ANNUAL REPORT

2017-18

SickKids®
THE HOSPITAL FOR
SICK CHILDREN

Department of
Paediatrics

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MESSAGE FROM OUR CHAIR

Walt Disney once said: “All you need is Faith, Trust & a little Pixie-Dust”. Perhaps Mr. Disney was right since his magic formula has been creating miracles since 1955?

Although we would like to believe there is a small blanket of pixie-dust sprinkled throughout our corridors that contribute to the many miracles that occur each day, I know these miracles are mainly attributed to the dedication of our faculty and staff for being so courageous and adventurous. This contagious power then manifests itself and transformative change happens.

Our 2017-2018 Annual Report profiles the many courageous individuals and their adventurous initiatives achieved this past year. The collection of stories from each of our 17 Divisions and Medical Education Programs will give you a snapshot of the many miracles happening within the Department of Paediatrics.

As we continue to build our culture of being courageous and adventurous in our work, we will begin to shift gears to chart our new future. Commencing fiscal 2018-2019, we will reach out to our faculty, staff, partners and the paediatrics community to help us build our Vision 2022: a bold five-year strategic plan for the Department of Paediatrics. Our future success will depend on our ability to identify the right strategies, structures, priorities and accountabilities to achieve our targeted goals.

My parting comment - since we live on a blue planet that circles around a ball of fire next to a moon that moves the sea… don’t you think it’s hard not to believe in miracles?

I hope you enjoy the read!

Ronald D. Cohn, M.D. FACMG
Professor and Chair,
Department of Paediatrics, University of Toronto
Paediatrician-in-Chief, The Hospital for Sick Children
Professor, Department of Molecular Genetics,
University of Toronto

ENHANCING SERVICE DELIVERY THROUGH CAPACITY BUILDING AND EDUCATION

Savina, and Dr. Melanie Penner, Holland Bloorview Kids Rehabilitation Hospital.

SUPPORTING CHILDREN AND YOUTH WITH DEVELOPMENTAL DISORDERS AND DISABILITIES

Transitions represent changes in expectations regarding one's cognitive and adaptive functioning and the social roles they take on. For this reason, people with intellectual and developmental disabilities and their families typically identify times of transition, including that between adolescences and adulthood, as some of the most challenging times in life. To this end, the Division of Developmental Paediatrics is leading the development of transition guidelines, pathways and tools to build capacity for primary care and community providers supporting individuals with developmental disorders and disabilities as they age. Here are some of the ways how:

- In spring 2018, guidelines to support transitions to adult care were published in **Canadian Family Physician** along with a special edition article, co-authored by Developmental Physician, Dr. Alvin Loh, Surrey Place Centre. These guidelines assert that primary care physicians are in an important position to be involved in personalized transition plans for youth with intellectual and developmental disabilities that will, in turn, improve the quality of life of these individuals and their families during key life transitions, such as the transition to adult life.
- Concurrently, over the past year, Surrey Place Centre, St. Michael's Hospital and the Departments of Family Medicine and Paediatrics, including members of the Division of Developmental Paediatrics Drs. Alvin Loh, Elizabeth Young, and Ripu Minhas, have worked on a framework for a Transition Clinic for Toronto region. The goal is the creation of a unique service model designed for the needs of youth with intellectual and developmental disabilities, complex physical and mental health and behavioural and social issues.

Efforts are also underway to improve access to consultation for community providers. This requires innovation, such as the use of e-consultation and **Project ECHO** to move towards building regional networks of expertise. The successful ECHO proposal to the Ministry of Health and Long-Term Care led by Drs. Melanie Penner and Evdokia Anagnostou at Holland Bloorview Kids Rehabilitation Hospital will see the establishment and evaluation of a network focused on improving assessment and management of children and youth with Autism Spectrum Disorder in Ontario. In doing so, the project aims to reduce wait-times for specialized care by increasing community provider capacity, thereby reserving specialized care for complex cases.

ADVANCING PAEDIATRIC CARE THROUGH EXCELLENCE IN EDUCATION:

THE EDUCATION SCHOLARS PROGRAM

As part of the Department's vision for advancing paediatric care through excellence in education, the Department of Paediatrics is committed to advancing educational scholarship across the Department and training programs. Ongoing support of scholarship is provided through the Office of Medical Education Scholarship and teachers and educators benefit from programming put in place through the Office of Faculty Development.

Over the past decade, the Department has supported faculty interested in pursuing additional training in the area of education scholarship and education science. Currently there are 13 faculty members with higher education degrees in education. In addition, over the past decade, 14 faculty members have completed the Education Scholars Program (ESP); a two-year longitudinal leadership development program for health professional educators that fosters academic excellence, creativity and a scholarly approach to teaching and educational development. The Department's Education Scholars report they have developed "a new language of education" and an "armamentarium of tools" that they have put to immediate use in the Department's educational programs. Furthermore, ESP graduates report having a better "appreciation and understanding of the theory behind medical education" and being able to make deliberate choices to enhance what they do as academic clinicians. Their teaching practice has benefited from the incorporation of new materials and best pedagogical practices that focus on meeting individual learner needs. They have gone on to design new curricular materials and to update and refine educational routines and practices in their respective divisions. Education Scholars Program graduates have also developed professional relationships with educators across the Faculty of Medicine and other disciplines. They have continued to work on projects together with members of their ESP cohort and to share resources best practices. Most ESP graduates are now in educational leadership positions within the Department and/or have taken on educational leadership roles at the Faculty of Medicine, the Royal College and other health professional organizations. Specifically, the current Clerkship Director for Undergraduate Medical Education, the current Postgraduate Program Director and the Director of Faculty Development in the Department of Paediatrics are graduates of ESP, as well as many of the education division leads and Subspecialty Program Directors.

JUST WEED?

An estimated one in three Canadian teens will have tried cannabis at least once by age 15. Use in this age group is strongly associated with a number of risks including increased presence of mental illness, including depression, anxiety and psychosis as well as potential negative impacts on brain development and cognition. Furthermore, an estimated one in six adolescents who use cannabis will develop Cannabis Use Disorder with dependence.

The Division of Adolescent Medicine has created an interactive educational resource, 'Just Weed', to help young people navigate the unique risks associated with cannabis use for their age group. Led by Dr. Karen Leslie, Staff Physician in the Division of Adolescent Medicine and Lead of the Adolescent Substance Abuse Program, the resources was developed with input from young people attending the Division's Substance Abuse Program with 'lived' experience with Cannabis Use Disorder. In designing the module, young people were asked what kind of information they felt was important for teenagers to know about cannabis use with the goal of presenting information to teens and people that work with teens in an engaging and informative way. Additionally, the content aligns with information on cannabis use in adolescents published through the Canadian Centre for Substance Abuse and Addiction, Health Canada and the Canadian Pediatric Society. The goal is to increase the perception of risk that teens associate with cannabis use, which has been linked to a reduction in use. To date, a pilot evaluation of the intervention has demonstrated an increase in teens' perception of risk after participating in a session that used 'Just Weed'.

A recently launched train-the-trainer program has introduced the 'Just Weed' e-learning resource and its accompanying facilitator guide to over 50 community-based professionals who work with teens including teachers and community agency workers such as child protection, mental health and addiction workers. In light of the recent legalisation of cannabis in Canada, the team will also work to build further capacity and evaluate both the use and impact of the resource. Furthermore, the University of Toronto MD program will be incorporating 'Just Weed' into the learning for all second year medical students as a component of their learning about adolescents, which extends the impact of this resource to over 200 future physicians each year.

Excerpts from the online educational resource, 'Just Weed'.

