



Thunder Bay Regional Health Research Institute

2021-2022 Annual Report



Thunder Bay Regional
Health Research
Institute

Exceptional
care
for every patient,
every time.

Message from the CEO and Board Chair



As CEO and Board Chair of Thunder Bay Regional Health Research Institute (TBRHRI), it is our pleasure to provide this report back to the community for fiscal year 2021-22.

The past two years of the global pandemic has brought health care research to the forefront, as the world's researchers rushed to find the answers to the prevention and treatment of the

novel coronavirus. As science and health care go hand in hand, so too does Thunder Bay Regional Health Research Institute (TBRHRI) and Thunder Bay Regional Health Sciences Centre (TBRHSC), where health care research is driven by the needs of the patients in Northwestern Ontario.

Having the Research Institute as a part of an academic health sciences centre allows for a multi-disciplinary, synergistic approach to research. For example, TBRHRI supports clinical researchers solving local health care challenges, and these solutions have global implications. Working collaboratively with academics, clinicians, industry partners, and funding agencies has developed a truly patient-centred research program that is unique to Northwestern Ontario.

Our Scientists have continued their important work throughout the pandemic thanks in part to the strong partnerships across the region starting with Lakehead University and NOSM University and extending internationally. Our hospital, through the efforts of many, was a part of CATCO - the Canadian arm of the World Health Organization SOLIDARITY Trial for COVID-19 therapeutics, a multi-centre adaptive, randomized, open-label, controlled clinical trial. This meant that patients in our region had access to the most promising therapeutic approaches for treating COVID-19. This past year, physicians with hospital privileges and cross-appointments at NOSM University participated in a Speaker's Series for education and dissemination. We are also working to develop new and innovative inter-institutional collaborations to improve health and health care in Northwestern Ontario. One example is the appointment of Dr. Brianne Wood as the joint Social Accountability and Learning Health Systems Associate Scientist. Dr. Wood's work focuses on developing health systems education and fostering sustainable research collaborations.

In closing, I want to thank our Scientists, Clinician Researchers and their teams. Their accomplishments over these past twelve months are thanks to the strength of their vision and the collaborative research environment that they have fostered. This will continue to carry us forward with the launch of the Strategic Plan 2026 in which Research, Innovation and Learning is identified as a key objective. By prioritizing research, and creating an environment supportive of learning, we will enhance our capacity for success, which, in turn, will help create a better health care experience for the patients we serve. With the brilliance of our team and the launch of our new strategic plan, I am looking forward to seeing what the future brings.

Dr. Rhonda Crocker Ellacott
President and CEO, Hospital, and CEO, Thunder Bay Regional Health Research Institute

Dr. Andrew Dean
Chair, Thunder Bay Regional Health Research Institute Board of Directors

Board of Directors

(as of March 31, 2022)

Dr. Andrew Dean (Chair)
Vice-President, Research & Innovation, Lakehead University

Dr. Pam Wakewich (Vice-Chair)
Professor Emeritus Sociology and Women's Studies, Lakehead University
Past Director, Centre for Rural & Northern Health Research

James Peotto, (Treasurer)
Senior Accountant, Impala Canada Limited

Dr. Rhonda Crocker Ellacott
Chief Executive Officer, Thunder Bay Regional Health Research Institute and President & Chief Executive Officer, Thunder Bay Regional Health Sciences Centre

Tim Larocque
Director, Applied Research & Innovation, Confederation College

Dr. Sheldon Tobe
Professor in Medicine, Staff Physician, Division of Nephrology, University of Toronto; Professor and Heart and Stroke Foundation Chair, Aboriginal and Rural Health Research, NOSM University

Andrew Ross
Manager of the Anishnaabe Bimaadiziwin Research Program, a collaboration of the Sioux Lookout Meno Ya Win Health Centre and Sioux Lookout First Nations Health Authority

John Dixon
Director of Mental Health and Addiction Services at Dilico Anishinabek Family Care

Dr. David C. Marsh
Associate Dean, Research Innovation and International Relations Professor, Clinical Sciences NOSM University

Peter Bishop
Retired Judge serving communities in Northwestern Ontario and remote First Nations communities

Jocelyn Bel
Doctor of Philosophy candidate, Biotechnology, Lakehead University

Dr. Erin Cameron
Assistant Professor, Medical Education/Curriculum Development, Human Sciences, NOSM University

Dave Knutson (Observer)

Dr. Christopher Mushquash
VP Research, Thunder Bay Regional Health Sciences Centre

Message from the Vice President Research and Chief Scientist



I want to thank our researchers and staff for their dedication and hard work this past year; their groundbreaking concepts and commitment to progressing patient care through research continues to amaze. Together, Thunder Bay Regional Health Research

Institute and Thunder Bay Regional Health Sciences Centre will leverage our innovations, technologies, and patient-centred programs to deliver the highest quality care and advance patient care.

The second year of the COVID-19 pandemic has been challenging in many ways, but with the support of our municipal, provincial and federal partners and the generous donors to the Thunder Bay Regional Health Sciences Foundation, the following research activities were possible:

Dr. Mitchell Albert and group performed hyperpolarized xenon-129 magnetic resonance imaging (MRI) scans on individuals that had had COVID-19 and found they had impaired lung function in terms of ventilation and transfer of gases into the red blood cells, months after recovering from COVID-19. They also developed and demonstrated a novel hyperpolarized xenon-129 MRI method for imaging brain perfusion and cerebral function.

Dr. Michael Campbell has been working on developing new imaging agents to diagnose and stage concussion and brain injury. He is also applying the cyclotron to the detection of pollutants such as mercury in Northwestern Ontario waterways.

Dr. Zubair Fadlullah and his team focused on using artificial intelligence and non-intrusive smart sensors to work on advancing health monitoring system that preserve privacy over the past year.

Dr. Jinqiang Hou's group has been synthesizing and evaluating drug candidates for early detection of liver cancer. Those drug candidates also have potential for liver cancer therapy.

Dr. Alla Reznik and team successfully developed a high-resolution, high-sensitivity Positron Emission Mammography (PEM), a mammography alternative for women at high-risk for breast cancer. Clinical trials have demonstrated best-in-class detection of small breast lesions at more than 10-fold reduction

in radiation dose—results that have so far been unattainable with any other molecular breast imaging device on the market or in clinical trials. Clinical use of this PEM technology will allow a large cohort of patients to benefit from improved breast cancer detection and reduce unnecessary biopsies because of its combined low-false-negative and low-false-positive findings. This will facilitate the implementation of predictive and preventive precision breast cancer medicine, delivering a major impact on improved patient survival.

Dr. Brianne Wood was appointed the inaugural joint Social Accountability and Learning Health Systems Associate Scientist in 2021, a joint position with TBRHRI, Thunder Bay Regional Health Sciences Centre (TBRHSC), and NOSM University. She was awarded a prestigious national Fellowship in Health Systems Resilience by the Health Research Foundation of Innovative Medicines Canada in November 2021. This fellowship will bring \$450,000 over the next three years for her to advance her research program in socially accountable learning health systems. Also, Dr. Wood was awarded a \$100,000 CIHR Catalyst grant, alongside Dr. Chris Mushquash, NOSM University researchers, and TBRHSC knowledge users for this research. Dr. Wood collaborated with TBRHSC and Northwestern Ontario health leaders to advance the Ontario Health Team Impact Fellowship in the region.

