SUMMER 2019 ISSUE 9

UNIVERSITY OF TORONTO | Interdepartmental Division of Critical Care Medicine

IDCCM NEWSLETTER

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Save the Date!!!

External review of Interdepartmental Division of Critical Care
- September 10-11, 2019

Critical Care Canada Forum 2019
- November 10-13, 2019

Nuts and Bolts of Research (NABOR)
- November 1, 2019
- December 2, 2019

Art Slutsky Research Day Photos June 18, 2019

Message for Dr. Laurent Brochard

Dear colleagues and friends,

I hope you all enjoy a great summer. Taking time to relax, enjoying life with family or friends and reshaping our brain and body with art, sport, nature, barbecue or … crosswords is essential for well-being. All our 'leaders' in the Division do care about this well-being and how best to offer a good work-life balance to everyone across our stressful jobs.

We also want to facilitate diversity and inclusiveness and I encourage you to read the …*ten strategies to use everyday to advance women in academic medicine*, written by Anna Geagea and Geeta Mehta and published this month online in Can J Anesth/J Can Anesth. We'll do our best to practice!

Achieving individual success and professional accomplishment is a major 'collective' goal of IDCCM and this Newsletter celebrates some of the numerous and impressive academic success of our members.

We present a snapshot of two research groups of IDCCM. This is the spirit of the Alliance days in IDCCM: to foster collaborations and create opportunities. We believe that collaboration – through subspecialities, clinical versus basic research, disciplines and professions - is key to be better and stronger. IDCCM and Toronto are the places to make it possible.

We're happy to have a great website! Please look at it: it is your website and we are happy to improve it and to use it as better communication tool.

Life can be terrible too and we all have been affected by the loss of Brian Kavanagh. A big loss for IDCCM, for his friends and family. Many things have been said recently about this great man. We have inserted at the end of this Newsletter the nice editorial / obituary prepared by John Marshall and Art Slustky as a tribute to Brian's memory. The publication contains a lovely photo of Brian, how we will remember him. Another obituary will be published soon in Anesthesiology by Bev Orser and myself (Brian was Editor in Anesthesiology).

Please continue with all your enthusiasm to be successful scientists, teachers, educators, quality improvers, administrators and clinicians and thank you for all the hard work it represents!

Dr. Laurent Brochard

Promotions and Appointments

Dr. Brian Cuthbertson, Professor in the Interdepartmental Division of Critical Care Medicine, is completing his 2nd term as Department Chief of Critical Care Medicine at Sunnybrook Health Sciences Centre. Brian was recruited to Toronto from the University of Aberdeen in 2009 and over the past decade has led the recruitment of a large, diverse and highly productive and successful faculty at Sunnybrook, catalyzed substantial clinical expansion, championed improved quality of care of clinical services at Sunnybrook, established an inter-professional Chair in Critical Care Medicine leading to the recruitment of a nurse Clinician Scientist, and has led numerous international research collaborations. Over the coming years, Brian will be leading the SuDDICU cross-over cluster randomized trial that is staring up in Canada, Australia and the United Kingdom. The Department, Division and the University have been incredibly fortunate to benefit from Brian's leadership over the past decade, and in the years ahead.

Dr. Damon Scales was appointed Chief of the Department of Critical Care Medicine at Sunnybrook Hospital, starting September 2019. He is a graduate of University of Toronto where he also completed postgraduate training in internal medicine and adult critical care medicine. Damon obtained a PhD in Clinical Epidemiology from Department of Health Policy, Management and Evaluation, University of Toronto and holds certification from the Royal College of Physicians and Surgeons of Canada in Internal Medicine and Adult Critical Care Medicine.

Dr. Scales began his career with Sunnybrook in 2005 as staff in the Department of Critical Care Medicine. He has years of administrative and leadership experience that includes serving as Program Director for the large Critical Care residency program at the University of Toronto, leading large regional quality networks and successfully organizing national working groups. Damon is a Professor in the Department of Medicine, Interdepartmental Division of Critical Care Medicine, University of Toronto and a Scientist at Sunnybrook Research Institute.

Dr. Rob Fowler was appointed as the Tory Trauma Program Chief at Sunnybrook Hospital. He is a medical graduate of McGill University. Following completion of internal medicine training at the University of Toronto, he completed three years of fellowship in critical care medicine at Stanford University. Rob obtained a Master of Science in Clinical Epidemiology from Stanford University and holds certification from the Royal College of Physicians and Surgeons of Canada in Internal Medicine and certification in Internal Medicine and Critical Care Medicine from the American Board of Internal Medicine.

In 2002, Rob joined Sunnybrook as staff in the Departments of Medicine and Critical Care Medicine. He is a Professor in the Department of Medicine at the University of Toronto and Dalla Lana School of Public Health. He is Director of Clinical Epidemiology & Health Care Research at the Institute of Health Policy Management and Evaluation, University of Toronto, Senior Scientist at Sunnybrook Research Institute and Chair of the Canadian Critical Trials Group.

Dr. Nava Maham, new Assistant Professor at Toronto Western. She was a critical care physician at Trillium Health Partners. She completed her medical school, internal medicine residency and respirology and critical care training at the University of Toronto. Dr. Maham has a master's degree in quality improvement and patient safety and was a lecturer at the University of Toronto. She is the co-lead of a quality improvement collaborative project of 18 ICUs in Ontario.

Dr. Federico Angriman will be joining the Department of Critical Care at Sunnybrook in October 2019 as a Junior Attending. He received his medical degree from the University of Buenos Aires and subsequently specialized in internal medicine. He then completed a Master's degree in quantitative methods at the Harvard School of Public Health. He is currently a clinical fellow in critical care at Sunnybrook Health Sciences Centre. He is starting his PhD in clinical epidemiology at the Institute of Health Policy, Management and Evaluation with support from a Connaught Scholarship. His research interests are focused on pharmacoepidemiology and the care of critically-ill very elderly adults.

Dr. Ian Randall, take over the Education site lead at Toronto Western Hospital. Dr. Randall graduated with honors from civil and environmental engineering from the University of British Columbia. After working overseas in public health, he completed his medical degree at the University of Toronto. He completed a postgraduate training included a residency in anesthesiology and fellowships in critical care medicine and cardiovascular anesthesiology. Concurrently he completed a Masters of Public Health at the Dalla Lana School of Public Health at the University of Toronto.

