McGill Clinical Innovation Competition │2018-19 Entrants

AlphaTB: Low-Cost AI-assisted Emergency Radiograph TB Screening

Tuberculosis (TB) is a leading cause of death worldwide, and delays in diagnosis on chest x-rays cause significant burden to affected communities. Implementing artificial intelligence and deep learning to accelerate triage and image interpretation can limit the time a patient with active disease can pose a risk to the public. We propose taking our team's neural network to detect tuberculosis and bring it to the frontlines as an efficient and cost-effective method for TB screening and diagnosis.

Antibiotic Sentinel

Choosing the right antibiotic to treat a life-threatening bacterial infection is essential to patient care. Antibiotic sentinel is a web-based application that provides up-to-the-minute information to help doctors select the best antibiotic to maximize the chance of curing an infection while minimizing harmful side effects. This novel tool will immediately aid the care of patients presenting with serious bacterial infections and eventually learn to predict them.

BetaSense

BetaSense allows a high performing, invasive nuclear medicine imaging technique to be performed non-invasively in a greater number of clinics. Their product is a non-invasive detector that is placed over a patient's wrist during a positron emission tomography scan that can collect the same information normally collected by a highly invasive blood sampling procedure. This will allow smaller clinics to take advantage of this powerful technique and give many patients access to personalized medicine.

Centre for Global Surgery

Five billion people worldwide remain without access to safe, timely and affordable surgical care. The iTrauma application is a novel tool that facilitates remote surgical data collection in resource-challenged

settings. iTrauma improves evidence-based surgical care for individuals and has the potential to save time and money for health care providers in low- and middle-income countries.

Certus Therapeutics

We propose to treat pancreatic cancer with the dopamine DRD2 receptor antagonist pimozide, a psychiatric drug. We base this on robust evidence showing that DRD2 is increased in pancreatic cancer, and pimozide strongly suppresses pancreatic cancer cell growth. We have shown that pimozide is more effective in combination with gemcitabine, the standard therapy for pancreatic cancer. We aim to bring this new innovation to patients who suffer from this deadly cancer.

Clinique Ouverte

We have created Clinique Ouverte, a private non-profit family medicine clinic that will apply the principles of human- centered design to health care delivery in a family medicine context. Our goal is for this first Clinique Ouverte to become a "lab" clinic for innovative projects that will be studied, communicated, and scaled if proven to be adding value. We are creating a playground for practical and concrete innovation in family medicine in order to improve the health of the population.

Denovogen

Denovogen is a medical technology company focused on the design and commercialization of an augmented reality system for minimally invasive procedures. They aim to improve teaching, communication and efficiency in the surgical theater.

Enovative Care

Enovative Care is a medical device start-up focused on a real time and point-of-care approach for diagnosing bacterial infections in situ. Early detection of infectious diseases plays a crucial role in all treatment and prevention strategies. Rapid and accurate identification of the underlying agent (the bacterium) using diagnostic testing is essential to select the correct control measure. By reducing the time required to identify the infection, we aim to improve patient outcomes.

Exotech Therapeutics

Exotech Therapeutics aims to provide clinically significant improvements in cardiac function following a myocardial infarction through the use of extracellular vesicles and bioactive hydrogels.

FemTherapeutics

FemTherapeutics is a leading innovator in medical diagnostics and treatment methods in women's health. We have developed a solution to treat Pelvic Organ Prolapse (POP) a condition that 1 in every 10 women is diagnosed with. POP involves the abnormal descent of the pelvic organs beyond the vaginal walls leading to vaginal discomfort, urine leakage, and bowel problems. The currently available solution is an intravaginal device called a pessary which causes bleeding and open sores due to its geometric shape and does not fit the female anatomy. With FemTherapeutics non-invasive proprietary technology, POP patients can obtain their own customized pessary, decreasing pessary failure rates and side effects.

GBS

We are conducting a randomized, controlled research trial to study the impact of probiotics on maternal Group B Streptococcus (GBS) rectovaginal colonization and pregnancy outcome. Our research aims to determine if oral probiotics in the third trimester decrease the prevalence of GBS colonization at birth and decrease the incidence of early-onset GBS infection in neonates. The findings of this research may bring a practice change in health care services and decrease the costs of the health care system.

