Scientific Overview: CSCI-CITAC Annual General Meeting and Young Investigators’ Forum 2015

Abstract

The 2015 Annual General Meeting of The Canadian Society of Clinician Investigators (CSCI) and Clinician Investigator Trainee Association of Canada/Association des Cliniciens-Chercheurs en Formation du Canada (CITAC/ACCFC) was held in Toronto November 23-25, 2015, in conjunction with The University of Toronto Clinician Investigator Program Research Day. The theme for this year’s meeting was “It takes a village” and the focus was the various support systems necessary to train a successful clinician scientist. The meeting featured an opening presentation by Dr. Vincent Dumez and workshops by Dr. Peter Nickerson, Dr. Jane Aubin, Dr. Kelly Warmington and Dr. Norman Rosenblum, and MD/PhD trainees Nardin Samuel, Kevin Wang and Kirill Zaslavsky. The keynote speakers were Dr. David Malkin (Hospital for Sick Children) who received the CSCI-RCPSC Henry Friesen Award, Dr. Brent Richards (McGill University) who received the Joe Doupe Award and Ernesto Shiffrin (Lady Davis Institute) who received the Distinguished Scientist Award.

As always, the conference showcased outstanding scientific presentations from clinician investigator trainees from across the country at the Young Investigators’ Forum. The research topics, which ranged from basic sciences to clinical medicine and translational work, are summarized in this review. Over 90 abstracts were presented at this year’s meeting during two poster sessions, with several of the outstanding abstracts selected for oral presentations.

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**President’s Forum Oral Presentations**

Each year, six outstanding abstracts are selected for oral presentation during the President’s Forum session. This year, the selected individuals were:

- Xin (Kevin) Wang (University of Toronto) (UofT)
- Shari Manga (University of Calgary) (UofC)
- Nayan Madhur (University of Toronto)
- Adam Ramzay (University of British Columbia) (UBC)
- Christopher Wallis (University of Toronto) and
- Kanda Pushpinder (University of Ottawa) (UOttawa).

Xin (Kevin) Wang (UofT) aimed to study medulloblastoma pathogenesis by generating transgenic mice using transposon systems. Model validation using *in vitro* overexpression and knockdown studies is on-going. Establishing this model would allow scientists to discriminate driver events and passenger events of medulloblastoma. Shari Manga (UofC) presented work on the augmentation of pulse pressure with exercise as a reliable prediction for remodelling post-cardiac resynchronisation. Manga found that patients with left ventricular remodelling were more likely to have a > 5mmHg increase in pulse pressure, and that a 5mmHg or higher augmentation of pulse pressure post-exercise predicted favourable left ventricular remodeling with 74% accuracy. Nayan Madhur (UofT) presented epidemiological data evaluating the association between medication exposure (metformin, statins and NSAIDs) and all-cause mortality and kidney cancer-specific mortality among type 2 diabetic patients. Interestingly, he reported that current statin exposure was associated with significantly reduced risk of all-cause mortality and kidney cancer-specific mortality. Neither metformin nor NSAIDs were associated with survival outcomes. Adam Ramzy (UBC) presented work from the Kieffer Lab at UBC that investigated the role of insulin in pancreatic development. Using mice lacking the insulin gene, he showed that insulin is an important signal for alpha-cell maturation, and highlighted the developmental plasticity of the pancreas. Christopher Wallis (UofT) gave a presentation on the incidence of treatment-related complications from contemporary treatments of prostate cancer. Complications requiring urological procedures and hospital admissions were common, may occur many years after treatment and are depend on the type of treatment used. This information should be considered when determining a course of treatment. Kanda Pushpinder (UOttawa) explored the mechanism underlying encapsulated cardiac stem cell-enhanced cardiac repair beyond acute retention of transplanted cells. Pushpinder found that encapsulation forces these cells to adopt an invasive migratory phenotype, promoting invasion, engraftment and therapeutic repair.

**Basic Science**

Given their training trajectory, clinician investigators are well positioned to carry out basic science research in conjunction with the study or practice of medicine. As always, basic science research was well represented at the 2016 CSCI-CITAC Annual General Meeting, and drew from diverse fields.