St Michael's Hospital Department of Critical Care welcomes **Dr. Alberto Goffi** as member of its faculty on July 1, 2019. Dr. Goffi has also been appointed as Director of Educational Residency Program of the Department. After graduating from the University of Torino (Italy) and completing his internal medicine/emergency medicine training in the same city, he moved to Toronto in 2010 for a fellowship in adult critical care medicine. His clinical and academic interests include neurocritical care and point-of-care ultrasound in acute care medicine, with a focus on the clinical utility of ultrasound in critical care medicine and optimal teaching strategies for its competency achievement.

Clinical Associates

Dr. Christopher Yarnell, new Clinical Associate at Mount Saini. Chris Yarnell completed his medicine, internal medicine and critical care medicine training at the University of Toronto. He is now undertaking a PhD in Clinical Epidemiology through the Institute for Health Policy Management and Evaluation. His research interests to date include motor vehicle trauma, end-of-life care to nationally and ethnically diverse patients, and quantitative methodology for investigating the social determinants of health. Through his PhD, he is building expertise in adaptive clinical trials with the aim of improving the efficiency and usefulness of clinical trials for all critically ill patients. He is greatly looking forward to joining the team at Mount Sinai with their tradition of excellence in research, teaching and clinical care!

Dr. Alya Kamani joins the Department of Critical Care Medicine at Sunnybrook Health Sciences Centre in July 2019 as a Clinical Associate. She is concurrently completing a royal college fellowship in Clinical Pharmacology and Toxicology at the University of Toronto. She will begin a Masters of Science (Health Professionals Teacher Education) at the University of Toronto Dhalla Lana School of Public Health in the fall of 2019.

She completed her critical care medicine fellowship at the University of British Columbia where she received the clinical academic excellence award in 2018. She completed her postgraduate internal medicine training at the University of Toronto and medical school at the University of Wollongong in Australia. She completed a Bachelor of Life Science degree at Queen's University in Kingston, Ontario. Dr. Kamani's academic interests are in curriculum design, education administration and clinical pharmacology and toxicology.

Dr. Jenna Spring completed her training in Internal Medicine and Critical Care at the University of Toronto and will be starting at Sunnybrook as a Locum Clinical Associate in July. Her academic interests include oncologic critical care, quality improvement, and medical education.

Awards

Dr. Margaret Herridge is the winner for the Eaton Clinical Researcher of the Year Award 2019 (Department of Medicine).

Dr. Rob Fowler is being awarded for the Robert Hyland Award for Excellence in Mentorship 2019 (Department of Medicine).

Dr. David Mazer is the 2019 Canadian Anesthesiologist Society (CAS) Honour Award Winner. He win the CAS Gold Medal, which is the highest award given by CAS. It is a personal award consisting of a medal given in recognition of excellence and leadership in anesthesia.

Dr. Ewan Goligher win the 2019 ANZICS Intensive Care Global Rising Star Fellowship. He also ranked first in the competition for the CIHR Early Career Investigator Award.

Dr. Luciana Rodriguez-Guerineau win the 2019 Postgraduate Medical Trainee Leadership Award.
Dr. Irene Telias received a CIHR Fellowship.

Dr. Bruno Ferreyro received a Vanier fellowship.

Orla Smith RN, PhD won the Inaugural IDCCM Interprofessional Award; this to highlight and honour the essential contribution that our interprofessional colleagues make to our research and teaching enterprise in Pediatric and Adult Critical Care across the University of Toronto.

Dr. Mike Sklar won a Resident Research Award from PSI Foundation.
29,000$ over 2 years - EEG phase SynchrOny, Sedation and Delirium in the CVICU – The SOS Study

Dr. Christopher Yarnell received the CCCTG Education Travel Award.

Dr. Briseida Mema and **Dr. Andrew Helmers** were awarded the Spring 2019 Medical Humanities Education Matching Funding Grant for their submission Literary Arts in Critical Care. As stated on the University of Toronto website "The integration of humanities in medical education curricula has the potential to improve observation skills, self-reflection, and enhance learner competencies in the CanMEDS roles. Projects and proposals may reflect a variety of curricular designs which identify how medical humanities will be integrated into curricula and further enhance CanMEDS competencies"

Congratulations to all on your deserved awards!!

Say hello!! Aleks Leligdowicz, her husband Mark and son Leo welcomed a baby girl on April 18th, 2019. Margo Roseann Chandy was born in San Francisco at 6lb 13oz.

Art Slutsky Research Day June 18, 2019

Art Slutsky Day 2019 was another great success and wonderful culmination of our academic year! We are thrilled to again have the chance to honour the legacy of Art Slutsky and to celebrate his exceptional vision and contributions to our diverse pediatric, adult and interprofessional critical care community across the University of Toronto. The Art Slutsky Day festivities begin with a very special evening the night before at the Mill St Brew Pub in the Distillery District. This is an opportunity to come together informally as a larger community and to reach out and engage with our alumnae. This is now an entrenched tradition and a fun-filled gathering to greet friends and colleagues over local beer and delicious food!

The AS Day had another record attendance this year of over **160** faculty, trainees, and other colleagues at the Munk School of Global Affairs. Faculty judges vetted **53** abstracts encompassing basic and clinical science, quality, physiology and education contributed by our adult and pediatric trainees. Once again this year, the breadth and quality of work was exceptional and we have so much to take pride in and celebrate as a divisional group.

Distinguished Speakers:

Dr. Elie Azoulay- Chief of the Medical ICU at the Saint-Louis hospital, Paris, Editor-In-Chief of Intensive Care Medicine (2012-2018), leader of both the FAMIREA and GRRR-OH groups for communication with families of ICU patients and management and outcomes of respiratory failure in immunocompromised patients respectively- was so kind to graciously serve as our visiting professor and to also join in on the celebratory Brew Pub festivities. He gave an authoritative and thought-provoking talk on ' **Acute Respiratory Failure in Immunocompromised Patients : What's New?'** This served to stimulate a thoughtful discussion on the approach to high risk, complex and immunocompromised patient groups and their outcomes.

Our own **Dr. Laurent Brochard** inspired the IDCCM with his "State of Research in the IDCCM " and highlighted many of the international contributions of the university –wide group over the past year.

We wanted to showcase some of our valued faculty and their high impact contributions over the past year and they are detailed below.

