

Teamwork

2021 Annual Report

CHEO

RESEARCH INSTITUTE
INSTITUT DE RECHERCHE





Dr. Jason Berman

Exemplifying teamwork across the CHEO Research Institute

As we continue to navigate the successive waves of the COVID-19 pandemic and what it means to “live with the virus”, I welcome the opportunity to reflect back on the CHEO Research Institute’s 2021/2022 fiscal year and all that we have accomplished as a team.

The Research Institute continues to live out our vision of “Making discoveries to inspire the best life for every child and youth”. We are finding answers to some of the many questions and challenges presented by the pandemic. We have been providing national and international leadership in COVID-19 wastewater testing and monitoring, studying COVID-19 vaccine safety during pregnancy, exploring mental health implications of the pandemic on children, understanding the household transmissibility of the virus, and serving as a Canadian site for a clinical trial of a vaccine for our youngest children who have yet to receive this important layer of protection.

The amazing teamwork and nimbleness that defines the CHEO Research Institute was exemplified early in 2022 when, in coordination with our hospital partners, we successfully delivered four priority COVID-19 vaccination clinics, vaccinating 1,227 teachers, administrators, early childhood educators, custodians and bus drivers in order to make the return of children to in-person learning as safe as possible. What started as an idea for meaningful redeployment quickly became a reality within days because of the hard work, dedication and collaboration of our amazing Team CHEO.

In November 2021, the CHEO Research Institute implemented the power of positive teamwork by introducing a new research framework comprised of seven research teams, which are supported by five research cores. The seven research teams are:

- Improvements Now!: Acute and Critical Care Team (INACCT)
- Biology Breakthrough Team
- Ready, Set, GO Team
- Mind Matters Team
- Data-Driven Discovery Team
- Best Life Through Science Team
- Cancer, Infection, Arthritis (CIA) Therapeutic Approach Team

Each team is featured in this year’s annual report and you will have a chance to learn about a few of the many accomplishments coming out of each team during their inaugural year.

We saw the retirement of a number of Senior Scientists this past year, including Dr. Ciaran Duffy, Dr. Ashok Kumar and our former CEO, Dr. Martin Osmond. We will miss them but their research contributions will live on and we wish them well in the next phase of their lives. We welcomed a new Senior Scientist, Dr. Nancy Young, a physiotherapist and epidemiologist by training, and former Tier 2 Canada Research Chair in Rural and Northern Children's Health at Laurentian University. Nancy has continued her innovative and highly collaborative research in Indigenous child health at CHEO and has also taken on the role of Chair of our new Research Mentorship Program, a key vehicle for achieving our strategic goal of fostering the next generation of child health researchers. We also brought on a number of new Office of Research Services (ORS) staff, and adapted some existing roles, in order to continue supporting our growing institute and the work of our researchers.

CHEO continues to rank in the top 30 research hospitals in Canada. Our research teams were actively engaged in 630 studies and published more than 500 peer-reviewed scientific papers last year. This work was undertaken in close collaboration with over 17,000 patient and family partners. With more than 100 media appearances since December 2021 and the relaunch of our Discovery Minute video series, our researchers continue to share their findings beyond the scientific community.

The CHEO Research Institute continues to embody its value of being equitable and further its commitment to Equity, Diversity, Inclusion and Indigeneity (EDI). At the Research Institute we have made many EDI improvements in the past year, including updating many of our human resource templates and processes and developing an EDI guide for grant writing. Through the stories featured in this annual report, you will see EDI is woven into the fabric of everything we do.

I would like to thank Alex Munter, President and CEO of CHEO, for continuing to lead with our shared vision of integrating research across all of Team CHEO. I would also like to recognize the contributions of Kevin Keohane, who retired as President and CEO of the CHEO Foundation in December 2021. I look forward to working with the CHEO Foundation as we continue to advocate for and support research at CHEO. A special thank you to Rhonda Correll (COO), Chris St. Germain (CFO), Chris Dyrda (Chair of the Board) for your ongoing leadership and partnership, particularly during this ever-changing pandemic environment. Of course, none of this ground-breaking work would be possible without the ORS staff, researchers and their teams, learners and the patients and families who help inform and inspire all the research we undertake at CHEO.

Dr. Jason Berman
CEO and Scientific Director, CHEO Research Institute
Vice-President Research, CHEO



Dr. Jason Berman at a priority COVID 19 vaccination clinic for the education sector in January 2022.

Team CHEO continues to inspire every day

At CHEO our Team is mighty and made up of incredible people who all play a valuable role. Team CHEO includes staff, medical staff, researchers, learners, volunteers, donors, community supporters, and of course family members. Collectively, this team ensures the children in our care have the best possible shot at living their best life.

As we enter year three of this pandemic, we can say proudly that Team CHEO continues to step up, finding creative ways to maintain the world-class standard of care we have set for our children, youths, and families, continuously innovating, discovering and looking to the future in a positive light.

Teamwork isn't a term we use loosely at CHEO. It is a true reflection of who we are and how we do things. Using our collective power and resources, Team CHEO bands together and, year after year, digs deeper, innovates further, and finds more answers to provide support, care and hope for our families.

This past year, we saw examples of teamwork everywhere at CHEO. Our research and clinical teams worked together with singular focus: to improve patient care. We saw it in virtual family-centered rounds (first introduced at the onset of the pandemic), in our collaboration with engineers from uOttawa and the City of Ottawa measuring COVID-19 levels in wastewater, in mounting an education-sector vaccination clinic to new and exciting research around a COVID-19 vaccine for our youngest children. Teamwork got results.

The Research Institute is a powerful player on Team CHEO and these are only a few highlights of the research and teamwork that 'upped our game' and translated innovation into the best care.

There are better and exciting days ahead. As we eventually put the pandemic behind us, Team CHEO will continue to focus on advancing the impact of science in Eastern Ontario and well beyond.

Alex Munter
President & Chief Executive Officer
CHEO



Alex Munter



Steve Read

Working together to give kids their best life

At the CHEO Foundation we see first-hand the huge impact that donors have on the children, youth and families who rely on CHEO. Year after year, the support from our donor community fuels the pursuit of new knowledge and innovative discoveries by CHEO researchers.

