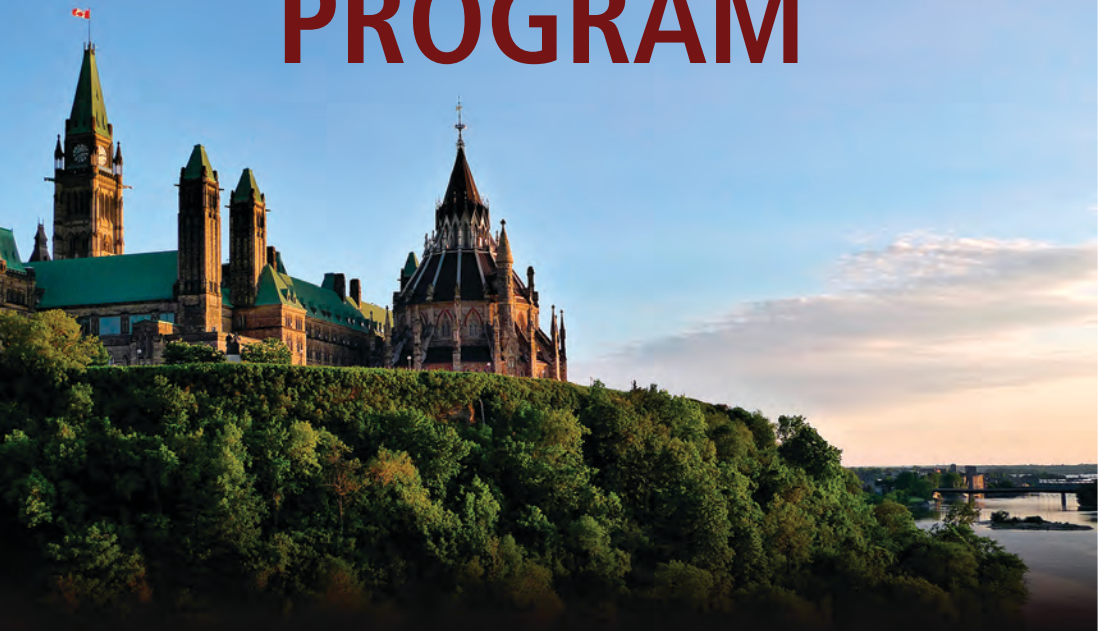
CMBES/SCGB

CMBEC42 2019

PROGRAM



MAY 21-24, 2019

The Ottawa Conference and Events Centre
Ottawa, Ontario

Endorsed By : IFMBE

Jim Watson
Mayor/Maire

Office of the Mayor
City of Ottawa

110 Laurier Avenue West
Ottawa, Ontario K1P 1J1
Tel.: 613-580-2496
Fax: 613-580-2509
E-mail: Jim.Watson@ottawa.ca

Bureau du Maire
Ville d'Ottawa

110, avenue Laurier Ouest
Ottawa (Ontario) K1P 1J1
Tél. : 613-580-2496
Téléc. : 613-580-2509
Courriel : Jim.Watson@ottawa.ca

On behalf of Members of Ottawa City Council, it is my distinct pleasure to extend a warm welcome to all those participating in the **42nd Canadian Medical and Biological Engineering Conference** (**CMBEC**), hosted by the **Canadian Medical and Biological Engineering Society** (**CMBES**), and taking place at the Ottawa Conference and Event Centre, on unceded Algonquin territory, from May 21st to 24th 2019.

I am equally delighted that Canada's fourth largest city, and an important centre of cutting-edge research and higher education, has been selected as the host venue for this national gathering. The conference provides a valuable forum for professionals representing the domains of medical technology development and management, and biomedical engineering, to convene under the themes *Innovative Healthcare Technologies* and *Bridging the gap between Clinical Engineering (CE), IT and Clinicians*. Delegates will also gain greater insight into new research pertaining to healthcare technologies and have opportunities to share information in their fields of expertise.

As Head of Council, I want to acknowledge the CMBES Planning Committee, guest speakers, sponsors, exhibitors and facilitators for dedicating efforts, insights, services and resources to the successful organization of this educational meeting.

Tourists will want to explore the National Arts Centre, and its spectacular new façade. The newly expanded Ottawa Art Gallery will amaze visitors with captivating works by the Group of Seven.

Allow me to convey my best wishes to the participants for a productive and rewarding assembly, as well as to the visitors for a most enjoyable stay in Ottawa.

Sincerely,

J'ai l'immense plaisir de souhaiter une cordiale bienvenue, au nom des membres du Conseil municipal d'Ottawa, à tous les participants au **42e Congrès de génie biomédical canadien** (**CGBC**), organisé par la **Société canadienne de génie biomédical (SCGB)**, qui aura lieu au Centre de conférences et d'événements d'Ottawa, sur un territoire algonquin non cédé, du 21 au 24 mai 2019.

