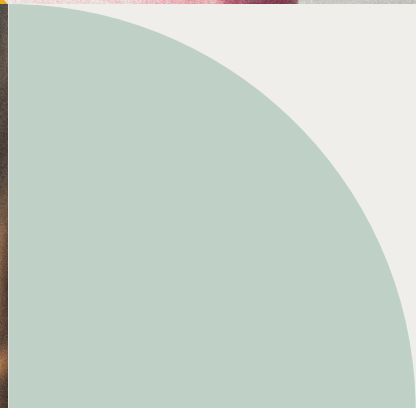
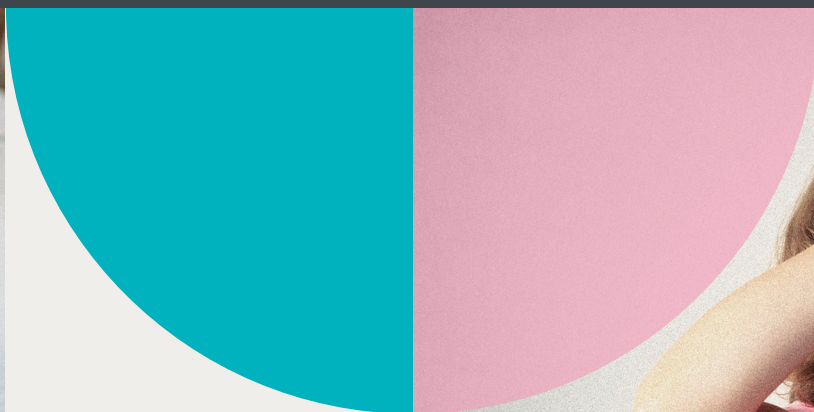


Pediatric Emergency Research Team





MISSION

**To improve outcomes
for acutely ill and injured
children by creating and
sharing new knowledge.**

VISION

**Exceptional acute care
for children through
innovation and discovery.**

Background

The emergency department (ED) at the Alberta Children's Hospital provides care to acutely ill and injured children 24 hours a day, seven days a week. During the past 24 months, **144,234** children received care in the Alberta Children's Hospital ED. The high volume and diversity of patients seen in the ED provides a unique opportunity for generating new knowledge and improving the quality of pediatric care. Our research team is the largest pediatric emergency team in Canada. Team members contributed to the science of COVID-19 epidemiology and pandemic response, resuscitation, precision medicine, quality improvement and simulation. During the past two years we published **135** peer reviewed articles and received over **\$34,752,482** dollars in peer review funding from local, national and international sources.

Years in Review: May 1, 2021 – April 30, 2023

Clinical Care

Exceptional care for over

144,234 Children

Provided by a team of

66 physicians

And

199 Nurses

Research

The research team enrolled over

2237 patients

And generated

135 publications

With grant funding totaling

\$34,752,482

Principle and co-principal

\$24,927,569

Co-investigator or collaborator

\$9,824,913

Education

Approximately

195 Medial Trainees

Including medical students, residents, and fellows were trained in the ACH ED

Who we are

Physicians

Tania Principi

Section Chief, Pediatric Emergency Medicine

Antonia Stang

Department Head, Department of Pediatrics

Graham Thompson

Research Director, PEMRAP & PERT Lead

Adam Cheng

Simulation Research Lead

Stephen Freedman

*Alberta Children's Hospital Foundation,
Professor in Child Health and Wellness*

*Associate Dean, Clinical Trials,
Cumming School of Medicine*

Vincent Grant

Medical Director for eSIM Provincial Simulation

David Johnson

*Senior Medical Director, AHS Maternal Newborn,
Child & youth Strategic Clinical Network (MNCY SCN)*

Kelly Millar

Education Lead

Jennifer Thull-Freedman, MD, MSc

*Physician Lead for Quality, ACH Emergency Department,
Clinical Associate Professor, University of Calgary*