HIGHLIGHTING THE TRUE POTENTIAL OF POCUS IN LOW-RESOURCE SETTINGS

As handheld point-of-care ultrasound (POCUS) systems are becoming more portable and less expensive, there is growing interest in how this disruptive technology can be used by non-physician health-care providers in remote areas. To this end, the Division of Paediatric Emergency Medicine has partnered with Aga Khan University (AKU) in Karachi, Pakistan, to determine if community health workers (CHWs) in Pakistan can be effectively trained to use POCUS for the diagnosis of pneumonia.

Pneumonia remains a leading cause of mortality in children under five worldwide. In some rural regions of Pakistan, children with respiratory symptoms are assessed and treated for pneumonia using the World Health Organization (WHO) Integrated Management of Childhood Illness algorithm. Community health workers use this very rudimentary algorithm, which relies solely on respiratory rate and chest in-drawing to decide on management. This could lead to problems such as antibiotic resistance, inappropriate referrals and failing to recognize some severe cases. Medical imaging could improve the accuracy of detecting pneumonia and complications, but up to three quarters of the world's population does not have ready access to diagnostic imaging services. Lung POCUS has recently emerged as an equivalently accurate test as chest x-ray for the diagnosis of pediatric lung consolidation and its complications. Point-of-care ultrasound has the potential to greatly improve the care of children living in remote areas by ensuring that severe pneumonias are not missed and that scarce resources, like antibiotics and transportation, are used more wisely.

Funded by Grand Challenges Canada, the main objective of the collaboration with AKU is to examine whether CHWs can be effectively trained to diagnose paediatric pneumonia using POCUS. The training emphasizes both image interpretation and acquisition. Image interpretation focuses on trainees' ability to recognize patterns of findings that would suggest pneumonia taught and evaluated through in-person didactic lectures, online modules and a online quiz. In contrast, image acquisition

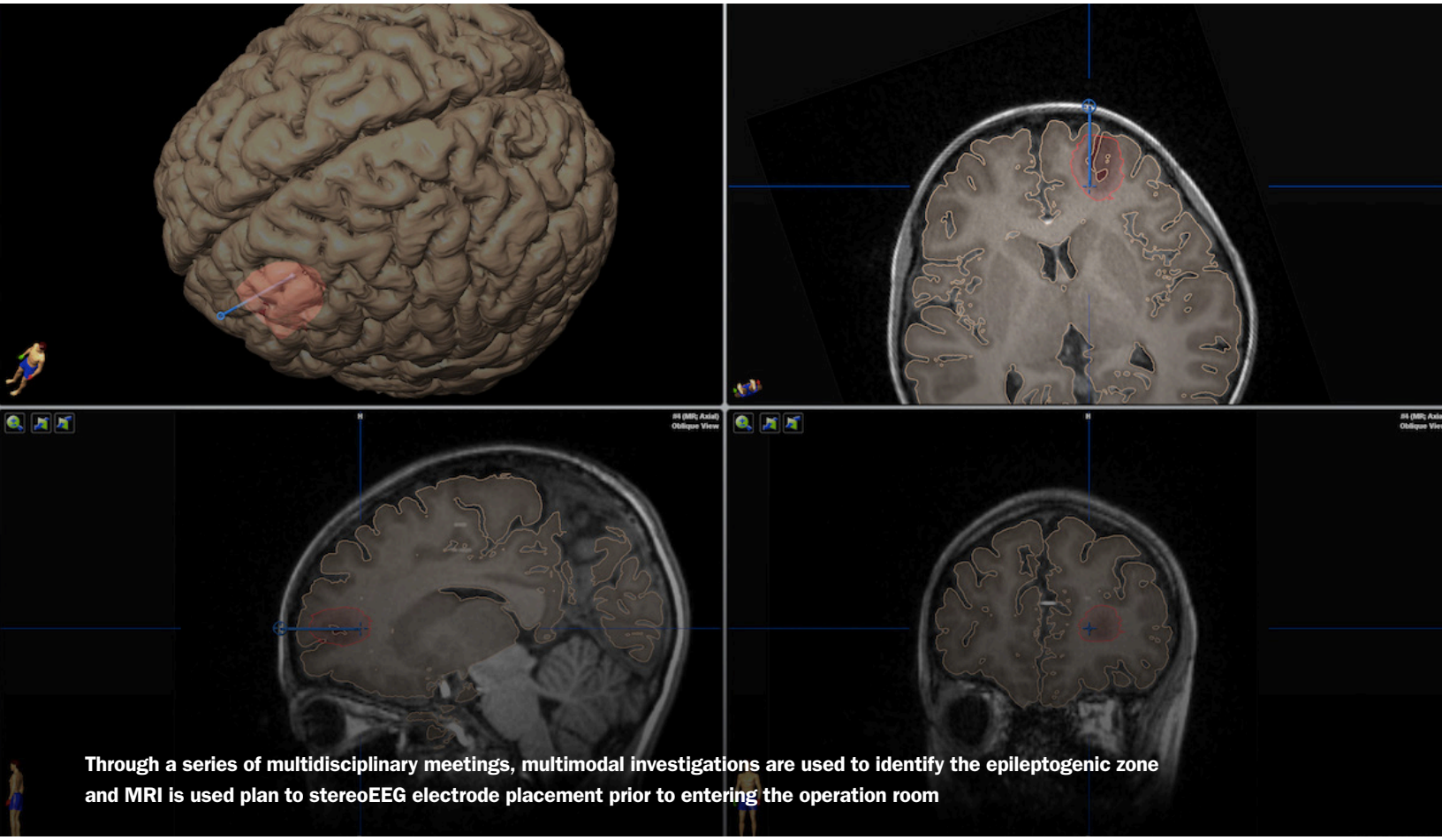
Community health workers use POCUS as part of the AKU collaboration.

focuses on the trainees' ability to acquire high-quality images at the bedside. This is taught and evaluated through hands-on demonstrations with the handheld devices, mentored scans on real paediatric patients and simulation models, as well as successful completion of a performance checklist. Furthermore, the project utilizes a "train-the-trainer" model, where experts from SickKids on-site in Karachi train local physicians at AKU to become local trainers themselves. Utilizing this model allows for improved sustainability and local capacity building. In the subsequent validation phase, the team will determine the inter-rater reliability between the local trainers and the CHWs using paediatric patients who present to AKU Hospital with respiratory symptoms. This project will contribute to knowledge of how to optimize POCUS training for novice users, such that similar scale-up projects can be executed in a safe and effective manner.

TRANSFORMING PAEDIATRIC EPILEPSY CARE

There are an estimated 14,000 children with epilepsy living in Ontario and up to 30 per cent have disabling seizures that do not remit with medical treatment. To this end, the SickKids Comprehensive Paediatric Epilepsy Program continues to innovate to improve the care for children with epilepsy. Established as a cutting-edge epilepsy surgery program receiving referrals from across Canada and globally, in 2018 the Program expanded its expertise to include stereotactic EEG. Using depth electrodes, stereotactic EEG is a less invasive procedure which allows epileptologists to target multiple brain regions to find the source of disabling seizures deep within the brain and collaborate with epilepsy neurosurgeons to remove the critical regions. Children better tolerate the procedure than the traditional, more invasive approach, reducing adverse effects and improving outcomes.

While the Program offers the most advanced expertise in treating and curing epilepsy, it is known that many children with epilepsy in Ontario cannot access the specialty care they need due to limited access to neurology and other specialties. Many children with epilepsy have significant concurrent disorders including mental health and neurodevelopmental disorders such as ADHD and autism. These complexities conspire to increase social and educational needs which create enormous challenges for families, schools and health-care providers. To address this issue, **Project ECHO: Epilepsy Across the Lifespan** was launched in 2018 with the goal of enhancing the capacity of primary care providers to diagnose and treat epilepsy in their communities, and importantly, to recognize when children require referral to specialized centres. The interdisciplinary team at SickKids connects with providers in communities across Ontario via one-to-many videoconferencing for TeleECHO sessions, twice monthly. Through sharing evidence-informed knowledge, an actionable care plan is developed to provide best-practice specialty care and, in turn, reduce health disparities across Ontario. With SickKids as the lead and partnering with the Children's Hospital of Eastern Ontario (CHEO) and Children's Hospital: London Health Sciences Centre, Project ECHO: Epilepsy Across the Lifespan plans to expand to 10 hubs throughout the province.