Dr. Ingeborg Zehbe's team completed all three human papillomavirus (HPV) projects on basic research, HPV detection and therapeutics. This concludes Dr. Zehbe's research program at the TBRHRI and Lakehead University as she retires in June 2022.

As we roll out the Strategic Plan 2026, it is with strengthened focus and partnership between Thunder Bay Regional Health Sciences Centre (TBRHSC) and TBRHRI. Prioritizing research, innovation and learning is key to advancing health care for the people of Northwestern Ontario and beyond and to bringing us forward into the future of health care.

Dr. Christopher Mushquash
Vice President Research and Chief Scientist,
Thunder Bay Regional Health Research Institute

Scientists

Dr. Mitchell Albert
Lakehead University/ TBRHRI
Research Chair in Molecular Imaging and Advanced Diagnostics Professor of Chemistry, Lakehead University Adjunct Professor of Biology, Biotechnology, Health Sciences, and Physics, Lakehead University Adjunct Professor of Medical Sciences, NOSM University Scientist, TBRHRI

Dr. Michael Campbell
Lakehead University/ TBRHRI Research Chair in Radiochemistry for Molecular Imaging and Advanced Diagnostics Assistant Professor, Department of Chemistry, Lakehead University Scientist, TBRHRI

Dr. Alla Reznik
Canada Research Chair in Physics of Molecular Imaging Associate Professor, Department of Physics, Lakehead University Scientist, TBRHRI

Dr. Ingeborg Zehbe
Lakehead University/ TBRHRI Research Chair in Biology Associate Professor, NOSM University Scientist, TBRHRI

Dr. Jinqiang Hou
Lakehead University/ TBRHRI Research Chair in Radiochemistry Assistant Professor in the Department of Chemistry, Lakehead University Scientist, TBRHRI

Dr. Zubair Fadlullah
Lakehead University/ TBRHRI Research Chair in Smart Health Technology Associate Professor in Department of Computer Sciences, Lakehead University Scientist, TBRHRI

Associate Scientists

Dr. Jane Lawrence Dewar
Dr. Brianne Wood

Dr. Christopher Mushquash, PhD, C. Psych

Chief Scientist, TBRHRI and Vice President Research, TBRHSC
Canada Research Chair in Indigenous Mental Health and Addiction, and Professor in the Department of Psychology at Lakehead University and the Division of Human Sciences at the NOSM University



This past year, Dr. Mushquash was invited to moderate the inaugural Parliamentary Health Research Caucus Virtual Panel entitled Game Changers in Health Research and Health Innovation held on March 1, 2022. This event was the first in a series featuring the best and brightest Canadian health researchers and innovators who shared their game-changing health research and innovations with Parliamentarians. As a Moderator of the panel, Dr. Mushquash set the stage for the presentations of five panelists who each have five minutes to present their research to an audience of Parliamentarians. Dr. Mushquash introduced panelists and after their presentations, moderated a Q&A session with Parliamentarians attending this panel presentation. The Thunder Bay Regional Health Research Institute (TBRHRI) was happy to nominate five candidates as Game Changers: Dr. David Savage, Dr. Arnold Kim, Dr. Hazem Elmansy, Dr. Walid Shahrour and Dr. Brianne Wood. As part of the event, each of the candidates were able to highlight their research and findings.

Grants

CIHR Training Grant: Strategy for Patient-Oriented Research National Training Entity (\$5,250,000) Innovative National Strategies for Patient-Oriented Research Education. LeBlanc, A., nominated Principal Investigator (NPI), Mushquash, C. co-investigator (Co-I)

CPA Section on Clinical Psychology Collaborative Grant Initiative 2021 (\$4,915) Understanding Barriers and Facilitators for Participation in Professional Training for BIPOC Students. Sabourin, B. (NPI), Mushquash, C. (Co-I)

CIHR Catalyst Grant: Quadruple Aim and Equity (\$100,000) Mobilizing and evaluating a multi-level learning health system: Examining the influence and impacts of northern, rural, and remote context. Wood, B., Meservia-Collins, K. (PIs), Cameron, E., Mushquash, C., Nicholas, B., & Raynak A. (Co-Is)

CIHR, Health Research Training Platform Grant (\$2,387,580). DIVERT Mental Health: The digital, inclusive, virtual, and equitable research training in mental health platform. Pillai Riddell, R. Nominated Principal Applicant (NPA), McGrath, P., Ali, S., Crawford, A., Green, R., Majnemer, A., Newton, M., Orji, R., Wozney, L. Co-Principal Applicant (Co-PAs), Belleville, G., Campbell-Yeo, M., Cappelli, M., Catherine, N., Chow, C., Corkum, P., Curran, J., Mushquash, A., Mushquash, C., Doan, Q., Graham, I., ... Hatchette, J. Co-Applicants (Co-As)

CIHR, Project Grant: Fall 2021 (\$971,550) Walking for Harm Reduction through Street Engagement (WHISE) 2.0: Assessing Indigenous-specific harm reduction needs and increasing access and knowledge of harm reduction. Benoit, A., Gauvin, A., Young, M. (PAs), Barkman, L., Cotnam, J., Muchano, T., Mushquash, C., Pablo, L., Sinoway, C., & Walker, J. (Co-As)

Publications

Malik, I., Toombs, E., Mushquash, A. R., McGrath, D. S., & Mushquash, C. J. Materialism and drinking motives: Examining the longitudinal associations in an undergraduate sample. (2021) Psi Chi Journal of Psychological Research

Jumah, N. A., Mushquash, C., Tyler, L., Turuba, R., Bishop, L., Tait, M., & Renaud, A. On the path to reclaiming Indigenous midwifery: The maternal infant support worker pilot program clinical article. (2021) Journal of Gynecology and Obstetrics

Toombs, E., Lund, J., Bobinski, T., Dixon, J., Drebit, M., Byzewski, J., Radford, A., Kushnier, L., Mushquash, C. J. Client and staff experiences assessing Adverse Childhood Experiences in a clinical setting: Results from the First Nations ACE study. (2021) Child Abuse and Neglect

Radford, A., Toombs, E., Zugic, K., Boles, K., Lund, J.I., & Mushquash, C. Examining adverse childhood experiences (ACEs) within Indigenous populations: A systematic review. (2021) Journal of Child and Adolescent Trauma

Science, M., Thampi, N., Bitnun, A., et al. School operation for the 2021-2022 academic year in the context of the COVID-19 pandemic. (2021) Science Briefs of the Ontario COVID-19 Science Advisory Table, 2(38)

Pride, T., Lam, A., Swansburg, J., Seno, M., Lowe, M. B., Bomfim, E., Toombs, E., Marsan, S., LoRusso, J., Roy, J., Gurr, E., LaFontaine, J., Paul, J., Burack, J. A.,

Mushquash, C. J., Stewart, S. H., & Wendt, D. C. Trauma-informed approaches to substance use interventions with Indigenous Peoples: A scoping review. (2021) Journal of Psychoactive Drugs

Maunder, R. G., Heeney, N. D., Strudwick, G., et al. Burnout in hospital-based healthcare workers during COVID-19. (2021) Science Briefs of the Ontario COVID-19 Science Advisory Table, 2(46). <https://doi.org/10.47326/ocsat.2021.02.46.10>