Pediatric Emergency Medicine Fellows

Alexandra St-Onge-St-Hilaire

Dana Stewart

Gloria Yoo

Grazyna Burek

Katherine Anker

Mary Tong

Nick Monfries

Omar Damji

William MacDougall

Research Nurses

Kimberly Wolf

Kristen Kersey

Ruza Goulden

Sarah Weisbeck

Vicki Jacobs

Research Manager

Sarah Williamson-Urquhart

Coordinators/Research Assistants

Alicia Kanngiesser

Alissa Kazakoff

Ashley Jones

Bailey MacLellan

Becky Emerton

Beata Mickiewicz

Conné Lategan

Elaine Chau

Jacinda Larson

Jena Shank

Jessica Dalere

Jianling Xie

Joseph Lee

Joy Gobran

Kassi Prisnie

Kate Winston

Kelly Kim

Krishna Patel

Myka Estes

Nidhi Lodha

Ximena Huertes-Mancipe

50+ Volunteer Research Assistants

*(Pediatric Emergency Medicine Research
Assistant Program PEMRAP)*

Research Trainees

Anna Funk — *Post-Doctoral Fellow*

Conné Lategan — *Graduate & Medical Student*

Frederick Dun-Dery — *Post-Doctoral Fellow*

Kaden Lam — *Summer Student*

Hannah Byles — *Pediatric Resident*

Kosar Lotfali Khani — *Graduate Student*

Madeleine Sumner — *Medical Student*

Madison Riddell — *Pediatric Resident*

Matthew Lau — *Graduate student*

Minea Hill — *Summer Student*

Sarah Tougas — *Medical Student*

Sarah Williamson-Urquhart — *Graduate Student*

Administration

Gertrud VanDerMey

Heather Numrich

Jeffrey Stone

Susan Shenfield

Tanya Borthwick

Tracey Boyle

Academic Highlights

Choosing Wisely in Pediatric Emergency Medicine: Five Opportunities to Improve Value and Outcomes

Jennifer Thull-Freedman and 8 other physicians have developed a new Choosing Wisely list aimed at helping clinicians avoid unnecessary diagnostic tests for pediatric patients in EDs. The list, "Five Things Physicians and Patients Should Question," was developed by a task force comprised of members of the American Academy of Pediatrics Section on Emergency Medicine's Committee on Quality Transformation subcommittee and colleagues in Canada. A total of 205 suggested items were initially collected from the 33 contributors from six pediatric EDs. Seventy-two non-duplicative items were independently scored by the task force to create the top 25 item electronic survey. The survey had a 63% response rate. Task force members removed three items based on their similarity to existing Choosing Wisely items on non-pediatric emergency medicine Choosing Wisely lists. The final five items were published by Choosing Wisely USA and Choosing Wisely Canada on December 1, 2022.

Shiga toxin-Producing *E. coli*

Learning more about an uncommon form of *E. coli* that can cause kidney failure in kids.

Dr. Stephen Freedman is leading a multi-disciplinary group of researchers from across North America who are evaluating a treatment protocol for a type of *Escherichia coli* (*E. coli*) infection called Shiga-toxin producing *E. coli* (or STEC). Alberta has one of the highest rates of STEC infections in the world which can lead to devastating outcomes including kidney failure and strokes. The research team is evaluating novel approaches to treat infected children to prevent complications.

Over 1000 children will be enrolled at 26-sites. Two are in Alberta, the other 24-sites are spread across Canada and the United States. The study is comparing two protocols that vary based on the recommendation to hospitalize children and the volume of intravenous fluids they receive to determine if administering large volumes of intravenous fluids early on, called hyperhydration, can enhance blood flow to prevent complications. Biospecimens are also being collected so the team can seek and identify biomarkers of adverse outcomes, as well as to identify novel therapeutic targets.

PRoMPT BOLUS

Sepsis, or severe infection, is a life-threatening emergency in children. In Canada, approximately 4000 children are hospitalized every year; many experience hospital stays from weeks to months in length. Intravenous fluid administration is the cornerstone of treating children with septic shock. Two types of crystalloid fluids are commonly used during life-saving care: Normal Saline or Balanced Fluid. Both kinds of fluids have proven clinical benefits in septic shock and are readily available in EDs across the country. However, the most effective and safest crystalloid to use for initial resuscitation of children with septic shock has yet to be established.

The goal of the PRoMPT BOLUS study is to determine if children presenting to the ED in septic shock have better outcomes when treated with balanced fluid than when treated with normal saline. The PRoMPT BOLUS study also evaluates the safety and cost-effectiveness of the two types of fluids.

The PRoMPT BOLUS study is a multi-national clinical trial that includes 3 large pediatric emergency medicine research networks from Canada (PERC), United States (PECARN) and Australia and New Zealand (PREDICT). There are 13 Canadian pediatric EDs participating in the study. While the target sample size is 8800 participants, we have already enrolled 59.