Je suis également ravi que la quatrième ville en importance du Canada, pôle majeur de recherche de pointe et d'enseignement supérieur, ait été choisie comme ville-hôte pour ce rassemblement national. Le congrès offrira un cadre précieux où des professionnels représentant les domaines du génie biomédical et du développement et de la gestion de la technologie médicale se réuniront sur les thèmes *Innovative Healthcare Technologies* et *Bridging the Gap between Clinical Engineering (CE), IT and Clinicians*. En outre, les délégués comprendront mieux la nouvelle recherche se rapportant aux technologies des soins de santé et auront la possibilité de partager de l'information dans leur domaine d'expertise.

En tant que chef du Conseil, je tiens à remercier le comité de planification de la SCGB, les conférenciers invités, les commanditaires, les exposants et les animateurs de consacrer leurs efforts, leurs idées, leurs services et leurs ressources à l'organisation de ce congrès éducatif pour en assurer le succès.

Les touristes voudront explorer le Centre national des Arts, dont la spectaculaire nouvelle façade. La Galerie d'art d'Ottawa, nouvellement agrandie, fascinera les visiteurs, grâce à des œuvres captivantes du Groupe des Sept.

Permettez-moi de souhaiter aux participants une assemblée fructueuse et enrichissante et aux visiteurs un séjour des plus agréables à Ottawa.

Meilleures salutations.

Jim Watson, Mayor/Maire

House of Commons
Chambre des communes
CANADA

Mona Fortier
Member of Parliament / Députée
Ottawa—Vanier

Dear participants,

It is with great pleasure that I welcome all participants to Ottawa for this year's Canadian Medical and Biological Engineering Conference. I hope that you will enjoy your stay in the nation's capital for this fantastic event.

CMBEC is a vital opportunity for researchers and practitioners from across the country to discuss valuable information on healthcare technologies. Sharing innovative ideas and knowledge are fundamental to strengthening medical and biological engineering in Canada.

Once again, I would like to welcome you all to our city and I hope you can explore it while you are here. Thank you for the important work that you do for Canada's medical technology industry. I would like to wish you all a very rewarding, informative, and productive conference.

Sincerely,

Mona Fortier

Mona Fortier – Member of Parliament for Ottawa-Vanier

Ottawa
Room 809, Justice Building, Ottawa, Ontario K1A 0A6
Tel.: 613-992-4766 Fax.: 613-992-6448

Ottawa
Pièce 809, Édifice de la Justice, Ottawa (Ontario) K1A 0A6
Tél. : 613-992-4766 Téléc. : 613-992-6448

Mona.Fortier@parl.gc.ca

Welcome / Bienvenue

Message from CMBES President, Mike Capuano

It is an honour to present all delegates of the 42nd CMBES Conference with the official program of this year's special event. On behalf of the CMBES Executive and all members of the Society, I wish to thank the CMBEC42 Organizing Committee led by Kim Greenwood, Director of Clinical Engineering at the Children's Hospital of Eastern Ontario. They are an extremely competent team that has worked tirelessly leading up to this event. There is no other forum like CMBEC. We bring scientists, teachers, students, researchers, engineers, technicians, technologists, healthcare professionals, government, and industry all together in one place and at one time. We do this so we can network and share our knowledge in Medical and Biological Engineering in both Canada and abroad. The scope and breadth of this event is significant. We cover biomedical engineering, tissue engineering, management of medical devices in hospitals, and so on. We are also pleased to bring our industry partners to the exhibition floor. The vendor exhibition is packed with most of the key players in the medical device, supplies, and equipment industry. We thank them and our sponsors for their continued participation and support. We also thank the conference committee chairs and the Secretariat staff for their time and efforts. Anyone who has worked on a conference knows the amount of work required in order to make these events successful. I hope you are able to attend your selected events. It will be time well spent.

Sincerely,

Mike Capuano, CBET, CCEus, fCMBES
President, CMBES/SCGB

Welcome from the CMBEC42 Organizing Committee

Message from CMBEC42 Organizing Committee Chair, Kim Greenwood

On behalf of the CMBEC42 Organizing Committee, I am very pleased to welcome you to the conference and to Ottawa, the capital of Canada. We are looking forward to the opportunity to show you the beautiful National Capital and present our conference at the Ottawa Conference and Event Centre on the traditional unceded territory of the Algonquin people.

Over the last year, the Organizing Committee has worked very hard to bring you an insightful and diverse program that will interest all participants. I would like to take this opportunity to express my thanks to all members of the committee for their endless efforts, as well as Natalia Kaliberda and the Willow Group for all their hard work & support and ensuring we stayed on track with our timelines.

