FIRST60 2024

ANNUAL REPORT 2024

FIRST60: Prehospital, Trauma, Resuscitation Sciences

FIRST60
PREHOSPITAL, TRAUMA, RESUSCITATION SCIENCES

UNITY HEALTH TORONTO

Contents

Our Story

The FIRST60 represents an inter-professional team of clinicians, researchers, and trainees seeking to understand and improve care from time of injury or illness to acute resuscitation. We specialize in resuscitation sciences and prehospital research, ranging from traumatic injuries to cardiac arrests.

FIRST60
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Why the FIRST60?

Prehospital trauma and resuscitation investigators are spread across various institutions and regions, each possessing unique interests, expertise, and resources. While successful in their own right, we envisioned the impact of uniting these individual programs through collaboration. The strategic alliance of FIRST60 is already making its mark as a world-class leader in resuscitation science, specializing in emergent prehospital care of trauma and cardiac arrest patients.

www.first60.ca

Welcome from our Co-Founders

Wow. What an extraordinary journey this inaugural year has been!

It started with a pivotal strategic retreat held in a classroom at the Li Ka Shing Knowledge Institute in May 2023, convening investigators and clinicians with a shared passion for advancing prehospital care, trauma, and resuscitation science. This assembly brought together experts spanning various clinical disciplines, including emergency medicine, surgery, transfusion, paramedicine, and nursing, complemented by specialists in knowledge translation, quality improvement, education, and clinical epidemiology. Recognizing that saving lives requires more than just rigorous research, our mission crystallized around the imperative to translate science into bedside practice: to understand and improve care from the time of injury to illness or acute resuscitation.

In the realm of trauma, the notion of the "golden hour" resonates deeply: the critical window within which patients receiving specialized care within the first hour of injury are more likely to survive. Our group's name, FIRST60, pays homage to this principle, anchoring our collective efforts in the pivotal first 60 minutes following injury or illness.

Summarizing the myriad achievements and diligent efforts of FIRST60 over the past year is no small feat. Nonetheless, several milestones stand out prominently:

- Launch of the EpiDOSE cardiac arrest clinical trial.
- Establishment of our online presence with the launch of our website (www.first60.ca) and Twitter/X handle @FIRST60_resus.
- Implementation of trauma video review and commencement of the PrO-STAT (Prospective observational study of safety threats and adverse events in trauma) study.
- Successful completion of three PhD transfer exams by our graduate students.

We are profoundly grateful for the opportunity to showcase our accomplishments and the impact we've made on our patients, our team, and our healthcare system over the past year. None of this would have been possible without the steadfast support of our frontline clinicians, grant agencies, and generous donors. While reports and metrics may inadequately convey the unwavering dedication, commitment, and hustle of FIRST60, we eagerly anticipate the remarkable achievements that undoubtedly lie ahead in the next 12 months.

Drs. Steve Lin and Brodie Nolan

Dr. Steve Lin MD MSc FRCPC
FIRST60 Co-Founder

Dr. Brodie Nolan MD MSc FRCPC
FIRST60 Co-Founder

Program Update

DR. BRODIE NOLAN

Dr. Nolan is an emergency physician and trauma team leader at St. Michael's Hospital, as well as a transport medicine physician for Ornge, Ontario's air ambulance and critical care transport organization. He is also an Assistant Professor in the Department of Medicine at the University of Toronto and as a Scientist in the Li Ka Shing Knowledge Institute at Unity Health Toronto. Dr. Nolan is a founding member of FIRST60 and Chairs the Research and Scholarly Activities Committee at Ornge. His research interests span trauma, prehospital care, transfusion, and patient safety, with a focus on improving timely access to trauma care, exploring novel transfusion therapies, and leveraging artificial intelligence to enhance trauma resuscitation.

Launching of Trauma Video Review and Pro-STAT

One of Dr. Nolan's notable achievements this year is the launch of the Prospective Observational Study of Safety Threats and Adverse events in Trauma (Pro-STAT), a culmination of four years of work. He developed the Safety Threats and Adverse Events in Trauma (STAT) taxonomy, comprising 65 metrics over nine categories, to standardize the evaluation of latent safety threats and adverse events in trauma resuscitation. Dr. Nolan validated the taxonomy through in-situ simulation and video-recorded trauma resuscitations. In August 2023, Dr. Nolan launched the trauma video review research program, exploring how team performance and safety threats in the trauma bay affect downstream patient outcomes. The study has been enrolling with incredible success (and plenty of hard work from PhD student Anisa Nazir) and there are new international partnerships on the horizon. We're looking forward to sharing our findings in the upcoming year.

