

ReseNeX ACCESS 2026: Breaking Barriers to Healthcare



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Abstract

ACCESS 2026 is a national, fully virtual undergraduate case competition hosted by ReseNeX, an organization committed to making research opportunities more accessible regardless of students' background or prior connections. The 2026 competition challenged undergraduate participants to address the theme, "Breaking barriers to health care: Proposing new or improved prevention strategies using science, technology, or systems thinking." Open to students from any university or program, ACCESS 2026 brought together 102 teams, 304 participants, and representatives from 12 universities across Canada. Competitors worked collaboratively to develop and present innovative, evidence-informed solutions to contemporary healthcare challenges. This abstract booklet showcases selected submissions from the competition and highlights the creativity, critical thinking, and interdisciplinary perspectives of undergraduate students engaged in healthcare innovation. Through ACCESS 2026, ReseNeX continues to foster collaboration, research skill development, and equitable access to academic opportunity. Additional information about ReseNeX and ACCESS 2026 can be found at <https://www.resenex.org>.

Keywords: ACCESS 2026; ReseNeX; undergraduate case competition; healthcare innovation; prevention strategies; systems thinking; science and technology; health equity; interdisciplinary collaboration; undergraduate research

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Conference Abstracts

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Winners and Finalists

Wearable Posture Monitoring and Targeted Exercise to Prevent Occupational Hyperkyphosis in Personal Support Workers

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Sustained trunk flexion during physically demanding caregiving tasks places repeated mechanical load on the spine, contributing to elevated rates of work-related musculoskeletal disorders among personal support workers (PSWs). Emerging evidence suggests that prolonged exposure to moderate sagittal loading, rather than isolated high-force events, may contribute to progressive postural adaptation including thoracic hyperkyphosis, defined as excessive thoracic curvature exceeding 40° in the sagittal plane. Current interventions primarily focus on managing symptoms after injury rather than preventing flexion-driven alignment changes. This study proposes a novel prevention-focused approach targeting sustained trunk flexion as a modifiable occupational exposure. The study hypothesizes that real-time haptic biofeedback, combined with targeted thoracic extensor and scapular conditioning, will reduce cumulative time spent in flexion and limit early changes in thoracic curvature among full-time PSWs. This will be tested using a randomized 2×2 factorial trial in which participants complete a 7-day baseline monitoring period using wearable inertial sensors before allocation to control, biofeedback, exercise, or combined intervention groups. Vibrotactile alerts will be triggered when trunk flexion exceeds 30° for sustained periods, while a brief conditioning program will target postural endurance. Thoracic kyphosis angle will be measured over 12 weeks using a Debrunner kyphometer, alongside self-reported discomfort and functional limitation. It is anticipated that reducing sustained flexion exposure will interrupt early postural adaptation pathways and preserve spinal alignment. This study may reframe hyperkyphosis as an occupationally modifiable condition and support scalable prevention strategies for PSWs.

Preliminary Investigation of Novel Diagnostic Dyslexia Testing in Moose Cree First Nations

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Indigenous children in rural Canadian communities have faced systemic underdiagnosis of dyslexia, contributing to poorer academic outcomes, economic disadvantage, and adverse mental and physical health. Conventional assessments, reliant on reading proficiency and multi-session psychological evaluations, exacerbate inequities in isolated Indigenous communities where access to specialists are often limited. This community-based pilot study evaluated a novel, pre-literacy diagnostic testing technology which integrated the Benton Visual Retention Test (BVRT) with Pupil Invisible eye-tracking glasses and delivered results in under 15 minutes through neural network analysis. Conducted with Moose Cree First Nations, in partnership with the Indigenous & Community Eye Examination (ICEE) mobile clinic and Weeneebayko Area Health Authority (WAHA), the pilot investigation targeted 80 children aged 4-14 years. The treatment implementation followed a 12-month co-development framework grounded in medicine wheel wholistic teachings and community engagement principles. Iterative sharing circles were used to ensure community-directed priorities, Ownership Control Access Possession (OCAP)-compliant data governance, and cultural safety within ICEE's established pediatric services. Feasibility metrics including uptake, completion, accuracy, and satisfaction were assessed alongside bi-weekly co-facilitated sharing circles. Following the pilot, adjustments would be made to facilitate expansion through ICEE across all Indigenous communities in the James Bay and Hudson's Bay region. This work advanced health equity by enabling early interventions, rebuilding medical trust and centering Indigenous self-determination in digital health innovation.