Our lineup includes the Clinical Engineering, Medical Device Innovation and Academic streams alongside an eleven-course Continuing Education program. Realizing the importance of networking with your peers at this event, on Wednesday afternoon May 22nd we have arranged a Student Networking Session to give students the opportunity to gain the insights to our experienced membership as they are planning their career path, as well as the Opening Reception in the Exhibit Hall of the Conference Centre. On Thursday May 23rd, the Conference Gala and Awards Banquet will be held at the Canadian Aviation and Space Museum where we will present our annual Society awards to this year's honoured recipients.

Please make a point of being a regular in the exhibit hall to ensure you are up to date with respect to the latest technological advances of our industry partners. They make the conference possible.

We are fortunate to be able to offer four high profile keynote addresses this year! With such a packed schedule we are still hopeful that you'll be able take some time to enjoy the sights and attractions around Ottawa-Gatineau!

Thank you for participating in CMBEC42 and I look forward to seeing you all during the conference.

Sincerely,

Kim Greenwood MASc, P.Eng, CCE, CET, CBET, FEIC
CMBEC42 Organizing Committee Chair

2019 CMBEC42 CONFERENCE COMMITTEE

Chair
Kim Greenwood
Children's Hospital Eastern Ontario

Long Term Conference Planning
Sarah Kelso
Winnipeg Regional Health Authority

Treasurer
Kyle Eckhardt
Providence Health Care

Clinical Engineering, Medical Device & Industry Program
Gnahoua Zoabli
Centre intégré de santé et de services sociaux des Laurentides

Academic Program
Prof. Sreeraman Rajan
Carleton University

Xudong Cao
University of Ottawa

Continuing Education Program
Marie-Ange Janvier
Children's Hospital Eastern Ontario

Local Arrangements
Rachel Zhang
Children's Hospital Eastern Ontario

Publicity
Andrew Ibey
Children's Hospital Eastern Ontario/ The Ottawa Hospital

Exhibits and Sponsorship
Hal Hilfi
Microbiology Canada, Thermo Fisher Scientific

Student Coordinator
Marianne Fenech
University of Ottawa

Website Support
Kelly Kobe
Alberta Health Services

Committee Members
Mike Capuano
Hamilton Health Sciences

Martin Poulin
Vancouver Island Health Authority

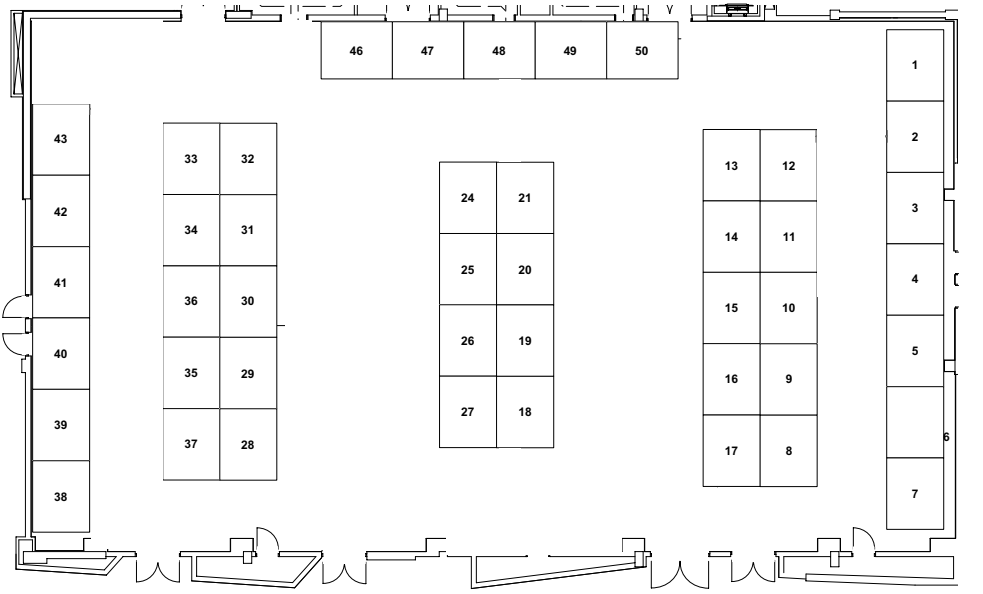
Murray Rice
Mount Sinai Hospital and University Health Network

Parisa Bahrami
Children's Hospital Eastern Ontario

Conference Secretariat
Natalia Kaliberda
Kenza Loulidi
Wanda Byron
The Willow Group

CMBES would like to thank this dedicated group of volunteers for their time and energy in coordinating this year's conference.