Introducing TRAUMA AI: Augmenting Trauma Resuscitation

In collaboration with Dr. Michelle Sholzberg, Dr. Nolan pitched TRAUMA AI, a groundbreaking artificial intelligence system, at Angel's Den, Canada's premier medical research competition hosted by the St. Michael's Hospital Foundation. TRAUMA AI will be engineered to analyze real-time patient vital signs and laboratory results, providing actionable personalized transfusion strategies for massively bleeding patients. Dr. Nolan leads this transformative initiative, supported by Dr. Muhammad Mamdani and the Data Science and Advanced Analytics team at Unity Health Toronto, with plans to launch a pilot version in the upcoming year.

Driving Change in Prehospital Trauma Triage

Timely access to trauma centers is paramount in saving lives. However, for Canadians, geographical constraints often impede prompt trauma care. Dr. Nolan is actively investigating the effectiveness and efficiency of the Ontario Field Trauma Triage Standard, which guides paramedics in determining which patients should be directly transported to a trauma centre. Moreover, Dr. Nolan is advocating for revisions to the provincial Field Trauma Triage Standard to ensure alignment with the latest evidence-based practices. Additionally, Dr. Nolan is spearheading the development of a prehospital transfusion prediction score, overseen by PhD student Melissa O'Neill. This innovative score aims to identify patients experiencing massive bleeding in the prehospital setting, enabling paramedics to promptly alert the receiving trauma team for enhanced preparedness and improved patient outcomes.

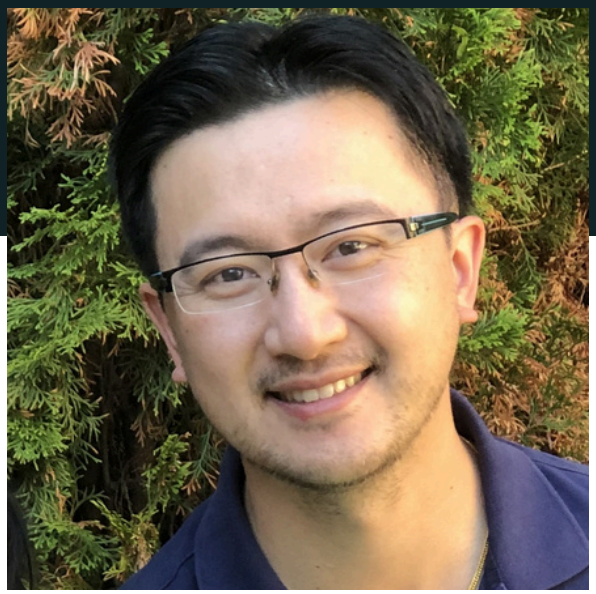
SWiFT Canada: Pioneering Prehospital Transfusion Trials in Canada

Dr. Nolan is Principal Investigator for Study of Whole blood in Frontline Trauma, SWiFT Canada. Over the next year, this pilot study will assess prehospital whole blood versus component therapy (red blood cells + plasma) in traumatic hemorrhage for patients transported by air ambulance. Dr. Nolan is orchestrating this trial and establishment of a collaborative prehospital trauma network with the involvement of Ornge Air Ambulance, Canadian Blood Services and 6 lead trauma hospitals in Southern Ontario, marking a historic milestone as Canada's inaugural prehospital transfusion clinical trial.

DR. STEVE LIN

Dr. Lin is the Interim Chief of the Department of Emergency Medicine and Scientist at St. Michael's Hospital. He is an Associate Professor in the Department of Medicine with appointments at the Institute of Health Policy, Management and Evaluation, and the Institute of Medical Science at the University of Toronto. He is also an Adjunct Professor in the Department of Physics at the Toronto Metropolitan University. Dr. Lin's translational research program aims to improve resuscitation and outcomes in cardiac arrest patients. He is the Co-Principal Investigator of the CIHR-funded CanROC Epinephrine Dose: Optimal Versus Standard Evaluation (EpiDOSE) randomized controlled trial (www.epidose.ca). He has over 100 publications, over 2900 citations and an H-index of 26. He has held over $8.3M in peer-reviewed operating funds, of which over $4.4M as Principal Investigator.