Friesen, E. L., Kurdyak, P. A., Gomes, T., et al. The impact of the COVID-19 pandemic on opioid-related harm in Ontario. (2021) Science Briefs of the Ontario COVID-19 Science Advisory Table, 2(42). <https://doi.org/10.47326/ocsat.2021.02.42.10>

Lund, J. I., Boles, K., Radford, A., Toombs, E., and Mushquash C. A systematic review of childhood adversity and executive functions outcomes among adults. (2022) Archives of Clinical Neuropsychology

Tanner, B., Plain, S., George, T., George, J., Mushquash, C. J., Bernards, S., Ninomiya, M. M., & Wells, S. Understanding social determinants of health using a four-domain model of health and wellness based on the Medicine Wheel: Findings from a community survey in one First Nation. International (2022) Journal of Environmental Research and Public Health, 19(5), 2836. <https://doi.org/10.3390/ijerph19052836>

Dr. Mitchell Albert, PhD

Lakehead University/ TBRHRI Research Chair in Molecular Imaging and Advanced Diagnostics Professor of Chemistry, Lakehead University Adjunct Professor of Biology, Biotechnology, Health Sciences, and Physics, Lakehead University Adjunct Professor of Medical Sciences, NOSM University Scientist, TBRHRI



This past year, Dr. Albert and team performed hyperpolarized xenon-129 MRI scans on individuals that had had COVID-19 and found they had impaired lung function in terms of ventilation and transfer of gases into the red blood cells, months after recovering from COVID-19. The team also developed and demonstrated a novel hyperpolarized xenon-129 MRI method for imaging brain perfusion and cerebral function.

Awards

In recognition for his exceptional achievements in research, Lakehead University - Thunder Bay Regional Research Institute (TBRHRI) Research Chair Dr. Mitchell Albert was named 2021 Distinguished Researcher at Lakehead University's Research and Innovation Awards of Excellence.

Grants

NSERC Alliance (\$1,250,000) HP MRI/ PET dual imaging modality for AD detection. Albert, A. and Reznik, A. (Co-PI)

NSERC Open Access Fund (\$2,000) Hyperpolarized 129Xe multi-slice imaging of the human brain using a 3D gradient echo pulse sequence

Ontario Research Fund- Research Excellence (\$2,415,470) Ontario Network of Excellence for Translation of Hyperpolarized MRI Technologies

Publications

Grynko, V., Shepelytskyi, Y. Li, T., Hassan, A., Granberg, K., Albert, M.S. Hyperpolarized 129Xe multi-slice imaging of the human brain using a 3D gradient echo pulse sequence; (2021) Magnetic Resonance in Medicine; <https://doi.org/10.1002/mrm.28932>

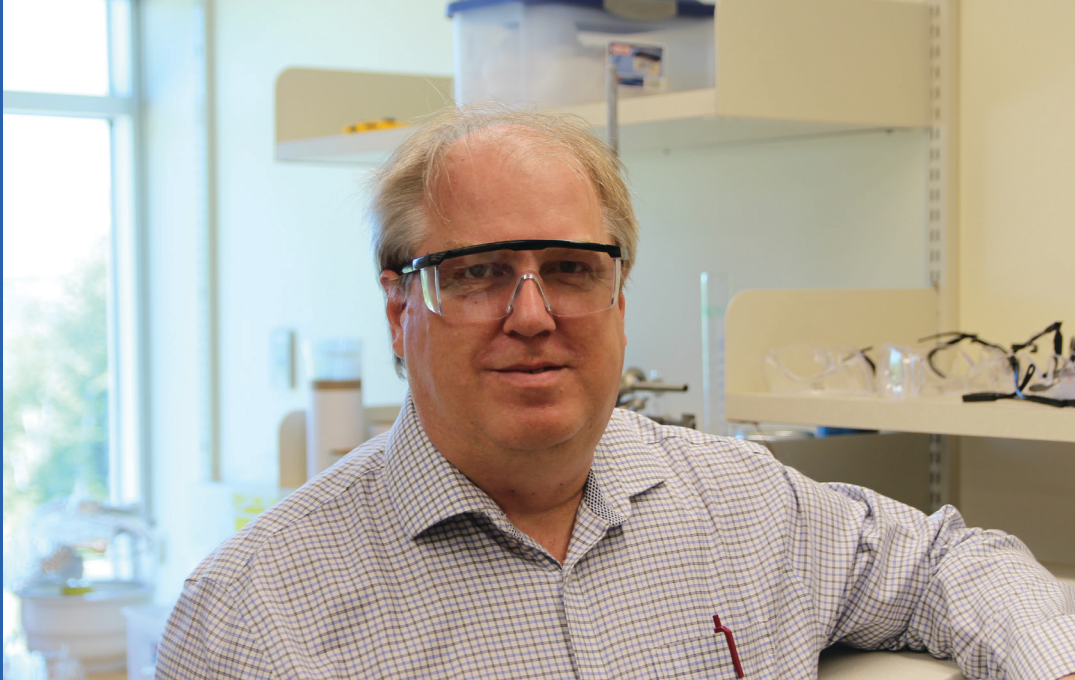
Grynko, V., Shepelytskyi, Y., Li, T., Hassan, A., Granberg, K., Albert, M.S. The effects of an initial depolarization pulse on dissolved phase hyperpolarized 129Xe brain MRI; (2021) Magnetic Resonance in Medicine; <https://doi.org/10.1002/mrm.28918>

Shepelytskyi, Y., Li, T., Grynko, O., Reznik, A., Grynko, V., Hane, F. T. and Albert, M. S. Photoinduced nonlinear magnetoelectric effect detection in Zn2Y hexaferrite (2021) Appl. Phys. Lett. 119, 062401 <https://doi.org/10.1063/5.0050808>

Shepelytskyi, Y., Grynko, V., Rao, M.R., Li, T., Agostino, M., Wild, J.M, Albert, M.S. Hyperpolarized 129Xe imaging of the brain: Achievements and future challenges; (2022) Magnetic Resonance in Medicine; <https://doi.org/10.1002/mrm.29200>

Dr. Michael Campbell, PhD

Lakehead University/
TBRHRI Research Chair in
Radiochemistry for Molecular
Imaging and Advanced
Diagnostics Assistant
Professor, Department
of Chemistry, Lakehead
University Scientist, TBRHRI



Dr. Campbell spent this past year developing new imaging agents to diagnose and stage concussion and brain injury. He also worked on applying the cyclotron to the detection of pollutants such as mercury in Northwestern Ontario waterways.

Grants

NSERC Discovery (\$24,000 per year plus ECR supplement of \$12,500 for the first year) Radiochemical methods for labeling and isotope production.

NSERC RTI (\$39,451) A Microwave System for Medicinal Chemistry and Radiochemistry Research.