In Situ Interprofessional Team-Training Simulation

We have initiated an innovative Interprofessional Team Training Program in Crew Resource Management (CRM) at the Montreal Children's Hospital. It is simulation-based, occurs monthly in situ in the operating room and has involved over 200 health care professionals to date. We noted major enhancement in CRM skills amongst the teams, optimization of human resources, and improvement in environment and system. This program is effective and sustainable, and can improve patient safety and minimize medical errors at a low cost.

Industrial Team

The Medical Assistant Arm (MAA) is a concept being developed in partnership with Kinova, a robotics company based in Montreal specializing in assistive robotics. To create the MAA, we are modifying the JACO robotic arm to include audio and visual recognition by leveraging machine learning, and integrating a grasping piece specialized for surgical tools. The goal is to automate simple tasks and, ultimately, decrease time spent per surgery.

Ma MobiClinique

Ma MobiClinique aims to be the first smart pediatric mobile clinic in Montreal, offering primary and secondary care to vulnerable children.

McGill Primary Eye Exposure and Prevention Sessions (PEEPS)

Our project aims to address the need for high quality education regarding ocular health with the growing elderly population. Vision loss translates to the loss of independence, loss of work productivity and the ability to earn a living with a doubling of the risk of falls in older individuals. We plan to provide educational talks in the community with interactive tools and various audio-visual mediums to demonstrate the impact of visual impairment.

MedComm

MedComm is founded by a team of medical students who believe that quality of communication between the health professional and the patient can impact health care outcomes and promote patient-centered care, especially for those facing a linguistic barrier. We aim to bridge the need for easily accessible and sustainable interpretation services in the McGill University teaching hospital network with medical students' language skills, multiculturalism and professionalism by utilizing an online platform.

Medify

Medify aims to improve quality of care and patient safety in clinical settings by mitigating the language barriers between health care providers and patients through a user-friendly application offering reliable medical translation.

MedSafer

Medication overload, common for older adults, is costly and harmful. Taking multiple medications can result in side effects including adverse drug events. MedSafer is an electronic decision-support tool that guides doctors and pharmacists through the process of medication reviews and deprescribing. The outcome is fewer medications and ultimately safer prescriptions for elderly patients who are at risk of drug complications such as falls, fractures, delirium and death.

MicroPredictome

MicroPredictome aims to create artificial intelligence algorithms to predict the risk and presence of irritable bowel syndrome and irritable bowel disease based on sequencing data from the bacterial population of the human gut, also known as the intestinal microbiome.

MRI-PREDICS Group of the Jewish General Hospital

MRI-PREDICS involves a clinical trial that is assessing if a MRI based radiomics tool (MRT), a product of machine learning, is as effective as biopsy for prostate cancer patients having their cancer closely watched. The process of running this trial will present the opportunity to develop infrastructure that could further refine this and future MRTs. MRI-PREDICS seeks to use this infrastructure to build a Big Data resource that can catalyze the development of radiomics tools for prostate cancer.

Next Gen Medicine Hospital Maps

Hospital Maps is an app aimed at helping hospital visitors and staff find their destination within the hospital. The app will be able to search for medical departments and offices within the health complex and help users reach their desired location using GPS. This will help reduce patient anxiety and improve hospital experience for visitors. The app will also benefit health care workers by increasing their efficiency and identifying the fastest route to a certain location within a hospital.

Next Gen Medicine Procedure Assist

Procedure Assist is an app aimed to help health care workers to perform safer, faster and easier medical procedures. The app provides educational teaching material and checklists to ensure a safe and standardized approach to medical procedures. This will enhance the trainee learning experience, reduce medical errors and ultimately improve patient care.

NXTSENS Microsystems Inc

NXTSENS Microsystems is on a mission to empower healthcare professionals with the ability to pre-empt severe medical conditions, improving patient outcomes. This rapidly growing team specializes in next generation cloud-enabled Micro-Electro-Mechanical Systems (MEMS) technology. Their first product, MY01, is entering a targeted commercialization phase with a clear clinical study pipeline involving leading trauma centres across North America.

