Signal Processing and Control*, vol. 48, pp. 179-188, Feb, 2019.
6. Shahbazi M, SF Atashzar, Ward C, Talebi HA, Patel RV. Multimodal Sensorimotor Integration for Expert-in-the-Loop Telerobotic Surgical Training. *IEEE Transactions on Robotics*, vol. 34, no. 6, pp. 1549-1564, 2018.
7. Shahbazi M, Atashzar SF, Patel RV. A Systematic Review of Multilateral Teleoperation Systems. *IEEE Transactions on Haptics*; vol. 11, no. 3, pp. 338-356, 2018.
8. Atashzar SF, Shahbazi M, Patel RV. Haptics-enabled interactive NeuroRehabilitation Mechatronics: Functionality, Challenges and Ongoing Research. *Mechatronics*, vol. 57, pp. 1-19, 2019.
9. Ahmed M, Tawfic Q, Schlachta C, Alkhamesi N. Pain and surgical outcomes reporting after laparoscopic ventral and incisional hernia repair in relation to mesh fixation techniques: a systematic review and meta-analysis of randomized clinical trials. *Journal of Laparoendoscopic and advanced surgical techniques. Part A*. 2018;28(11):1298-1315
10. Almamar A, Schlachta CM, Alkhamesi NA. The systemic effect and the absorption rate of aerosolized intra-peritoneal heparin with or without hyaluronic acid in the prevention of postoperative abdominal adhesions. *Surgical Endoscopy*. Online October 22, 2018
11. Camacho DR, Schlachta CM, Serrano OK, Nguyen NT. Logical considerations for establishing reliable surgical telementoring programs: A report of the SAGES Project 6 logistics working group. *Surgical Endoscopy*. 2018;32(8):3630-3.
12. Atashzar SF, Shahbazi M, Tavakoli M, Patel RV. A Computational Model based Study of Supervised Haptics-enabled Therapist-in-the-Loop Training for Upper-Limb Post-Stroke Robotic Rehabilitation. *IEEE/ASME Transactions on Mechatronics*, vol. 23, no. 2, pp.563-574, 2018.
13. Lalli R, Merritt N, Schlachta CM, Bütter A. Robotic-assisted, spleen preserving, distal pancreatectomy for a solid pseudopapillary tumour in a pediatric patient: a case report and review of the literature. *Journal of Robotic Surgery*. Online June 8, 2018
14. Shahbazi M, Atashzar SF, Tavakoli M, Patel RV. Position-Force Domain Passivity of Human Arm in Telerobotics Systems. *IEEE/ASME Transactions on Mechatronics*, vol. 23, no. 2, pp. 552-562, 2018.
15. Zarrin PS, Escoto A, Xu R, Patel RV, Naish MD, Trejos AL. Development of a 2-DOF sensorized surgical grasper for grasping and axial force measurements. *IEEE Sensors*, vol 18, no. 7, pp. 2816-2826, Apr.2018
16. Almamar M, Alkhamesi NA, Davies WT, Schlachta CM. Cost Analysis of Robot-Assisted Choledochotomy and Common Bile Duct Exploration as an Option for Complex Choledocholithiasis. *Surgical Endoscopy*. 2018;32(3):1223-7