Hou, J. (PI), Jiang, J. (Co-I) and Campbell, M. (Co-I)

Publications

Campbell, M., Tikkaa, A. Low-cost target system for neutron activation using a medical cyclotron. Application to the non-destructive analysis of gold and silver. (2022) Applied Radiation and Isotopes 184, 110117 <https://doi.org/10.1016/j.apradiso.2022.110117>

Dr. Zubair Fadlullah, PhD

Lakehead University/ TBRHRI
Research Chair in Smart
Health Technology Associate
Professor in Department of
Computer Sciences, Lakehead
University Scientist, TBRHRI



This past year, two students from the Fadlullah group (Sadman and Tahrat) graduated with a Master of Science (MSc) in Computer Science, Artificial Intelligence (AI) specialization with a focus on medical analytics. The research group has published more than twelve papers and book chapters in top tier conferences, journals, and book chapters.

Training highly qualified personnel (HQP) is a top priority in Dr. Fadlullah's research program. Recruitment during the pandemic has been difficult; however, Dr. Fadlullah was able to recruit six MSc students (in Computer Science) and one Doctor of Philosophy (PhD) student (Electrical and Computer Engineering). Dr. Fadlullah also organized several international conferences (EAI WiCON 2021, Orillia) and (IEEE HPSR 2022, China) representing TBRHRI and Lakehead University.

Awards

Dr. Fadlullah received the Lakehead University Research Excellence Award, March 2022 in the NSERC category for his contributions to research.

Grants

Qatar National Research Fund - Cycle 13 (\$393,342) Privacy-Preserving Health Monitoring System Using AI and Non-Intrusive Smart Sensors. Collaboration with Al Ahli Hospital, Qatar University, Trio Investment and Tennessee Tech University

Publications

Tazrin, T., Fouda, M., Fadlullah, Z., Nasser, N. UV-CDS: An Energy-Efficient Scheduling of UAVs for Premises Sterilization (2021) IEEE Transactions on Green Communications and Networking ISSN: 2473-2400; doi: 10.1109/TGCN.2021.3074536

Sakib, S., Fouda, M., Fadlullah, Z., Nasser, N. and Alasmay, W. A Proof-of-Concept of Ultra-Edge Smart IoT Sensor: A Continuous and Lightweight Arrhythmia Monitoring Approach (2021) IEEE Access 9: 26093-26106, doi: 10.1109/ACCESS.2021.3056509

Bodrul Alam, A. B. M., Fadlullah, Z., Choudhury, S. A. Resource Allocation Model Based on Trust Evaluation in Multi-Cloud Environments (2021) IEEE Access 9: 105577 - 105587; ISSN: 2169-3536; DOI: 10.1109/ACCESS.2021.310031

Kato, N. and Fadlullah, Z. On Smart IoT Remote Sensing over Integrated Terrestrial-Aerial-Space Networks: An Asynchronous Federated Learning Approach. (2021) IEEE Network 35(5): 129-135; doi: 10.1109/MNET.101.2100125

Mohamed, E., Hashima, S., Hatano, K., Fouda, M.M., Fadlullah, Z.M Sleeping Contextual/Non-Contextual Thompson Sampling MAB for mmWave D2D Two-Hop Relay Probing. (2021), IEEE Transactions on Vehicular Technology 70 (11) doi: 10.1109/TVT.2021.3116223

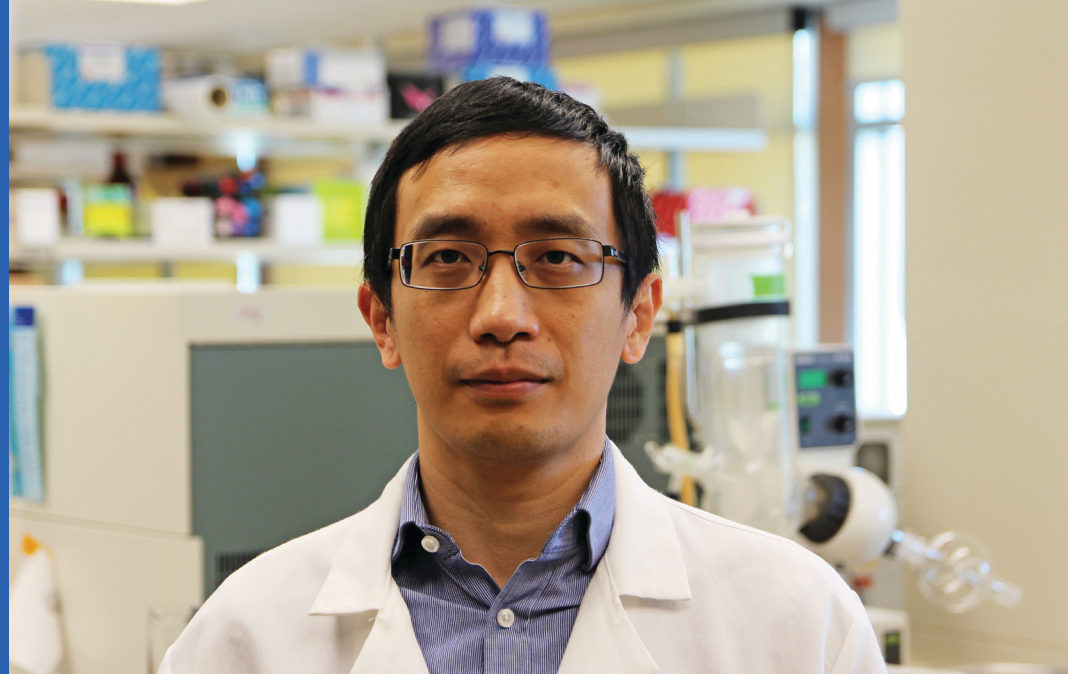
Fadlullah, Z. M. and Kato, N. On Smart IoT Remote Sensing over Integrated Terrestrial-Aerial-Space Networks: An Asynchronous Federated Learning Approach IEEE Network 35(5): 129-135; doi: 10.1109/MNET.101.2100125

Mughal, B., Fadlullah, Z., Fouda, M. M. and Ikki, S. Allocation Schemes for Relay Communications: A Multi-Band Multi-Channel Approach Using Game Theory. (2022) IEEE Sensors Letters 6(1): 7500104,

Sakib, S., Fouda, M. M., Al-Mahdawi, M., Mohsen, A., Oogane, M., Ando, Y. and Fadlullah, Z.M. Deep Learning Models for Magnetic Cardiography Edge Sensors Implementing Noise Processing and Diagnostics (2022) IEEE Access 10: 2656-2668

Dr. Jinqiang Hou, PhD

Lakehead University/
TBRHRI Research Chair in
Radiochemistry Assistant
Professor in the Department
of Chemistry, Lakehead
University Scientist, TBRHRI



Dr. Hou and group has been synthesizing and evaluating drug candidates for early detection of liver cancer. Those drug candidates also have potential for liver cancer therapy.

Grants

NSERC RTI (\$39,451) A Microwave System for Medicinal Chemistry and Radiochemistry Research.