**Microbiology and Immunology**

Connie Le (University of Alberta; UofA) presented work investigating the role of chemokines (CKs) in asthma relapse in a mouse model of asthma. Age-matched naïve mice, recovered primed mice, and recovered mice that were re-challenged with allergen were compared with respect to gene expression of 18 CKs and protein levels of three CKs. While naïve and recovered mice demonstrated similar CK gene expression, re-challenged mice had 13 upregulated CK genes. Richard F. Xiang (UofC) studied the role of Rac, Src family kinases (SFK) and integrins in toxicity against cryptococcal fungi. Using various molecular biology techniques, Xiang found that natural killer cell mediated anti-fungal killing initiated by integrin and NKp30 activation of Rac and SFK pathways, respectively. Ilya Mukovozov (UofT) presented work on the role of the Slit family of secreted proteins in influencing clearance of oxidized low-density lipoproteins (oxLDL). The binding and uptake of oxLDL was investigated using fluorescently (DiI)-labeled oxLDL, and quantified by microscopy and flow cytometry. Mukovozov found that both human and murine macrophages express the Slit2 receptor, Robo-1. He also found that treatment with Slit2 inhibited foam cell formation and blocked macrophage binding and uptake of oxLDL. (P<0.01).

Robyn Elphinestone (UofT) presented work exploring the role of S-nitrosothiol in improving survival in mice infected with cerebral malaria. She found that T-cells in S-nitroglutatine reductase (GSNOR) knockout mice appear blocked macrophage binding and uptake of S-nitroglutatine reductase (GSNOR) knockout mice appear blocked macrophage binding and uptake of S-nitroglutatine reductase (GSNOR) knockout mice appear blocked macrophage binding and uptake of S-nitroglutatine reductase (GSNOR) knockout mice appear blocked macrophage binding and uptake of S-nitroglutatine reductase (GSNOR) knockout mice appear blocked macrophage binding and uptake of S-nitroglutatine reductase (GSNOR) knockout mice appear blocked macrophage binding and uptake of S-nitroglutatine reductase (GSNOR) knockout mice appear.
concluded DAMPs can regulate von Willebrand factor levels and function by inducing its release from WPBs. Jason Bau (UofC) presented work exploring the role of Keratinocyte growth factor (KGF) in protecting against C. difficile toxin-mediated cell-death. He found that KGF protected against TxnA and TxnB-induced cell death both in vitro and in vivo and prevented disruption of barrier function as measured by Z0-1 tight junction staining. These data suggest that modulation of KGF activity may hold promise for preventing/treating C. difficile infection.

Cardiology

Jessica Blom (University of Western Ontario; Western) presented a validated adapted surgical model of mammalian cardiac regeneration in a neonatal mouse. This 10-15 minute procedure allows for visualization of the left anterior descending coronary artery and can be used to elucidate mechanisms of mammalian cardiac regeneration after myocardial infarction. Frank M. H. Lee (UBC) studied the role of biochemical cascade to exhibit clot-busting capabilities and found that Xa-K, a modified version of activated clotting factor X, is a viable target for developing novel clot-busting agents.

Neuroscience and Psychiatry

Enoch Ng (UofT) presented studies showing that deletion of a neuronal calcium concentration sensory decreased motivation in mice and dopamine release in structures underlying motivation-related behaviour. Jennie Pouget (UofT) investigated whether autoimmunity and schizophrenia shared genetic risk factors. Preliminary findings suggest a shared genetic risk but also suggest that they are likely not major factors to either morbidity. Siddharth Nath (McMaster University) examined the role of ataxin-7 in spinocerebellar ataxia and how mutations to ataxin-7 may alter protein function producing the disease symptoms.

Raphael Schneider (UofT) presented studies on the use of exosomal microRNAs in the cerebrospinal fluid as diagnostic biomarkers in ALS. Several microRNAs were found with different expression levels in ALS patients compared to controls. His work could yield new diagnostic markers. Devon L. Johnstone (UOttawa) presented work on the genetic mechanism and therapies for a novel epileptic encephalopathy. Johnstone found that a patient who died with intractable epilepsy at 1 month of age had a rare homozygous frameshift deletion in PROSC; a highly conserved gene with unknown function. They will now knockout this gene in zebrafish and produce iPS-derived neurons to characterize the gene’s functions and identify potential treatments.