Dr. Ewan Goligher, the current recipient of the IDCCM Scholars Program, gave a wonderful overview of his novel and innovative DIAPHRAGM Program and its leading edge contributions: "Diaphragmatic Myotrauma During Mechanical Ventilation: A Few Answers and Many Questions"

Dr. Haibo Zhang, a senior scientist at Li Ka Shing shared a pivotal research contribution from his group with the IDCCM community**. Identification and Modulation of Microenvironment Is Crucial for Effective Mesenchymal Stromal Cell Therapy in Acute Lung Injury** (Am J Respir Crit Care Med. 2019 May 15;199(10):1214-1224).

Dr. Andreas Laupacis, Professor, Department of Medicine, Institute of Health Policy, Management and Evaluation, Dalla Lana School of Public Health, Editor in Chief of Healthy Debate gave a very personal, engaging and thought-provoking talk on '**Why is an EBM trained doc like me listening to patient stories?'**

Dr. Najma Ahmed, Vice-Chair Education, Department of Surgery, Interim Surgeon-In-Chief at St. Michael's Hospital who has become a national leader in gun control in Canada gave an inspired and riveting talk on **'Gun Control, Advocacy and "Staying in Your Own Lane".**

As a new addition to the program this year, we created a tribute to retiring or transitioning faculty entitled **"Transitions".** We invited faculty to pay tribute to the following faculty:

Toronto General Hospital-Dr. Neil Lazar (Dr. John Granton)
Toronto Western Hospital- Dr. Wilfred Demajo (Dr. Jeff Singh)
Sunnybrook Health Sciences Centre- Dr. Taz Sinuff (Dr. Dominique Piquette)
Sickkids- Dr. Peter Cox (Dr. Peter Laussen)
Dr. Tilman Humpl (Dr. Peter Laussen)

<u>Oral and Abstract Presentation Awards:</u>

The lead authors of the top 9 abstracts were:

1. Dr. Federico Angriman
2. Dr. Aili (Alice) Luo
3. Dr. Lu Chen
4. Dr. Dmitry Rozenberg
5. Dr. Michael Sklar
6. Dr. Abdulrahman Al Fares
7. Dr. Braden Waters
8. Dr. Rémi Coudroy
9. Dr. Christopher Yarnell

From this group of 9 abstracts, the IDCCM research executive with the assistance of our Visiting Professor Dr. Elie Azoulay- awarded 2 prizes.

Congratulations to:

1st Place Overall Best Abstract – Dr. Michael Sklar

2nd Place Overall Best Abstract – Dr. Alice Luo

The remaining abstracts were delivered as poster presentations and judged by a separate gracious group of judges!

Congratulations to the winners from each of our abstract categories:

Best Abstract (Clinical Research) – Abdulrahman Al-Fares

Best Abstract (Basic & Translational Science) – Eileen Liu

Best Abstract (Quality Improvement) – Melanyi Gaetani

Best Abstract (Physiology) – Kohei Osada

Best Abstract (Systematic Review)- Taylor Kain

Thanks to ALL of our Judges who donated their precious time!!

Dr. Alberto Goffi
Dr. Andrew Baker
Dr. Art Slutsky
Dr. Briseida Mema
Dr. Christie Lee
Dr. Claudia Dos Santos
Dr. Dominique Piquette
Dr. Élie Azoulay
Dr. Ewan Goligher
Dr. Gail Annich
Dr. Gaspard Montandon
Dr. Geeta Mehta
Dr. Gordon Rubenfeld
Dr. Haibo Zhang
Dr. Haifa Mtaweh
Dr. Hannah Wunsch
Dr. John Granton
Dr. Laurent Brochard
Dr. Laveena Munshi
Dr. Lorenzo Delsorbo
Dr. Margaret Herridge
Dr. Matteo Parotto
Dr. Niall Filewod
Dr. Orla Smith
Dr. Pat Murphy
Dr. Shelly Dev
Dr. Tài Pham
Dr. Victoria McCredie
Dr. Warren Lee

Thanks to everyone who worked so hard to make this year's AS Day such a great success!

We look forward to seeing you all at the Mill St. Brew Pub night and the AS Day in June 2020!! Thanks so much for supporting this day and for helping to celebrate all the exceptional achievements of our University of Toronto IDCCM community!!

Margaret Herridge
Director of Research- IDCCM
On behalf of the IDCCM Research Executive

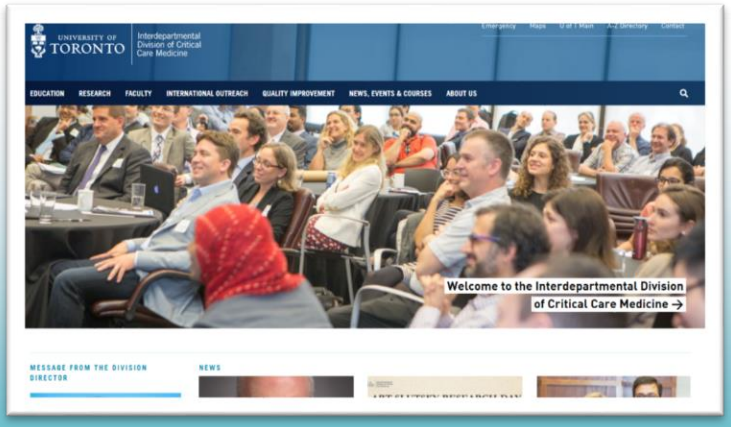
ATS 2019

The International Conference of the American Thoracic Society was held in Dallas in May. The ATS is an important meeting for IDCCM with a huge participation and contribution to the program every year. Geeta Mehta was the chair of the program committee this year - a very busy task- and Hannah Wunsch was chairing the planning committee. Congratulations to both.

Here, the main participants and chairs of an oral presentation session on respiratory physiology. Very Toronto centered: Sarina Sahetya (Baltimore) and Ewan Goligher chairs, Lu Chen, Tai Pham and Michael Sklar (Toronto) presenting.

IDCCM New Website is live now!

It is our pleasure to share the news with you that the IDCCM new website launched on the Annual Art Slutsky Day 2019. We hope you will enjoy the different sections. Thank you.
Here is the link for the website: http://www.criticalcare.utoronto.ca/



Celebration of Residents and Fellows

On **June 18, 2019** we celebrated another great year paying tribute to the legacy of Art Slutsky, as well as sharing our success and highlighting the exceptional work done by our Critical Care residents.