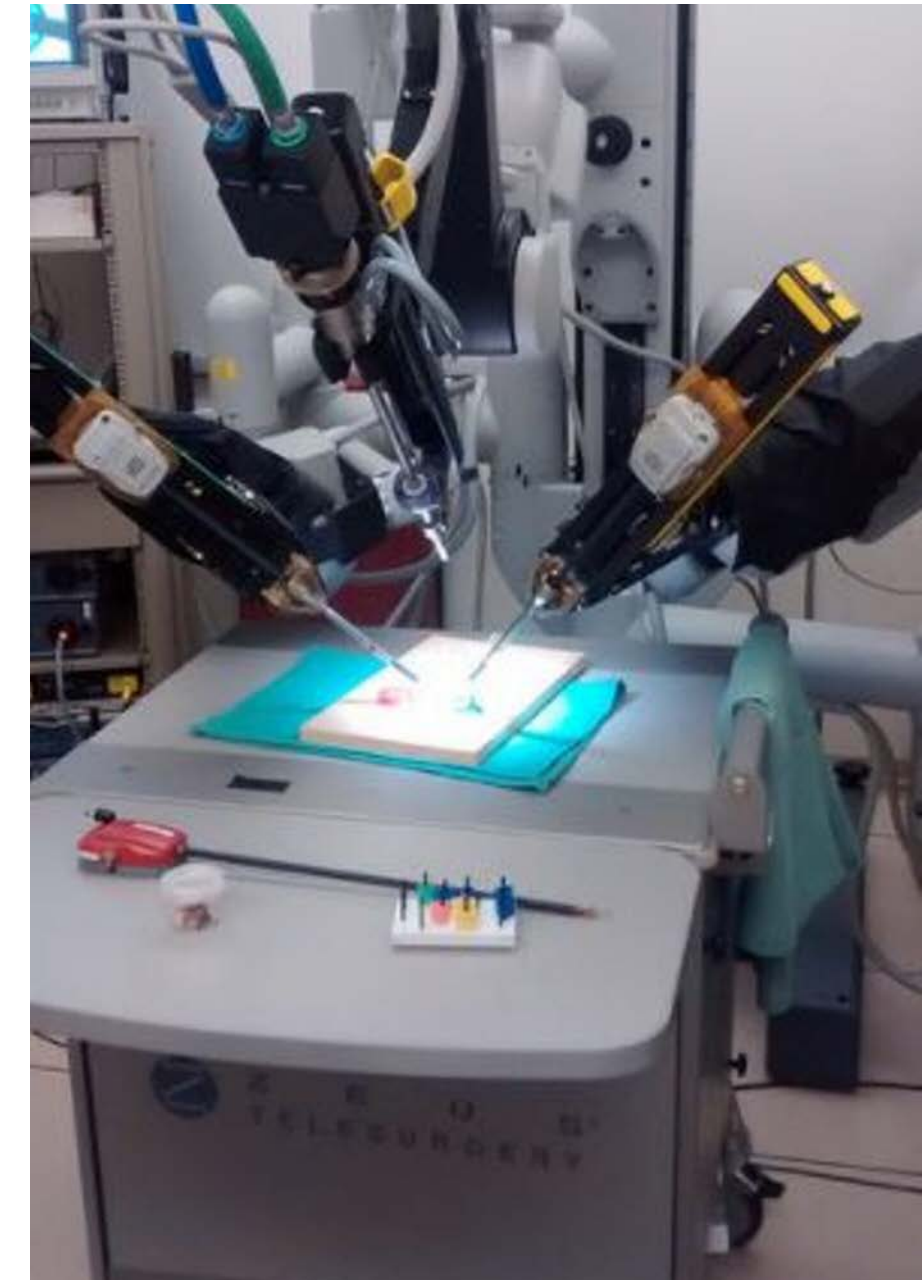
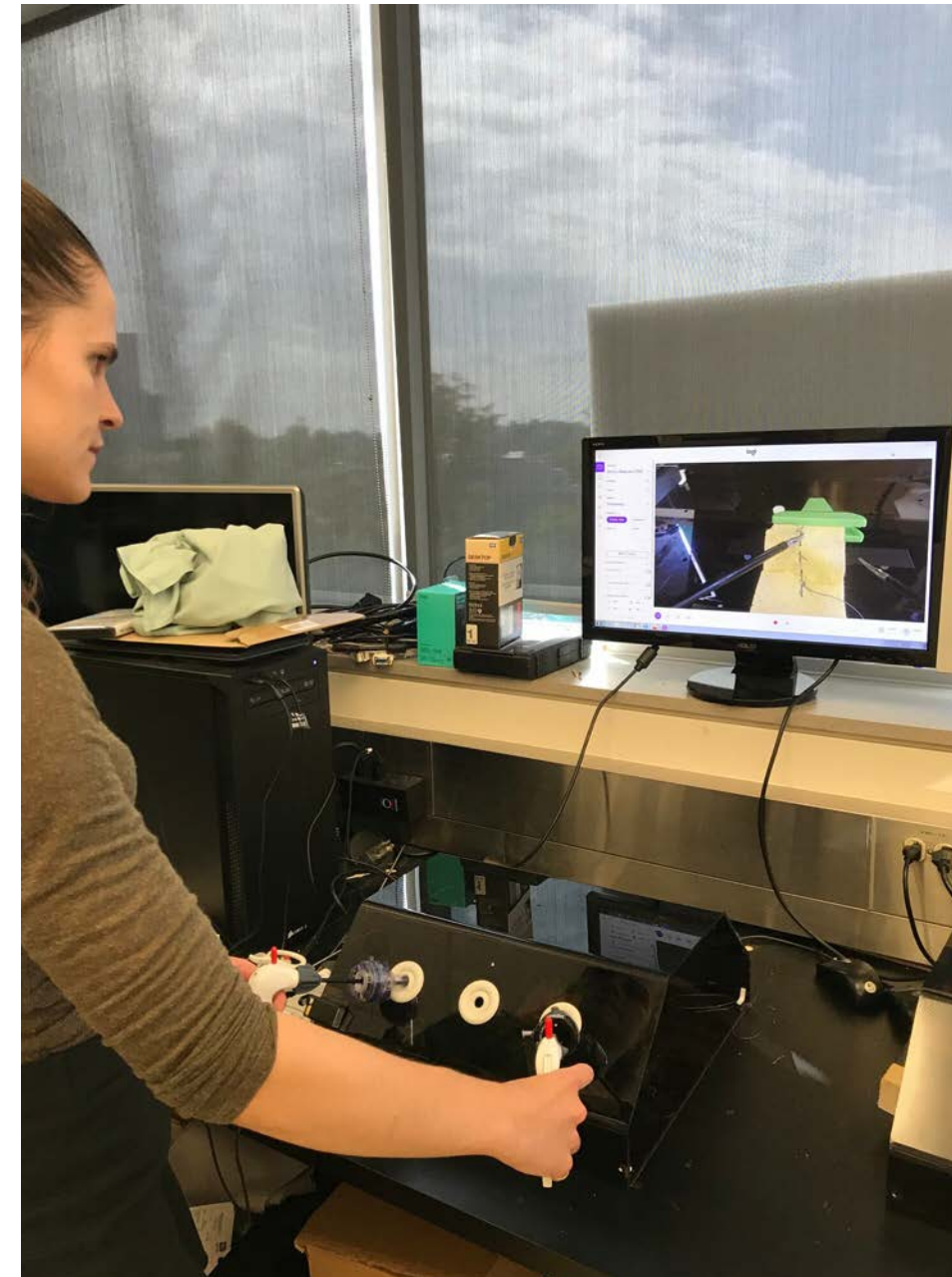
CSTAR Research Report 2018-19 continued...