Campbell, M. (Co-I) and Jiang, J. (Co-I)

Publications

Tang L., Yan H., Wu W., Chen D., Gao Z., Hou J., Zhang, C., jiang, Y. Synthesis and anti-influenza virus effects of novel substituted polycyclic pyridone derivatives modified from Baloxavir. (2021) Journal of Medicinal Chemistry 64(19) 14465-14476

Liu W.J., Hopkins A.M., Hou, J. The development of modulators for lysophosphatidic acid receptors: a comprehensive review. (2021) Bioorganic Chemistry; doi: 10.1016/j.bioorg.2021.105386

Long, W., Zheng, B., Li, Y., Huang, X.H., Lin, D., Chen, C., Hou, J., Ou, T., Wong, W., Zhang, K., Lu, Y. Low-cost target system for neutron activation using a medical cyclotron. Application to the non-destructive analysis of gold and silver. (2022) Applied Radiation and Isotopes 184, 110117 <https://doi.org/10.1016/j.apradiso.2022.110117>

Dr. Alla Reznik, PhD

Canada Research Chair
in Physics of Molecular
Imaging Associate Professor,
Department of Physics,
Lakehead University
Scientist, TBRHRI



The reporting year in Reznik's group was marked by a success in the development of a high-resolution, high-sensitivity Positron Emission Mammography (PEM), a mammography alternative for women at high-risk for breast cancer. Clinical trials have demonstrated best-in-class detection of small breast lesions at more than 10-fold reduction in radiation dose—results that have so far been unattainable with any other molecular breast imaging device on the market or in clinical trials. Clinical use of this PEM technology will allow a large cohort of patients to benefit from improved breast cancer detection and reduce unnecessary biopsies because of its combined low-false-negative and low-false-positive findings. This will facilitate the implementation of predictive and preventive precision breast cancer medicine, delivering a major impact on improved patient survival.

Grants

NSERC Alliance (\$1,250,000) HP MRI/PET dual imaging modality for AD detection. Albert, A. and Reznik, A. (Co-PI)

Teledyne DALSA (\$50,000) New materials for the radiation medical imaging detectors.

Publications

Semeniuk, O., Reznik, A. Lead Oxide as Material of Choice for Direct Conversion Detectors Chapter 7, Oxide Electronics, edited by Prof. Asim Ray (2021) Wiley Series in Materials for Electronic & Optoelectronic Applications, 1st Edition

Grynko, O., Thibault, T., Pineau, E., and Reznik, A. Engineering of a Blocking Layer Structure for Lag-Free Operation of the a-PbO Based X-ray Detector. (2021) IEEE Transactions on Electron Devices 68(5):2335-2341

Reznik, A., Semeniuk, O. Lead Oxide as Material of Choice for Direct Conversion Detectors. (2021) Oxide Electronics <https://doi.org/10.1002/9781119529538.ch7>

Grynko, O., Thibault, T., Pineau, E. and Reznik, A. The X-ray Sensitivity of an Amorphous Lead Oxide Photoconductor. (2021) Sensors 21(21), 7321; <https://doi.org/10.3390/s21217321>

Happy Retirement Dr. Ingeborg Zehbe

Dr. Ingeborg Zehbe, PhD, DSc, is a Cancer Biologist with focus on human papillomavirus (HPV)-related cancer. Her personalized health approach brings basic research, tumour model engineering, patient-targeted, non-invasive treatments, as well as screening and prevention under the same umbrella.

Her multi-disciplinary and award-winning research portfolio is a reflection of her dual commitment to the humanities and the sciences. Her work includes both qualitative and quantitative aspects. She collaborates with experts in widely spanning fields: physics, engineering, computer science, chemistry, virology, epidemiology, public health, sociology and ethical philosophy. Her love of the arts spills into her work more directly as she supported local artists by incorporating their work in her research. Local designers prepared images for her scientific articles and a local Indigenous artist was commissioned to create logos for her cancer screening and prevention work.

Dr. Zehbe joined the Thunder Bay Regional Health Research Institute (TBRHRI) in 2009 with cross appointments at NOSM University and the Biology Department of Lakehead University (LU). In November 2015, she was awarded an LU/TBRHRI Research Chair position at the Biology Department.

Dr. Zehbe is known for her successful mentoring of more than 50 students of all levels, and has a work philosophy based on collaboration rather than competition among students and staff. Dr. Zehbe embraces many ways of thinking and is a great admirer of Indigenous culture and art. Her student teaching follows the Wilhelm von Humboldt approach incorporating research in learning early on.

This past year, Dr. Zehbe's group completed all three human papillomavirus (HPV) projects on basic research, HPV detection and therapeutics, which concludes Dr. Zehbe's research program at the TBRHRI and Lakehead University. Two final publications will be published in this regard:

1. Robert Jackson, Alejandro Ortigas-Vásquez and Ingeborg Zehbe: Human papillomavirus 16 sub-lineages and integration in Cancer; and
2. Guillem Dayer, Ashley Faulkner, Tanu Talwar, Melissa Togtema and Ingeborg Zehbe: Targeting the human papillomavirus 16 E6 with antibodies.

After 13 years with TBRHRI, Dr. Zehbe announced her retirement in June 2022. Her passion for research, strong work ethic and thirst for knowledge advanced HPV research for Northwestern Ontario and beyond. As a mentor, she has supported the development of future leaders in health care research. Congratulations and all the best in this next step!



In the News

Radialis Medical Submits FDA 510(k) Premarket Notification for its Organ-Targeted PET Camera

Precision imaging for precision medicine

Radialis Medical today announced that it has submitted a U.S. Food & Drug Administration (FDA) 510(k) premarket notification for the Radialis PET Camera, an organ-targeted positron emission tomography system.

“Compared to whole-body PET scanners, an organ-targeted PET camera positions detectors in close proximity to the organ of interest for a higher quality image of a smaller field of view,” said Michael Waterston, CEO of Radialis Medical.

“Our compact high-resolution PET camera would be an ideal addition to clinics with whole-body PET systems due to its improved sensitivity, spatial resolution, and flexibility enabling precision imaging of multiple organs with potentially as little as 1/10th the radiotracer dose,” he said.

Radialis Medical is now seeking FDA clearance to market its planar dual-head organ-targeted PET system. The system employs a seamless silicon

photomultiplier-based detector array using patented light-sharing technology to efficiently localize radiation emission.

The detector electronics have integrated cooling to enhance signal quality (patent pending), and the high-throughput data acquisition is optimized for low-dose imaging. The underlying technology of the system was developed in Dr. Reznik’s research laboratory at Lakehead University and the Thunder Bay Regional Health Research Institute (TBRHRI).

“Emerging radiotracers being developed for PET imaging allow specific disease processes to be visualized and facilitate precision medicine. The Radialis PET Camera is the first organ-targeted PET system focused on low-dose PET imaging of multiple diseases,” said Dr. Alla Reznik, Professor and Tier 1 Canada Research Chair in Physics of Radiation Medical Imaging at Lakehead and a Scientist and the TBRHRI.

The University Health Network-Princess Margaret Cancer

Centre (UNH-PMCC) in Toronto is currently using the Radialis PET Camera in a study titled “Evaluating Positron Emission Mammography Imaging of Suspicious Breast Abnormalities” (ClinicalTrials.gov Identifier: NCT03520218).

“The submission of the 510(K) application is a great milestone to achieve as Radialis moves to develop their novel cancer detection imaging equipment. Equally exciting is the development of manufacturing facilities in Thunder Bay to produce this new medical device,” said Dr. Andrew P. Dean, Vice-President, Research and Innovation, Lakehead University.