Through a series of multidisciplinary meetings, multimodal investigations are used to identify the epileptogenic zone and MRI is used plan to stereoEEG electrode placement prior to entering the operation room

Staff at the desk of the Poison Information Centre (now the Ontario Poison Centre), ca. 1989

40 YEARS OF POISON EXPOSURE CARE

The Ontario Poison Centre recently celebrated 40 years of offering poison exposure care to Ontario.

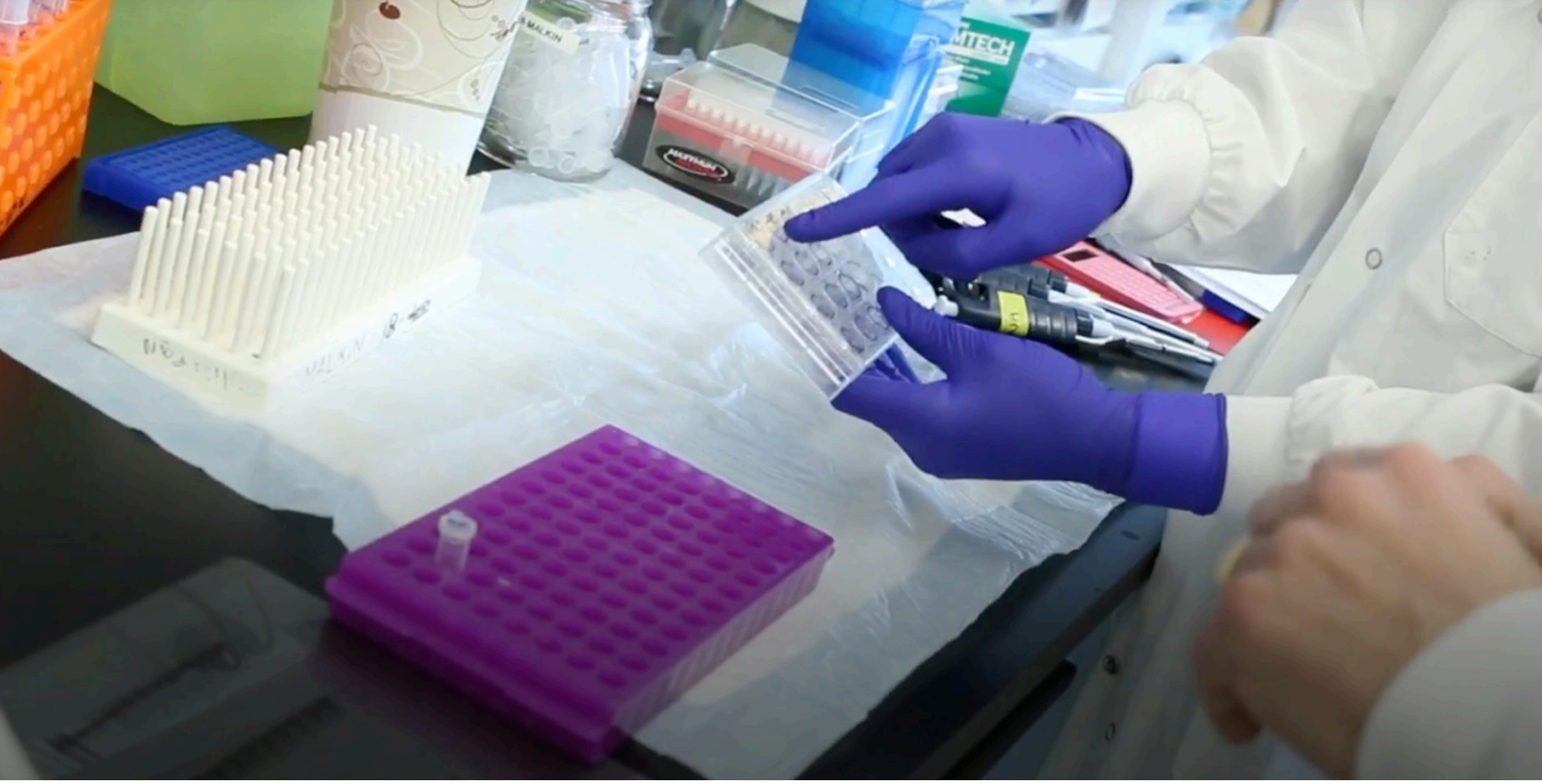
The Ontario Poison Centre (OPC), part of the Division of Clinical Pharmacology and Toxicology, is operated and supported by SickKids. In 1977 the first Medical Director was appointed and the first specialists in Poison Information were hired and trained; resources (a microfiche) were purchased; and records of calls were kept in a ledger. The Centre operated out of the triage kiosk at the Gerrard Entrance doors outside the emergency department 24 hours a day, seven days a week and took approximately 1,000 calls that first year. Forty years later, online resources are now used, calls are managed using specific computerized and searchable toxicology software and 31 specialists are employed who handle up to 72,000 calls per year. In addition, the OPC has extended its reach within Ontario. Through collaboration with Montfort Hospital in Ottawa, the OPC opened the Centre Antipoison de l'Ontario satellite site in 2007. The OPC has recruited bilingual specialists to the satellite site and is able provide expert poison advice in both official languages. Furthermore, through the use of telephone interpreter services, the Centre provides live telephone advice to callers from the province's diverse multicultural community.

The issues addressed by the OPC have also evolved over time. At present, the OPC has been able to provide valuable data related to the opioid crisis, detergent pod ingestion and e-cigarette health risks and, most recently, has been working to address the risk of cannabis poisoning in children. Notably, in 2017, the Poison Centre received Health Canada's Deputy Minister Award of Recognition for the support services provided to Canadians as well as the Centre's continued collaborative efforts to develop a national database and surveillance system.

WHAT HAS CHANGED IN 40 YEARS OF SERVICE?

- **Technology** – For instance, poison information databases have gone from file cards to microfiche to online systems. Calls used to be handled on rotary dial phones and now can be managed by voice-over IP computer technology.
- **Medical Direction** – The OPC began under the direction of Dr. Raymond Ng in 1967. Later, it was overseen by Dr. Michael McGuigan for many years, and currently, the team is led by Dr. Margaret Thompson and Dr. Connie MacKenzie as the Director and Assistant Medical Director, respectively.
- **Personnel** – The OPC has had many expert nurses and pharmacists working in the role of Poison Specialist over the years. Currently, the OPC consists of a team of almost 30 expert health-care professionals.
- **Coverage** – The Ontario Poison Centre is the largest of five poison centres in Canada officially covering the provinces of Ontario, Manitoba and Nunavut and offering poison care advice to the public and health-care providers.

EXEMPLIFYING A CULTURE OF COLLABORATION TO DRIVE IMPACT



10TH ANNUAL CCTU:

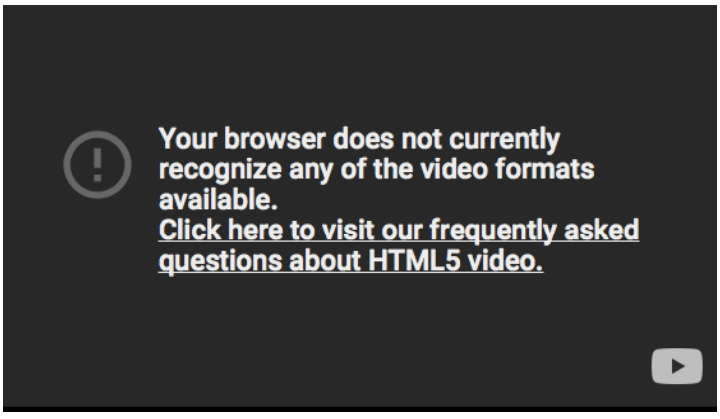
LOOKING BACK ON 10 YEARS OF PAEDIATRIC ONCOLOGY CARE

On February 7, 2018, the 10th Annual Childhood Cancer Therapy Update (CCTU) was held at the Peter Gilgan Centre for Research and Learning (PGCRL).