TRADE SHOW FLOOR PLAN



TRADE SHOW LOCATION AND HOURS:

The Trade Show will take place in the Hall 118

Ottawa Conference and Event Centre

Wednesday, May 22, 2019

TRADE SHOW IS OPEN FROM 10:00 TO 6:00 PM

10:00 am – 10:30 am – Trade Show Networking: Refreshments in Exhibit Hall

12:00 pm – 1:30 pm – Trade Show Networking: Lunch in Exhibit Hall

4:00 pm – 6:00pm - Opening Reception in the Exhibit Hall

Thursday, May 23, 2019

TRADE SHOW IS OPEN FROM 10:00 TO 3:30 PM

10:00 am – 10:30 am – Trade Show Networking: Refreshments in Exhibit Hall

12:00 pm – 1:30 pm – Trade Show Networking: Lunch in Exhibit Hall

3:00 pm – 3:30 pm - Trade Show Networking: Refreshments in Exhibit Hall

Booth	Exhibitor
1	High Purity Water Services
2	Keir Surgical
3	Datrend Systems
5	Philips
6	Computer Room Services
7	Medical PM
8	Umano Medical
9	Avante Patient Monitoring
10	Fresenius Kabi
11	Prime Focus Endoscopy
12	ICU Medical
13	Summit Imaging
14	Masimo
15	Novatech Medical Inc.
16	The Stevens Company Limited
17	Spacelabs Healthcare Canada
18	Acertara
19	Technical Prospects
20	B Braun
21	Elite Biomedical Solutions
24	DirectMed
25	Roxon
26	Zoll Medical Canada Inc

Booth	Exhibitor
27	Bracco Imaging Canada
28	Amico Corporation
29	Ultra Solutions
30	Spectramedx Inc
31	Draeger Medical
32	Draeger Medical
33	MedSet Specialties
34	McArthur Medical Sales Inc.
35	BOMImed
36	ECRI Institute
37	SciCan Ltd.
38	CHS Ltd.
39	GE Healthcare
40	ACCESSOTRONIK
41	BBM Battery
42	Olympus
43	Shop3D.ca
46	Northern Optotronics Inc
47	Tekniscience
48	Dixon Med
49	Getinge
50	Baxter Corporation

2019 CMBEC42 CONFERENCE – **KEYNOTE SPEAKERS**

WEDNESDAY, MAY 22, 8:30 AM – 10:00 AM

Dr. Molly Shoichet

University Professor and Canada Research Chair, Tissue Engineering Senior Advisor to President on Science & Engineering Engagement Chemical Engineering & Applied Chemistry Donnelly Centre University of Toronto.

Delivering the Promise of Regenerative Medicine

Two key challenges in regenerative medicine are survival and integration of exogenous transplanted cells or endogenous stimulated cells. To address these issues, we have designed bioengineered materials that both promote cell survival and enhance the environment in which the cells are transplanted. Using pro-survival factors incorporated into the design of injectable hydrogels and innovative biomolecule delivery strategies, we have had some success in animal models of blindness, stroke and spinal cord injury.

WEDNESDAY, MAY 22, 3:15 PM – 4:00 PM

Dr. Monique Frize, Ph.D., FIEEE, FEC, O.C.

Distinguished Research Professor at Carleton University
Professor Emerita at the University of Ottawa

Gender Balance in Biomedical Engineering

Current levels of involvement of women in the field of biomedical engineering will be presented and strategies to increase women's participation will be explored. The speaker will provide examples from her viewpoint on the impact of BME works that contributed to society and health care.

THURSDAY, MAY 23, 8:30 AM – 10:00 AM

Dr. Carl-Éric Aubin, Ph.D., ScD (h.c.), P.Eng.

Full Professor, Dept. Mechanical Engineering, Polytechnique Montreal
Chief Executive and Scientific Officer – Montreal TransMedTech Institute
Scientist & Head, Musculoskeletal Health, Rehabilitation and Medical Technologies Axis- Sainte-Justine University Hospital Center
Assistant Director – Rehabilitation Technopole & Applied innovation, Sainte-Justine University Hospital Research Center, Tier 1 - Canada Research Chair in Orthopedic Engineering, NSERC-Medtronic Industrial Research Chair in Spine Biomechanics

From Scoliosis Treatment Simulators to the Montreal TransMedTech Institute

TransMedTech Institute: an open interdisciplinary innovation ecosystem for the development of next generation medical technologies.
Medtech development: driven by users and the dynamics of needs, up to the innovative product implemented in the health system.
Technologies that change the treatment trajectory of children with complex spine deformities.

THURSDAY, MAY 23, 7:30 PM – 8:00 PM

Tiago Falk, PhD, SMIEEE

Associate Professor, INRS-EMT
Director, MuSAE Lab

Artificial Intelligence, Signal Processing, and Wearables: Building Blocks for Healthcare Technologies of the Future.

Advances in biosensor technologies have enabled the development of new low-cost wearable devices, which are now being explored for remote health monitoring applications. Advances in artificial intelligence, in turn, have resulted in algorithms capable of assisting clinicians improve diagnostic accuracy. Exploration of these elements in combination with advanced signal processing tools to develop healthcare technologies of the future for applications such as gait analysis of the elderly to predict/prevent falls, Alzheimer's disease diagnostics using videogames, and remote stress monitoring of nurses in hospitals will be showcased.