The past few years have presented many new and unexpected challenges. But, in the face of every problem, we have come together so that children and youth can beat the odds and reach further than anyone thought possible. It's inspiring to know that work goes on every day to support these young people and their families, and that the CHEO Foundation remains a trusted conduit to bring financial contributions from our generous community to the bedside and research labs to build healthier futures.

All of us who work for Team CHEO share a common goal – to better the lives of children, youth and their families. Collaboration and purpose link teams within our walls, in our region, across Canada and around the world. The health and wellbeing of the next generation unites us all and I am truly honoured to be a part of this vital work.

Scientific research plays a critical role in enhancing and advancing medical care. Without our dedicated research community at CHEO, we would not be able to translate new knowledge from bench to bedside as quickly as we do. That is just one of the many reasons the CHEO Foundation is pleased to fundraise in support of the CHEO Research Institute each year, with last year's contributions surpassing \$6 million.

New questions and challenges are always around the corner but seeing the power of teamwork brings me energy and optimism. I especially want to thank our donor community for enabling the research that will lead to better treatments and important discoveries in the years ahead. When innovation is mixed with kindness, determination and drive, we can do wonderful things for those we serve, and all of us at the CHEO Foundation are proud to be part of this great team.

Warmest regards,

Steve Read
Acting President and CEO
CHEO Foundation

Governing to support discoveries today and beyond

As I reflect on the past year, I am humbled and honoured to be part of the CHEO Research Institute team. It is a collection of incredibly smart, talented, resilient and dedicated individuals who once again rose to the challenges presented by the ongoing COVID-19 pandemic with ingenuity and passion.

In 2021, we continued to make great strides in achieving the goals set out in our 2020-2024 strategic plan, while also remaining nimble and adapting to the evolving COVID-19 pandemic. The Board is consistently impressed with how much the CHEO Research Institute accomplishes, even amidst a seemingly relentless pandemic. Researchers and their teams continue to carry out important research, seeking answers to the many perplexing questions the pandemic has raised, while at the same time supporting CHEO and our community when there are calls for redeployment.

The Board is excited about the establishment of the seven Research Teams and associated Team Captains at the CHEO Research Institute. This structure and collaboration will positively impact the research output and growth of the CHEO Research Institute moving forward. Reading about the discoveries and successes these teams have already experienced within their first year of existence is truly inspiring.

To complement and support these teams, we also have the five Research Cores. I am particularly thrilled about the establishment of the Innovation and Commercialization Core, which continues to signal the CHEO Research Institute as an excellent place to incubate start-ups and accelerate the transition of academic research into practice.

I would like to acknowledge the new members who joined the Board in the past year, namely Margo Crawford, Natalie Evans, Sapna Mahajan, and Sacha Bararmand. Additionally, Heidi Elmoazzen, Lisa Mayhew, Dane Bedward, and Catherine Eckenswiller joined as Committee members, with both Heidi and Catherine, joining the Board for the coming year. This has deepened the skill set of the Board and its various Committees and has helped the Board better reflect the diverse make-up of the community we serve.

When you have a great team, it is hard to say goodbye to outgoing teammates. I would like to thank Don Husereau, Lynn van der Linde, and Kevin Keohane for their incredible dedication to not only the CHEO Research Institute, but to the youth of our community. Kevin's contribution as the recently retired President and CEO of CHEO Foundation can simply not be overstated.

And lastly, thank you to the CHEO Research Institute leaders, researchers, trainees, and staff for their dedication and positivity during what has been yet another challenging year. Working in tandem with our colleagues at the Hospital and Foundation, we continue to make discoveries to inspire the best life for every child and youth.

Chris Dyrda
Chair, Board of Directors
CHEO Research Institute



Chris Dyrda



Dr. Cecile Bensimon

REB poised for novel future of research

It is a privilege to lead the CHEO Research Ethics Board (REB) and I'd like take this opportunity to recognize the outstanding service and commitment of REB members and the research ethics office staff. The CHEO REB is an oversight body that determines the ethical acceptability of the design and conduct of human research at CHEO. Our role is to fundamentally protect the rights and dignity of research participants and to pragmatically protect the institution from liability. In 2021, the REB had oversight of 1,025 active research studies, reviewed 221 new studies and 367 modifications, and managed 1,621 post-approval activities. These numbers clearly demonstrate the vibrancy of research at CHEO. I invite you to read the [REB's 2021 Annual Report](#).

I have a longstanding passion for pediatric ethics and research ethics, and firmly believe that children have the right to be seen and heard as competent, meaningful research participants. The role of REB Chair presents a unique opportunity to work at the intersection of these two fields at a time of transformative change in research. The complexity of biomedical research, the pace of translational and implementation science research, and the experience of community-based research such as participatory and co-design approaches, among other new research designs, have increased significantly in the last decade. This complexity has generated novel ethical issues that provide exciting opportunities for – and unique challenges to – research ethics. Exploring what these issues are, and how to navigate them to promote the ethical conduct of research, promises to be fruitful.

As I enter my third year as Chair of the REB, I look forward to continuing to work with the CHEO and CHEO Research Institute teams to leverage the possibilities for governance innovation as we continue to bolster the role of the REB as part of the ecosystem of care at CHEO in a spirit of collaboration and learning.

Dr. Cecile Bensimon
Chair, CHEO Research Ethics Board

Combining measurement science with Indigenous wisdom

Indigenous children in Canada face inequities in accessing health services, including mental health and wellness resources. By combining the precision of measurement science with Indigenous wisdom, Dr. Nancy Young and her team are providing tangible and actionable information to Indigenous communities across Canada to support and improve the well-being of First Nations, Inuit and Métis children and youth.

Dr. Young, who joined the CHEO Research Institute as a Senior Scientist in July 2021, is passionate about improving the health and well-being of Indigenous children in a valid, reliable, and culturally appropriate manner. That is why her team co-created a “wholistic” health assessment tool called The Aaniish Naa Gegii: the Children’s Health and Well-being Measure© (ACHWM). The tool comes in the form of a user-friendly application (app) to measure health and well-being for Indigenous children (ages 8-18 years). The tablet-based app, created by the children for the children, generates immediate results for children in a balance chart, presents details to a local health worker, then rolls the data up in an automated community report. The automated reports make evidence-informed health care possible in small community settings. The app and its built-in safety net identify children who need support and connect them to natural helpers and local health workers.