As leaders in paediatric health care, the goal of the CCTU is to advance paediatric oncology practice locally, nationally and internationally. Chaired by Dr. Angela Punnett, Staff Oncologist in the Division of Haematology/Oncology and the Haematology/Oncology Nurse Practitioners Denise Mills and Sue Zupanec, the one-day symposium brought together national and international health-care providers, quality and safety specialists, educators and satellite partners in health care, to share leading practices and applied science.

In honor of the 10th Anniversary of the CCTU, the agenda focused on the past, present and future in oncology care and included plenary talks and workshops that focused on future directions for oncology. This included a workshop facilated by Dr. Anita Villani, Associate Staff Oncologist, on “Advances in Paediatric Precision Oncology in Canada”.

View below to look back at the past 10 years of paediatric oncology care:



THE INAUGURAL SICKKIDS GHN RESEARCH DAY

The inaugural SickKids Gastroenterology, Hepatology/Liver Transplantation and Nutrition (GHN) Research Day was attended by over 100 participants from the large SickKids and University of Toronto community of researchers and clinicians with interest in paediatric GHN research. More than 80 oral and poster presentations described research conducted within the Division and across SickKids clinical departments, the Research Institute or within multicentre research collaborations. The day was held on April 5th, 2018 in the Peter Gilgan Centre for Research and Learning and was hosted by the Division of Gastroenterology, Hepatology and Nutrition, supported by the Inflammatory Bowel Disease Centre, the Transplant and Regenerative Medicine Centre and the Cystic Fibrosis Centre.

Research in the Division of Gastroenterology, Hepatology and Nutrition spans the spectrum from basic and translational science to patient-based research in areas including inflammatory bowel disease, hepatology, nutrition, and cystic fibrosis. Funding support of over $5 million dollars is awarded annually to this research, including grants from CIHR, NIH, the Leona M and Harry B Helmsley Charitable Trust, the Bill and Melinda Gates Foundation, the C.H.I.L.D. Foundation, the CF Foundation, and others. The inaugural GHN Research Day provided a new opportunity to not only showcase the depth and breadth of this research but to exchange ideas between investigators, promote collaboration and foster knowledge translation related to basic science, translational and clinical research. Key to these objectives were keynote presentations by visiting faculty from Children's Hospital Los Angeles and Children's Healthcare of Atlanta.

The various backgrounds and affiliations of attendees demonstrate the importance of GHN research at SickKids and its relevance to a wide variety of researchers and clinical groups.

Photos from the day can be viewed in the slideshow below:

Participants of the first team huddle.

IMPROVING THE TRANSFER-OF-CARE FOR NICU PATIENTS UNDERGOING SURGERY

This year, the Division of Neonatology successfully launched the Safe Transitions and Euthermia in the Peri-operative Period in Infants & Neonates Project; a new process to optimize peri-operative teamwork, patient management and communication for all NICU patients undergoing transfer-of-care for surgery. This project is a collaboration with the Children's Hospitals Neonatal Consortium (CHNC), a network of major American children's hospitals, with SickKids being the only Canadian site.

Key to the successful launch of this project at SickKids was the close collaboration between the NICU and the Departments of Anesthesia, Surgery and Perioperative Services. Parental involvement was also essential to the project design with parents included during the planning stages with the project team. Upon launch of the new process, parents participated in "huddles" where the surgical team gathered at the patient bedside, pre-operation. These huddles were not only useful for communication between the parents and anaesthesiologist as parental anaesthesia consent could be easily attained, but ensured parents could better understand what to anticipate with the surgery. Huddles were evaluated to confirm that the appropriate staff were present and that hand-off tools including a checklist of peri-operative communication needs were used. Participants reported the huddles as being well organized and informative as well as helpful for providing a clear summary and an opportunity to ask questions prior to patient transfer to the operating room.

Overall, the project has received high satisfaction scores by all services involved and achieved a 67 per cent reduction in the rate of post-operative hyperglycemia, which is correlated with long-term outcomes of decreasing surgical infection. The project has also driven a 50 per cent reduction in post-operative hypothermia and, to date, SickKids has the best post-operative respiratory outcomes in the network. Parents have participated in 70 per cent of the pre-operative huddles and the innovative practice of including parents in the huddle has been adopted by other participating sites in the CHNC network.

TARGET KIDS! TURNS 10!

THE APPLIED RESEARCH GROUP FOR KIDS! CELEBRATED ITS 10TH ANNIVERSARY THIS YEAR

TARGet Kids! (The Applied Research Group for Kids) Is an ongoing open longitudinal cohort study enrolling healthy children from birth to five years of age and following them into adolescence. The aim of the TARGet Kids! cohort is to link early life exposures to health problems including obesity, micronutrient deficiencies and developmental problems with the overarching goal of improving the health of Canadians by optimizing growth and developmental trajectories through preventative interventions in early childhood.

Community-based health-care practitioners and child health researchers at SickKids and St. Michael's Hospital and CAMH collect information on important physical, mental health and educational factors that affect the well-being of Canadian children. The result is a state-of-the-art primary care practice-based research network and child cohort striving to improve children's health through effective and primary care. To date, TARGet Kids! is the only child health research cohort study embedded in primary care practices in Canada, leveraging the unique relationship between children and families and their trusted primary care practitioners.

After 10 years, TARGet Kids! has become the largest prospective cohort study of young children in Canada with more than 10,200 study participants and over 10 million data points collected. "Ten years ago, we realized there was little being done for key unanswered questions in early childhood health," says Dr. Catherine Birken, Staff Paediatrician in the Division of Paediatric Medicine and Co-Lead, TARGet Kids! with Dr. Jonathon Maguire. "We wanted to do more to promote health in young children and their families."

Over the past decade, TARGet Kids! has published more than 70 papers in scientific journals. Some of the milestone findings include:

- reducing iron deficiency in early childhood;
- parent screen time, meals in front of the TV and a lack of household rules are linked to increased screen time for children; and
- longer sleep duration and a healthy weight in children are associated with better cholesterol levels.

Moving forward, TARGet Kids! will continue to listen to study participants to help shape the focus of further research projects. "It's exciting to hear from our families and healthcare providers how to make participation in this work easier, and more impactful," says Dr. Birken.

Drs. Catherine Birken and Jonathon Maguire (St. Michael's Hospital), the co-principal investigators for TARGet Kids!

IMPROVING CARE THROUGH STEWARDSHIP:

ONE ANTIMICROBIAL AT A TIME

The Division of Infectious Diseases (ID) is leading the way among Canadian paediatric hospitals in care delivery, quality improvement and research in the area of antimicrobial stewardship. Antimicrobial stewardship includes limiting inappropriate and excessive antimicrobial use while improving antimicrobial therapy and outcomes for patients. Since 2013, Accreditation Canada mandates that all acute care facilities, such as SickKids, have an antimicrobial stewardship program (ASP).

The ASP at SickKids is a joint program between ID and Pharmacy that works in a number of ways at the patient-specific level as well as providing hospital-wide reviews and recommendations. Patient-specific recommendations involve reviews of patients in selected units within the Hospital who are prescribed antibiotics, with the aim of ensuring the best treatment and treatment duration for the patient. Hospital-wide interventions include formulary restrictions and empiric treatment guidelines for common infections.