Tianwei (Ellen) Zhou (McGill) investigated inflammatory changes present in retinopathy of prematurity; a serious complication in premature infants. She visualized the functional expressions of animal models with oxygen-induced retinopathy in order to study the functional impacts of inflammation mediated changes in the retina. Kirill Zaslavsky (UofT) investigated a method to produce more consistent cultures of induced pluripotent stem cell-derived neurons. This method may help to address the issue of heterogeneity and impact the application of this potential therapeutic avenue in autism spectrum disorder. Alexander Levit (Western) developed an animal model that overexpressed mutant human amyloid-precursor protein to test the hypothesis that a genetic predisposition for Alzheimer’s disease can be triggered by hypertension.

Nabeela Nathoo (UofC) presented high resolution MRI of a multiple-sclerosis mouse model and detected previously unseen neuroanatomical changes within the brains of these mice. This work demonstrated the utility of advanced imaging tools to understand disease and structural changes in animal models of neurological diseases. Michael Richards (UofT) used maximum likelihood estimation (MLE) to study the process of multisensory integration. He examined adults with amblyopia and his findings suggested that normal visual experience may be required for proper development of multisensory integration and can, thus, have a lifelong influence on neurological function. Allan R. Martin (UofT) used multimodal MRI to study patients with degenerative cervical myelopathy. He found various advanced MRI metrics that correlate well with white matter injury and disease-related impairment. These methods may help to identify novel imaging biomarkers and improve diagnostics for this disease.

Jonathan Keow (UOttawa) investigated the neurotoxic effects of rotenone, a commonly used pesticide, on zebrafish. They found that zebrafish embryos treated with rotenone displayed a 50% reduction in dopamine neurons in the ventral diencephalon, and a logarithmic increase in markers of oxidative damage. Dopamine neuron loss in zebrafish treated with rotenone may provide a useful tool for studying environmental causes of Parkinson’s disease. Jeremiah Hadwen (UOttawa) presented on establishing a database for repurposing clinic-ready small molecules for rare neurological disorders. Hadwen treated mouse cortical neurons with over 200 drugs at therapeutic dose and harvested neuronal RNA, which was converted to mRNA sequencing libraries for drug-gene interaction analysis. Heather Leduc-Pessah (UofC)
explored the role of microglial P2X7 receptors in morphine tolerance in mice. Leduc-Pessah reported a causal involvement of P2X7 receptors in the development of morphine analgesic tolerance, with repeated morphine leading to increased total microglial expression that, in turn, induced a potentiation of P2X7 receptor function. She concluded that these receptors represent a potential therapeutic target in the management of morphine tolerance.

Mark Chandy (UofT) presented work on microRNA biomarkers of vascular cognitive impairment in mice. They hypothesized that in a mouse model of type-2 diabetes, which results in the development of vascular cognitive impairment, anti-inflammatory microRNA in circulating microvesicles is reduced and vascular cognitive impairment pathogenesis is promoted.

Cancer

Paul Savage (McGill) probed single-cells from breast cancer patients to identify cell subpopulations. Savage found multiple subtypes and is working to strengthen these preliminary findings. Allen W. Zhang (UBC) studied the genomic heterogeneity present in high-grade serous ovarian carcinomas in order to investigate treatment resistance and therapeutic options. In particular, his work focused on the spatial variability in tumour infiltrating lymphocyte composition with the aim of elucidating the role of immune response to cancer.

Eric Zhao (UBC) presented on the merits of genomic mutational signature of BRCA1/2 deficiency in breast cancer as a potential predictive marker of platinum-based therapy response. He found that the signature is associated with improved radiological responses and time to treatment failure of platinum-based chemotherapies. Ashton Connor (UofT) presented work on metachronous pancreatic ductal adenocarcinoma tumour evolution examined with whole genome sequencing. Connor found that metachronous lesions share a common ancestor, and that low allele frequency mutations drive metastases. David Twa (UBC) studied the link between programmed death ligand 1 (PDL1) and genomic structural rearrangements in non-Hodgkin’s B-cell lymphomas. Through DNA sequencing, Twa identified a number of rearrangement partners, allowing the comprehensively characterization of the landscape of PDL rearrangement mechanisms.