Book Chapters

- Ahmad MA, Alkhamesi NA, Alsowaina K, and Schlachta CM. Minimally Invasive Robotic Gastrointestinal Surgery. Chapter 4 in 'Minimally Invasive Surgical Robotics' (Editor: R.V. Patel), Vol. 1 of the Encyclopedia of Medical Robotics (Editor-in-Chief: J.P. Desai), World Scientific Publishing Company, Singapore, 2018.
- Atashzar SF and Patel RV. Teleoperation for Minimally Invasive Robotics-Assisted Surgery. Chapter 12 in 'Minimally Invasive Surgical Robotics' (Editor: R.V. Patel), Vol. 1 of the Encyclopedia of Medical Robotics (Editor-in-Chief: J.P. Desai), World Scientific Publishing Company, Singapore, 2018.
- Atashzar SF, Naish MD and Patel RV. Active Sensorimotor Augmentation in Robotics-assisted Surgical Systems. Chapter 5 in 'Mixed and Augmented Reality in Medicine' (Editors: T. Peters, C. Linte, Z. Yaniv), Taylor & Francis, 2018.

Refereed Conference Papers

1. Bernardinis M, Atashzar SF, Jog M, Patel RV. Visual Temporal Perception in Parkinson's Disease Analyzed Using a Computer-Generated Graphical Tool. 9th International IEEE/EMBS Conference on Neural Engineering (NER), San Francisco, CA, March 20-23, 2019.
2. Khosravi M, Atashzar SF, Gilmore G, Jog M, Patel RV. Unsupervised Clustering of Micro-Electrophysiological Signals for Localization of Subthalamic Nucleus During DBS Surgery. 9th International IEEE/EMBS Conference on Neural Engineering (NER), San Francisco, CA, March 20-23, 2019.
3. Khosravi M, Atashzar SF, Gilmore G, Jog M, Patel RV. Electrophysiological Signal Processing for Intraoperative Localization of Subthalamic Nucleus during Deep Brain Stimulation Surgery. 6th IEEE Global Conference on Signal & Information Processing (GlobalSIP): Advanced Bio-Signal Processing and Machine Learning for Medical Cyber-Physical Systems, Anaheim, CA, USA, November 2018.
4. Bernardinis M, Atashzar SF, Jog M, Patel RV. Visual Displacement Perception in Parkinson's Disease Analyzed Using a Virtual Reality Toolbox. 40th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC'18), Honolulu, USA, July 2018.
5. Chopra N, Nicholson-Smith C, Shahbazi M, Malthaner RA, Patel RV. Toward Lung Tumor Localization based on Strain Variability of Lung Surface during Video-Assisted Thoracoscopic Surgery. 40th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC'18), Honolulu, HI, 2018.
6. Shahbazi M, Poursartip B, Siroen K, Schlachta CM, Patel RV. Robotics-Assisted Surgical Skills Evaluation based on Electrocardiac Activities. 40th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Honolulu, HI, 2018.
7. Lau E, Alkhamesi N, Schlachta CM. Impact of Robotic-Assistance on Mental Workload and Cognitive Performance of Surgical Trainees Performing a Complex Minimally Invasive Suturing Task. *Surgical Endoscopy*. 2018;32:S30
8. Koichopolos J, Hawel J, Shlomovitz E, Habaz I, Elnahas A, Alkhamesi N, Schlachta C. A comparative study of skills using Basic Endoscopic Skills Training (BEST) Box and Fundamentals Of Laparoscopic Surgery (FLS) Training Box. *Canadian Journal of Surgery*. 2018;61(4 suppl 2):S106
9. Lau E, Alkhamesi N, Schlachta C. Impact of robotic assistance on mental workload and cognitive performance of surgical trainees performing a complex minimally invasive suturing task. *Canadian Journal of Surgery*. 2018;61(4 suppl 2):S125



Thank You