Dr. Lin is also an Advanced Cardiac Life Support medical director and instructor at the Heart and Stroke Foundation of Canada, and is currently the medical director of the ACLS education program at Unity Health Toronto.



BEYOND RESTARTING THE HEART

There are over ~40,000 cardiac arrests each year in Canada and more than 90% of these people die due to brain death. The brain is especially vulnerable to low oxygen levels during cardiac arrest and brain injury is the final cause of death and disability for many cardiac arrest patients. Cardiopulmonary resuscitation (CPR) helps to pump blood and oxygen to vital organs when the heart has stopped. The goal of CPR has shifted from not only restarting the heart but to improving brain recovery. However, there is no standard method to measure how much blood and oxygen is going to the brain, particularly in real life patients during cardiac arrest.

Our research program is focused on how to evaluate CPR interventions and techniques in preclinical studies. In collaboration with Dr. Vladislav Toronov from Toronto Metropolitan University, we are developing near-infrared techniques to measure real time brain oxygen levels and brain cell metabolism. Near-infrared spectroscopy (NIRS) may help optimize goal-directed brain resuscitation and individualize patient care during cardiac arrest.

EPINEPHRINE DOSE: OPTIMAL VS. STANDARD EVALUATION TRIAL

Epinephrine (also known as adrenaline) has been used to treat cardiac arrest for more than 50 years. Recently, there have been concerns amongst doctors, nurses, paramedics, and patients that epinephrine may be harmful when used during cardiac arrest resuscitation, particularly with higher doses. The EpiDOSE trial is a prospective, multicentre, randomized controlled trial evaluating the effectiveness of a low cumulative dose (up to 2mg) of epinephrine compared to a standard dose (up to 6mg) of epinephrine during resuscitation from ventricular fibrillation (VF) or ventricular tachycardia (VT) in adult out-of-hospital cardiac arrest patients. The EpiDOSE trial is working in collaboration with the emergency medical services associated with the Canadian Resuscitation Outcomes Consortium (CanROC) and is funded by the Canadian Institutes of Health Research (CIHR).

NAVIGATING NALOXONE: ADDRESSING UNCERTAINTIES IN OVERDOSE RESPONSE

Opioid related deaths remain a public health crisis in Canada. Keys to the management of opioid overdoses include early recognition, early airway and circulatory support, and early administration of naloxone. If these are successful, cardiac arrest can be avoided and patients can be discharged after appropriate observations. However, the role of naloxone in patients who suffer cardiac arrest after overdose is less clear. It is difficult to recommend the appropriate dosing of naloxone to pre-hospital providers and emergency clinicians, as it is not clear which dose is optimal in cardiac arrest situations, nor is it clear what the risk/benefits of naloxone administration are. Our goal is to develop a risk prediction tool to identify the optimal dose for naloxone administration in suspected opioid overdoses, helping inform clinical trials that will allow emergency health care providers to have the best possible chance of resuscitating someone who has an opioid related cardiac arrest.

Our Investigators

DR. JOHANNES VON VOPELIUS-FELDT

Dr. Vopelius-Feldt is an emergency physician and trauma team leader at St. Michael's Hospital and a transport medicine physician for Ornge. He is an assistant professor in the Department of Medicine at the University of Toronto and Scientist at the Li Ka Shing Knowledge Institute, Unity Health Toronto. His education spans Scotland, Germany and most recently England. He completed a PhD funded by the National Institute for Health Research (NIHR UK, over $300,000) on the topic of prehospital critical care for cardiac arrest. He is first author on over 10 publications relating to various aspects of prehospital critical care and completed a fellowship in prehospital critical care at the University of Toronto.

DR. IAN DRENNAN

Dr. Drennan is a Paramedic Scientist, and an Assistant Professor in the Department of Family and Community Medicine (DFCM) and the Institute of Health Policy, Management and Evaluation (IHPME) and Associate Director of the Paramedicine Collaborative at DFCM at the University of Toronto. He is an Affiliate Scientist position at the Department of Emergency Services, Sunnybrook Health Sciences Centre and Adjunct Scientist, Li Ka Shing Knowledge Institute, Unity Health Toronto.

Dr. Drennan is the current vice-chair of the Advanced Life Support (ALS) Task Force for the International Liaison Committee on Resuscitation (ILCOR) and co-chair of the Basic Life Support chapter of the American Heart Association 2025 Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care.