Oath MedTech

C-arms are used in surgeries to image patients and aid in implant and instrument positioning. C-arm positioning requires a burdening amount of coordination leading to inadequate X-ray images and inefficiencies. Oath MedTech's X-Ray Precise Repositioning System can be added onto any C-arm, providing a non-operator dependent system that allows for precise repositioning. This can decrease surgery time, radiation exposure, and staff frustration to ultimately improve patient outcomes and decrease hospital costs.

Orthopedic Solutions

Orthopedic Solutions has developed a novel hip Spica cast application stand for holding a patient's legs in a desired position while the cast, which extends from the torso to the feet, is applied. The Spica cast generally requires at least two physicians to apply; it takes time to solidify and dry, during which time the physician who holds the lower extremities may become fatigued and the changing position of the hips increases as the optimal final result of the procedure lessens. This stand solves the aforementioned problems. Moreover, the stand is capable of being configured in a folded position to occupy less storage space and facilitate movement thereof.

Pediatric Otolaryngology Team

Botox injection is a treatment option for sialorrhea (drooling) that can be directed either with manual palpation and/or ultrasound guidance. However, manual palpation will not confirm the location of the injection and ultrasound has limitations when it's used on children. This project seeks to evaluate the use of electromyography-guided Botox injections into the salivary glands in children with sialorrhea as a new technique.

Perioperative Research Team

Brain function may decline in some patients after surgery. Postoperative Delirium (POD) is a decrease in attention within a few days after the operation. Postoperative Cognitive Dysfunction (POCD) can persist for months after the surgery. Currently, there is no medication to prevent or treat POD and POCD; however, studies suggest that the intranasal insulin can be a novel therapeutic option. This team is conducting research to find out whether intranasal insulin decreases the risk of POD and POCD.

Precare: Multilingual Animated Surgical and Medical Information for Patients

Precare.ca is designed and tailored to be a holistic guide to help patients prepare for and recover from medical procedures. It utilizes up-to-date medical information that can be effortlessly understood by patients and their families to allow for optimal planning, decrease anxiety and improve recovery. The short, animated guides are offered in various languages and can be accessed 24/7 for free through any smartphone, tablet, or computer.

Re3 Therapeutics

Therapy for ovarian cancer, the "silent killer", is 80 per cent effective, but the five-year survival rate is 9 per cent due to late diagnosis and recurrent disease. Early diagnosis—absent to date—would offer greater opportunity for curative therapy. Re3 Therapeutics has developed a simple blood-test for quantitative detection of ovarian cancer tumor markers that is diagnostic of 95 per cent early stage ovarian cancer and is absent in normal or non-cancer pathologies; this tumour marker may also detect early recurrence.

Reproduction and Epigenetics

Epigenetic Biomarkers of Human Embryos Extracted from Spent Culture Media as Predictors of Implantation. This research project aims to identify specific epigenetic biomarkers extracted from the embryo to the culture media that can predict positive outcomes of Assisted Reproductive Technology.

SLX in Glaucoma

SLX (Slit Lamp XEN) represents the first and only current option for a glaucoma surgical procedure performed outside of an operating room. SLX is a safe, effective and unique solution and provides for the most advanced care for glaucoma patients in an ambulatory setting, such as an office or eye clinic. The procedure provides technical advantages through a unique and innovative approach designed and tested by the authors.

Stoke Brain

PREDICT is a web-based resource on transcranial stimulation for people at risk of Alzheimer's Disease (AD). Currently, people with early signs of AD undergo extensive specialized testing, often for little gain as treatments are scarce and moderately effective. PREDICT offers direct access and guidance to safe, non-invasive treatment. Accessible by patients, clinicians, and researchers, PREDICT promises to optimize use of medical resources and improve health outcomes for people at risk of AD.

Stop Malaria

Cerebral malaria is a severe complication Plasmodium parasite infection, causing over 400,000 deaths yearly. This major threat is exacerbated by the lack of an efficacious vaccine and emergence of drug resistance. The Stop Malaria team has recently demonstrated that rocaglates, a group of plant-derived products, are highly efficient to block Plasmodium replication and are protective against cerebral malaria. This dual activity of rocaglates should prove extremely valuable for therapeutic intervention in human cases of cerebral malaria.