“We are thrilled by the warm welcome we’ve received from the CHEO Research Institute and are very excited to have the support of so many experts who share our goals to improve children’s wellness,” said Dr. Young. “The CHEO research family has added invaluable expertise to our project in the areas of mental health, research methods and contracts. Because of this and the Research Institute’s incredible leadership, I am confident the ACMHW tool will continue to grow and evolve to better serve Indigenous children, youth and their communities.”

Thanks in part to significant funding from the Government of Canada and the Canadian Institutes of Health Research, Dr. Young’s ACHWM team has grown to support 212 new members across Canada and 12 Indigenous communities are gathering local data to inform their program decisions.

Dr. Young’s team is now examining the needs of younger children (ages 4 – 7) and youth older than 18, and testing the relevance of the content for children in Iqaluit in partnership with the Government of Nunavut’s Regional Mental Health Team. These studies will expand the reach of the ACHWM and enable more communities to make data-informed decisions for more children.



Dr. Nancy Young (left) and Linda Kaboni work with children of Wiikwemkoong Unceded Territory on gifting the ACHWM a more child friendly name.

Data Driven Discovery Team

Team Captain: Dr. Dhenuka Radhakrishnan

Data and technology are used in many aspects of our modern lives, and health research is no exception. The outcomes of the research conducted by our Data-Driven Discovery Team lead to innovations in health care and health services. Our team has access to large data sets and uses machine learning and AI to drive forward medical innovation. Our data discoveries can be used in developing medical devices and algorithms; Advancements in E-health and digital health; Generating clinically actionable insights and other technology-related innovations. This research team uses data and technology as key tools in their discoveries, looking to answer research questions about pediatric conditions and the care we provide.

Acquisition of synthetic data trailblazer, Replica Analytics highlights CHEO as a place to incubate start-ups

When it comes to commercialization of research there is sometimes a difference of opinion in the academic world. The CHEO Research Institute is demonstrating the benefits of bridging academic research with industry partners through successful commercialization endeavours and a focus on innovation.

For Dr. Khaled El Emam, Tier 1 Canada Research Chair in Medical Artificial Intelligence, health technology research presents excellent opportunities for meaningful commercialization pursuits that have a positive impact on health care delivery and research.

Replica Analytics, a start-up specializing in synthetic data generation (SDG), which was incubated at the CHEO Research Institute and the University of Ottawa Faculty of Medicine, was acquired by Aetion, the leading regulatory-grade real-world evidence (RWE) technology provider, in January 2022. This was Dr. El Emam's second successful acquisition through the CHEO Research Institute; the first being Privacy Analytics which was started in 2007 and acquired in 2016.

"The CHEO Research Institute has been very supportive, recognizing the societal and economic impacts that can come from enabling the commercialization of academic research, which is also important for the research funding agencies themselves," said Dr. El Emam.

SDG is a privacy enhancing technology gaining rapid adoption, particularly in health care, and Replica Analytics has been at the forefront of these developments. A machine-learning model is built that generates new, synthetic data that closely captures the statistical properties and patterns in real datasets. Because there is no one-to-one mapping back to a person, synthetic data can be shared more freely, addressing many of the administrative and regulatory constraints that exist with real personal data. The applications of SDG can be a game changer for research, particularly as researchers look to recruit enough participants for cutting-edge clinical trials.

The Replica Analytics success story is one illustration of the CHEO Research Institute's work in the area of commercialization and CHEO's broader commitment to streamline the development of health innovations aimed at improving the lives of Canadians.

Innovation – it's in our core!

The CHEO Research Institute created a new Innovation and Commercialization Core in 2021. The Innovation and Commercialization Core aims to capture the passion and creativity at CHEO and create a rich supportive ecosystem designed for healthcare professionals. It will provide product management support, advice, innovation mentors, and system navigation to help transform inspiration into high-impact products and services for patients and families. The core is led by Dr. Matthew Bromwich, ENT surgeon at CHEO, Investigator at the CHEO Research Institute and founder of Shoebox, which now employs over 100 people and develops and distributes medical devices worldwide, and Jim Bottomley, Innovation Manager at the CHEO Research Institute.

Dr. Khaled El Emam

Cutting-edge COVID-19 vaccine research for at risk age group

The CHEO Research Institute has a long history of leading and contributing to important vaccine research. As our youngest children continue to wait for an approved vaccine against SARS-CoV-2 (COVID-19), the need for pediatric vaccine research is critical. The CHEO Research Institute is one of eighty-seven sites in Canada and the United States participating in a clinical research study, called the KidCOVE Study, to evaluate the safety and effectiveness of an experimental vaccine to prevent COVID-19.

KidCOVE is a randomized, observer-blind, placebo-controlled study to evaluate the safety, tolerability, and immunogenicity of two doses of mRNA-1273 (COVID-19 vaccine) given to healthy children 28 days apart. The purpose of this study is to test a vaccine that may protect children from getting sick if they come into contact with COVID-19.