We would like to again congratulate our graduating class!

- **Lior Bibas**
- **Maude Peretz-Larochelle**
- **Jenna Spring**
- **Christopher Yarnell**
- **Alexander White**
  Markus Ziesmann

Awards were also presented to faculty for individual teaching excellence at all of our Clinical Sites including one community site in the GTA. Other awards for training and faculty included the John Granton, John Laffey and Simon Abrahamson Award. Congratulations to everyone below!

Site Awards for Individual Teaching Excellence:

- **Toronto Western Hospital** – Dr. Alberto Goffi
- **Toronto General Hospital** – Dr. Ghislaine Douflé
- **Mount Sinai Hospital** – Dr. Laveena Munshi
- **St. Michael's Hospital** – Dr. Simon Abrahamson
- **Sunnybrook Health Sciences Centre** – Dr. Dominique Piquette
- **The Hospital For Sick Children -** Dr. Haifa Mtaweh
- **Trillium Health Partners** – Dr. Bill Wong

The John Granton Award for outstanding contribution to Critical Care Education
Awarded to: Dr. Brian Kavanagh

The Simon Abrahamson Award for outstanding academic performance in Critical Care Medicine
Awarded to: Iva Bursac (SickKids)

The John Laffey Award for outstanding academic achievement and contribution to Critical Care Research)
Awarded to: Bruno Ferreyro

Chief Residents and Fellows

Thank you to our 2018-19 Chief Resident and Fellow for their contributions over the course of the last year!

- **Jenna Spring (Chief Resident) & Federico Angriman (Chief Fellow)**

As of July 1, 2019 we also welcomed our Chief Resident, **Maria Jogova** and Chief Fellow, **Tasneem Mehesry** (SHSC). Congratulations on your elected candidacy!

2019 Incoming Trainees

Lastly, we would like to welcome all of our new trainees, including our 2019 residents:

- **Sissi Cao**
- **Amanda Formosa**
- **Prateek Sehgal**
- **Vatsal Trivedi**
- **Victor Dong**
- **Casey Park**
- **Shaurya Taran**

We look forward to another great year with everyone!

SickKids Resident & Fellow Appreciation week in February

On the first week of February The Hospital for Sick children celebrated Resident & Fellow Appreciation Week. It was a time to recognize their many contributions and to say “thank you” for all of their hard work and dedication. Each morning breakfast was provided and held special appreciation rounds with a different activity each day including Jeopardy, a Technical Skills Relay and awards as voted by the Nurses, RTs and their peers.

Special rounds activities. All games were trainees vs staff.
Monday: Jeopardy
Tuesday: Funny Awards
Wednesday: Technical Skills Relay
Thursday: Charades
Friday: Formal Awards & Fun Videos from past fellows

Formal Awards
Voted by RTs
Most Agile Laryngoscopist for Elegant Intubations: Mariella Vargas-Gutierrez
Most In-Depth Knowledge of Mechanical Ventilation: Shubhadeep Das
Voted by RNs
Most Calm Under Pressure: Seth Gray & Iva Bursac
Creates the Most Harmonious Working Relationships: Montserrat Sierra Colomina
Most Polished Proceduralist: Evyatar Hubara
Most Timely Assessments of Patients: Iva Bursac & Seth Gray
Voted by Fellows
Most Collegial: Montserrat Sierra Colomina




RESEARCH GROUP

"Exploring the Intersection of Critical Illnesses through Molecular/Systems Epidemiology"

It is a privilege to highlight some of our ongoing and emerging research interests. Our work mainly uses molecular/systems epidemiology to characterize potential disease mediators and predictors of clinical outcomes. A lot of our questions are driven by a push towards precision medicine, and involve studies at the clinical intersection of various etiologies of shock. We have three areas that we are currently focusing on.

First, we are interested in the concept of "endotypes" – mechanistically-related subgroups of patients within a disease that may have different outcomes and responses to therapy. We have been exploring the hypothesis that endotypes in critical illness may be genetically determined, and represent conserved molecular patterns of "host response" that unfold within a given patient in response to diverse critical illness-related triggers. We are performing several retrospective studies using leukocyte genetic expression data from patients with sepsis, myocardial infarction (MI), and trauma, using data-driven clustering to identify conserved expressed genomic endotypes across these three conditions. We were also funded to perform a prospective, proof-of-concept study examining individual patients' leukocyte transcriptional responses to cardiac surgery and paralleling this to their leukocyte response to endotoxin. Studying the overlap in endotypes across infectious and non-infectious critical illnesses-related triggers may enable us to identify common molecular threads which weave together important host response endotypes with clinical relevance across various diseases. Such work may enable the development of novel molecular predictive approaches, facilitate patient selection for targeted molecular therapies, and allow repurposing of therapies across critical illness syndromes.

Second, we have an interest in metabolism in shock and pre-shock. We have several ongoing collaborative studies using plasma metabolomics to identify predictors of survival in sepsis, including through data-driven subgrouping. We are also examining metabolic "staging" in cardiogenic shock, applying metabolomics across a spectrum from "pre-shock" through "emerging shock" through "fulminant shock" stages in a completed MI trial. We are also studying metabolic determinants of energetic compensation in chronic heart failure, with a focus on preventing deterioration to cardiogenic shock and the subsequent need for durable ventricular assist device/heart transplant.

Third, we have an emerging interest in post-sepsis cardiovascular disease (CVD) risks. Long term mortality rates following sepsis remain elevated for several years, beyond what would be predicted by antecedent health status. An increasing number of studies have observed elevated, sustained risks of incident CVD post-sepsis. However, it is uncertain whether this is mediated by traditional CVD risk factors (lipids, blood pressure, etc.) or non-traditional risk factors (inflammation, coagulation, oxidative stress, etc.) – which may be persistently dysregulated after sepsis. Understanding post-sepsis CVD risk epidemiology and mediating risk factors may support risk stratification, and perhaps targeting of post-sepsis CVD prevention strategies.

It's been invigorating joining such a great community across U of T. In the two years since I have been here, I have met impactful mentors and under their guidance matured ideas into studies, supported through collaborations here. I'm very excited to be here, and grateful to have the chance to share some of our scientific interests.