Amanda Dansok (UBC) performed immunohistochemical assays on 57 human synovial sarcomas, an aggressive cancer of young adults. She found that expression of KDM2B was associated with improved overall survival at 15 years. Rola Saleeb (UofT) presented data on expression of miR-200 family of microRNAs in Clear Cell Renal Cell Carcinoma. Saleeb found that these microRNAs are over expressed, patients have a worse survival and that this overexpression could be used as a prognostic marker. Jack Brzezinski (UofT) investigated the loss of imprinting (LOI) at five imprinting centers in Wilms Tumour, adjacent renal tissue and cells sloughed into urine. Brzezinski described, for the first time, a prevalent LOI at 14q32 and its association with 11p15 LOI in the somatic tissue of Wilms Tumour and the detection of 11p15 LOI in urine from sloughed somatic tissue.

Matthew G.K. Benesch (UofA) presented data on the role of autotaxin, a secreted enzyme that produces lysophosphatidylcholine (LPA) from lysophosphatidylcholine. Benesch found that malignant thyroid tumours had higher levels of tumour autotaxin and LPA, and that LPA increased thyroid cancer cell inflammatory mediator and autotaxin secretion. Xenograft thyroid tumour mice treated with autotaxin inhibitor showed reduced tumour volume, angiogenesis and inflammation. Alexandra Kuzyk (UofM) presented work examining telomere organization in neuroblastoma. Using 3D quantitative fluorescence in situ hybridization, she identified four subgroups, each with a distinct level of genomic instability based on telomere organization. Interestingly, subgroups correlated with patient characteristics such as histology, age of diagnosis, MYCN amplification and MYCN expression. Moreover, the number of short and long telomeres increased with MYCN transfection. These findings suggest that genomic instability in neuroblastoma may be mediated through changes in telomere organization due to MYCN overexpression.

Laura Forrest (UOttawa) presented studies on the relationship among estrogen (E2), GREB1 and E2-stimulated proliferation of ovarian cancer cells. The role of GREB1 in ovarian cancer progression was validated via proliferation assays, using Esr1 (estrogen receptor 1) + and - ovarian cancer cells (+/- E2 treatment). qPCR data supported the hypothesis that GREB1 may promote ovarian cancer progression via modulation of ESR1-mediated signalling. Xiao Zhao (UofT) studied the role of adipose stromal cells in reversing the formation of radiation fibrosis. Zhao found transplanting these cells reduced fibrosis, which may be useful in mitigating sequelae following cancer remission.

Other topics

John Soleas (UofT) examined the mechanical forces during lung development and how they guide the fate of cells during differentiation. Soleas demonstrated a tissue-engineering model that examined geometric cues to guide cell differentiation. Ranita Manocha (Western) worked to quantify the effect of bracing on elbow stability after elbow surgery.
Clinical Research

With dedicated training in study design and research methodologies, many clinician investigator trainees are carrying out high quality clinical research studies. These studies range from case series and epidemiological surveys to randomized controlled trials. Grouped by medical topics, this section explores the wealth of clinically-focused research carried out by Canadian clinician investigator trainees.

Population Health and Epidemiology

Amrita Roy (UofC) examined the ability of health service systems to meet the needs of pregnant aboriginal women. By conducting interviews with multiple stakeholders, Roy determined that reducing stigma and barriers to access such as transportation, and increasing training and culturally-appropriate services are needed. Rebecca Rich (UofT) reviewed recommended performance and quality indicators for use in circumpolar maternity care systems. When completed, this review will highlight the extent and nature of research and policy-related activities on the performance of maternity care systems.

Jonathan Fuller (UofT) presented data showing that randomization does not necessarily balance all confounding causes in a randomized control trial. His work highlighted the reasons why randomized controlled trials often have internal validity metrics. Ben Ouyang (UofT) determined the incidence of needle stick injuries among medical trainees, and the distribution of needle stick injuries across the medical specialties. Ouyang reported that needle stick injuries posed a common risk to medical trainees at Toronto East General Hospital.