CMBEC42 **SOCIAL AND NETWORKING EVENTS**

May 22, 2019, 4:00 pm – 6:00 pm, Room 118 (TRADE SHOW)

Welcome Reception

Join us at the Opening Reception on the exhibit floor at OCEC, for an evening of conversation, networking, snacks and drinks.

May 22, 2019, 5:30 pm – 6:00 pm, Room 106FG

Speed Networking

This is a social networking event that is geared towards giving students an opportunity to meet with professional engineers and healthcare professional to discuss different topics related to career opportunities, Biomedical Industry, best practice etc.

The open forum allows interaction with these professionals in a relaxed group setting. The goal of this event is to connect a group of students with one professional at a time within a pre-assigned time block to ask questions and after the time is up, the group would have the opportunity to rotate to meet with another professional. Each session will be about 5-8min, so you will have the face-to-face time at the beginning of a national conference.

May 22-24, 2019

Mentorship Program

Mentorship Program is an informal mentorship opportunity to facilitate the connection between the students or young biomedical engineers with experienced professionals. We hope that this initiative will help bring people together and remove any formal barrier. Mentee will feel invited and welcome to talk to senior professionals. Mentors will be wearing the blue color badges and mentees will wear yellow color badges.

CMBEC42 **AWARDS DINNER**

May 23, 2019, 5:00 pm – 10:00 pm

Canadian Aviation and Space Museum

Shuttle bus will be provided. Pick up time from OCEC: 5:00 pm, 5:30 pm, 6:00 pm. Return time from the Museum: 9:30pm, 10:00pm.

5:00 pm – 6:30 pm – Cocktails and self-guided tour of the Museum
6:30 pm – 9:30 pm – Dinner, Keynote, Awards Presentation and Entertainement

Check out this special exhibit and explore surprising artifacts that reveal how Canada has contributed to advancing our understanding of Health in Space. Please note that only the partial experience of this exhibit will be available after 5:00 pm.

CHEO

CHEO Clinical Engineering Department will set-up the 3D printing demo to demonstrate the wide applications of 3D printers in Healthcare. Don't miss out on this opportunity and stop by to check it out!

The Dave Ward Trio

The Dave Ward Trio (David Ward with alto sax, Tom Denison with acoustic bass and Peter Foret with guitar) consists of professional musicians who each have over 30 years of experience in the music business. They play a mix of jazz standards and bossas as well as any requests you may have. Some of their engagements include Prime Minister Stephen Harper's Garden Party, Prime Minister Paul Martin's Christmas Party, Prime Minister Jean Chretien's Retirement Party and a cocktail reception for President George Bush.

CONGRATULATIONS TO THE 2019 CMBES AWARD WINNERS

Outstanding Canadian BMET: Navtej Virdi (Toronto ON)
Navtej is a Team Leader in Medical Engineering at the Hospital for Sick Children where over the years he has supported the technology in the NICU, NICU Transport, Neurology, and Dialysis areas. His accomplishments include the development of the first set of implantable electrodes for monitoring the location of the Epileptic activity in the brain, co-leading the technical advisory committee for purchasing neonatal transport systems in the province, and planning a new epilepsy monitoring unit.

Early Career Achievement Award – Brendan Gribbons (Vancouver BC)
Brendan is a clinical engineer with the Lower Mainland Biomedical Engineering team in Vancouver BC, where he started first as an intern, and has worked full time since September 2016. He is responsible for the infusion pump portfolio and incident investigations in the Vancouver region. He provided outstanding technical leadership on a province wide incident investigation into medication over-infusions.

Brendan is an active member of CMBES. He initially volunteers with the Professional Affairs committee, and he is now Chair of the Publications committee.

Fellow of CMBES (FCMBES) – Evelyn Morin (Kingston ON)
Evelyn is a faculty member in Electrical Engineering at Queens University. She developed an independent research program in the application of myoelectric signals and sensors to musculoskeletal biomechanics, investigations of human body movement, and measurement of muscle force output. The impact of this work has been extensive with many journal publications, invited presentations, invited book chapters, and term as Assistant Editor of the IEEE Transactions on Rehabilitation Engineering journal. She has contributed to the development of Queen's Collaborative Biomedical Engineering graduate program and mentored graduate students in Biomedical Engineering who have gone on to contribute to the field.

Evelyn is an active member of CMBES. She has volunteered as a chair of the CMBES Awards Committee and a member of the CMBES Task Force for the 50th Anniversary Journal.

Fellow of CMBES (FCMBES) – Martin Poulin (Victoria BC)
Martin is Director of Biomedical Engineering, Vancouver Island Health Authority. In this role he has overseen the opening of two hospitals on Vancouver Island, and been instrumental in working with the University of Victoria Biomedical Engineering program to train the next generation of Clinical and Biomedical Engineers.