DR. ANDREW BECKETT

Dr. Beckett is a trauma surgeon, critical care physician, and Medical Director of the St. Michael's Hospital Trauma Program. He is also a Lieutenant-Colonel in the Royal Canadian Medical Service, having served multiple military missions overseas. He has spent nearly two decades in the Canadian Forces, first as a paramedic and then as a trauma surgeon. He holds active positions in the Canadian Armed Forces, including Chief of General Surgery, Trauma Advisor to the Surgeons. General and a Senior Advisor on the Canadian Forces Health Services' blood program. Dr. Beckett has a master's in clinical epidemiology from the University of Toronto and is a graduate of the Critical Care fellowship program.

DR. ANDREW PETROSONIAK

Dr. Petrosoniak is an emergency physician and trauma team leader at St. Michael's Hospital and an Assistant Professor in the Department of Medicine at the University of Toronto. He is an Education Scientist in the Li Ka Shing Knowledge Institute and the Translational Simulation and Clinical Integration Lead with the Simulation Program at Unity Health Toronto. He has completed a Master of Science in medical education where he focused on the use of in situ simulation (practice in the actual workplace) in procedural skill acquisition. His work focuses on using simulation to help design clinical infrastructure and improve patient safety. His other areas of research involves understanding how rare, life-saving procedures can be best taught and practiced using simulation.

DR. GARRICK MOK

Dr. Garrick Mok is an emergency physician, trauma team leader, and deputy chief of the emergency department at St. Michael's Hospital. He is an assistant professor in the Department of Medicine at the University of Toronto.

Dr. Mok completed a Master of Science in Quality Improvement and Patient Safety at the University of Toronto, where he focused on improving the use of patient portals after ED visits.

Dr. Mok's research interests are in measuring and improving the quality of CPR in ED cardiac arrests, use of artificial intelligence tools in the ED, and improving environmental sustainability in the ED.

DR. SHELDON CHESKES

Dr. Sheldon Cheskes is a Professor with the Division of Emergency Medicine, Department of Family and Community Medicine at the University of Toronto, and a scientist at the Li Ka Shing Knowledge Institute at St. Michael's Hospital in Toronto, Ontario, Canada. He is the Medical Director for the Regions of Halton and Peel with the Sunnybrook Centre for Prehospital Medicine. He is one of the principal investigators for the Canadian Resuscitation Outcomes Consortium (CanROC) and is a recognized international authority in the area of CPR quality and out-of-hospital cardiac arrest resuscitation. Dr. Cheskes has published over 100 manuscripts in high impact journals such as the New England Journal of Medicine, Circulation, CMAJ and Resuscitation that have changed resuscitation practice around the world.

DR. ROHIT MOHINDRA

Dr. Rohit Mohindra is an emergency medicine doctor and researcher focusing on refugee health, cardiac arrest care in marginalized populations, and AI in emergency medicine. His goal is to help people get the best care they need when they need it most. As the site lead for SREMI at NYGH he is also heavily involved in building research infrastructure and networks to improve the success of research projects. His academic appointments include Clinical Investigator for the Department of Medicine at the University of Toronto, Affiliate Scientist at the Li Ka Shing Knowledge Institute at St. Michael's Hospital, Clinician Scientist at the Schwartz Reisman Emergency Medical Institute, and Associate Professor of Biomedical Engineering at Toronto Metropolitan University Faculty of Engineering and Architectural Science.

DR. SAMUEL VAILLANCOURT

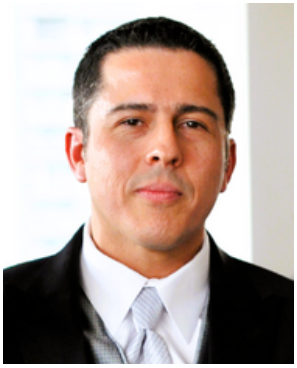
Dr. Samuel Vaillancourt is a specialist emergency physician and trauma team leader practicing at St. Michael's Hospital. He is currently an Associate Scientist at the Li Ka Shing Knowledge Institute of St. Michael's Hospital. He is interested in the potential for data and patient-community participation to improve care integration and outcome. He currently leads a project on developing a patient-reported outcome measure for emergency care. From 2013-2015, he was a health policy research fellow under the supervision of Andreas Laupacis and Michael Schull. He also worked as an innovation fellow at Women's College Hospital's Women's College Hospital Institute for Health System Solutions and Virtual Care (WIHV) on the creation of an innovation incubator and the application of design thinking methodology to healthcare.