Mohamad Hussain (UofT) assessed the validity of carotid endarterectomy and carotid artery stenting coding in Ontario administration databases by comparing them to procedures documented in charts through a blinded review. This analysis demonstrated that these codes accurately identified patients, so researchers can confidently use administrative data to conduct population-based studies. Aleksandra Legidowicz (UofT) presented a study on biomarkers of endothelial dysfunction and mortality prediction in Ugandan children hospitalized for acute febrile illness. Their preliminary results suggest that adding biomarkers of endothelial dysfunction can independently predict mortality and improve discrimination.

Given the recent availability of HPV vaccination, Karla Willows (University of Manitoba; UofM) performed a meta-analysis to determine whether a 2- or 3-dose schedule was more effective in girls aged 9-14. Willows found that two doses of HPV vaccination resulted in inferior immunogenicity 24-35 months post vaccination; however, longitudinal data on these cohorts is missing and it is unknown whether booster shots may be necessary for those that have received only two shots. Julie Lovshin (UofT) presented data on whether inequities in retinopathy screening and treatments were present for immigrants to Ontario with type 2 diabetes. Immigrants had lower screening rates compared with long-term residents; however, access to treatment was similar for both groups. Nater (UofT) aimed to identify key survival predictive factors in surgical metastatic epidural spinal cord compression (MESCC) patients. Nater found that slow tumour growth, preoperative physical disability were predictive factors for longer survival in selected surgical MESCC patients.

Surgery

Kyle Ricord (UofC) reported the incidence, demographics and outcomes of burns treated at the Burn Unit of Foothills Medical Complex (FMC) in Calgary, Alberta. The majority of patients were young males with facial and neck burns. There was a greater severity of burn injuries sustained during the illegal manufacturing of hash oil; with these burns affecting a greater average body surface area and requiring a longer length of admission than in the general population. David Berger-Richardson (UofT) presented data on the attitude of staff surgeons on changing gloves and instruments during cancer surgery. He found that there is little consensus among surgeons on how gloves and instruments should be handled.
and surgeons rely on clinical evidence for changing gloves and instruments during cancer resections to avoid tumour seeding.

Andras Fecso (UofT) presented survey data on how surgeons distribute “takes” to trainees during a complex laparoscopic procedure. The most important steps were not performed routinely by trainees, and trainee involvement could be improved with defined performance standards. Natasha Seemann (UofT) examined surgeon stress in the operating room. While great inter-surgeon variability was observed, unexpected stressors such as previous complications proved very important. Physiological measures of stress were only interpretable in the context of subjective stress experience and sociocultural aspects (e.g., OR team composition) were an important contributor. Together, these findings suggest that an individualized approach to stress management is important for surgeon wellness.

Abdul Elkadri (UofT) discussed a novel form of protein losing enteropathy. A patient, who presented at 8 days old with hyponatremia and died at 136 days old from sepsis, was found to have a plasmalemma vesicle-associated protein mutation, which resulted in sieving protein-losing enteropathy and death. Van Woudenberg (UofC) described an ongoing study to test a relationship between infliximab serum levels and clinical outcome in children with ulcerative colitis. Out of 19 children treated with a standard infliximab regimen, 71% were in clinical remission and 59% demonstrated a clinical response by week 8. Although the serum infliximab levels of these children are monitored, further work is required to characterize the relationship between infliximab levels and clinical outcomes.

Dmitry Rosenberg (UofT) examined elderly and more complex patients who were being offered lung transplantation. Two fifths of these patients had skeletal muscle dysfunction resulting in impairments in daily function, and these patients required a longer hospital stay post-transplantation. Ewan Goligher (UofT) presented data on an optimal technique to evaluate sniff airway pressure and diaphragm function. Goligher found that sniff airway with marked airway resistance applied was a valid measure of respiratory muscle function, and that diaphragm thickening was a more reliable method of diaphragm function evaluation than diaphragm excursion.