For more information visit our study website: *PRoMPT BOLUS* | Cumming School of Medicine | University of Calgary (ucalgary.ca)

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COVID-19 in the Simulation Lab

1. Developing methods to quantify droplet and aerosol contamination on Personal Protective Equipment

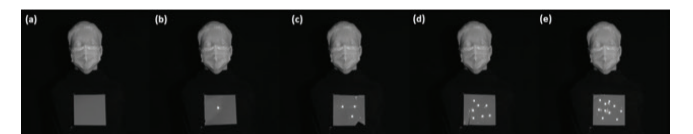
Simulation-based research has played an important role in improving care for SARS-CoV-2 patients and for minimizing exposure to healthcare providers. In one study, we aimed to develop a method of measuring surface contamination on personal protective equipment and provide validity evidence for various level of simulated contamination. To do this, we used an increasing number of simulated contamination spots using fluorescent marker applied on a manikin chest to simulate a contaminated healthcare provider. An ultraviolet light was used to illuminate the manikin to highlight the simulated contamination. Images of increasing contamination levels were captured using a camera with different exposure settings. Image processing software (ImageJ) was used to measure area of contamination. We demonstrated that Integrated density and area of contamination measured by ImageJ can differentiate various levels of simulated, fluorescent contamination. This study provides a method that can be used in future aerosol research to quantify surface and environmental contamination.



2. Aerosol Box use In Reducing Healthcare Worker Contamination during Airway Procedures (AIRWAY Study): A Simulation based Randomized Controlled Trial

The aerosol box has been used during the management of COVID-19 patients to reduce healthcare provider exposure during aerosol generating medical procedures. Little is known about the impact of the aerosol box on health care provider contamination and aerosol generating medical procedures time. We did a multi-center, prospective simulation-based randomized trial to determine if use of an aerosol box during aerosol generating medical procedures reduces healthcare provider contamination or influences the time to successful completion and first pass success rate for endotracheal intubation and laryngeal mask airway insertion. Healthcare providers were randomized in teams of 2 to perform 3 airway procedures, either with or without use of an aerosol box. In our study we found that airway providers using an aerosol box had significantly less contamination deposited to the torso across all three procedure types, and that there was no significant difference between groups in surface contamination after doffing personal protective equipment. Time to completing intubation was longer in the aerosol box group compared to the control group. This study highlights the importance of effective doffing and provides evidence which will inform guidelines for use of aerosol boxes in the management of patients with COVID-19.

In our study we found that airway providers using an aerosol box had significantly less contamination deposited to the torso across all three procedure types, and that there was no significant difference between groups in surface contamination after doffing personal protective equipment.



Aerosol Box use In Reducing Healthcare Worker Contamination during Airway Procedures (AIRWAY Study): A Simulation-based Randomized Controlled Trial.

Partnerships & Collaborations

Pediatric Emergency Medicine Research Associate Program (PEMRAP)

Over the past two years PEMRAP has responded to and embraced an extraordinary level of change. From the evolving COVID-19 pandemic and its impact on healthcare, research, education, and our volunteers, to the implementation of ConnectCare at the Alberta Children's Hospital, PEMRAP has chosen to view these challenges as opportunities for growth.

Our volunteer research assistants benefit from the mentorship of our research nurses and research coordinators as they gain experience interacting with patients, families, and the clinical team. Fully integrated into PERT, PEMRAP volunteers develop research skills through experiential learning, contributing 16,856 hours to nine studies led by PERT investigators and partnering study teams during this reporting period.

In addition to providing a cost efficient and effective way for researchers to partner with PERT and conduct research in the ED at the Alberta Children's Hospital, PEMRAP strives to provide a robust

training experience for individuals with an interest in medicine, nursing, allied health, health research or STEM fields. In May 2021 we launched a new application process with the intention of recruiting volunteers from a range of academic backgrounds with attention to equity, diversity, and inclusion. We are committed to ensuring PEMRAP is a welcoming and supportive space for personal and professional development that reflects the population it serves. Over the past two years we have delivered 28 program and study specific training sessions.

In May of 2021 we began the year with 17 dedicated volunteers who had worked continuously with PERMAP since the re-introduction of research in July 2020. Of these 17 volunteers, 15 have now graduated PEMRAP to attend medical school (6), pursue academic or industry research (6), a career in allied health fields (2) or nursing (1). In fact, one of our former volunteers has just started working as a faculty member in the Section of Pediatric Infectious Disease at Alberta Children's Hopstia! With the assistance of these experienced peer mentors, we have welcomed and trained 64 new volunteers to build up our roster to pre-pandemic capacity.