Additionally, the ASP has collaborated with the Hospital's Choosing Wisely initiative, with items on the second SickKids **Choosing Wisely list**, released in 2017, sharing a common thread of increased focus on antibiotic stewardship. This includes recommendations on the appropriate use of broad-spectrum antibiotics; treatment of urinary tract infections with antibiotics; and guidelines for the use of antibiotics for surgical site infections post-operatively, the latter of which was incorporated on the **Hospital's Quality Improvement Plan for 2017-2018**.

The team is also working to advance the academic mission of the Division and of the Program. Specifically, this past year, Drs. Michelle Science, Infectious Diseases Consultant, and Jacqueline Wong, Clinical Associate Physician, Infectious Diseases with the ASP pharmacist lead, Kathryn Timberlake, conducted a cross-sectional survey of 16 academic paediatric hospitals in Canada and their respective implementation of an ASP. Published in **Infection Control and Hospital Epidemiology**, results found that 93 per cent of surveyed Canadian academic paediatric hospitals had established ASPs. Programs were in various stages of program development and implementation and varied in their team composition, implementation of stewardship strategies and measured metrics. This was the first survey of its kind to document the implementation of ASPs and the current status of antimicrobial stewardship across Canadian academic paediatric centres. Going forward, the project will support further collaborative work with ASPs across Canada for benchmarking and research.

Members of the SickKids Antimicrobial Stewardship Program, Kathryn Timberlake, Dr. Stanley Read and Dr. Michelle Science

A LEADING PRACTICE:

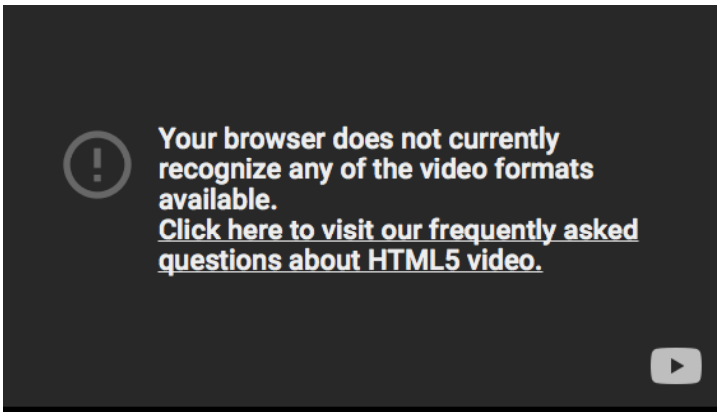
HELPING SICKLE CELL AND THALASSEMIA PATIENTS TRANSITION SMOOTHLY TO ADULT CARE

A patient's transition from a paediatric to an adult hospital can be challenging and confusing as the patient gains responsibility for their health care and begins to advocate for themselves. To this end the Sickle Cell and Thalassemia Programs developed the Transition Navigator role to help patients during this time. In the past year the Program has successfully coordinated 10 joint paediatric-adult transfer clinics between SickKids and Toronto General Hospital, attended by 44 patients. Furthermore, the Transition Navigator role was recognized by Accreditation Canada as a Leading Practice in June 2017.

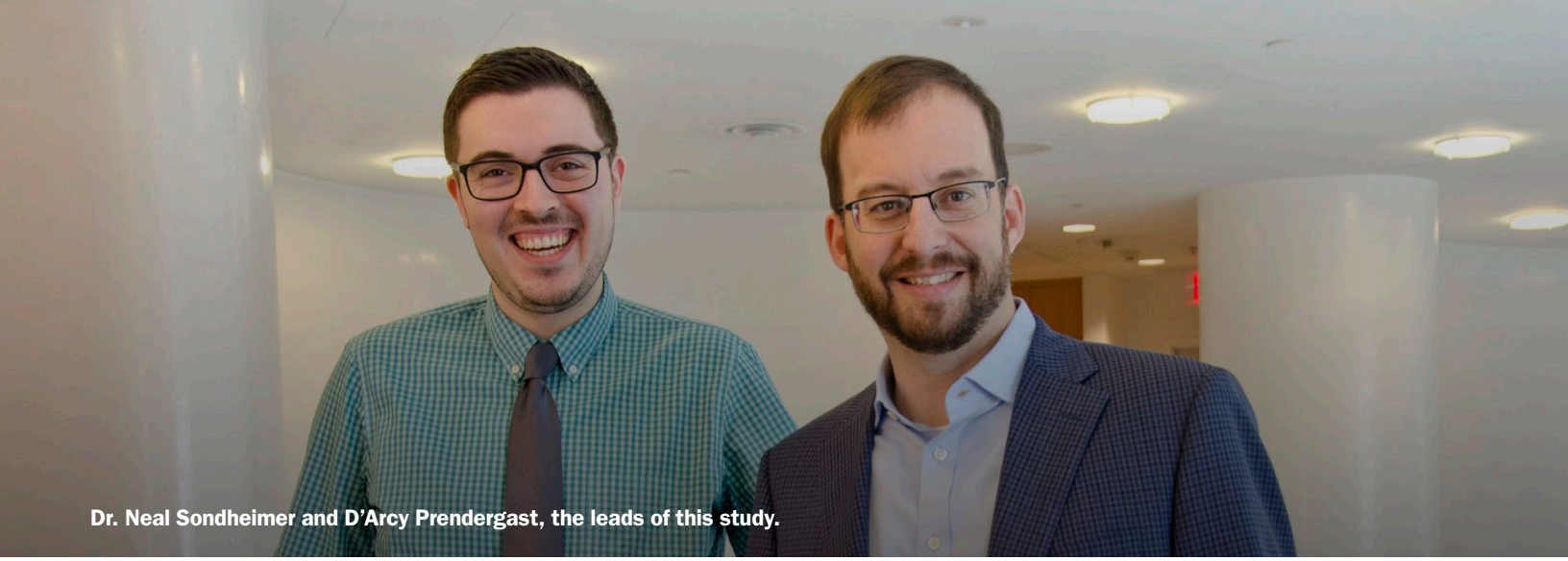
Since its development, the transfer clinic process has been streamlined by incorporating input from key stakeholders. SickKids and Toronto General Hospital staff have open and collaborative communication about each patient's needs and history during pre-clinic rounds. Every transitioning patient now receives adequate prep including My Health Passport, a portable medical summary and a transition resource package; views a hemoglobinopathy transition video; has the opportunity to meet their adult provider prior to transfer; and participates in a tour of the adult facility. As a result of this work, four patients, who were previously lost to follow-up, have successfully re-engaged.

Patient and parent feedback is gathered using pre and post-clinic satisfaction surveys at each clinic. Feedback about the transfer clinic process has been overwhelmingly positive, with 97 per cent of patients rating the clinic as excellent or good; 100 per cent feeling well prepared to leave paediatric care after attending the clinic; and 97 per cent indicating they would recommend the clinic to another teen with the same condition. Upon transfer to adult care, patients who went through this process were significantly more likely to attend their clinic appointments and maintain or improve adherence to medications when compared to those who transferred prior to the initiation of the monthly transfer clinics.

View the hemoglobinopathy transition video below:



IMPROVING OUTCOMES THROUGH TRANSFORMATIVE RESEARCH AND DISCOVERY



Dr. Neal Sondheimer and D'Arcy Prendergast, the leads of this study.

'DIVERGENT ANCESTRY' IN INFANTS' DNA

ASSOCIATED WITH INCREASED RISK OF PRETERM BIRTH

Preterm birth is a critical public health problem that may cause a wide range of health issues for the one in ten premature babies born in North America every year. While ongoing research into various aspects of prematurity has resulted in a better clinical understanding of how to manage the complications that may arise in these babies, the causes of spontaneous preterm birth remain largely unknown. Existing epidemiological evidence has shown that preterm birth rates vary according to ethnic group; according to the National Center for Health Statistics, babies born to African-American mothers have one-and-a-half times the risk of delivery before 37 weeks' gestation, compared with the general population. Previous research also suggests that maternal heredity may influence the risk of preterm birth, and that good mitochondrial function is important in maintaining pregnancy.