Patrick Lawler, MD, MPH
Peter Munk Cardiac Centre
Clinician-Scientist, University Health Network/Sinai Health System

RESEARCH GROUP

Description of the Physiological Data Program at the Hospital for Sick Children

Two separate platforms archive physiological data at the Hospital for Sick Children. The first of these, Etiometry's T3 platform (www.etiometry.com), samples physiological data at 5 second increments and generates a sparkline graphic allowing vital sign trends to be illustrated. This infrastructure includes a customizable user interface which is displayed at the patient bedside and used to augment insight into patient condition and change. The second platform was developed by the Laussen Labs (www.laussenlabs.ca) group within Critical Care Medicine primarily to archive raw physiological waveforms. This platform, known as AtriumDB archives data at rates of up to 200bytes per second and signal frequencies at up to 500Hz. The AtriumDB dataset currently contains more than 2.4 trillion datapoints on just over 4600 unique patients in the three years that it has existed and is substantially larger than the 5 second data archive continuously collected since 2013. In addition to vital signs, these research platforms both archive laboratory biomarker data.

Both datasets are used to drive both clinical and research insights. Some examples of our recent work utilizing the 5 second data includes:

1) Better understanding typical vital sign behavior in critically ill patient populations, for whom normative ranges derived in well patients are of little utility [1].
2) Examining how accurate assessment of the variability of patient physiological behavior depends on the frequency of vital sign observation [2].
3) Examining our unit adherence to neuroprotective measurement protocols where specific physiological targets are set
4) Development of a pediatric cardiopulmonary arrest risk model that we are translating to the bedside as part of a 3-year CIHR/NSERC award [3].

The ability to archive and examine laboratory data creates additional opportunities. Recently, we re-examined the oxygen dissociation curve (ODC) in critically ill patients and found the median ODC shifted rightwards from the classic report and that rather than a single relationship, in vivo, these observations are drawn from a wide distribution of relationships between blood pO_2 and saturation. An interactive display of the distributions can be found at http://media.laussenlabs.ca/figures/oxygen-dissociation/.

As useful as the 5 second data has proved to be, our research is increasingly focusing on the raw waveform data. The density and continuity of this data permits in depth assessment of more complex physiological phenomenon, such as cardiopulmonary interactions and the measurement of Hering-Traube Mayer waves superimposed on arterial waveforms that assess baroreceptor and chemoreceptor reflex control systems in critically ill patients.

Classic physiological phenomenon are patterned. This coupled with the rich source of features within waveform data make an ideal substrate for machine learning. Using labelled physiological events as grounding datasets, we are developing models that we believe will augment clinician awareness at the bedside and even anticipate near horizon patient behavior. Our focus on physiological data is the result of a strongly held belief that this data is uniquely suited to examining the many unsolved problems in Critical Care Medicine, both now and in the future.

References:

1) *Eytan, D., Goodwin, A. J., Greer, R., Guerguerian, A. M., Mazwi, M., & Laussen, P. C. (2018). Distributions and behavior of vital signs in critically ill children by admission diagnosis. Pediatric Critical Care Medicine, 19(2), 115-124.*
2) *Eytan, D., Jegatheeswaran, A., Mazwi, M. L., Assadi, A., Goodwin, A. J., Greer, R. W., ... & Laussen, P. C. (2019). Temporal Variability in the Sampling of Vital Sign Data Limits the Accuracy of Patient State Estimation. Pediatric Critical Care Medicine, 20(7), e333-e341.*
3) *Tonekaboni, S., Mazwi, M., Laussen, P., Eytan, D., Greer, R., Goodfellow, S. D., ... & Goldenberg, A. (2018, November). Prediction of cardiac arrest from physiological signals in the pediatric ICU. In Machine Learning for Healthcare Conference(pp. 534-550).*

Drs. Mjaye L. Mazwi MBChB and Peter C. Laussen MBBS
The Hospital for Sick Children

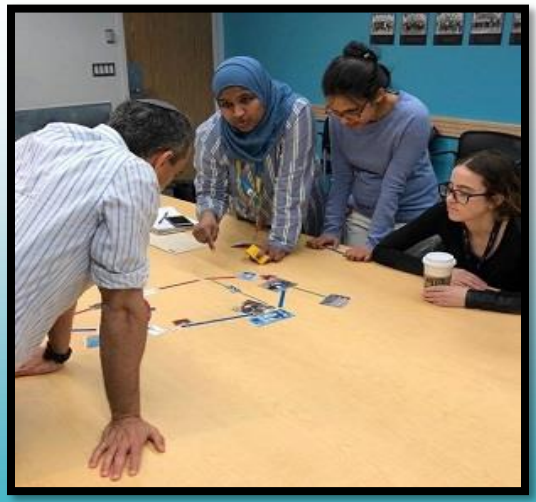
SickKids ECLS Program & Fellowship – Going global

Dr. Michael Alice Moga is leading the SickKids Education Committee with Mark Todd ECLS Coordinator and Anamaria Stanisic Perfusion Educator with the SickKids ECLS PCCM Fellow, Dr. Asma Salloo sponsored by SickKids International: Lots of academic productivity – chapters, workshops, and key was the theme about "Going Global" this spring:

In May 2019: https://www.ipssglobal.org/ipssw-2019/ ECMO Simulation-a Practical Approach. Allan K, McBride M, Su L, **Moga MA, Salloo A**.

In June 2019:
https://www.pcics.org/wpcontent/uploads/newsletters/2019/spring/Brochure%20India%20CICU%20mtg%20June%202019.pdf Preconference Workshops on Preoperative Stabilization & Transport and ECMO/ECLS And Nursing Skills

Dr. Asma Salloo, Clinical Fellow, Critical Care Medicine, is one of five South African fellows currently training at SickKids supported through the SickKids International/NMCH Initiative. Asma is about to complete her year of subspecialty training in paediatric extra corporeal life support (ECLS) at SickKids. She shared her story with us and what the opportunity to learn at SickKids has meant to her. Asma also describes the impact her experience at SickKids will have upon her return to Johannesburg in contributing to improving the health care of children in South Africa.



Dr. Mariella Vargas-Gutierrez was selected as the PCCM ECLS Fellow for 2019-2020 Academic Year. Dr. Vargas-Gutierrez completed her paediatric subspecialty in Costa Rica and her PCCM Fellowship at SickKids where she held the position of Chief Fellow in 2018. In addition to being the 3rd candidate to complete the Desmond Bohn Fellowship in Paediatric ECLS – she will be spearheading the University of Toronto's IDCCM Alumni Network Activities with Drs. Laussen and Herridge.