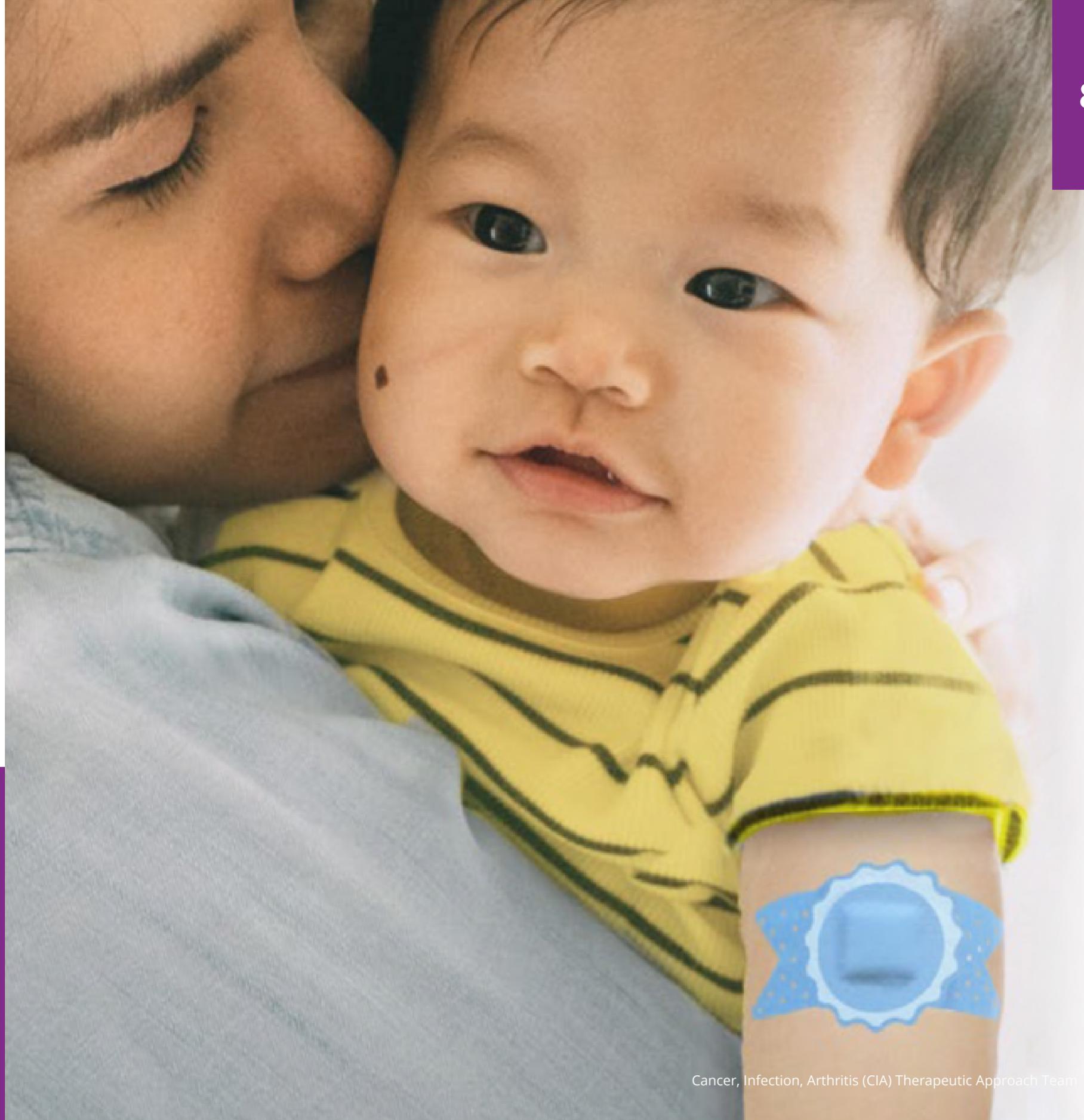
The CHEO Research Institute study age group involves children 6 months to under 6 years of age. Recruitment for the study began in December 2021 and as of March 2022, the team at CHEO had reached their target goal of 40 families enrolled as part of the study.

"The research team, which includes CHEO infectious diseases physician Dr. Jason Brophy as one of the study's site investigators and Jennifer Bowes as the research coordinator, and the families have been very excited to participate in this cutting-edge research to evaluate the COVID-19 vaccine in this at risk age group. The CHEO Research Institute has been a huge help in facilitating this very important and timely trial," said Dr. Charles Hui, Chief of Infectious Diseases at CHEO and Principal Investigator of the CHEO KidCOVE study.

Cancer, Infection, Arthritis (CIA) Therapeutic Approach Team

Team Captain: Dr. Tommy Alain

Research investigation of Cancer, Infection, or Arthritis (CIA) to improve outcomes for children and youth is important to the Scientists on this team. These dedicated researchers can be clinical, laboratory-based, or a combination of the two. Working on discoveries to improve treatments for inflammatory or immunological conditions, infectious disease, or childhood cancers, this acclaimed CIA team works tirelessly to make research discoveries to inspire the best life for every child and youth.





Dr. Tyson Graber

Making poop a regular dinner time conversation and trusted source of information

When Dr. Tyson Graber, cellular biologist and Associate Scientist at the CHEO Research Institute, joined the Ottawa COVID-19 wastewater surveillance team led by uOttawa engineering professor Dr. Rob Delatolla and Dr. Alex MacKenzie, Senior Scientist at the CHEO Research Institute, he could have never imagined he would become more popular (and trusted) than the weather station!

But in December 2021, as the arrival of the highly-infectious Omicron variant coincided with restricted public access to COVID-19 polymerase chain reaction (PCR) tests, the wastewater surveillance program that Dr. Graber and colleagues had worked on for almost two years became the best and, in reality, the only reliable means of tracking the level of COVID-19 in Ottawa.

“When we started this project, we would have never imagined that our work analyzing poop would have made for regular dinner conversation and serve as a key indicator for decision makers during the pandemic,” said Dr. Graber.

The Ottawa wastewater surveillance team was one of the first labs in the world to report daily levels of viral RNA from SARS-CoV-2 (COVID-19) on a publicly accessible website 613covid.ca/wastewater at the outset of the pandemic in 2020; a game changing innovation that was replicated worldwide. In Ontario, all 34 public health units currently use the method, covering 80% of the population.

Now, more than two years since the start of the global pandemic, “living with the virus” has become public rhetoric and most community protection measures, such as masking in public places and limiting large gatherings, are lifted. Accurate accounting of positive COVID-19 cases is unavailable, which leaves people to assess their own level of risk. It is for these reasons, and many more, that Ottawa Public Health, along with local and national media, turned to Dr. Graber and team to help understand where the pandemic was heading and what the levels of infection were like in Ottawa during the fifth and sixth wave of the pandemic. It is invaluable information made possible by cutting-edge research.

“Very rarely do scientists get to see the fruits of their research having such a broad effect on the public good in their lifetimes. It is humbling and a tangible example of how basic research benefits society,” said Dr. Graber.



[Watch Dr. Tyson Graber's CBC The National interview](#)

[Watch Dr. Tyson Graber's 2022 CHEO Telethon segment](#)

Dr. Chaput points to collaboration as the name of the game

As team captain, Dr. Jean-Philippe Chaput has really taken his team's name "Ready, Set, GO!" to heart and hasn't stopped going since!