Volunteer Quotes

“The most valuable benefit I gained from PEMRAP was the access I had to like-minded and highly driven individuals. PEMRAP has a unique demand for motivated individuals which creates a community of mentorship. I remember working with students who were older and more experienced than me; I had many opportunities to ask questions about anything and everything (research related, school related, or life related) to people who had more life experience than me. I also had the opportunity to answer these types of questions as I progressed through the program and eventually became more “senior” as new volunteers joined the team. I believe this opportunity to have mentorship, as well as become a mentor played a role in my ability to teach and mentor new nurses in my current nursing practice. ”

— **Joy Gobran**, RN, former PEMRAP Volunteer, Clinical Nurse and Research Assistant

“PEMRAP has given me the opportunity to step into the world of research while still holding a clinical RN position at the Foothills ED. Over the last 7 months I have had the opportunity to get to know the PEMRAP volunteers. This has been incredibly rewarding. I am constantly amazed at their ability to step into a setting, such as a pediatric ED, and put themselves out there approaching and enrolling for studies, without hesitation. ”

— **Bailey McLellan**, RN, PEMRAP Educator

PEMRAP Studies and Collaborations

Bicycling Injuries in the Kids and the Environment (BIKE)

BIKE is a national CIHR funded study led by Dr. Brent Hagel (PhD, Department of Pediatrics, Cumming School of Medicine) which is looking at the determinants of bicycling injuries in children and adolescents. Every year in Canada, bicycling results in 20 deaths 1,800 hospital admissions and 4% of all ED visits for those under 15 years old. The PERT team is currently identifying child and adolescent bicyclists who present to the ACH ED. The members of the BIKE team then collect data and conduct location audits to identify site characteristics associated with injury. The results of this work will inform urban planning policies to make bicycling safer for children. This study enrolled 345 participants.

Principal Investigator: Dr. Brent Hagel
PERT Investigator: Dr. Antonia Stang

Functional Light Imaging in Concussion (FLIC)

This study is a prospective, longitudinal cohort study of adolescents aged 12 — 18 years led by Dr. Jeff Dunn (PhD), Department of Clinical Neurosciences, University of Calgary). By age 25, over 30% of Canadians are likely to have had a brain injury, with mild traumatic brain injury being the most common. Currently, there is no accepted imaging method to monitor mild traumatic brain injury. There is a critical need to understand the injuries, predict outcomes, detect treatment response and determine when to return to activity. Functional near-infrared spectroscopic measures of coherence as a new biomarker of injury in mild traumatic brain injury patients. This project will provide novel data on brain injury and show how functional near-infrared spectroscopy could be useful for monitoring mild traumatic brain injury. We have seen 89 participants enrolled for this reporting period.

Principal Investigator: Dr. Jeff Dunn
PERT Investigator: Dr. Stephen Freedman

Exploring Experiences of Racism by BIPOC Patients and Health Care Providers at a Pediatric Tertiary Care Centre

Racism remains a concern and challenge in institutional policies, structure and broader society. Racism is a determinant of health, negatively impacting Black, indigenous and People of Colour (BIPOC) through access to care, quality of care provided, and health outcomes. The purpose of this study is to understand how racism manifests at the Alberta Children's Hospital and affects patients, families and healthcare providers.

Principal Investigator: Dr. Jennifer Graham
PERT Investigator: Dr. Graham Thompson

The Canadian Anaphylaxis Network- Predicting Recurrence after Emergency Presentation for Allergic Reaction (CAN-PREPARE)

Anaphylaxis is the most severe form of allergic reaction which affects multiple systems. Current Canadian treatment guidelines vary widely, recommending that patients who present to the Eds for anaphylaxis be monitored for 6 — 24 hours after initial symptoms have been treated because of the possibility of symptom recurrence. In this study we will develop a prediction rule to identify children with anaphylaxis who are at risk of anaphylaxis recurrence. For this period, we have enrolled 71 participants.

PERT Investigator: Dr. Stephen Freedman

Optimizing the Management of Pain and Irritability in Children with Severe Neurological Impairments (PIUO Study)

Children with diseases affecting the nervous system often experience ongoing, unexplained pain and irritability that is difficult to identify and treat. While some sources of pain and irritability can be identified through careful physical examination, blood tests and diagnostic imaging, there is no standardized approach to identifying or treating these problems in this patient population. Through the conduct of this study, we hope to develop and test a new approach to reducing and resolving pain in children with severe neurological impairments. In total 157 participants were screened and 71 were enrolled.