About the SickKids and Nelson Mandela Children's Hospital Partnership:

"There can be no keener revelation of a society's soul than the way in which it treats its children." - Nelson Mandela

The SickKids/NMCH partnership was made possible by a financial contribution (April 2016-June 2019) from the Government of Canada, through Global Affairs Canada. In April 2016, SickKids and Nelson Mandela Children's Trust established a strategic partnership to provide capacity building technical assistance to support the clinical commissioning of a brand-new children's hospital in Johannesburg. The Nelson Mandela Children's Hospital (NMCH) is a legacy project honouring the late Nelson Mandela and his support of children's causes.

NMCH is one of two dedicated paediatric hospitals in South Africa and one of only five on the continent. With SickKids support, this 200-bed academic paediatric hospital has already begun phasing in clinical services. Despite its early stages of operations, children have already benefited from increased access to specialized tertiary/quaternary paediatric services at NMCH. As the hospital increases to full capacity, it is expected that this remarkable legacy will contribute to strengthening the health-care system for children in South Africa and the Southern African Region. It is well known that that there is a shortage of paediatric medical subspecialists in South Africa, which can exacerbate disparities in child health outcomes. Through the SickKids/NMCH partnership, the opportunity to support enhanced training for South African healthcare providers and the need to fill this shortage was identified. This ignited the interest of the Kadey Family Charitable Trust to generously fund an education-focused initiative through the SickKids Foundation. This gift covers the entire cost of training and education programs for medical fellowships, nurses, allied health professionals and Child Life specialists. Furthermore, this gift supports knowledge-exchange visits of NMCH leaders to SickKids to observe or learn from our staff. Beneficiaries of this fund are expected to return to Johannesburg and contribute to their knowledge to the public health sector.

OUI the North !!!

(From Paris to Toronto and back)

When I arrived in Toronto with my family in 2016, we were happy to start a new adventure away from home, but we did not quite realize what a life changer it would be. There is no doubt that these past 3 years had a more significant impact on us than any of the other experience we had (with a $P<0.001$). Being a clinical/research fellow at SMH and then a full-time research fellow at Dr Brochard's lab was the most fantastic period of my life. Don't take me wrong: it was a lot of hard work…but it was also a lot of fun and I've learned so much about my work, about my family about myself. The IDCCM created a unique environment to interact with people from different countries, with different background and I was impressed by every single co-worker I met in clinical, research or academic setting.

No need to say that having spent this period in Toronto is a huge asset on my CV, boosted my research skills, collaborative works and publication list. Most importantly, I met fantastic people from all over the globe that I am sure I will continue to interact with my whole life and true friends to visit worldwide and who will always have a home open in Paris.

So here I am 3 years later, with 2 bilingual kids that make fun of my accent, a "-40°C parka" that will be way too hot even in the coldest winter Parisian day (actually we may need to invent a +40°C parka to bear with the regular heat waves we had lately), ordering IPA rather than wine at the restaurant, starting all my sentences by "sorry" and unable to cope with ordinary Parisian roughness and incivility. Recovery will be long and challenging! Though I am looking forward to starting my new position in Kremlin-Bicêtre hospital medical ICU with brilliant colleagues, I feel I will always have two homes: Paris and Toronto.

As it was said in 1793 during the French National Convention (and later in Spider-Man):"With great power comes great responsibility"; thus, gathering the most impressive team in the history of critical care, the IDCCM faces the most difficult challenge: to keep on being the Center of Excellence in Critical Care Education, Research and Patients' Care and to spread its model around the world.

Aurevoir Toronto, I'll miss you so much!

July 2019,

Dr. Tài Pham

Art Slutsky VP BBQ photo

Farewell Group Photo

The Use of Well-Known Games as a methodology for team building and education: the TWH CCRT experience.

It is well known that educational methods that promote student engagement and participation result in greater retention of knowledge and skills. The understanding of this fundamental concept was the basis for the emergence of Problem based learning (PBL) in medical and nursing education. In order to seek new ways to engage learners, the use of games, creatively based on existing well-known games-- whether board games to competitive television reality shows-- has now emerged as the latest innovation in teaching that promotes engagement and participation of the learner in her/his own education.

This use of games is a new and rapidly expanding concept in both medical, nursing and inter-professional education. Such use of games has received very positive feedback from learners who perceive it as a more dynamic and fun way to learn and a means of teaching that is an effective tool for the acquisition of both knowledge and skills[1]. When used in inter-professional education, the use of games has been shown to improve roles and responsibilities of different team members and enable the team to improve its function through improved collaboration[2]. Ms Wingrove had previously created very successful Escape Room and other game-based educational events. However, until now, the use of games has never, to our knowledge, been used in the professional development of Critical Care Response Teams (CCRT). The CCRT professional develop would seem to be the ideal platform for the deployment of games based education as the team blends inter-professional experts from multiple disciplines that need to collaborate to provide seamless and effective care to acutely deteriorating critically ill patients.

For this year's CCRT Professional Development Day at Toronto Western Hospital, we initially conducted a needs assessment, asking our team members to identify perceived gaps in knowledge and skills including areas where they felt they wanted to improve their knowledge.

From this needs based assessment a variety of topics were identified including looking an approach to CXR and CT brain, understanding what lab tests were requested and the significance of the results, triage and crisis management and end of life decision-making in the hospital ward/ CCRT context.