Building upon this existing knowledge base, a new study co-led by the Division of Clinical and Metabolic Genetic and the University of Pennsylvania identifies a possible explanation for this phenomenon in some African-American babies: in pregnancies where the mitochondrial DNA and nuclear DNA have highly distinct ancestries, an association with higher rates of prematurity was observed. Divergent ancestry appears to explain up to 20 per cent of the increased risk for preterm birth observed in African-American infants. The research is published online in **The Journal of Pediatrics.**

The research team conducted a re-analysis of three large, publicly available data sets that were previously collected on premature infants. In what is believed to be the first study of its kind, the team evaluated how mitochondrial genetics impact common health problems such as preterm birth. Knowing that that mixed nuclear ancestries were more common in women of African ancestry, the team decided to study that population in the hopes that differences in mitochondrial and nuclear inheritance may be more apparent. The re-analysis revealed that the inheritance of mitochondrial and nuclear DNA from distinct ancestral origins is associated with an increased risk for preterm birth.

"This finding will contribute to our collective understanding of genetic influences on prematurity, and may have important clinical implications down the road."

"Studying an animal model that demonstrates this effect in the lab could help us determine how it could be controlled to prolong pregnancies to full term through the development of new therapies," says Dr. Neal Sondheimer, Staff Physician in the Division of Clinical and Metabolic Genetics. "Ultimately, we hope to help reduce the incidence and severity of preterm birth and improve outcomes."

Next steps for the research include creating an animal model in which mitochondrial and nuclear ancestries could be controlled, which would enable researchers to confirm the divergence effect and to understand how it impacts the function of the mitochondria.

HIGH INCIDENCE OF KIDNEY INJURY

IN KIDS WHO RECEIVE OTHER SOLID ORGAN TRANSPLANTS, IN WORLD-FIRST SICKKIDS STUDY

Acute kidney injury occurs in approximately one-third of children that receive a heart, lung, liver or multi-organ transplant in the first year following transplant and is associated with significantly greater risk of developing chronic kidney disease, according to a study led by the Division of Nephrology, published online in the **American Journal of Transplantation**. The research is the first in the world to describe acute kidney injury in paediatric patients who had received non-kidney solid organ transplants.

In the study led by Dr. Rulan Parekh, Chief of Clinical Research and Staff Physician in the Division of Nephrology, the research team studied children after solid organ transplantation to determine if there was evidence of acute kidney injury, how often it happened and if it led to chronic scarring of the kidney. The team also studied this patient population's risk of developing chronic kidney disease, which is harder to reverse than acute kidney injury.

"We know that chronic kidney disease in the adult transplant population is a serious issue but the data is limited for children," says Dr. Parekh. "The incidence of acute and chronic kidney injuries after transplant in the paediatric population was relatively unknown."

The study also established the risk of chronic kidney disease and mortality up to 18 years of age. In the study cohort, acute kidney injury occurred in 67 per cent of children within the first week post-transplant. After the first week post-transplant, acute kidney injury occurred in 36 per cent of children, with the highest incidence among lung and multi-organ recipients.

"The high prevalence of acute kidney injury in the first year of transplantation, beyond that first week post-transplant, was surprising," says Dr. Parekh. It highlights how children after liver, heart, lung or multi-organ transplant are vulnerable to kidney injury which in turn can lead to scarring of the kidney."

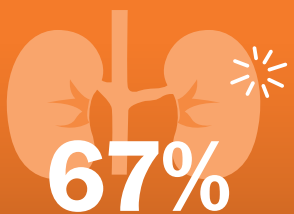
The researchers found that 23 participants developed chronic kidney disease after a follow-up of 3.4 years on average. Those children who experienced at least one acute kidney injury episode by three months post-transplant had a significantly greater risk for developing chronic kidney disease. The overall incidence of chronic kidney disease in childhood was nine per cent, with lung and multi-organ recipients having the highest risk. The rates of chronic kidney disease are likely to continue to rise as children transition to adulthood which can have a significant impact on survival.

While the actual cause of kidney injury in each event is not known, the findings have implications for clinicians, who will now have to monitor carefully and try and prevent acute kidney injury in paediatric patients. Dr. Parekh says that a better understanding of the risks of kidney injury after transplant could help clinicians ensure that families are informed before surgery.

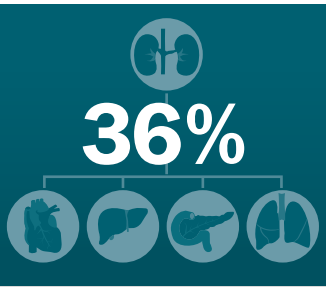
The next step in the team's research is to figure out what is causing acute kidney injury in these instances and to use provincial data to understand long-term risk as children age and as they transition to adult care.

300 ORGAN TRANSPLANT RECIPIENTS (INCLUDING HEART, LUNG AND LIVER RECIPIENTS) UNDER 18 WHO WERE CARED FOR EXCLUSIVELY AT SICKKIDS, BETWEEN JAN. 1, 2002 AND DEC. 31, 2011

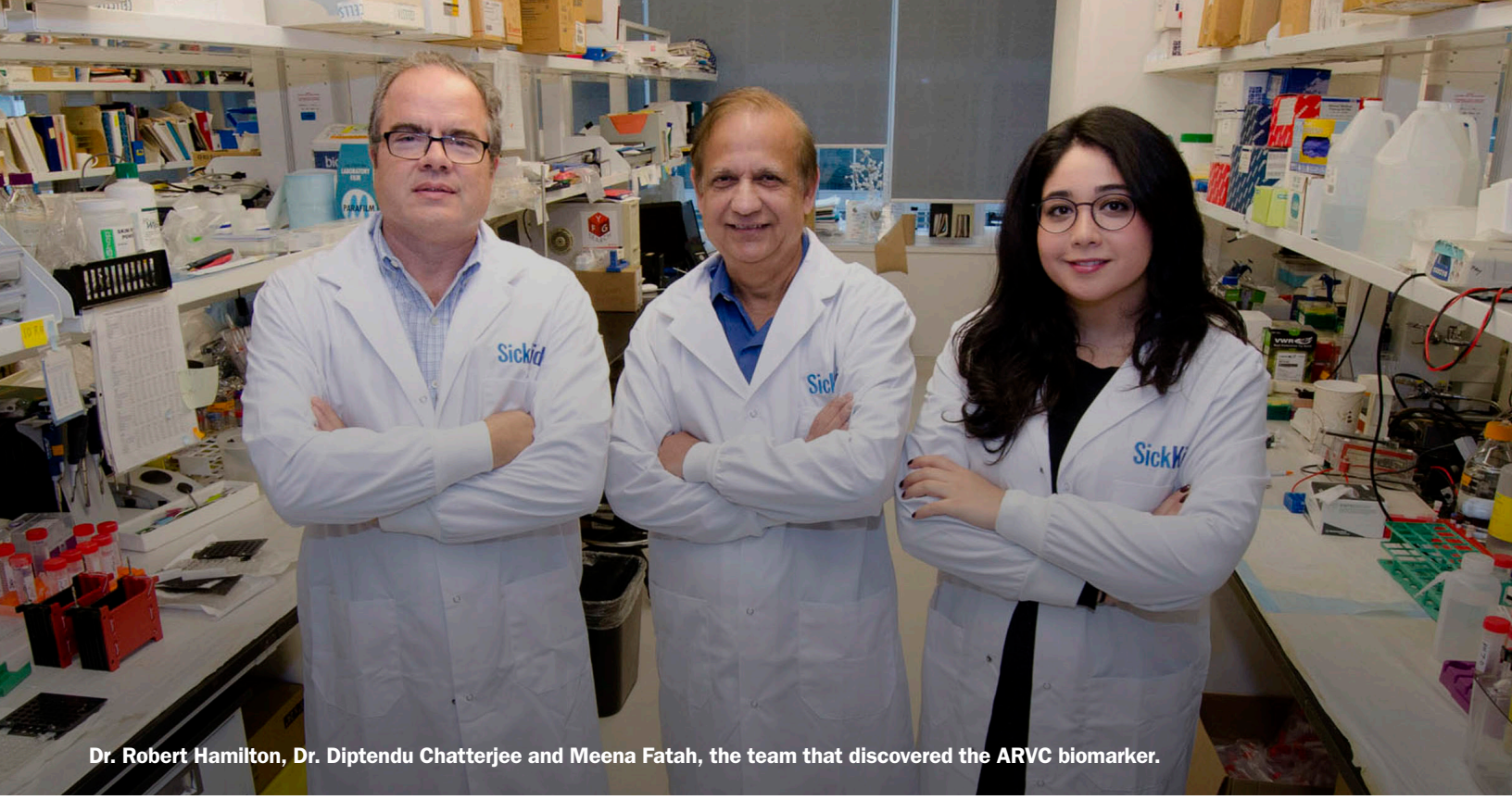
THE CHILDREN WERE FOLLOWED FOR AN AVERAGE OF 3.4 YEARS.