Portable Bioelectric Lymphatic Modulation Device for Functional Rehabilitation in Lymphatic Filariasis Patients

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Lymphatic filariasis (LF), caused by the filarial nematode *Wuchereria bancrofti* and transmitted by *Culex* mosquitoes, remains a leading cause of preventable disability worldwide, affecting over 51 million individuals across 72 endemic countries. While Mass Drug Administration (MDA) programs utilizing ivermectin, diethylcarbamazine (DEC), and albendazole have successfully suppressed microfilarial transmission, a critical therapeutic gap persists, established lymphatic

damage is irreversible with pharmacological intervention alone. Chronic lymphedema and elephantiasis represent a biomechanical failure state characterized by vessel dilation, valvular incompetence, impaired smooth muscle contractility, and progressive fibrosis. We propose the development and evaluation of a Portable Bioelectric Lymphatic Modulation Device (PBLMD), a low-cost, solar-powered wearable that applies low-energy electrical field stimulation to restore lymphatic smooth muscle excitability, entrain coordinated contraction propagation, and improve lymph clearance in affected extremities. Device parameters will be optimized through ex vivo bovine lymphatic vessel preparations and validated in a randomized controlled pilot trial (n=60) in an LF-endemic region over 24 weeks, with outcomes including limb volume reduction, quality of life (LYMQOL scale), and lymphoscintigraphic transport indices. The PBLMD addresses the unmet need for functional rehabilitation in LF by shifting the treatment paradigm from pathogen eradication alone toward biomechanical restoration. If efficacious, this adjunct therapy could reduce disability burden, preserve economic productivity, and be deployed through community health worker programs in resource-limited settings.

Conference Abstracts

Healing the Mind, Honouring the Land: An Indigenous-Led, Environmentally Sustainable Preventative Mental Health Hub

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The persistent effects of colonization, intergenerational trauma, and unequal access to culturally appropriate care are reflected in Canada's disproportionately high rates of depression, substance abuse, and suicide among Indigenous populations. Despite this, mental health services are still mostly crisis-focused, with emergency rooms frequently being the only place people go for care when they are in extreme distress. This reactive approach delays early detection of mental health issues and maintains institutional and cultural barriers to care. An Indigenous-led, community-based preventative mental health hub model is being advanced by this concept, which aims to move care upstream from crisis response to early intervention. Three Ontario reserves including Pikangikum, Attawapiskat, and Neskantaga will participate in a 12-month multi-site pilot project using a community-based participatory research (CBPR) framework, with a focus on adolescents between the ages of 15 and 25. Three pillars will be integrated into each hub: (1) Indigenous mental health workers will lead voluntary early screening and mental wellness check-ins; (2) culturally grounded programming, such as land-based healing and talking circles; and (3) preventative education centered on identity development, emotional regulation, and mental health literacy. Indigenous wellness frameworks that link land and health will be strengthened by environmental sustainability initiatives like medicine gardens and fewer single-use items. Changes in stress, emotional control, mental health literacy, involvement, cultural safety, and crisis-service use will all be evaluated using a mixed-methods approach. Indigenous-led preventative hubs are expected to decrease dependency on crisis-based services, increase community trust, and improve mental wellness metrics.

Effectiveness of Olfaction-Encompassing Virtual Reality Therapy for Treating Opioid Use Disorder Measured Through Baseline Assessments

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With over 100,000 deaths occurring annually from opioid overdose, new interventions are essential to combat the opioid crisis. Although the current methadone substitute tapering method has shown success, addressing the cause of addiction and equipping patients with relapse-prevention is absent. By employing olfaction-encompassing virtual reality (VR) therapy, patients practise self-control through systematic desensitisation and contingency contracting. This study employs a 12-week randomised controlled trial: individuals aged 18-65 with DSM-5-diagnosed heroin use disorder are stratified by sex and randomised to immersive VR cue exposure or standard cue exposure therapy (n=120). As acetic anhydride contributes to the scent of heroin, Gas Chromatography Mass Spectrometry (GCMS) is used to analyse its chemical proportion; a similar dilution of acetic acid mimics its scent for the habituation trial and study. Eligible participants attend twice-weekly, 45-minute sessions where baseline and daily measures (heroin craving questionnaire, Barratt impulsiveness scale, scent similarity ratings, resting electroencephalogram (EEG), and heart rate variability) assess behavioural and neurophysiological responses to VR cue exposure. Through a combination of studies, olfaction-encompassing VR therapy proposes a decrease in daily baseline assessments for patients with substance use disorder (SUD). Thus, rehabilitation takes on a less substitute-

reliant approach, suggesting long-term recovery. Further investigations should be conducted on the applicability of this method for other substances with specific olfactory substitutes. Strengthening of the method could be achieved through international experimentation on opioid SUD. If integrated into rehabilitation programs, VR therapy could be monumental in treating patients with SUDs.