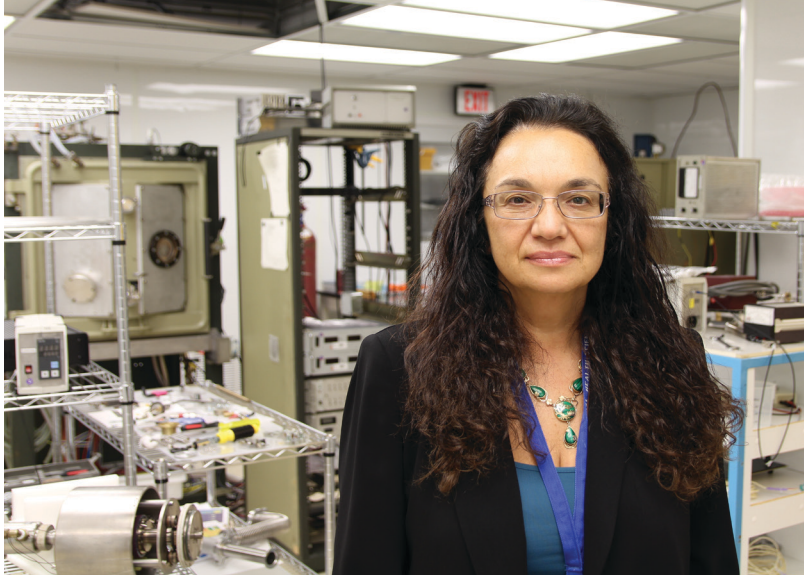
About Radialis Medical

Radialis Medical was founded as a joint venture of the TBRHRI and Lakehead University. Radialis delivers best-in-class organ-targeted positron emission tomography (PET) medical imaging systems. Radialis’ facility for advanced manufacturing of medical devices is in Thunder Bay, Ontario.



On February 4, 2022, Radialis Medical received FDA approval for their Positron Emission Tomography (PET) Camera. Congratulations to Dr. Alla Reznik, Canada Research Chair in Physics of Molecular Imaging at Lakehead University and Thunder Bay Regional Health Research Institute Scientist, and Radialis Medical, on this important achievement.

Lakehead University and TBRHRI researchers receiving more than \$244,000 from the Canada Foundation for Innovation



Lakehead University and Thunder Bay Regional Health Research Institute scientists are receiving a total of more than \$244,000 in research grants through the John R. Evans Leaders Fund provided by the Canada Foundation for Innovation.

Dr. Qiang Wei, Assistant Professor in Electrical Engineering, is receiving \$127,079 to design the next generation of wind energy conversion systems featuring small size and low weight, low cost and high conversion efficiency.

“Existing wind systems are very bulky, costly, and inefficient,” Dr. Wei said.

“The research program is focused on developing next-generation power converters: topologies, modulations, and controls for wind energy systems.”

This funding will allow Dr. Wei and his team to develop cutting-edge wind technologies for Canada’s next generation wind energy industry, which will help generate more low-cost clean electricity to meet increased electricity demand and further lowering emissions and carbon taxes.

Dr. Wei’s research will also create a high tech wind industry with much-needed and competitive employment opportunities.

Dr. Alla Reznik, Tier 1 Canada Research Chair in Physics of Radiation Medical Imaging at Lakehead University and a Scientist at the Thunder Bay Regional Health Research Institute, is receiving \$68,407

to manufacture large-area detector prototypes for medical use, which will use a new photoconductor material called amorphous lead oxide.

This new photoconductor material will allow for the implementation of the direct conversion of X-rays, which is the most efficient way of detecting them.

“This research will develop detectors for fluoroscopic applications used in cardiac intervention, to improve the radiation safety and effectiveness of minimally-invasive cardiac interventions,” said Dr. Reznik, a professor in Physics.

It will also allow for three-dimensional tomosynthesis, a novel approach to detecting breast cancer that has emerged to overcome the frequent ambiguity of conventional two-dimensional mammography.

“The development of amorphous lead oxide detector technology is an important scientific and engineering accomplishment in the continuing development of digital X-ray imaging systems,” Dr. Reznik said.

“The high sensitivity of these detectors will lower the barrier towards harm-free X-ray imaging to the benefit of health-care patients in Canada and worldwide.”

“This generous funding from the Canada Foundation for Innovation strengthens our patient-centred research program and supports our researchers like Dr. Reznik to find solutions to regional health

care challenges – solutions that often have global applications,” said Dr. Rhonda Crocker Ellacott, President and CEO of the Thunder Bay Regional Health Sciences Centre and CEO of the Health Research Institute. “This research and technology can potentially provide our patients with more personalized care and better outcomes,” she added.

Dr. Lindsay Galway, Tier 2 Canada Research Chair in Social-Ecological Health and Associate Professor in Health Sciences, is receiving \$49,033 to establish the Confluence Collaboratory at Lakehead University, which will enhance and support research, training and the collaborations necessary to spark innovation, implement discoveries and share knowledge.

“The Collaboratory will be a unique gathering place for students, researchers, community partners and knowledge-users to advance the field of planetary health and inform much-needed public policy and action on health and well-being in Canada and beyond,” Dr. Galway said.

The Collaboratory is connected with Dr. Galway’s Canada Research Chair. She studies and addresses the interconnected social and ecological dimensions of health and well-being. Her creative and interdisciplinary approach to community-engaged, place-based, and applied socio-ecological research is timely and relevant in a rapidly changing and inequitable world.

Hospital and Health Research Institute Announce New VP Research and Chief Scientist



Dr. Christopher Mushquash has been appointed as Vice President, Research and Chief Scientist at Thunder Bay Regional Health Sciences Centre (TBRHSC) and Thunder Bay Regional Health Research Institute (TBRHRI).

The VP, Research and Chief Scientist is a member of the Senior Leadership Council (SLC) of TBRHSC and provides leadership, oversight and strategic direction to a diverse portfolio of health professionals and scientists in the area of research and development. This role also provides scientific research leadership and strategic direction for TBRHSC and TBRHRI, as well as scientific advice and expertise to SLC, the TBRHRI Executive Management Team, the Boards and other scientific committees. Dr. Mushquash will champion scientific direction at conception and through implementation of a strategic plan based on those directions, the recruitment and retention of scientific staff, and for the overall success of the research agenda.

“The research expertise that Dr. Mushquash brings to this position aligns our organizations for success,” says Dr. Rhonda Crocker Ellacott, President & CEO, TBRHSC and CEO, TBRHRI. “We are confident that Dr. Mushquash will be a key driver in advancing

research that supports innovation and best care for the people of Northwestern Ontario. His track record is undeniable.”

Dr. Mushquash is a Lakehead University Tier II Canada Research Chair in Indigenous Mental Health and Addiction, and his primary academic affiliation is as Professor in the Department of Psychology at Lakehead University. He also serves as the Director of the Centre for Rural and Northern Health Research at Lakehead University. In addition to his academic appointments, Dr. Mushquash is a Registered Clinical Psychologist providing assessment, intervention, and consultation services for First Nations children, adolescents, and adults at Dilico Anishinabek Family Care.

“Congratulations to Dr. Mushquash on his appointment as Vice President of Research and Chief Science Officer at TBRHSC and TBRHRI,” says Dr. Moira McPherson, President and Vice-Chancellor of Lakehead University. “He is an extremely accomplished researcher and will be able to provide strategic direction to the research portfolio at TBRHSC. We look forward to working with Dr. Mushquash to further research partnerships between Lakehead University and the Hospital and

Health Research Institute.”