IN THE STUDY COHORT, ACUTE KIDNEY INJURY OCCURRED IN 67 PER CENT OF CHILDREN WITHIN THE FIRST WEEK POST-TRANSPLANT



AFTER THE FIRST WEEK POST-TRANSPLANT, ACUTE KIDNEY INJURY OCCURRED IN 36 PER CENT OF CHILDREN, WITH THE HIGHEST INCIDENCE AMONG LUNG AND MULTI-ORGAN RECIPIENTS



Dr. Robert Hamilton, Dr. Diptendu Chatterjee and Meena Fatah, the team that discovered the ARVC biomarker.

A LIFE-SAVING NEW BLOOD TEST

Arrythmogenic right ventricular cardiomyopathy (ARVC) is a leading cause of sudden cardiac death in children and young adults. The condition affects the muscular wall of the heart by causing it to break down over time, usually resulting in an abnormal heartbeat and potentially, sudden death. Like many diseases, ARVC can stay hidden as it may not cause symptoms in its early stages. A genetic mutation can be identified in approximately half of affected individuals, but the remainder are gene elusive and difficult to diagnose. Furthermore, current taskforce diagnostic criteria perform poorly with one-third of diagnoses potentially missed through time consuming and expensive annual cardiac tests.

In an elegant example of translational research, Dr. Robert Hamilton, Staff Cardiologist in the Division of Cardiology and his team identified a new biomarker for ARVC. Recognizing the desmosomes that hold heart cells together perform a similar role in the skin, the team began to work closely with dermatologists knowing that, at a molecular level, ARVC had parallels with a blistering skin disorder called pemphigus. The team were able to show that one antibody specific to to desmosomes, anti-DSG2 (anti-Desmoglein-2), was elevated in all cases of ARVC tested.

The anti-DSG2 antibody can be identified in a routine blood test and is the first autoantibody linked to ARVC. According to Dr. Hamilton, this discovery could identify 98 per cent of all cases of the disease. Moreover, the blood test is simpler, more sensitive and far less expensive than the annual heart tests currently utilized.

The researchers tested for anti-DSG2 in other diseases of the heart, but couldn't find the antibodies in these other patients. Rather, anti-DSG2 seems to be specific for ARVC and appears to be linked to the cause of the condition as well, meaning researchers could develop brand new treatments for this difficult condition.

"In caring for children with dangerous heart rhythm conditions for 30 years, I became convinced that arrhythmogenic cardiomyopathy is an important cause of sudden cardiac death in children," says Dr. Hamilton. "When you consider the years of life these patients could lose, the potential impact of better diagnosis and new treatments is tremendous."

This pioneering work was published in the **European Heart Journal**. The next step in the team's research will be to transform these findings into a clinical test available to clinicians around the world.

TEAM SHEDS MORE LIGHT ON NEW AUTOINFLAMMATORY DISEASE

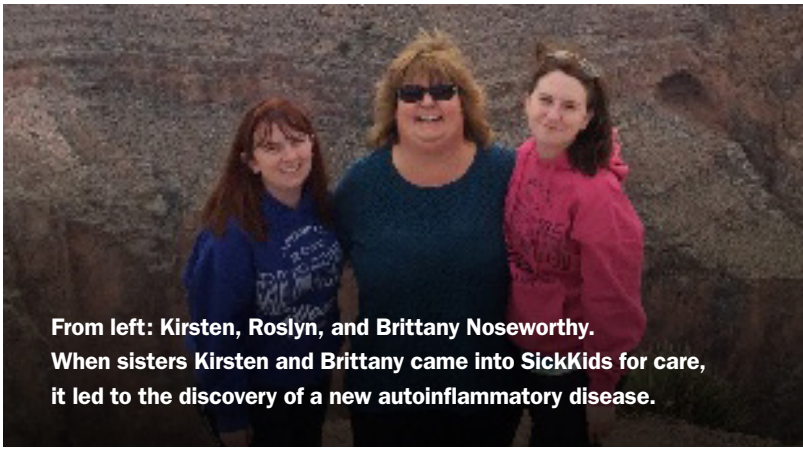
An international research collaboration led by SickKids has released their latest research project on a cohort with a rare autoinflammatory disease, A20 hapolinsufficiency (HA20). SickKids, along with their National Institutes of Health (NIH) collaborators in Washington, D.C., was the first to report on the mutated gene responsible for HA20 in 2016.

The latest research, A20 haploinsufficiency (HA20): clinical phenotypes and disease course of patients with a newly recognised NF-kB-mediated autoinflammatory disease, is the first comprehensive clinical description of the cohort. It was published in the online edition of **Annals of the Rheumatic Diseases.**

Two sisters treated at SickKids over 20 years were the impetus for the research. As an infant, Kirsten Noseworthy, now 25, came under the care of Dr. Ronald Laxer, Staff Rheumatologist in the Division of Rhuematology and principal investigator of the study. Her mother Roslyn knew that something was seriously wrong with her first-born daughter. “I couldn’t touch her legs, she would be screaming in agony,” she says. “I couldn’t even change her diaper without causing her pain.”

A referral from a paediatrician brought Kirsten to SickKids and Ron. A few years later, her younger sister Brittany was born; she also came under his care. Both sisters had an unusual form of inflammation with arthritis that presented like juvenile idiopathic arthritis (JIA), together with many mouth ulcers that present like the rare Behçet’s disease, which causes the inflammation of blood vessels throughout the body. They also had eye inflammation (which is seen in both JIA and Behçet’s), to the point where Brittany lost the vision in her left eye.

When Dr. Laxer learned that Roslyn had similar symptoms, his team began investigating a potential genetic component, especially as both sisters showed symptoms before the age of one. Working with colleagues at the NIH, a novel mutation in a gene that is involved in inflammation and immunity was identified in their family, and the associated disease was named HA20.



From left: Kirsten, Roslyn, and Brittany Noseworthy. When sisters Kirsten and Brittany came into SickKids for care, it led to the discovery of a new autoinflammatory disease.

The latest research paper outlines how his team and their NIH colleagues searched through their databases and worked with other centres around the world to identify a total of seven families who had mutations in the same gene. The main symptoms displayed by the 16 patients in the study were recurrent oral, genital, and/or gastrointestinal ulcers; musculoskeletal and gastrointestinal complaints, cutaneous lesions, episodic fever and recurrent infections.