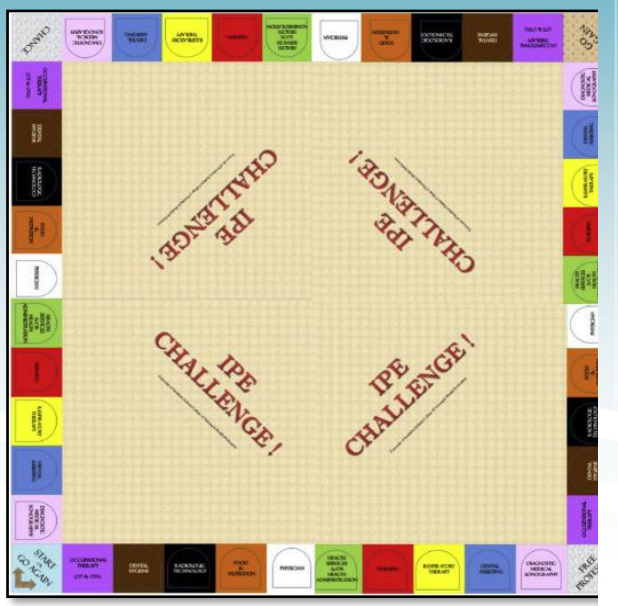
To meet the varied knowledge and skills needs of the inter-professional team, we decided to shift from the everyday "intensity" to a fun and informative educational approach and utilize a games-based learning as our educational methodology for the first time. To achieve our educational goals, we created a "Case Based Amazing Race", each case was created to meet previously identified educational objectives. The Race initially divided the learner participants into teams of 3-4 members, creating 4-5 CCRT teams. The Race begins when the CCRT receives 3 simultaneous consult calls read by the Faculty facilitators.

The task is for each team to then triage the cases based on the information contained within the initial call. Once their initial case is chosen each team must work through the case, answering a series of questions designed to challenge their knowledge and management of complex patients in crisis. Each time the team gave priority to the wrong case, they encountered delays and or interruptions from the case that should have been ascribed higher priority. Each case was built to contain roadblocks and dynamic interactive team challenges that were modeled after the Amazing Race game itself. Such roadblock and challenges were designed to build teamwork and collaboration and skills such as CT, CXR interpretations, CPR and IO insertions. Each challenge was built as a game/ competition within the overarching Case based Amazing Race game itself. In order to win the Race, teams had to win based on correct answers in each case and the time in which they managed to get all three patients to "safety" either stabilized on the wards or admitted to the ICU. The reasons for assigning triage priorities was discussed and answers to each of the cases as well as key education take home messages were provided at the end of the Race.

The feedback we received was overwhelmingly positive. The majority of participants stated they had not been so engaged in learning in years and a few stated it was the best educational event they had ever participated in. All felt their educational needs had been met and all requested more of this kind of learning format.

From our perspective as faculty, it was challenging to build our Race, to ensure each case met the educational objectives without overlap, and had appropriate roadblocks and challenges as additional well-known games and competitions. In addition understanding what would be a feasible timeframe within which to run the Race needed to be carefully considered. These challenges however had the unanticipated benefits of building our own teamwork and collaborative skills as faculty and we had as much fun planning and developing the challenges as our team had in conquering what we had built.

Any IDDCM faculty who are interested in participating, observing or learning how to build their own game- based educational event are welcome to contact us and/or join us on September 13 at Toronto Western Hospital for our next iteration of our CCRT Case Based Amazing Race.



The figure: from Reference 1

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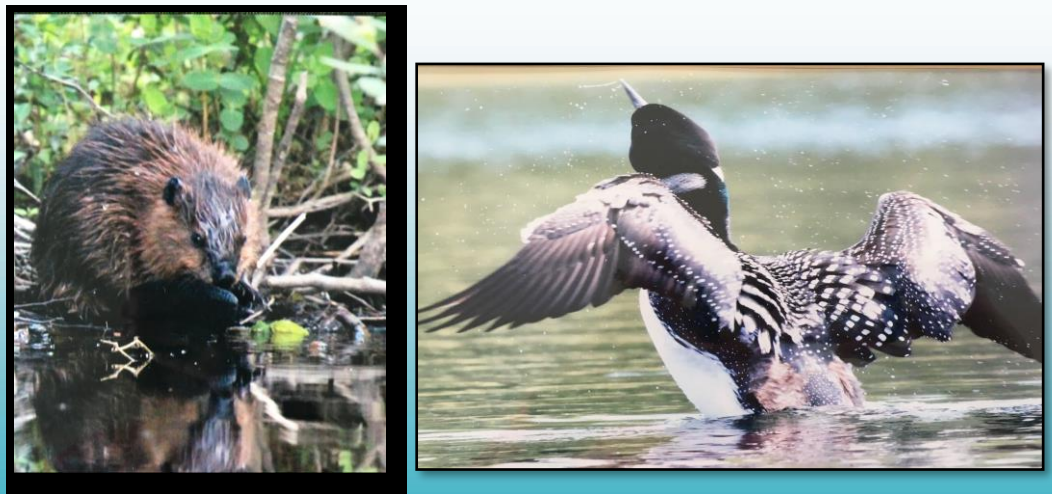
By: Laura Hawryluck MSC. MD FRCPC
& Kaila Wingrove BScN, BPHE, RN, MN



Some beautiful summer photos taken by Laura Hawryluck

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Critical Care

EDITORIAL Open Access

Obituary Brian P. Kavanagh, MD

John C. Marshall* and Arthur S. Slutsky

Critical care lost a scientific giant and a treasured colleague and friend when Brian Kavanagh passed away on June 15 at the age of 57. He was brilliant, complicated, and revered by patients and their families, as well as students and colleagues around the world.

Brian was born in Dublin in 1962. His Irish upbringing imparted a passion for literature and music and honed in him a uniquely Irish sense of humor. Following a residency in internal medicine, he moved to Canada in 1989, undertaking a residency in anesthesia and a fellowship in critical care at Stanford. He began his critical care career at the Toronto General Hospital and moved to the Hospital for Sick Children in 1999. Over the ensuing two decades, he left an indelible mark.

He was the Chair of the Department of Anesthesia at the University of Toronto and of the Critical Care Canada Forum (CCCF), held in Toronto each autumn. He ran a productive laboratory that made important contributions to our understanding of the role of carbon dioxide during mechanical ventilation and developed new approaches to limit ventilator-induced lung injury. He mentored countless research trainees from around the world and was cherished as a clinician and an educator.

The skeletal details of a biography do not capture the essence of a complex human being and do not do justice to the impact he has had on the lives of others—patients and their families, Irish musicians, academic leaders, students, colleagues, family, and friends. This impact is better reflected through the outpouring of reminiscences, anecdotes, and condolences that followed his death.