P4 and SSZ Used Synergistically to Minimize Neuropathic Pain in Cancer Patients

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Neuropathic pain is a type of chronic pain in cancer and its treatments that patients continuously face, specifically in chemotherapy-induced peripheral neuropathy, reducing both quality of life and optimal therapy. Current treatments include the use of Gabapentinoids and SNRIs synergistically but are not reliable in providing long term pain relief and cause patient-dependent side effects. Importantly, these medicines do not address issues such as oxidative stress and neuroinflammation, which are major contributors to neuropathic pain. The use of novel synergetic medications, P4 and SSZ, can minimize the cancer-related neuropathic pain patients feel, with SSZ reducing glutamate signalling to modulate oxidative stress and P4 metabolizing allopregnanolone to enhance GABA inhibitory and counteracting central sensitization. Using experimental mouse models of neuropathic pain, we will assess behavioral pain responses, markers of oxidative stress, and neuroinflammatory changes following combined drug administration. This paper hypothesizes that combining SSZ and P4 in cisplatin-induced neuropathic pain models in mice has greater analgesic effects over time compared to monotherapy. When future research studies are conducted, the use of female mice would be necessary to see the side effects and differences the medicine may have in the opposite sex. It is necessary to assess the effects P4 may have on the male mice as progesterone is a female sex hormone. This synergistic strategy may offer a solution to provide relief to cancer patients while also providing an alternative for managing chemotherapy-induced peripheral neuropathy.

Addressing Healthcare Inequities on Ontario First Nations Reserves with Indigenous-Led Telehealth: Mashkiki Wellness Network Proposal

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First Nations people living on reserves in Ontario experience significant health disparities. Despite the increased accessibility of virtual care, the Ontario Telemedicine Network (OTN) does not adequately serve First Nations communities due to a lack of cultural competency and the digital divide. This study proposes the Mashkiki Wellness Network (MWN), an Indigenous-led, holistic approach to telehealth that expands on the existing infrastructure of the OTN. The MWN will be governed by First Nations representatives, centering the needs of their communities via regular feedback and engagement. The MWN will provide holistic health services that reflect the social determinants of health, including expanding virtual mental health access, providing traditional medicine consultations, developing digital chronic disease management tools, and engaging with dietitians, physiotherapists, and psychiatrists. To ensure safety and accessibility, a real-time translation tool for patients speaking Indigenous languages will be incorporated, and all working healthcare providers will complete Indigenous cultural safety training. The MWN will pilot in three reserves with varying levels of healthcare resources to collect comprehensive data and establish reasonable, universal standards for community-led care. While telehealth improves healthcare access, Internet infrastructure gaps across reserves and federal-provincial jurisdictional divides limit effectiveness and divert resources from direct care. Further structural reform is necessary to ensure that Indigenous voices and traditional healing practices are prioritized nationally and that reserves receive sufficient funding. The MWN proposes a new model for Indigenous-focused healthcare on First Nations reserves, improving accessibility via telehealth while prioritizing holistic, culturally-informed care.

Optimizing Provincial Emergency Department Wait Times Through Integrated Artificial Intelligence Implementation

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Overcrowding in Ontario emergency departments (EDs) remains a persistent challenge, with longer wait times linked to poorer clinical outcomes, unequal access to care, and increased healthcare costs. Although artificial intelligence (AI) is integral in daily life and shows some promise in healthcare contexts, there remains little high-quality evidence assessing fully integrated AI systems in publicly funded settings. Most studies are restricted to a few hospitals or private healthcare contexts, limiting generalizability to Ontario's emergency care infrastructure. This study evaluates the implications of AI implementation on ED wait times on a broader scale. A cluster-randomized study design will be used including 28 Ontario public hospitals, with 14 assigned to AI implementation and 14 serving as controls. Hospitals will be stratified by geographic region, patient volume and baseline ED wait times before randomization into the sample to ensure balanced population representation. The intervention will integrate three AI tools into existing electronic health records: (1) a patient surge-prediction system providing 24-72 hour forecasts to inform staffing and bed allocation; (2) an AI image diagnostic tool that flags high-risk findings for radiology review; and (3) a clinical documentation assistant that reduces clerical burden and frees physician time. The primary outcome will be decreased time from arrival to physician assessment over 12 months. Comparative analyses will account for hospital differences and annual trends. This trial aims to generate rigorous evidence on whether province-wide AI implementation can sustainably reduce ED wait times and advance equitable emergency care in Ontario.