Husam Abdel-Qadir (UofT) reviewed randomized controlled trials studying interventions for prevention of anthracycline-related cardiotoxicity in adults. Although the data was limited, it suggested that dexrazoxane was better than placebo for effective cardiotoxicity protection. Daniel Kagedan (UofT) presented an analysis of overall survival following curative-intent resection of pancreatic adenocarcinoma at the population level. Following resection, only patients with negative lymph nodes demonstrated improved overall survival with adjuvant chemotherapy. Helen Cheung (UofT) used preoperative gadolinium-enhanced MRI to predict colorectal liver metastases prognosis post-hepatectomy. Cheung found that patients with weaker MRI enhancement on preoperative gadolinium-enhanced MRI are at a higher risk of disease-specific mortality following colorectal liver metastases resection. Anna Schmidt (UofC) used cardiovascular magnetic resonance to examine the relationship between intra-thoracic fat volume and myocardial function in remaining healthy myocardial tissue patients with known or suspected CAD. Intra-thoracic fat volume was negatively correlated with myocardial function. No such correlation was found with body mass index.

Reed A. C. Siemieniuk (UofT) performed a meta-analysis to examine the impact of corticosteroids on adults hospitalized with community-acquired pneumonia (CAP). Adjunctive corticosteroids reduced all-cause mortality, the need for mechanical ventilation, acute respiratory distress syndrome and the length of clinical stay, suggesting that patients with CAP would benefit from corticosteroid treatment. Jason Elliott (UofT) studied non-invasive genomic analysis of human endometrial receptivity in women with polycystic ovarian syndrome (PCOS). Elliott proposed that ovulation assessment of women with PCOS not actively trying to conceive will be conducted, RNA will be isolated and sequenced from aspirated endometrial fluid and compared with gene-set from women without PCOS to determine gene expression differences.

Neurology and Psychiatry

Alexander Wright (UBC) asked whether the brains of concussed athletes are more vulnerable to rapid blood pressure oscillations. By measuring cerebral blood flow using Doppler ultrasound and blood pressure using photoplethysmography, he observed a trend towards an acute reduction of the ability of cerebrovasculature to buffer blood pressure changes. David Brandman (Brown University) presented on a study using the precentral gyrus to decode common grasps for daily activities in two patients with amyotrophic lateral sclerosis (ALS). Brandman found that the precentral gyrus in humans can be used to accurately predict grasps for daily activities and could potentially be used to enhance prosthetic device utility. Ayan Dey (UofT) investigated whether functional connectivity differed in older adults with cerebral small vessel disease
(CSVD) who self-reported high versus low levels of executive dysfunction in their daily lives. Dey reported that relative to healthier older adults, those with symptomatic CSVD demonstrated reduced functional connectivity within and between critical attention neural networks such as the Default Mode Network and the Dorsal Attention Network.

Andrea Jones (UBC) presented data showing that marginally housed adults were more likely to suffering from psychosis if they had smaller utilized social networks. Utilized social network size may be associated with severity of psychotic illness at presentation. Jiameng Xu (McGill) analyzed the collective narratives of five patients undergoing mental health recovery to understand how these patients strive for their own wellbeing. Fighting and hiding were prevalent narratives, which may reflect patient beliefs about the appropriateness of their symptoms and how patients may choose to manage them.

Kathleen S. Bingham (UofT) characterized the predictive value of suicidality on treatment outcome in psychotic depression (MDpsy). Bingham reported that baseline suicidality predicts outcome in patients with MDpsy and that patients with suicidality of any intensity did better with combination therapy versus monotherapy. Ingunn Benediktsson (UofC) evaluated standardized anxiety and stress tools in pregnant and postpartum populations for evaluation of psychosocial risk against prospective longitudinal study data collected in Calgary. These generalized tools were found to be appropriate screening tools for pregnant and parenting women at risk for mental distress.

Medical Education

With an ever-increasing focus on evidence-based educational practices in medical schools, there is a growing number of Canadian trainees engaged in research focused on improving aspects of medical education.

Cynthia Min (UBC) presented work on the malleability of influences of self-assessment skills of medical students. The use of a checklist after an OSCE station allowing students to score their own performance was found more accurately reflect their performance than students’ self-identified strengths. Malika Sharma (UofT) described an ongoing study to characterize how health advocacy is taught in the postgraduate infectious disease curriculum. Because the “Health advocate” CaRMS role is one of the most difficult to teach and appraise, it is necessary to gain a greater understanding of the ways in which advocacy is understood and taught to help health science centres define their commitments to social accountability. Victoria McCredie (UofT) presented data on the effectiveness of a one-day Emergency Neurological Life Support course by assessing post-course knowledge uptake and 6-month retention by physicians in Nepal. Overall, knowledge had not significantly deteriorated at 6 months compared to the immediate post-course scores, suggesting that this education technique is effective at disseminating evidence-based practice.