Martin has been a staple and strong advocate for Clinical Engineering in Canada for the past 25 years. He has been an active volunteer with CMBES over the last 11 years starting as Treasurer in 2008 and President for 4 years (2014-18). He was Conference Chair of CMBEC37 in Vancouver, BC 2014, and has been a Board Member of the Canadian Board of examiners for Clinical Engineering Certification since 2013.

Fellow of CMBES (FCMBES) – Mario Ramirez (Toronto ON)
Mario is the Director of Medical Engineering at the Hospital for Sick Children's Medical Engineering Department. Prior to that, he served as a Director of Biomedical Engineering at both IWK Hospital in Halifax and St. Michael's Hospital in Toronto. He has been a key contributor to the Canadian Clinical Engineering field for over the last thirty five years. He has participated in several university engineering programs academic reviews through the Canadian Engineering Accreditation Board (CEAB) since 2010. Mario has been a significant supporter of CMBES, serving servicing a Vice President from 1996 to 2000 and then President from 2000 to 2002. He participated in the working group that revised and published the 2014 version of Canadian Clinical Engineering Standards of Practice. Mario is a peer reviewer for other Clinical Engineering departments in Canada, utilizing his valued experience to help others improve.

2019 CMBEC42 CONFERENCE

Schedule-at-a-Glance

Tuesday, May 21, 2019

10:30 am – 4:00 pm **Continuing Education Course**

CE1 **Location:** **Room 106H**	**Intro to Diagnostic Imaging & PACS**

Wednesday, May 22, 2019

7:30 am – 8:30 am **Registration and Continental Breakfast** ..... *Atrium*

8:30 am – 10:00 am **Conference Opening & Welcoming Remarks and Keynote Address**..... *Room 106ABC*

10:00 am – 10:30 am **Refreshment Break & Trade Show**..... *Room 118*

10:30 am – 12:00 pm **Concurrent Sessions & Continuing Education Course**

CE2 **Location: Room 106H**
Entrepreneurship Workshop

A1 **Location: Room 106E**	**B1** **Location: Room 106D**	**C1** **Location: Room 106FG**
Biosignal Acquisition and Processing	**Medical Device Interoperability**	**Mandatory Reporting to Health Canada by Hospitals**

Wednesday, May 22, 2019

12:00 pm – 1:30 pm **Lunch and Trade Show** ..... *Room 118*

1:30 pm – 3:00 pm **Concurrent Sessions & Continuing Education Course**

CE3 Location: Room 106H
Biomed Workshop **Shop3D**

A2 Location: Room 106E	B2 Location: Room 106D	C2 Location: Room 106FG
Medical Device Development	**Clinical Informatics and Patient Safety**	**Bed Entrapment Issues**

3:15 pm – 4:00 pm **Keynote Address** ..... *Room 106ABC*

4:00 pm – 6:00 pm **Opening Reception** ..... *Room 118*

5:30 pm – 6:00 pm **Speed Networking with Students** ..... *Room 106FG*

Thursday, May 23, 2019

7:30 am – 8:30 am **Registration and Continental Breakfast** ..... *Atrium*

8:30 am – 10:00 am **Continuing Education Course**

CE4 Location: Room 106H	Electrical Safety ->Defibrillator/AED Course

8:30 am – 10:00 am **Welcoming Remarks, Keynote Address** *106ABC*

10:00 am – 10:30 am **Refreshment Break & Trade Show** ..... *Room 118*

10:30 am – 12:00 pm **Concurrent Sessions & Continuing Education Course**

A3 / B3 Location: Room 106E	C3 Location: Room 106FG
Poster Presentations	**Cross Country Checkup / Across Canada Review**

Thursday, May 23, 2019

12:00 pm – 1:30 pm **Lunch and Trade Show** ..... *Room 118*

1:30 pm – 3:00 pm **Concurrent Sessions & Continuing Education Course**

CE6
Location: Room 106H

Endosope Inspection Training

A4
Location: Room 106E

Sensors and Instrumentation

B4
Location: Room 106D

Medical Device Performance Review

C4
Location: Room 106FG

Clinical Engineering Topics

3:00 pm – 3:30 pm **Refreshment Break and Trade Show** ..... *Room 118*

3:30 pm – 5:00 pm **Concurrent Sessions & Continuing Education Course**

CE7
Location: Room 106H

Water Systems Standards

A5
Location: Room 106E

Device Development and Physiology

B5
Location: Room 106D

Project Management in Clinical Engineering

C5
Location: Room 106FG

Improving the Effectiveness of Medical Device Donations - Round Table

5:00 pm – 9:00 pm **Awards Gala Dinner** ..... *Canadian Aviation and Space Museum*
Pick up time from OCEC: 5:00 pm, 5:30 pm, 6:00 pm.
Return time from the Museum: 9:30 pm, 10:00 pm.