Principal Investigator: Dr. Tammie Dewan
PERT Investigator: Dr. Graham Thompson

Pediatric Outcomes Improvement through COordination of Research Networks: COVID-19 Platform Prospective Cohort Study (POPCORN)

In recent waves of the COVID-19 pandemic, rates of infection have been highest in children. Most children with a COVID-19 infection have mild illness and fully recover. However, severe illness and adverse outcomes continue to occur. The purpose of this research study is to understand the acute and long-term outcomes following COVID-19 infection, including rare complications.

PERT Investigator: Dr. Stephen Freedman

Trainee Highlights



Conné Lategan

Over the past decade, visits to the ED by children and adolescents for mental health care have increased. Unlike many medical and surgical conditions treated in the ED, mental health concerns are often chronic and require ongoing care following the ED visit; thus, satisfaction with care is a particularly important ED mental health visit outcome measure. Thus, Conné's goal was to evaluate satisfaction with the delivery of ED mental health care in two pediatric EDs in Alberta.

She found that while parents/caregivers and children/adolescents were satisfied with the individuals providing mental health care, they were less satisfied with the perceived outcomes of the services, resolution of mental health concerns and/or symptoms, and access to mental health and addictions care specialists. Participants were more satisfied if they received an evaluation by a mental health team member, a psychiatry consultation during the ED visit, and self-identified as Asian or another non-White ethnicity. These findings are crucial and will inform service care delivery models going forward.

Kosar Lottfali Khani

Inflammation of the appendix (known as appendicitis) is a common cause of abdominal pain, vomiting and fever in children. New research shows that specific patterns of novel molecules, or biomarkers, could help determine if a child has appendicitis. But what is not known is how age and sex influence these inflammatory protein markers (IPMs), also called cytokines and chemokines. As part of a large study that includes children from across Canada, Kosar is using advance technologies (Luminex) to compare the levels of IPMs in children with suspected appendicitis. Her goal is to discover if there are different patterns of IPMs, like different fingerprints, for females compared to males, before and after puberty. Kosar's exciting work could help create an age — and sex-based diagnostic tools for children who may have appendicitis.



Madeleine Sumner

Madeleine is a fourth-year medical student at Western University with an interest in pediatric emergency medicine. She began working with Dr. Freedman and the Pediatric Emergency Research Team in the summer of 2021, and has continued to collaborate on projects ever since. Her primary research focus is SARS-CoV-2 infection in children. Madeleine has been involved in multiple PERT projects, including a meta-analysis examining the incidence of severe outcomes of SARS-CoV-2 infection in children (*Frontiers in Pediatrics*, 2022), and two retrospective analyses of the large multicenter PERC and PERN COVID-19 databases — the first described symptom profiles by COVID-19 variant of concern (*JAMA Network Open*, 2023), and a second examined the incidence of elevated transaminases in SARS-CoV-2 infected children (*Clinical Biochemistry*, 2023). She is currently finalizing a manuscript describing epidemiologic risk factors for SARS-CoV-2 infection in children, in collaboration with the PERT and PERC teams.

Madeleine has been involved in multiple PERT projects, including a meta-analysis examining the incidence of severe outcomes of SARS-CoV-2 infection in children (Frontiers in Pediatrics, 2022), and two retrospective analyses of the large multicenter PERC and PERN COVID-19 databases — the first described symptom profiles by COVID-19 variant of concern (JAMA Network Open, 2023), and a second examined the incidence of elevated transaminases in SARS-CoV-2 infected children (Clinical Biochemistry, 2023).

Reporting

Publications

1.

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8.

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Funding



Funding

1.

Cheng A (PI). University of Calgary Clinical Research Fund Grant. *Design and Development of an Augmented Reality Decision Support System for Cardiopulmonary Arrest*. **\$10,000**. March 1, 2023 – Feb 28, 2024.

2.

Cheng A (PI). Canadian Institutes of Health Research – Project Grant. *Impact of aerosol box use during cardiopulmonary arrest: A multicenter, randomized trial*. **\$478, 126**. March 1, 2023 – Feb 28, 2026.

3.

Cheng A (Collaborator). NSERC Alliance – *Alberta Innovates Advance Program. Design and Development of an Augmented Reality Decision Support System for Cardiopulmonary Arrest*. **\$38,000**. March 1, 2023 – Feb 28, 2025.

4.