With 23 publications in 2021, six of which he was the senior author, and 10 with an impact factor of more than 4, Dr. Chaput has continued to move the needle of research into pediatric obesity prevention and the adoption of a healthy lifestyle, in particular healthy behaviours such as sleep, physical activity and nutrition. Regularly featured as an obesity and sleep expert in national and international media in both official languages, Dr. Chaput continues to raise the profile of the CHEO Research Institute.

As a member of the World Health Organization's Guideline Development Group for guidelines on the management of adolescents with obesity, the Research Lead for CHEO's 1Door4Care project, and an Associate Professor in the Department of Pediatrics at the University of Ottawa, Dr. Chaput is passionate about leadership and working collaboratively to improve the lives of all children and youth. When asked to serve as team captain for the "Ready, Set, GO! team, Dr. Chaput jumped at the opportunity.

"Being team captain was a natural evolution for me and it's nice to assume more leadership roles as I advance my career path. It is exciting to be part of the frontline leadership group at the CHEO Research Institute and help develop our scientific program and recruit new scientists. Playing a role in defining and supporting the CHEO Research Institute vision, mission, and strategic plan is rewarding. Providing advice and feedback on staff career development is also something that I cherish very much," said Dr. Chaput.

One of the key benefits of the new team structure is that it provides a forum to ensure interactions among the scientific staff of the program. This structure will facilitate greater knowledge and awareness of the research happening at the CHEO Research Institute and be better informed about research leadership decisions. The new structure also lends itself well to new collaborations between team members who had not previously considered working together.

For example, Dr. Chaput submitted a grant application with Dr. Amy Robinson to further understand the role that fatigue plays in patient safety events at CHEO. Furthermore, Dr. Marie-Eve Robinson and Dr. Gary Goldfield obtained a two-year grant valued at \$250,000 to start a randomized controlled trial aimed at teaching adolescents with type 1 diabetes self-compassion to reduce diabetes distress. These new collaborations came organically as a result of team meetings in the past year.

"I'm very confident that the Ready, Set, GO! team will provide international leadership and research excellence as it relates to improving mobility and keeping our kids active and healthy," added Dr. Chaput.



Dr. Jean Philippe Chaput

Ready, Set, GO! Team

Team Captain: Dr. Jean-Philippe Chaput

Children and youth love to be on the go. Sometimes, either due to a health condition or the world we live in, keeping on the go may not come easy. We have a diverse team of researchers who are looking to improve mobility and keep our kids active and healthy. This team brings together researchers who study healthy active living, bone health, orthopedic conditions and rehabilitation every day to discover a way to help children and youth in our community and around the world get ready, get set, and GO!

[Learn more about Dr. JP Chaput and Healthy Active Living and Obesity \(HALO\) research](#)



Concussion research for the body and mind

A CHEO Research Institute study has put to rest the idea of prolonged rest when treating a child or youth with a concussion. Gone are the days of sitting alone in a dark room!

Resuming non-contact physical activity 72 hours after a concussion is safe, and may also reduce symptoms and the risk of delayed recovery, suggests the first and largest real-world, randomized clinical trial on the topic conducted with children and youth aged 10 to 18.

Led by CHEO Scientists Dr. Andrée-Anne Ledoux and Dr. Roger Zemek, the findings of the clinical trial were published in the British Journal of Sports Medicine, received significant national and international attention, including a cross-country radio syndication run and feature on CBC's The National.

"The findings of this study should give every health care professional who manages kids with concussions the confidence to prescribe early and controlled return to physical activity, even if they have symptoms. The study confirms that early return to physical activity is safe, can reduce concussion symptoms and reduces the rate of delayed recovery," said Dr. Ledoux.

Impacts of concussion on mental health

Dr. Ledoux also helped to answer a question many of our family leaders interested in concussion research sought to have answered: what are the impacts of a concussion on a young person's mental health?

Ledoux's population-based retrospective cohort study looked at children and youth aged five to 18 across Ontario over a 10-year period. The findings published by JAMA Network Open indicate that young people who sustain a concussion are at a 40% higher risk of mental health issues, psychiatric hospitalization, and self-harm compared to those who sustain an orthopaedic injury. This was the first study of its size and length of time to examine the association between a concussion and subsequent mental health issues amongst children and youth with no prior mental health visit in the year before their injury and no prior traumatic brain injuries in the five years before their injury.

The study's findings should influence how physicians and families assess children and youth post-concussion.

"During concussion follow-up visits, it's extremely important for physicians to screen for mental health issues and factors that might predispose children to a mental health problem. By intervening early and providing children and adolescents with the right tools to cope and adapt to the trauma and symptoms of a concussion, we can help them become more resilient and prevent the impacts of long-term mental health issues," said Dr. Ledoux.

Dr. Andrée-Anne Ledoux

Mind Matters Team

Team Captain: Dr. Noah Spector

The human brain is the body's most complex organ. Our Mind Matters Team is made up of researchers who conduct research which will lead to a better understanding of brain health in children and youth. Researchers are focused on understanding and protecting brain health, mental health, autism, concussion, or other neurological conditions. This important research team is also focused on research related to improving training and education of all medical staff who care for kids. Our research discoveries matter to the families of children with intellectual and behavioural conditions and improve child and youth mental health services.



Watch Dr. Andree-Anne Ledoux's Discovery Minute on return to non-contact physical activity.

Trans Youth CAN! reinforces need for better access to gender-affirming care and mental health support

Understanding the mental health realities of transgender and non-binary adolescents seeking gender-affirming medical care in Canada is an important field of research required to improve care and support these youth.

Dr. Margaret Lawson, Senior Scientist at the CHEO Research Institute, is the co-principal investigator and clinical lead for the Trans Youth CAN! study - a first-of-its-kind study that followed and examined the experiences of transgender youth in Canada.

The cohort study funded by the Canadian Institutes of Health Research (CIHR), explores the medical, social and family experiences of 174 transgender and non-binary youth seeking gender-affirming care at 10 specialized gender clinics across Canada. The study follows youth and their parents/guardians over a two-year period from their first clinic visit to discuss initiation of medication to put a hold on puberty, which would have happened when they were under the age of 16.