Friday, May 24, 2019

7:30 am – 8:30 am **Registration and Continental Breakfast** ..... *Room 106FG*

8:30 am – 10:00 am **Concurrent Sessions & Continuing Education Course**

CE8
Location: Room 106H

Ventilators (Philips V60 and V680) Workshop

A6
Location: Room 106E

Rehabilitation and Biomechanics

B6
Location: Room 106D

Medical Device Innovation and Human Factors

C6
Location: Room 106FG

Provincial or Regional Preventive Maintenance Effectiveness : Round Table : BC, ON, QC, AB

10:00 am – 10:45 am **Poster Presentation and Refreshment Break** ..... Room 106E

10:45 am – 12:00 pm **Concurrent Sessions & Continuing Education Course**

CE8
Location: Room 106H

Ventilators (Philips V60 and V680) Workshop

A7
Location: Room 106E

Recent Generation of Biomedical Professionals - Feedback over their academic

B7
Location: Room 106D

Z387 and the Standard Development Process

C7
Location: Room 106FG

CMBES Supportability Challenge

12:00 pm – 1:30 pm **Lunch and CMBES Annual General Meeting** ..... Room 106FG

Friday, May 24, 2019

1:30 pm – 3:00 pm **Concurrent Sessions & Continuing Education Course**

CE9 **Location: Room 106H**	**C8** **Location: Room 106FG**
Ultrasound probe repairs	**How is CESOP implemented Across Canada?**

3:00 pm – 3:30 pm **Closing Remarks, Paper Competition Awards** .....Room 106FG

3:30 pm – 5:30 pm **Continuing Education Course**

CE10	**Location:** **Room 107, STEM Complex, 150 Louis-Pasteur Private, University of Ottawa, Ottawa, ON, K1N 9A7**	**Session Basic 3D Workshop**

CMBEC42 Program

TUESDAY, MAY 21, 2019

Continuing Education Course

10:30 am – 4:00 pm
Continuing Education Course

CE1
Meeting Room: Room 106H

Intro to Diagnostic Imaging & PACS

Instructor: Mike Petelin (RSTI)

A 4 hour course for introduction to diagnostic imaging and PACS, include introduction to radiography and radiology modality basics.

WEDNESDAY, MAY 22, 2019

7:30 am – 8:30 am
Registration and Continental Breakfast *Atrium*

8:30 am – 8:45 am *106ABC*

Conference Opening & Welcoming Remarks
Kim Greenwood, Organizing Committee Chair

8:45 am – 10:00 am

Keynote Address
Meeting Room: Room 106ABC

Delivering the Promise of Regenerative Medicine

Dr. Molly Shoichet, University of Toronto, Donnelly Centre for Cellular & Biomolecular Research

Two key challenges in regenerative medicine are survival and integration of exogenous transplanted cells or endogenous stimulated cells. To address these issues, we have designed bioengineered materials that both promote cell survival and enhance the environment in which the cells are transplanted. Using pro-survival factors incorporated into the design of injectable hydrogels and innovative biomolecule delivery strategies, we have had some success in animal models of blindness, stroke and spinal cord injury.

10:00 am – 10:30 am
Refreshment Break & Trade Show *Room 118*

10:30 am – 12:00 pm
Continuing Education Course

CE2
Meeting Room:
Room 106H

Entrepreneurship Workshop

Offered by McArthur

Instructor: Frank Fiorenza (founder of "Flusso"); Pierre Robichaud Founding Partner of Andrews Robichaud Intellectual Law)

A 1.5 hour workshop on entrepreneurship in Biomedical Engineering and Medical Device Industry :

- Introduction to Intellectual Property
- Journey with Flusso

10:30 am – 12:00 pm
Concurrent Sessions

A1
Meeting Room:
Room 106E

Biosignal Acquisition and Processing

Moderator: Prof. Adrian Chan (Carleton University)

EMG-based Force Estimation using Artificial Neural Networks

Gelareh Hajian (Queen's University), Prof. Evelyn Morin (Queen's University), Prof. Ali Etemad (Queen's University)

In this paper, the surface electromyogram (sEMG) signals acquired from linear surface electrode arrays, placed on the long head and short head of biceps brachii, and brachioradialis during isometric contractions are used to estimate force induced at the wrist using an artificial neural network (ANN). We extracted some features, in time and frequency domain, from sEMG signals and used them as inputs to the ANN model. Different hidden layer sizes were considered to investigate its effect on the model accuracy and find the appropriate number of neurons for our problem. Also, we studied the model accuracy, where we used features individually as the model's input. The best accuracy, during train, validation and test, was obtained for the maximum number of sEMG features.