Our Collaborators

Dr. Morgan Hillier

Dr. Michelle Sholzberg

Dr. Yulia Lin



Dr. Luis Teodoro da Luz

Dr. Vladislav Toronov

Dr. Christopher Hicks

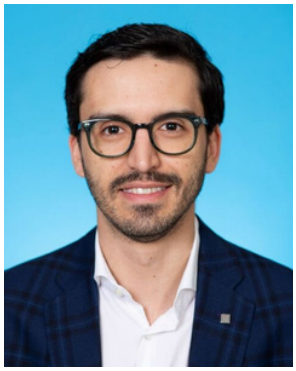
Dr. Joao Rezende Neto

Dr. John Marshall

Dr. Muhammad Mamdani

Dr. Katerina Pavenski

Dr. Ori Rotstein



Dr. David Gomez

Our Collaborators

Dr. Katie Dainty

Dr. Katherine Allan

Dr. Timothy Chan

Dr. Michael Peddle

Dr. Saswata Deb

Dr. Kanwal Singh

Our Studies

SWiFT Canada: Study of Whole Blood in Frontline Trauma

A trial of the clinical and cost-effectiveness of pre-hospital whole blood administration versus standard care for traumatic hemorrhage.
www.first60.ca/current-studies/swift/

EpiDOSE: Epinephrine Dose – Optimal vs Standard Evaluation Trial

A pivotal clinical trial comparing the usual dose of epinephrine to a lower dose during the treatment of adults experiencing cardiac arrest.
www.epidose.ca

PROMPT: Partial REBOA Outcomes Multicentre ProspecTive Study

A multi-centre prospective observational study of noncompressible torso hemorrhage (NCTH) patients being treated with the pREBOA-PRO™ catheter for partial or full occlusion as standard of care.

Resuscitation Repository and Research DataBase (R3DB)

A database for out-of-hospital resuscitation research, in collaboration with Emergency Medical Services (EMS) and Fire Services across the Greater Toronto and Horseshoe Area.
www.resuscitationresearch.com

Program Administration

PROGRAM MANAGER
Melissa McGowan

Melissa has over 15 years of experience managing large, dynamic research programs and projects while fostering collaborative relationships. She has led National and International projects and programs across translational pediatric and adult medicine. This work has contributed to improved patient outcomes and experiences, while simultaneously affording the opportunity to mentor countless students, trainees, research staff and clinicians.

DATA MANAGER
Courtney Truong

Courtney has 10 years of experience in out-of-hospital cardiac arrest research at St. Michael Hospital. She currently manages the Resuscitation Repository & Research Database (R3DB) and the Canadian Resuscitation Outcomes Consortium Registry (CanROC Registry). Her work supports quality improvement, observational studies, and serves as a foundation for clinical trials in sudden cardiac arrest.

PROJECT MANAGER
Emma O'Neil

Emma began her journey in emergency trauma in 2019 as a summer student, quickly transitioning to a Research Assistant role where she contributed to a variety of research projects. Amidst the COVID-19 pandemic, Emma worked as a Materials and Equipment Coordinator in the Emergency Department and later as a Project Administrator in Research Facilities. In November 2023, she joined the FIRST60 group as a Project Manager.

Achievements and Awards

Appointed Interim Chief of Department of Emergency Medicine at St. Michael's Hospital	**Dr. Steve Lin**
University of Toronto Department of Medicine Clinician-Scientist Merit Award	**Dr. Steve Lin**
Nominated for Anna Jarvis Award for Teaching Excellence in Emergency Medicine	**Dr. Steve Lin**
Appointed Research Lead for the Division of Emergency Medicine, University of Toronto	**Dr. Steve Lin**
Top 5 Canadian Journal of Emergency Medicine with highest Altmetric score	**Dr. Steve Lin**
Graham Farquharson Knowledge Translation Fellowship - Physician Services Incorporated	**Dr. Brodie Nolan**
Appointed Affiliate Scientist at the Li Ka Shing Knowledge Institute at St. Michael's Hospital	**Dr. Rohit Mohindra**
Citizen CPR Foundation Top 40 Under 40 Class of 2023	**Bianca Mammarella**
Appointed Adjunct Scientist at the Li Ka Shing Knowledge Institute at St. Michael's Hospital	**Dr. Ian Drennan**
Canadian Association of Emergency Physicians Ian Stiell Researcher of the Year	**Dr. Sheldon Cheskes**
St. Michael's Hospital Holmes-McInnes Research Student Leadership Award for Excellence and Community Building	**Anisa Nazir**