The first publication of many that will come from this in-depth study was published in Pediatrics in November 2021 and reports on the experiences of trans youth seen for gender-affirming medical care. The findings of the study's first publication are poignant and highlight the need for more research on, and support for, transgender and non-binary adolescents in Canada and the mental health realities they face, which are made worse by long waits to access gender-affirming care.

"The adolescents participating in Tran Youth CAN! had high levels of parental support and yet still waited almost four years to receive gender-affirming care," said Dr. Lawson, an endocrinologist at CHEO and Professor of Pediatrics at the University of Ottawa. "At their first visit for gender-affirming care, depression was high and anxiety even higher, with 67.6% engaging in self-harm in the previous year, 34.5% having suicidal ideation, and 16.8% had one or more suicide attempts."

Trans and non-binary youth in Canada need better access to gender-affirming care and mental health support. Trans Youth CAN! found that when transgender youth wait longer for their first visit to consider hormone suppression or gender-affirming hormone therapy, their likelihood of having anxiety, self-harm, suicidal thoughts, and suicide attempts increased significantly.

Gender diversity referrals increased each year at CHEO from 210 in 2019 to 280 youth in 2021, with wait lists increasing from 210 to 321 youth. As wait times for gender affirming medical care continues to increase across the province, so does the risk of anxiety, self-harm, suicidal thoughts and suicide attempts among these youth, as noted in the study.

Delays in access to mental health support were identified in the Trans Youth CAN! November 2021 Pediatrics publication. The report uncovers a lack of community care resources and highlights a now-urgent need for increased resources to provide access to gender-affirming medical care to transgender and non-binary youth. Every day matters in the life of a child; and, for vulnerable youth, every day of delay could have life-limiting consequences up to and including suicide.



Dr. Margaret Lawson

Trans Youth CAN! findings:

- 3.9 year average wait to receive gender-affirming care for the 174 adolescents (79% assigned female at birth) participating in the study
- 66% were aware of their gender before age 12
- 62.0% of the adolescents reported strong parental support for their gender identity.
- Depression was high and anxiety even higher, with 67.6% engaging in self-harm in the previous year,
- 34.5% having suicidal ideation
- 16.8% had one or more suicide attempts
- 47% said they did not feel safe in school washrooms
- 63% reported avoiding school locker rooms and washrooms
- 38% reported avoiding school to avoid harassment, transphobia or discrimination.
- 10% of adolescents reported that they had missed two or more weeks of school for reasons related to their gender, such as their mental health, being bullied/harassed, misgendered or outed.
- 41% of parents reported they had to get involved in their adolescent's school regarding gender issues with 27% reporting they had to defend their adolescent's right to use a washroom
- 14% of parents reported that their adolescent had to change schools because others had issues with their gender
- Another 28% had considered changing schools for these reasons.

[Watch Dr. Margaret Lawson's Discovery Minute on fear of hypoglycemia in children with type 1 diabetes and their parents](#)



The Ottawa Mask “pushed the limits” of what was possible as a research institute

Having immersed himself in the timely research of N95 mask decontamination to ensure a reliable supply of personal protective equipment at CHEO at the outset of the COVID-19 pandemic, Dr. Dayre McNally, Senior Scientist at the CHEO Research Institute and critical care physician at CHEO, also noticed shortcomings with masks being worn in the community setting. Individuals and their families had to choose between single-use, not environmentally friendly hospital grade surgical masks or reusable, cloth masks which often had poor filtration efficiency (averaging 30%).

“We recognized the need for another category of mask; one with good particle filtration efficiency that could be cleaned and sterilized in the home environment with minimal loss in performance,” said Dr. McNally. “It seemed as if there were bicycles and F-150s in the mask market, but no one had made a good solid sedan.”

A key step was connecting with EcoEquitable, an Ottawa-based not-for-profit that provides women with sewing job/employment opportunities with a focus on recycling and sustainability, and Dessius, a textile consultancy in Calgary. Recognizing a shared interest in providing Ottawa with a high-quality eco-friendly mask, the three teams collaborated to design a fashionable and comfortable mask with a filter that maintained high particle filtration despite cleaning and sterilization through regular laundering at home.

A critical step in mask development was acquiring and testing approximately a dozen different filters from manufacturers across the world. These filters were sent to the National Research Council to calculate not only their initial filtration efficiency, but also performance after 50 washing cycles. Fortunately, one of the filters demonstrated very high efficiency when new (88%), with minimal loss following repeated washing (>70%). Following the task of building the filter into the mask, Dr. McNally received approval to have CHEO employees (experts in wearing personal protective equipment for long periods) trial the mask in various community settings and provide feedback to improve the mask design including aspects such as materials, sizing, and strap adjustments.

The first 1,000 masks, dubbed “The Ottawa Mask”, were manufactured and sold online starting in April 2021 through EcoEquitable’s website and in person at Kardish Health Food Centre stores. Public reception was incredible, with the first 1,000 masks sold in less than 24 hours, and 4,000 masks over the first week of sales. In total, 15,000 Ottawa Masks were produced and sold in 2021, with profits of approximately \$30,000 donated to CHEO.

“I am very proud of what we were able to accomplish. It took help from dozens of people across the hospital and research institute to make the project a success. We really pushed the limits of what was possible as a research institute,” said Dr. McNally. “Critically, this project helped our new Innovation and Commercialization research core identify opportunities and current limitations as we continue to explore and refine bridging the gap from innovation and research to industry and commercialization.”



Alex Munter, President and CEO CHEO, presents Dr. Dayre McNally with the Green Award for his mask research and initiatives.

Improvements Now!: Acute and Critical Care Team (INACCT)

Team Captain: Dr. Waleed Alqurashi

For many families, pediatric medical care often comes urgently and without notice. Our researchers involved in the Improvements Now!: Acute and Critical Care Team are answering research questions about care and treatments related to critical and emergency care and surgery. This team is making discoveries associated with the medical management of childhood surgical procedures and acute injuries and illnesses. When a child faces an unforeseen condition, our internationally recognized researchers are in the background inacting improvements to pediatric acute care locally and worldwide.