A reminiscence from the UK: "A generous friend I never understood but will miss terribly." That speaks to so many who worked with Brian in an academic sphere. He was unrelentingly smart and did not suffer platitudes or sloppy thinking, particularly from those in our field who occupied a position of influence or authority. He relished disagreement, arranging debates at the CCCF, for example, that pitted Martin Tobin against Gordon Guyatt debating evidence-based medicine or Charles Natanson against Emmanuel Rivers debating industry engagement in acute care research. The goal was not to draw blood, but rather to challenge the brightest and the smartest to think more deeply about the themes that had defined their academic careers, and to give the audience a peek into the assumptions and thinking processes underlying major issues.

Brian was caustic and was caustic in direct proportion to the place his targets held within the critical care hierarchy. A Toronto intensivist recalls an oral exam with a local trainee; asked a challenging question on the physiology of ARDS, the trainee spluttered and fell short. Brian's response was as supportive of the trainee as it was dismissive of his teacher: "You answered that question on ARDS poorly, but Dr. X here probably couldn't have answered it at all." He was intolerant of sloppy, simplistic thinking and even more intolerant of those of us who deigned to put forward such ideas. As one colleague said, "It was only two days after a discussion with Brian that you realized that his comment to you was intended to be an insult."

Brian changed our way of seeing the world. He challenged evidence-based medicine, showed us how carbon

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dioxide may be beneficial, helped describe new mechanisms of lung injury, and, most recently, focused our attention on the possibility that ventilation with negative abdominal pressure could mitigate ventilator-induced lung injury. He was a superb physiologist, but his brilliance extended far beyond physiology. With his incisive intellect, and his wry (and rye) sense of humor, he addressed provocative questions, co-authoring papers with titles like "Declaration of conflicts of interest: a 'crooked' line towards scientific integrity" and "Negative trials in critical care: why most research is probably wrong." And he also tackled difficult ethical questions such as withholding and withdrawing treatment.

Brian mentored a new generation of critical care scientists whose words speak eloquently of his influence. "He opened doors for me and encouraged me to take on challenges I might have otherwise have passed up … We cared for Brian in the ICU … for the last 2 weeks of his life. That was a great privilege, but also heartbreaking. It was obvious then that Brian was going to die from this disease - but we thought that we would have a few more months with him. The end came quickly and somewhat unexpectedly when an infectious complication arose and he decided to decline invasive support for this. Even at the end, Brian was his best self … still working on manuscripts, planning future experiments and mentoring all around him. My favourite quote from the RN report on ICU rounds: 'Dr. Kavanagh only slept a few hours last night - he was up too late chatting with the on-call ICU fellow and giving him scientific and career advice till the small hours of the morning.'"

Brian also mentored senior faculty as well. "In the mid-90's the Chair of the Department of Anesthesiology asked me (AS) to mentor Brian when he returned from training at Stanford. It soon became clear how special and how talented Brian was. I think that I helped him a little bit at first, but I soon found myself turning to Brian for advice on a host of matters. He was strategic and was always thinking 3, 4, or 5 steps ahead. The mentor quickly became the mentee!"

From a junior faculty member: "Among the many lessons he taught me, the most important was the priority of understanding mechanisms of injury and treatment effect in individual patients. I remember most distinctly about Brian two things: he was present, and he aimed for perfection. When I started trying to find my way into physiology, Brian was an essential and constant guide and support—he opened up key opportunities and connected me to key people. He showed up for early morning thesis committees and joined me to celebrate graduation. He was also devoted to perfecting the art of scientific writing; I recall prolonged deliberations over the choice of wording in response to reviewers for an early breakthrough paper. He showed me how to wordsmith a grant application until each word represented a profoundly weighty choice."

"Brian was an outstanding doctor, researcher, mentor and a role model for any of the lucky individuals who had the opportunity to meet him … but this is only a small part of what he was … the other amazing part is that he was a genuinely good and generous human being, always trying to share the extent of his possibilities (which were beyond imagination). He would listen and consider you the same if you are a first year medical student or an internationally recognized Professor. He had such a sharp sense of humor that it was challenging not to laugh out loud when he was making little comments … I hope he felt how much we loved him."

"I was fortunate to learn from Brian as a Paediatric trainee, but even more fortunate that he was on service when my own son landed up in the PICU. I will be forever grateful for his kindness, humility and exceptional care." Brian was more than an insightful and generous scientist: he was a dedicated and humble clinician. His abrasiveness as a thought leader was overshadowed by his ferocious and passion for those who entrusted him with their lives, and they voiced his impact at his memorial service. A particularly moving tribute came from a family whose child had died in the ICU. As it became clear that the child would not recover, the family asked that friends and loved ones send the saddest songs they knew to honor the life of their child. Brian sent an Irish lament, but more than this, followed it up 2 years later with a recorded version on the uilleann pipes, along with an upbeat ending—music and culture interwoven with a lasting memory and a profoundly moving gift to a grieving family.

That sense of the interplay of science and art exemplified Brian's life. A gifted performer on the uilleann pipes, he found a home in a Toronto community of musicians who played Irish music and who drank Guinness and Irish whiskey at pubs around Toronto. The sad but profound sense of the music seemed to mirror a world view—deep, intense, and imperfect. Brian was a poet, and this same sensibility is reflected in the words of one of his favorite writers, W.B. Yeats, in his poem, "An Irish Airman Foresees his Death":

Nor law, nor duty bade me fight,

Nor public man, nor cheering crowds,

A lonely impulse of delight

Drove to this tumult in the clouds;

I balanced all, brought all to mind,

The years to come seemed waste of breath,

A waste of breath the years behind

In balance with this life, this death.

Brian brought the same Irish sensibility of passion and acceptance that he brought to his science to the terminal stages of cancer that took his life. Less than 24 h before his passing, he was updating his curriculum vitae with his latest acknowledgment—a prestigious CIHR Tier one Canada Research Chair. As his daughter, Aifric, said at this memorial ceremony—"He taught me how to live; he also taught me how to die."

Brian is survived by all who knew and were better for knowing him—his colleagues and friends in an international community of critical care; his dear friends in a community of Irish poets and musicians; the women who loved him, Hillary, Hannah, and Briseida; his daughters, Daire and Aifric; and a global community of those who care for the critically ill and have gained from knowing him.

Go raibh Maith Agat Mo Chara – thank you dear friend.

We are all better for the time you spent with us.

Authors' contributions
JM authored the first draft of the obituary; AS edited this, and provided a paragraph of personal reflection. Both authors read and approved the final manuscript.

Competing interests
The authors declare that they have no competing interests.

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Wishing you a great summer!