“What we did in the current work was to pull the data from all the families together and report the clinical manifestations and outcome,” says Dr. Laxer. “It’s important because it describes the clinical characteristics of the new disease and differentiates it from Behçet’s disease, which is what people would most commonly think about given this presentation. It should help clinicians and families who were looking for a diagnosis and might help dictate treatments. It should also help people who are doing research in the area by highlighting the importance of this gene in the inflammation pathway.”

The Noseworthy women found peace of mind having a name for their condition and are managing their symptoms well. They contributed to this research by making a few trips to the NIH in Washington, D.C. for blood work. “We were happy to support this research, to help other families get answers too,” says Brittany.

ADVANCING DIABETES RESEARCH

The Division of Endocrinology can trace its roots to the early days after the discovery of insulin by doctors Banting and Best at the University of Toronto. In 1923, Dr. Frederrick Banting was appointed physician in charge of diabetes at the Hospital, and a specialized diabetes clinic was established the following year. This made it possible to carry out metabolic studies that helped establish the principles of care for children with juvenile diabetes.

Today the Division is leading research dedicated to providing comprehensive consultation and ongoing management of children vulnerable to or already diagnosed with diabetes. The Division consists of a multidisciplinary diabetes health-care team involved in the ongoing care of children with Types 1 and 2 Diabetes as well as diabetes related to other disorders such as cystic fibrosis or glucocorticoid therapy. Researchers within the Division lead large research groups in Canada and internationally, with the aim of educating children at-risk of or with diabetes and helping them through the various challenges they will face with their diabetes management as they progress through childhood and adolescence. Here are some of the ways how:

Dr. Farid Mahmud's research focuses on diabetes, clinical and translational research relating to co-morbid autoimmune conditions, and early evaluation and prevention of related complications. Most recently Dr. Mahmud and colleagues completed The Adolescent Diabetes Cardio-Renal Intervention Trial (AdDIT), an international study that evaluated the use of medications to lower markers of heart and kidney disease in adolescents with Type 1 Diabetes. The results, published in the **New England Journal of Medicine**, did not show conclusive benefit, but the trial proved the medications were safe and opens opportunities for further trials. The group is now funded to follow teenagers in the AdDIT trial into young adulthood through a CIHR-JDRF SPOR (Strategies for Patient Oriented Research) grant. Dr. Mahmud also leads another SPOR study of a novel medication among youth with Type 1 Diabetes who are at higher risk of developing diabetes complications.

Dr. Diane Wherrett leads the international NIH and JDRF-funded Type 1 Diabetes **TrialNet Pathway to Prevention** study. The study has recruited over 180,000 family members of those with Type 1 Diabetes and has followed almost 6,000 participants who are at high risk of developing diabetes. Samples from these subjects have been used by researchers around the world to understand how Type 1 Diabetes develops.

Dr. Rayzel Shulman's research focuses on the access to, quality of and health policy related to the delivery of care for children and teens with diabetes. Her findings will impact care, such as learning that adolescents of the lowest socio-economic status and who have had a mental health visit are five times more likely to have a diabetes-related hospitalization in early adulthood. With support of a CIHR New Investigator Award and a CIHR-JDRF SPOR she will also test ways to improve transitions to adult care among youth with Type 1 Diabetes.

ORAL IMMUNOTHERAPY:

FROM ANAPHYLAXIS TO ICE CREAM

In recent years food allergies have become an epidemic affecting more than five per cent of Canadian children including an average of one or more pupil in every classroom in Ontario. The most common triggers for food allergic reactions in children are eggs, wheat, peanuts and tree nuts, shellfish, sesame and milk. Members of the Division of Immunology and Allergy have been investigating the potential causes and treatments for these food allergies that in some cases can lead to anaphylaxis and even death.

In this study, the smile on the face of a teenager, finally able to have ice cream with his classmates, was priceless.

The Division, in collaboration with McGill University, is part of a national group of leading allergists seeking better solutions for children suffering from severe food allergies, many of which can play an important social and nutritional role in the lives of children. In the past year, Dr. Julia Upton, Staff Physician in the Division of Immunology and Allergy and her team successfully completed the initial part of a ground-breaking oral immunotherapy (OIT) study; Milk Desensitization and Induction of Tolerance in Children. In this study, children with a milk allergy drank milk under close observation, in a controlled hospital environment and with full resuscitative equipment available, medical staff onsite and epinephrine on hand. The patients were initially given 10 mL of milk to consume – an amount that was steadily increased over the course of one year to where patients could safely consume 300 mL (a large cup of milk) while forgoing an allergic reaction.

Although not a cure, OIT has been viewed as a successful process, which can benefit many children with food allergies and may allow them to incorporate serving sizes in their diet. There is an ongoing time investment involved with OIT – parents are required to ensure the child continuously consumes the food they are allergic to upkeep desensitization. However, the energy and preparation that usually goes into avoiding the allergen is redirected towards safely consuming it.

Encouraged by the results, Dr. Upton and her team are looking into optimizing the OIT process by introducing multiple foods at the same time or by offering lower doses to the patient to make the process safer and easier. For some families, the goal may not be full serving sizes, but protection from accidental exposures of the food.

Dr. Upton and patient Shaan.

Dr. Padmaja Subbarao and Federal Science Minister, the Honourable Kirsty Duncan

‘MISSING’ MICROBES MAY PROVIDE A CLUE TO THE CAUSE OF CHILDHOOD ASTHMA

Approximately one in three Canadians is diagnosed with asthma in their lifetime and it is the most common cause of pediatric hospitalization. In children, asthma is the most common chronic disease, affecting one in seven Canadian children. New funding from Genome Canada and CIHR will enable researchers to further investigate the root causes of this chronic condition that affects a vast portion of the population. This funding comes as part of an announcement made by Federal Science Minister, the Honourable Kirsty Duncan on January 23rd, 2018, in which “Childhood Asthma and the Microbiome—Precision Health for Life: The Canadian Healthy Infant Longitudinal Development (CHILD) Study” was awarded over $9 million as part of a major investment in genomics and precisions health research.

The project, led by researchers at the University of British Columbia and Dr. Padmaja Subbarao, Staff Respirologist in the Division of Respiratory Medicine, will draw on data from the Canadian Healthy Infant Longitudinal Development (CHILD) Study, of which Dr. Subbarao is the Study Director. With nearly 3,500 Canadian children participating, the CHILD Study is one of the largest most deeply phenotyped birth cohort designed to provide key insights into gene-environment interactions. Over 500,000 questionnaires and over 600,000 biological samples have been collected since 2008, making CHILD a rich source of data for many researchers. The study is made possible through funding from CIHR and AllerGen, the Allergy, Genes and Environment Network.

With support from this new funding, the goal of the study will be to find new clues to the causes of childhood asthma, based on the gut microbiome. The CHILD team has already shown that a deficiency in four key microbes are associated with an increased risk in asthma. By building a catalogue of the gut microbes associated with asthma—particularly these ‘missing’ microbes in infants who later develop asthma—researchers hope to develop a screening tool to identify infants at the highest risk. Furthermore, beyond predicting which children may develop asthma, this research will guide the development of novel microbiome based therapeutics to ultimately prevent asthma from developing at all.

BY THE NUMBERS

393
POSTGRADUATE RESIDENTS AND FELLOWS

126
PART-TIME FACULTY

120
ADMINISTRATIVE STAFF

228
FULL-TIME FACULTY

27.59%
SUCCESS RATE IN CIHR PROJECT COMPETITION*

82,000
EMERGENCY DEPARTMENT VISITS

42
COUNTRIES REPRESENTED BY POSTGRADUATE RESIDENTS AND FELLOWS

* Relative to the 14.99% National Success Rate for Fall 2017

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