Bridging the gap from research to bedside in treatment of anaphylaxis

Allergic diseases affect more than 25% of the world's population. Food allergy affects more than 3 million Canadians and impacts one-in-two Canadian households. Anaphylaxis is the most severe form of allergic reaction that rapidly affects multiple body systems and can be fatal. The highest incidence of anaphylaxis is in children and adolescents. In Canada, there is an emergency department visit for food allergy approximately every 10 minutes.

As a clinician, Dr. Waleed Alqurashi, team captain for the Improvements Now!: Acute and Critical Care Team (INACCT), observed significant practice variation and confusion in how physicians cared for children with anaphylaxis. As an emergency physician, he has witnessed firsthand the gaps in original research and clinical practice and has devoted his efforts over the past several years to bridge these gaps.

"The gaps are huge, and we still have a lot of work to do," said Dr. Alqurashi.

"Current policies and practices of post anaphylaxis care are largely guided by consensus-based recommendations that have unintended negative impacts on patient safety and quality of life. Our research collaboration with leading scientists and community partners looks to fill some of those gaps."

As a Principal Investigator at the CHEO Research Institute, Dr. Alqurashi is a leader in the field of allergy and anaphylaxis research. In 2021, he won the Food Allergy Canada Robyn Allen Leadership Award, awarded yearly to those who champion anaphylaxis-related causes through awareness building and influence change that impacts quality of life through improved policies, research, education, and advocacy.

Dr. Alqurashi has distinguished himself as an expert in the field of biphasic anaphylaxis (BA), which is a severe allergic reaction occurring after resolution of an initial anaphylactic event, which can cause significant morbidity and caregivers' anxiety.

"There is ambiguity in how physicians manage anaphylaxis which adds a huge burden to health care and contributes to emergency department crowding. Most international treatment guidelines recommend that all patients present to the emergency department for a prolonged period (6-24 hours) of in-hospital monitoring after initial reactions have been treated to increase detection of BA," said Dr. Alqurashi. "These guidelines are based on limited evidence and have unintended negative impacts on patient safety and quality of life. Furthermore, this 'one-size fits all' approach to care leads to wasteful resource utilization that provides low-value care."

In 2021, Dr. Alqurashi received grant funding from the Canadian Institutes of Health Research for the Canadian Anaphylaxis Network study. The study will enroll patients from seven pediatric centres to develop a prognostic tool that informs clinicians' disposition decisions of children with anaphylaxis, so that children at high risk are monitored appropriately, whereas those at no or low risk for symptoms recurrence can be discharged from the emergency department once they become asymptomatic.

From research to bedside, Dr. Alqurashi's work continues to evolve and improve clinical practice and anaphylaxis management around the world.



Dr. Waleed Alqurashi

Study links poor housing conditions with respiratory health issues in First Nations children

The vital role indoor air quality plays on one's health has become an important topic during the COVID-19 pandemic. For Dr. Tom Kovesi, Investigator at the CHEO Research Institute, indoor air quality of the homes of Indigenous children in Canada has been a research passion for more than a decade.

In his most recent work, Dr. Kovesi led a joint study with the Sioux Lookout Meno Ya Win Health Centre, Sioux Lookout First Nations Health Authority and the Nishnawbe Aski Nation, which documented indoor air quality and housing characteristics in four isolated First Nations communities in northwestern Ontario. Published in the Canadian Medical Association Journal, the study found frequent rates of respiratory infections in children under three years of age and that high rates of wheezing in this age group was related to poor housing conditions. The study found that 25% of children involved required medical evacuation for respiratory illness, with just over 20% of children admitted to hospital during the first two years of life.

Researchers documented the extent to which many homes in the Sioux Lookout Region, north of Thunder Bay, ON, did not meet even minimum guidelines. They quantified the interior surface area of mould, monitored indoor air quality for three to five days in main living areas and conducted other detailed analyses, such as dust mite concentration and contaminants from wood smoke that could affect respiratory health.

"Inequalities and underfunding have resulted in houses that are poorly constructed and of insufficient size, with inadequate funding for maintenance and upkeep," said Dr. Kovesi.

This important research helps inform the broader socio-economic challenges that need to be addressed in order to improve the overall health and wellness of Indigenous communities in Canada.

"Increased housing stock appropriate for local geographic, climatic, and cultural needs should be matched to solutions that are First Nations led and governed. Economic opportunity, elimination of food insecurity, and potable water will allow communities and residents to apply more resources to the upkeep of existing houses," the researchers concluded.



Dr. Tom Kovesi

Best Life Through Science Team

Team Captain: Dr. Robert Klaassen

The CHEO Research vision is "discoveries to inspire the best life for every child and youth." Our Best Life Through Science Team embodies that vision, understanding the pathophysiology and improving the treatment of chronic childhood diseases. With the inclusion of quality of life research, researchers on this team work to improve many chronic conditions and complex care treatments. In this group you will find researchers passionate about diabetes, gastroenterology, respirology, and cardiac conditions, just to name a few.



[Watch Dr. Tom Kovesi's CTV News Channel interview](#)

Patience, preparation and parents: the keys to clinical trial success

Over the past year, patience and keeping an eye on the prize has been the name of the game for Dr. Bernard Thébaud, team captain of the Biology Breakthrough Team.

Dr. Thébaud, neonatologist and Senior Scientist at the CHEO Research Institute and The Ottawa Hospital, has been preparing to launch a phase 1 clinical trial of an experimental mesenchymal stem cell (MSC) therapy that may help heal the lungs of premature babies and prevent a common chronic condition called bronchopulmonary dysplasia (BPD). Dr. Thébaud and his team are the only group in Canada working with mesenchymal stromal cells in pediatrics.

"I'm not usually a patient person, it drives me nuts; but the devil is in the details. The preparation for a clinical trial is super important. In the beginning I thought I was losing time and I wanted to start right away, but in order to get it right you have to do your homework first. Once you're truly ready, then launch it," said Dr. Thébaud.

In September 2021, his team completed the observational arm of the study, which sought to see how such a trial would unfold. The "mock trial" went through the exact same inclusion and exclusion criteria, tested out recruitment materials and parent information (including an animated video), and helped refine their approach for the upcoming interventional trial.

"A lack of enrolment is one of the main reasons that a clinical trial fails," he said. "Integrating families and parents especially early on in the study increases the quality of the trial and the likelihood of completion. We learn a lot from parents. What appears important to physicians or the treatment team may not be important for parents, especially when it comes to clinical trials and expectations of outcomes."