Grants

Canadian Association of Emergency Physicians (CAEP) $10,000 CAD	**Dr. Steve Lin**
Canadian Institutes of Health Research Project Scheme $2,509,200 CAD	**Dr. Steve Lin, Dr. Sheldon Cheskes, Dr. Ian Drennan, Theresa Aves**
St. Michael's Hospital Medical Services Association $33,334 CAD	**Dr. Steve Lin**
2023 CBS Blood Efficiency Accelerator Program $30,000 CAD	**Dr. Brodie Nolan**
St. Michael's Hospital Foundation. Angel's Den $25,000 CAD	**Dr. Brodie Nolan, Dr. Michelle Sholzberg**
University of Toronto EMHSeed Funding Program $120,000 CAD	**Dr. Brodie Nolan, Dr. Johannes von Vopelius Feldt**
Zoll Foundation $50,000 USD	**Dr. Brodie Nolan**
Laerdal Foundation $50,000 USD	**Dr. Brodie Nolan**
Veteran Affairs Canada $700,000 CAD	**Dr. Brodie Nolan**
St. Michael's Hospital Medical Services Association $27,900 CAD	**Dr. Brodie Nolan**
St. Michael's Hospital Medical Services Association $35,100 CAD	**Dr. Johannes von Vopelius Feldt**
Canadian Association of Emergency Physicians (CAEP) $10,000 CAD	**Dr. Johannes von Vopelius Feldt**
Trauma Association of Canada (TAC) $5,000 CAD	**Dr. Johannes von Vopelius Feldt**
St. Michael's Hospital Medical Services Association $27,900 CAD	**Dr. Garrick Mok**

Total Grant Money Held

$3,669,434

Our Trainees

Anisa Nazir
PhD

Theresa Aves
PhD

Pierre-Marc Dion
BScInf, IA

Melissa O'Neill
PhD

Hania Siddiqui
MSc

Gemma Postill
MD/PhD

Vinyas Harish
PhD

Bianca Mammarella
BSc

Fayad Al-Haimus
PGY 3

Adam Greene
PhD

Nima Khalifehsoltani
PhD

Aron Shoara
Postdoc

Publications

PREHOSPITAL CARE

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3. Krugliak N, Gagnon K, Sawadsky B, Lewell M, **McGowan M, Nolan B.** The Role of Paramedics in Disclosure of Patient Safety Incidents: A Mixed Methods Study. Air Medical Journal. 2023 Dec 7.
4. Larsen K, **Nolan B, Gomez D.** A system in crisis: exploring how recent emergency department closures influence potential access to emergency care in Ontario. Can J Emerg Med 25, 218–223 (2023). https://doi.org/10.1007/s43678-023-00460-y
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7. Radulovic N, **Hillier M**, Nisenbaum R, Turner L, **Nolan, B.** (2023). The impact of out-of-hospital time and prehospital intubation on return of spontaneous circulation following resuscitative thoracotomy in traumatic cardiac arrest. Prehospital emergency care. 1-14. 10.1080/10903127.2023.2285390.
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EMERGENCY CARE

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2. **Myers V, Nolan B.** Characteristics associated with delays in decision to transfer injured patients. Trauma. 2023;25(2):115-121. doi:10.1177/14604086211049635
3. Riggs J, **McGowan M, Hicks C.** Dream one, do one, teach one: a mental practice script for bougie assisted cricothyrotomy. CJEM. 2023 Dec 9. doi: 10.1007/s43678-023-00630-y.
4. Sharif S, Kang J, Sadeghirad B, Rizvi F, Forestell B, Greer A, Hewitt M, Fernando SM, Mehta S, Eltorki M, Siemieniuk R, Duffet M, Bhatt M, Burry L, Perry J, **Petrosoniak A,** Pandharipande P, Welsford M, Rochwerg B. Pharmacological agents for procedural sedation and analgesia in the emergency department and intensive care unit: a systematic review and network meta-analysis of randomised trials. British Journal of Anaesthesia. 2024 Jan 6.
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CARDIAC ARREST

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Our Year

81
PRESENTATIONS

45
ONGOING PROJECTS

MENTORSHIP

11	13	3
Graduate Students	Residents	Medical Students

1	1
Undergraduate Student	International Visiting Scientist (Japan)

$3.6 million
GRANT FUNDING

58
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+1 437-778-2260

first60@unityhealth.to

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