Swift Medical Inc.

Chronic wounds are a hidden epidemic. Annually, 6,265 cases of diabetic foot ulcers in Quebec cause 1,260 amputations, many of which could be avoided if healing progression was accurately tracked. Current practice is to measure wounds using a ruler and paper documentation, meaning visual information is lost. Swift Medical addresses these challenges with an app to photograph, measure and document wounds. Current and historical information is then immediately available to clinicians allowing for better clinical decision-making and better outcomes.

The Ligand Zero-Sum Game Algorithm

Multi-functional medications have recently become a subject of intense study in recent years due to their significant clinical potential. Such drugs could be used in the treatment of infectious processes, malignancies and more. Till now, this goal has been elusive at best. Using methodologies in computational chemistry, a process for designing multi-targeted medications has been conceived for the purposes of developing a drug discovery web platform.

The MUHC - McGill University Ocular Pathology & Translational Research Laboratory

Our project aims to validate a new imaging technology called Optical Coherence Tomography to aid in the diagnosis of skin cancers. Currently, surgical sampling of the lesion followed by its microscopic analysis is the only way to confirm a diagnosis. With over 70,000 cases diagnosed each year in Canada, the application of a non-invasive imaging methodology will undoubtedly facilitate early detection of skin cancers, reduce the number of invasive surgeries and improve patient outcome.

The Opal - Health Informatics Group

The Opal - Health Informatics Group, a clinical research group at the McGill University Health Centre, has developed Opal-ORMS, a personalized patient portal and research application that allows patients to view their medical data, browse personalized, just-in-time educational material, and answer patient-reported outcome questionnaires. The questionnaire results are viewed by the treating team to improve care, and a database, in the background, collects real world evidence data for research.

Tiny Baby Team

We are a multi-disciplinary team at the Montreal Children's Hospital - Neonatal Intensive Care Unit, working to improve outcomes of our preterm babies and integrate their families to our unit life. The "Tiny Baby Team" will use web-tools to reach out to our teams, and to parents, to promote continuous education and offer an easy on-hand way to standardize and optimize care. For families, it will provide valuable information, promote engagement, create a family network, educate with video capsules/interviews and collect feedback.

Tracheo-Sure

Tracheo-Sure aims to revolutionize endotracheal intubation for airway management by creating a surgical device that improves speed, efficiency, and patient safety while reducing overall healthcare cost and improving medical education.

Transplantation Group

Artificial Intelligence (AI) is shaping the future of humanity in all aspects of life and progressively enhances the scientific discovery and innovation. Our group establishes the foundation for an efficient AI-aided drug discovery program to discover new therapies for diseases that are difficult to treat. We aim to position the Canadian pharmaceutical industry as international leaders.

Value-Driven Research Program

Our team wishes to establish a research program around value-based care that will implement and validate a methodology for assessing quality and cost in the context of orthopedic care at the McGill University Health Centre.

Vigilant

Ovarian and endometrial cancers primarily affect women over 45 years old and are the deadliest of gynecological cancers. The diagnostic tools available are neither specific nor sensitive enough. For this, we developed Vigilant, a novel sampling device capable of collecting samples from the uterine cavity for use in liquid biopsy techniques to increase sensitivity and specificity for these diseases. This is an affordable solution that could easily be made accessible and adopted in the clinical practice.

VPConnect

VPConnect is a simulated clinical education application for healthcare learners. Incorporating Virtual Patient (VP) cases (interactive simulated patient) in an immersive environment, our platform allows learners to develop clinical competencies as an adjunct to first-hand experience. The platform brings together over 20 years of Virtual Patient research with current advancements in screen-based technology.

Walk-Well

Many people do not walk well because of age, illness or injury; they are at risk for falls, further injury, and health deterioration. Our team has developed the Heel2Toe device that provides a real-time "beep" via a smartphone for each "good" step, one where the heel strikes the ground first. This simple strategy lengthens the stride and changes posture from stooped to upright. To accompany the Heel2Toe device, Our Walk-Well product line is unique, practical, feasible, and needed.

For more information regarding the 2018-19 McGill CLIC entrants, please email innovation.med@mcgill.ca.