What exactly is an MSC?

Another aspect of preparation and patience that has been a focus of 2021 for Dr. Thébaud is helping the scientific community define MSCs and agree upon clinical reporting guidelines to reduce controversy and enhance transparency and successful clinical translation.

"You'd think we would already have a clear definition and defined characteristics for MSC's, but we don't. Cell therapy for regenerative purposes is still in its infancy. Basic scientists and cell therapists speak two different languages when it comes to MSCs, which makes it impossible to compare clinical studies," he said.

In 2021, a first-ever scoping review was completed and a 25-member core group was established in preparation for an upcoming Delphi study to come up with a consensus on the definition and characteristics of MSCs (Leresme et al. Stem Cells Transl Med 2022). The Delphi method is a process used to arrive at a group opinion or decision by surveying a panel of experts. Experts respond to several rounds of questionnaires, and the responses are aggregated and shared with the group after each round.



Dr. Bernard Thébaud
Photo credit: The Ottawa Hospital

Biology Breakthrough Team

Team Captain: Dr. Bernard Thébaud

Research can be conducted clinically at the bedside or in the case of our Biology Breakthrough Team, at a molecular level in a laboratory. Our world-class team of lab-based researchers work to understand the underlying mechanisms of conditions at a genetic and molecular level. This research team facilitates both timely diagnoses and effective treatments through biological breakthroughs.

Next steps

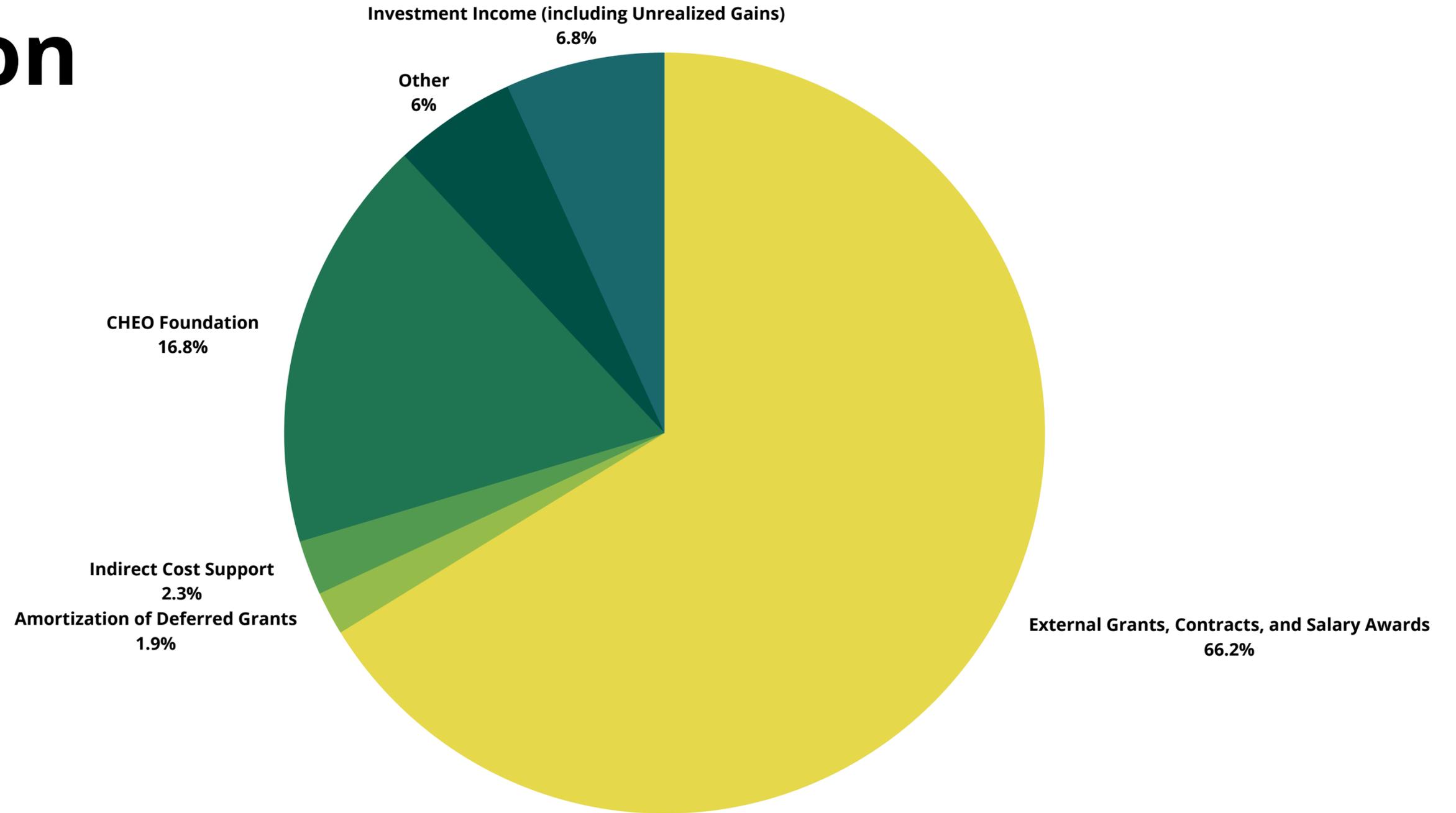
"With all of this preparation complete, and having received Health Canada approval in December 2021, Dr. Thébaud anticipates launching the phase 1 clinical trial at The Ottawa Hospital in the summer of 2022, with neonatal follow-ups taking place at CHEO for a number of years following.

"I hope that for this specific phase 1 trial, we will show the safety and feasibility for this new cell therapy so we can move onto a phase 2 trial. Ultimately what I hope for these cells is they will have a positive impact on the respiratory and neuro-development of babies," said Dr. Thébaud.

The last major breakthrough in neonatology was the discovery of pulmonary surfactant in 1990.

"In our lab we are currently working on three breakthroughs. This is super exciting! When I see how much effort it is to take MSCs into the clinic and I want to repeat that in two others, it's a lot of work and takes a lot of time, but it's definitely worth it."

Revenue Distribution 2021-2022



Expenditure Distribution 2021-2022