Early Screening of Hemochromatosis through Volatile Organic Compound Breath Analysis Using Gas Chromatography-Mass Spectrometry

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Hereditary hemochromatosis is an autosomal recessive disorder caused by mutations in the HFE gene, leading to systemic iron overload and subsequent oxidative stress. Iron accumulation can have irreversible consequences, including diabetes, cardiovascular disorders, and liver cirrhosis. However, hemochromatosis is heavily underdiagnosed due to significant challenges in detection tools. Specifically, blood tests that typically precede genetic testing are non-specific, yet large-scale genetic tests remain inadvisable. Oxidative stress from increased iron induces lipid peroxidation, thereby promoting the production of alkanes, aldehydes, and ketones. These volatile organic compounds (VOCs) can be measured by gas chromatography-mass spectrometry (GC-MS) through vaporization and separation based on chemical properties. It is therefore hypothesized that GC-MS can serve as a novel early screening tool to identify VOC profiles specific to hemochromatosis. The proposed methodology is a case-control observational study collecting 1.5L of VOCs from exhaled breath. VOC profiles of an experimental group of patients with diagnosed hemochromatosis will be statistically compared against a control group of biologically similar individuals without the condition. Identifying VOCs that differ to a clinically significant level may allow for the detection of patients with stage 3 or 4 hemochromatosis. These findings suggest hemochromatosis possesses a unique VOC signature suitable for patient screening. Previous literature suggests increased pentanal, octanal, and octan-2-one as anticipated outcomes. Overall, this tool has the potential to increase access to specific testing by repurposing existing analytical tools in the healthcare system. Future directions include creating VOC profiles specific to the severity of iron overload from hemochromatosis.

Preventing Maladaptive Cortical Reorganization and Phantom Limb Pain Through Early Post-Amputation Sensory Re-training

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The loss of sensory input following an amputation triggers a maladaptive rewiring in the brain. Maladaptive cortical reorganization is a major factor of phantom limb pain and poor prosthetic embodiment. Current interventions typically occur 6-12 months following amputation, after the neural reorganization has stabilized. This randomized controlled trial (N=60) proposes a 12-week early intervention using a custom silicone sleeve with vibrotactile actuators (60-120 Hz) applied to the residual limb immediately post-amputation. Compared to a standard control group, patients will receive four hours of daily spatially randomized stimulation. Functional magnetic resonance imaging (fMRI) will be used to measure the outcomes, tracking the lip-to-feet cortical distance at 6 and 12 months to quantify cortical preservation. Future research should seek to

optimize stimulation parameters to determine minimal effective dosing, potentially reducing the four-hour daily requirement to improve patient adherence to protocol. Additional studies must adapt these protocols for upper limb, pediatric, and traumatic amputations. Providing continuous sensory input during the post-amputation window allows the protocol to test whether the brain's initial response to limb loss can be regulated through targeted stimulation in a critical period. Positive results would demonstrate that cortical reorganization is a modifiable process, promoting preventative neurorehabilitation approaches rather than compensatory ones.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

AH: Founded the 2026 ACCESS Case Competition, established policies & procedures, coordinated logistics, served on the planning committee for ACCESS 2026, assisted authors with their abstract submissions, reviewed the abstract submissions and ensured that they adhered to correct formatting standards, drafted the conference abstract booklet, and gave final approval of the version to be published.

EA: Founded the 2026 ACCESS Case Competition, co-chaired the planning committee for ACCESS 2026, supervised the 2026 ACCESS Case Competition, and gave final approval of the version to be published.

SW: Founded the 2026 ACCESS Case Competition, co-chaired the planning committee for ACCESS 2026, supervised the 2026 ACCESS Case Competition, and gave final approval of the version to be published.

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