Brandon Girardi (UofT) showed that a novel 2-week intensive simulation skills course for all first year surgical residents significantly improved structured assessments of basic surgical skills, enabling residents to begin clinical practice with much greater technical skills. Peter Szasz (UofT) examined international perspectives with respect to technical competence assessments in surgical training. By analyzing seven responses to an open-ended survey from academic health centres around the world, he showed that while technical competence assessments were valued across all aspects of training, these assessments were rarely implemented during selection or certification of trainees both because of a lack of evidence for their use and because of financial limitations. Dale Podolsky (UofT) presented a proposal for developing a robotic approach to cleft palate repair using a phantom model created from an infant CT scan. Both staff surgeons and fellows were successful in performing a cleft palate repair using the phantom simulation. Moreover, all steps of the repair protocol were deemed feasible using the da Vinci Surgical System. Further modifications to the instruments and methodology to improve safety and efficiency of the procedure were recommended. Vivek Bodani (UofT) attempted to improve the training of neurosurgical residents in endoscopic colloid cyst resection. Bodani developed a patient-specific colloid cyst simulator and future work was needed to conduct validation studies.

Applied Science and Biomedical Engineering

Another theme this year was a growing number of trainees engaged in applied science research with the aim of elucidating tissue biomechanics or improving therapeutic approaches.

Kyle Eastwood (UofT) attempted to increase the use of minimally invasive neuroendoscope. Eastwood proposed a method using the established single burr-hole ETV/ETB procedure. This study established a platform for estimating the shape of curved dextrous tools, capable of targeting multiple intraventricular points, to guide future instrument design. Philip Edgcumbe (UBC) introduced the Pico Lantern, a miniature projector for minimally invasive surgery, with an intention to improve surgical navigation and reduce surgical complications. Edgcumbe showed that the proof-of-concept Pico Lantern offers sub-millimeter surface reconstruction accuracy and detection and display of subsurface pulsatile vessel motion.
Amanda Khan (UofT) investigated the amount of crush force a tissue can take before cellular injury occurs. At the conclusion of this study, Khan hoped to determine how much force can be safely exerted on each gastrointestinal tissue without causing damage. Carlyn Figueiredo (UofT) presented work investigating the use of gold nanoparticles (GNPs) in the detection and treatment of glioblastoma tumours. He demonstrated that using an enhanced Raman scattering signature to track GNPs allowed for in vitro and in vivo delineation of tumour boundaries. This work highlights the potential of GNPs to serve as cancer therapeutics. Cameron Kaye (UofM) reported on the use of microwave imaging for biomedical applications. Kaye successfully reconstructed experimental data collected from simple 2D targets with dilutions of magnetic nanoparticles using microwave imaging.

Knowledge Translation

Very important to patient-oriented research are large scale efforts at knowledge translation that can improve the way clinicians apply findings from scientific studies to their practice. Paul Kudlow (UofT) presented the results of a trial studying the effect of a novel, post-publication dissemination strategy on article page views at six weeks. Randomly-chosen articles distributed across the TrendMD network had 87% more views compared with control articles, and no differences were observed by article type or medical discipline. Laveena Munshi (UofT) investigated strategies for mechanical ventilation in acute respiratory failure (ARF). Using the Premier Database, she looked at findings from 514,809 patients for the use of various ventilation strategies and correlated actual practices against findings from landmark trials. She found that strategies used did not always reflect published evidence, and concluded that research such as this may help to improve knowledge translation.

Concluding Remarks

The landscape of clinician investigator training in Canada is continually shifting; however, two facts are clear: (1) trainees are engaged in a wide variety of high quality research endeavours; and, (2) the community is experiencing gradual but consistent growth. The work presented at the CSCI-CITAC Annual General Meeting provides an exciting glimpse at a set of research questions at the interface of health and science – a set of questions that clinician investigators are especially well positioned to tackle. As such, we are grateful that the Young Investigator’s Forum continues to provide a forum for the exchange of ideas and the mentorship and career development of these promising young scientists.

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