In 2017, Dr. Mushquash was inducted into the Royal Society of Canada’s College of New Scholars, Artists and Scientists. He is currently the vice-chair of the Institute Advisory Board for the Canadian Institutes of Health Research, Institute of Indigenous Peoples’ Health.

Dr. Mushquash is Ojibway and a member of Pays Plat First Nation. He is an Indigenous scholar who was born and raised in rural Northwestern Ontario. He completed his pre-doctoral residency in the Faculty of Medicine at the University of Manitoba, specializing in rural and northern clinical practice and his Ph.D. in clinical psychology in the Department of Psychology and Neuroscience at Dalhousie University in 2011.

He has served as the Interim Executive VP Research at TBRHSC and Chief Scientist at TBRHRI since November 2021. In this new additional appointment as TBRHSC’s new Vice President, Research and Chief Scientist, Dr. Mushquash will have dual reporting to both the President & CEO of TBRHSC and the CEO of TBRHRI.

Dr. Mushquash formally began as VP Research and Chief Scientist on March 15th, 2022.

NOSM University, TBRHSC and TBRHRI collaborate on the appointment of a joint Associate Scientist focused on social accountability and health education systems



Dr. Brianne Wood, Social Accountability and Learning Health Systems Associate Scientist.

NOSM University, in partnership with the Thunder Bay Regional Health Research Institute (TBRHRI) and the Thunder Bay Regional Health Sciences Centre (TBRHSC), announce Dr. Brianne Wood as the inaugural joint Social Accountability and Learning Health Systems Associate Scientist for a two-year term.

Dr. Wood will focus on the development, implementation, and evaluation of learning health systems research in Northern Ontario and support the integration of educational and health systems research. She will assist in the development of data infrastructure, evaluation processes and strategies that support health system education and foster sustainable research collaborations. This new role will be situated within the research mandate of the Centre for Social Accountability at NOSM University and the Academic mandate at TBRHSC.

With a PhD in Epidemiology from the University of Ottawa, Dr. Wood specializes in integrated knowledge translation and person-centered cancer screening. While completing her PhD, Dr. Wood worked as a

health system epidemiologist in Northern Ontario. Her experience includes health equity impact assessments, health system performance measurement, and primary health care capacity.

As Associate Scientist, Dr. Wood will support primary health care research, quality improvement, and capacity-building in Northern Ontario and serve as the Director of NORTH (the NOSM University Research Toward Health Hub—a practice-based research network for primary health-care providers) also within NOSM University's Centre for Social Accountability. Aligned with TBRHSC's aim to provide the highest quality of care, Dr. Wood's work will help ensure patient and population needs guide continuous improvement initiatives, education and research.

"Brianne Wood is an established, well-respected academic leader who specializes in both health systems research and health professions education research in Northern Ontario. A key strength is her in-depth knowledge of socially accountable research best practices," says Dr. Erin Cameron, Academic Director of the Centre for Social Accountability at NOSM

University. "The aim of her new role is to guide applicable, socially accountable, community relevant health research efforts that will inform research, education, and health service delivery."

NOSM University's new Centre for Social Accountability (CFSA) is the only one of its kind in Canada. The Centre will result in improved health of Northern Ontarians while extending beyond NOSM University's commitment to being socially accountable in our education and research programs and advocating for health equity. The CFSA's integrated approach in the areas of policy leadership and advocacy; research and innovation; education; and community impact will produce a deeper and broader understanding on a range of issues affecting population health outcomes inside and outside the medical system. In this way, the Centre's social accountability research defines and strengthens the School, making NOSM University and its partners more effective in the achievement of this critical mission.

STRATEGIC PLAN



Inspiring Exceptional Care for Every Patient Every Time through Research and Innovation.

On December 21, 2021, the TBRHRI Board approved Strategic Plan 2026, the inaugural joint plan between the Thunder Bay Regional Health Research Institute and the Thunder Bay Regional Health Sciences Centre.

Through extensive engagement with over 700 stakeholders, we have set a new Vision: Exceptional Care for every patient, every time. To achieve this Vision, we have set four strategic directions, including: Equity, Diversity, & Inclusion, Patient Experience, Staff Experience and Research Innovation & Learning. Underpinning this is a focus on our Sustainable Future as a key enabler for the organizations' financial health and future success; including initiatives to support expansion of digital health, creation of a clinical services plan, advancement of partnerships and system integration, and achievement of operational sustainability.

A clear emphasis on Research, Innovation, & Learning will help prioritize and integrate research efforts, build research capacity, and create an environment that better supports research, innovation, teaching and learning.

Through Strategic Plan 2026, we will:

- Increase patients enrolled or involved in research studies;
- Increase the number of research publications, grants and external funding; and,
- Increase the number of learners.

We are excited to embark on our journey towards Strategic Plan 2026, in collaboration with the Hospital, to ensure our research enables us to support improvements to the health of the residents of Northwestern Ontario.

To follow our progress and to learn more about the 2026 Strategic Plan visit www.tbrhsc.net or www.tbrhri.ca.

STRATEGIC PLAN 2026

MISSION:

We provide quality care to patients and families, supported and advanced by research, innovation, and education that is responsive to the needs of the population of Northwestern Ontario.

VALUES:

**Diversity
Compassion
Excellence
Innovation
Accountability**

VISION:

Exceptional care for every patient, every time.

PHILOSOPHY:

Patients at the centre of everything we do.

OUR STRATEGIC DIRECTIONS:



Equity, Diversity, & Inclusion

We all belong

WHAT WE WILL DO

Embed Equity, Diversity, and Inclusion in everything we do.

HOW WE WILL DO IT

- Assess policies and procedures, using an equity lens.
- Create an Equity, Diversity, & Inclusion Steering Committee.
- Recruit Indigenous staff.
- Identify opportunities for education and development of Indigenous individuals.

WHAT WE WILL DO

Provide a culturally safe experience for all patients and staff.

HOW WE WILL DO IT

- Provide cultural safety and equity, diversity, and inclusion training for all staff.
- Conduct a walk-through of the Hospital's physical environment with an equity lens.
- Implement the principles of the Truth & Reconciliation Call to Action.

HOW WE WILL MEASURE IT

- Increase staff engagement in cultural safety and equity, diversity, and inclusion training.
- Increase positive patient experience survey results related to their experience, views, and beliefs being acknowledged as part of care.



Patient Experience

Empathy, compassion, and respect in every encounter

WHAT WE WILL DO

Treat each person with compassion, respect, and empathy.

HOW WE WILL DO IT

- Develop and implement the framework for co-design.
- Embrace patient-centred communication principles.

WHAT WE WILL DO

Focus relentlessly on quality.

HOW WE WILL DO IT

- Develop an annual Quality Improvement Plan.
- Incorporate quality best practices.
- Review a summary of patient safety events.
- Assess current services through the lenses of consistency, coordination, and transitions.

WHAT WE WILL DO

Become experts in caring for patients with complex care needs.

HOW WE WILL DO IT

- Improve coordination, care, and support for patients with complex health issues.
- Develop a Substance Use and Addictions Strategy.