Cheng A (SI). Mount Royal University Research Grant Fund. *Speaking Up to Improve Patient Safety*. **\$7,364**. Dec 1, 2023 – Nov 30, 2024.

5.

Cheng A (PI). University of Calgary Medical Group – Bridge Grant. *Impact of Aerosol Box Use during Cardiopulmonary Arrest: A Multicenter Trial*. **\$25,000**. Sept 1, 2022 – August 31, 2023.

6.

Cheng A (PI). Alberta Children’s Hospital Research Institute/Alberta Children’s Hospital Foundation – Bridge Grant. *Development and Validation of a Pediatric Aerosolization Device*. **\$13,500**. Sept 1, 2022 – August 31, 2023.

7.

Cheng A (Co-PI). Alberta Children’s Hospital Foundation. *KidSIM Simulation Program – Infrastructure Grant*. **\$3,100,000**. May 1, 2022 – April 30, 2027.

8.

Cheng A (PI). Canadian Institutes of Health Research – Project Grant, COVID-19 Initiative. *Impact of Aerosol Box Use on Patterns of Contamination Healthcare Provider and Environmental Contamination during Aerosol Generating Medical Procedures: A Multicenter Study*. **\$248,625**. May 1, 2021 – Dec 1, 2023.

9.

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11.

Freedman SB (Co-Investigator), Man-Wei Cheung A (PI), along with >200 additional Co-Investigators. Canadian Institutes of Health Research – Canadian Post COVID-19 Condition Research Network (#492634). *Long COVID Web: Pan-Canadian Post-COVID Condition Research Network*. **\$3,999,923**. December 1, 2022 – November 30, 2027.

12.

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13.

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15.

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16.

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Freedman SB (PI), Schnadower D (co-PI), Tarr P (co-PI). National Institutes of Health – National Institute of Allergy and Infectious Diseases. *Hyperhydration to Improve Kidney Outcomes in Children with Shiga Toxin-Producing E. coli Infection (HIKO-STECC): A multinational, Embedded, Cluster, Crossover, Randomized Trial*. **\$8,844,058** USD. September 1, 2021 – August 31, 2027.

18.

Freedman SB (PI), Wright B, Doan Q, Sabhaney V, Berthelot S, Porter R, Beer D, Emsley J, Burstein B, Zemek R, Bhatt M, Kam A, Freire G, Mater A, Poonai N, Joubert G, Moffatt A, Gravel J, Goldfarb D, Webster R. Health Canada - Safe Restart Agreement Contribution Program. *A Multi-Center Evaluation of Buccal Swabs with the Abbott ID NOW COVID-19 for Point-of-Care Detection SARS-CoV-2 in Pediatric Emergency Departments*. **\$1,023,250**. September 1, 2021 – March 31, 2023.

19.

Freedman SB (Co-Investigator), Kho M, Choong K, Rewa O, et al. Canadian Institutes of Health Research Project Grant (#462503). *REVIVE: Frailty, Rehabilitation, and Hospitalization Outcomes in Adult and Pediatric Survivors of COVID-19*. **\$738,224**. July 1, 2021 – June 30, 2024.

20.

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21.

Freedman SB (Co-Investigator), Giesbrecht G, van de Wouw M, Kim J, Tomfohr L, Lebel C. Department of Pediatrics 2020 Innovation Awards. *Short-term effects of maternal SARS-CoV-2 infection during pregnancy on child neurodevelopment*. **\$24,970**. May 1, 2021 – April 30, 2023.

22.

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Thull-Freedman J (Co-Investigator), Bar Am N, and Miller J. University of Calgary Tim and Linda Tang Anesthesia Research Fund. *Stress after Pain in the Pediatric Emergency Department*. **\$11,600**. April 1, 2023 – March 31, 2024.

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Thull-Freedman J (PI), Chaput K, Santana M, Fouston C, Baily JAM. Alberta Children’s Hospital Research Institute Grand Challenge Seedling Award. *Getting Together for Safest Together: Enhancing Pediatric Patient Safety Through Family Co-Design and Engagement*. **\$50,000**. 2021-2023

27.

Thull-Freedman J (PI), Chaput K, Santana M, Fouston C, Baily JAM. Department of Pediatrics Innovation Award, University of Calgary. *Getting Together for Safest Together: An Initiative to Enhance Pediatric Patient Safety by Learning from Family Perspective and Building Engagement*. **\$12,000**. May 1, 2021 – May 1, 2024.

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