HOW WE WILL MEASURE IT

- Increase positive patient experience survey results.
- Improve quality of care and reduce preventable harm.
- Improve access, care, and support for patients with complex care needs in collaboration with our partners.



Staff Experience

This is where we want to work, grow, and thrive

WHAT WE WILL DO

Retain, recruit, and support the people needed to shape our future.

HOW WE WILL DO IT

- Improve physical and emotional safety, and violence prevention.
- Achieve a safe and just culture that encourages open dialogue.
- Update our current wellness plan.
- Monitor our staff vacancy rates and enhance recruitment processes.
- Implement recruitment processes to reflect Equity, Diversity, & Inclusion.
- Implement an Interprofessional Collaborative Model of Practice.

WHAT WE WILL DO

Support the ongoing development of our current and future leaders.

HOW WE WILL DO IT

- Ensure staff have access to professional development resources and opportunities.
- Implement a leadership development framework.

HOW WE WILL MEASURE IT

- Increase positive staff experience survey results.
- Improve staff engagement.
- Recruit and retain necessary staff.



Research, Innovation, & Learning

Driven by the needs of our patients, our staff, and our communities

WHAT WE WILL DO

Assess and prioritize our research efforts.

HOW WE WILL DO IT

- Prioritize research and assess current research initiatives.
- Enable opportunities for knowledge translation.

WHAT WE WILL DO

Enhance staff capacity and capability for research success.

HOW WE WILL DO IT

- Recruit researchers to address staffing gaps.
- Retain current staff and mentor new researchers.
- Establish an evaluation framework.

WHAT WE WILL DO

Create an environment supportive of research, innovation, and learning.

HOW WE WILL DO IT

- Encourage staff to lead and participate in research, innovation, and learning.
- Support continuous education and professional development.

HOW WE WILL MEASURE IT

- Increase patients enrolled or involved in research studies.
- Increase number of research publications, grants, and external funding.
- Increase number of learners.



Sustainable Future

Ensuring our Healthy Future

WHAT WE WILL DO

Advance digital health to improve patient and staff experiences.

HOW WE WILL DO IT

- Secure and implement the electronic health record.
- Determine required data systems.
- Implement a plan to meet information needs.

WHAT WE WILL DO

Develop a Hospital Clinical Services Plan to clarify our acute care and academic mandates.

HOW WE WILL DO IT

- Determine which current services are consistent with our mandates.
- Estimate our short and long-term service demand.

WHAT WE WILL DO

Advance Partnerships and System Integration.

HOW WE WILL DO IT

- Advance existing regional partnerships and programs.
- Pursue strategic partnership and integration opportunities.
- Be a voice and advocate for the needs of our entire region.

WHAT WE WILL DO

Achieve Operational Sustainability and Accountability.

HOW WE WILL DO IT

- Create an accountability framework.
- Provide training and supports to improve accountability.

HOW WE WILL MEASURE IT

- Prioritize our services and find operational efficiencies.
- Increase partnerships to improve and integrate care for patients.



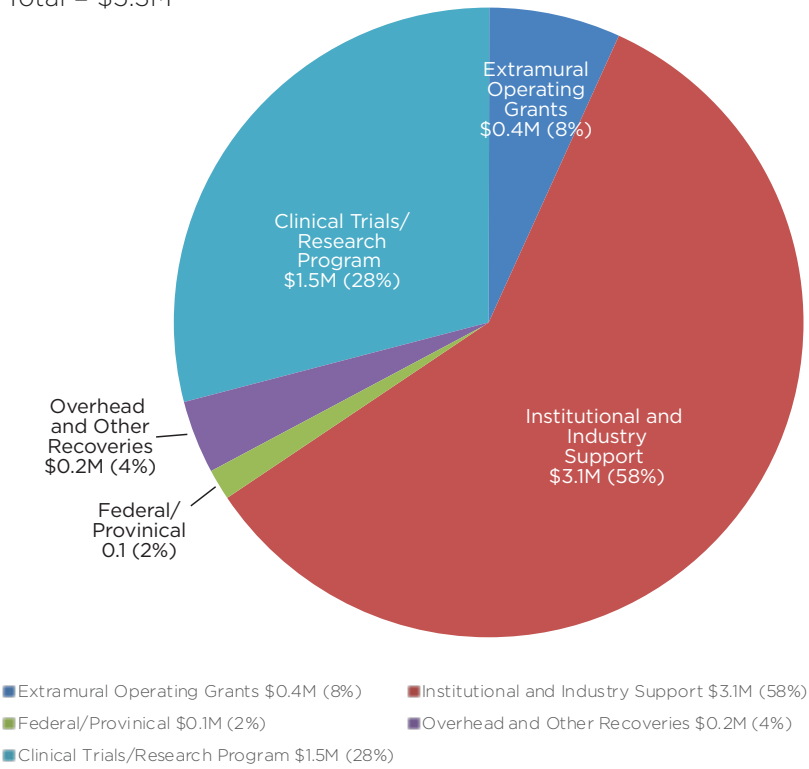
Thunder Bay Regional
Health Sciences
Centre

Thunder Bay Regional
Health Research
Institute

2021-2022 Financials

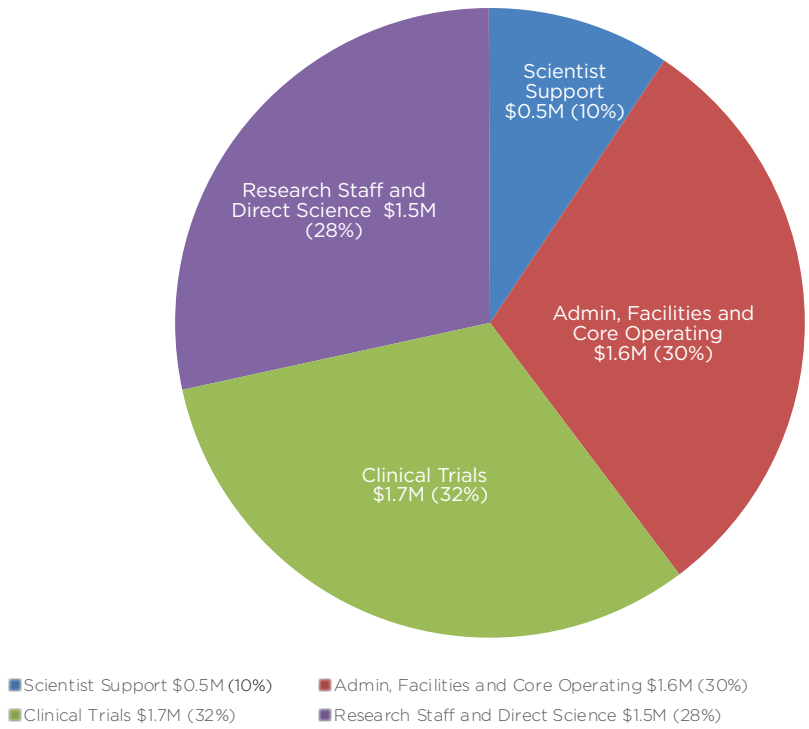
REVENUE SOURCES

Total = \$5.3M



EXPENSES

Total = \$5.3M



Funders and Partners

Government

Aboriginal Health Access Centres (AHACs):

Academics

Not for Profit

Not for Profit





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Exceptional
care
for every patient,
every time.