High Density EMG Spatial Distribution of the Vastus Lateralis during Isometric Knee Extension in Young and Elderly Men and Women

Ashirbad Pradhan (University of New Brunswick), Dr. Victoria Chester (University of New Brunswick), Dr. Usha Kuruganti (University of New Brunswick)

Multichannel surface electromyography (EMG) or high densi-ty EMG (HDsEMG) can be used to study spatial distribution and muscle characteristics in aging muscle. The purpose of this study was to compare spatial EMG potential distribution dur-ing isometric knee extension between young and older men and women. Torque and HDsEMG data were recorded from the vastus lateralis during maximal voluntary isometric knee extension (MVC) from 24 young men and women (ages 19 – 25 years) and 25 older men and women (ages 64-78 years). Spa-tial distribution was estimated using the RMS value for each of the 32 electrode grid locations and 2-Dimensional (2D) maps were developed for each participant. Peak torque, mean EMG RMS, intensity, were compared across age and gender. Analy-sis of variance indicated statistically significant differences in peak torque, mean RMS and intensity between age and gender groups. Strength, muscle activation and intensity differ due to age and sex during maximal isometric knee extension. Further research that includes a larger range of submaximal and max-imal contractions may provide further insight into the impact of age-related changes in muscle morphology on spatial distri-bution during force development.

10:30 am – 12:00 pm
Concurrent Sessions

A1
Meeting Room: Room 106E

Biosignal Acquisition and Processing

Moderator: Prof. Adrian Chan (Carleton University)

Impact of Motion Artifact on Detection of Atrial Fibrillation in Compressively Sensed ECG using a Deterministic Matrix

Mohamed Abdelazez (Carleton University), Dr. Sreeraman Rajan (Carleton University), Prof. Adrian Chan (Carleton University)

Early detection of Atrial Fibrillation (AFib) is warranted to reduce the chances of patients developing complications. Compressive sensing (CS) of electrocardiogram (ECG) will facilitate long term monitoring with detection of AFib in the compressed domain eliminating the need for the expensive operation of reconstructing the ECG. This paper presented an AFib detector in the compressed domain and studied the effect of noise on it. ECG records from the Long-Term Atrial Fibrillation Database were contaminated with motion artifact from the MIT-BIH Noise Stress Database and compressed to 50%, 75%, and 95% levels. A 100 tree random forest was used to detect AFib in the uncompressed and compressed ECG at different noise levels. The random forest was evaluated using 5-fold cross validation and patient hold-out method. The random forest achieved a maximum of 81.87% F1 score at the 3 dB Signal to Noise Ratio (SNR) and 75% compression level in cross validation. Changing the SNR to -10 dB reduced the F1 score by 3.25%. The random forest achieved a maximum of 61.03% at 3 dB SNR and on uncompressed ECG in the hold-out test. Changing the SNR to -10 dB reduced the F1 score by 6.55%. The results show that it is possible to detect AFib in the compressed domain with noise impacting the performance.

A Comparison of Two ECG Inter-Beat Interval Measurement Methods for HRV-Based Mental Workload Prediction of Ambulant Users

Abhishek Tiwari (Institut national de la recherche scientifique), Isabela Albuquerque (Institut national de la recherche scientifique), Dr. Mark Parent (Institut national de la recherche scientifique), Jean-François Gagnon (Thales Research and Technology Canada), Daniel Lafond (Thales Research and Technology Canada), Sebastien Tremblay (Thales Research and Technology Canada), Dr. Tiago Falk (Institut national de la recherche scientifique)

Heart rate variability (HRV) has been studied in the context of human behavior analysis and many features have been extracted from the inter-beat interval (RR) time series and tested as correlates of constructs such as mental workload, stress and anxiety. Extraction of inter-beat interval series requires processing of the electrocardiogram (ECG) signal. This processing is critical for high quality RR series extraction and overall HRV measurement. Typically, the Pan-Tomkins peak detection algorithm is used. Recently, however, innovative modulation spectral based heart rate detection methods have been proposed. In this paper, we compare the performance of both algorithms and their effects on HRV measurement for mental workload assessment under physical activity. Experiments were conducted with 45 participants while they performed the NASA Revised Multi-Attribute Task Battery II (MATB-II) under different types and levels of physical activity. We show that modulation spectrum based methods perform better than conventional peak detection methods for mental workload prediction in lower levels of physical activity, particularly in the bike riding condition.

10:30 am – 12:00 pm
Concurrent Sessions

B1
Meeting Room:
Room 106D

SDC - A New Interoperability Standard for Electromedical Devices - IEEE 11073

Chair: Dr. Monique Frize (Carleton University)

Presenters:
Max Rockstroh (University Hospital of Leipzig / the Innovation Center for Computer Assisted Surgery (ICCAS) / OR.NET), Michael Wilkening (Draegerwerk AG & Co KGaA), Dr. Stefan Schlichting (OR. Net & Draegerwerk AG & Co KGaA)

Today's medical devices for the acute point of care are not always capable of addressing the future needs of clinicians and hospital IT systems with respect to interoperability. To enable an "Internet of Medical Things", several medical device manufacturers, together with clinical experts, have developed a new web services-based architecture that in 2018 became an IEEE standard. Since existing communication standards and profiles like HL7v2 and IHE were designed for the purpose of data transfer to Clinical Information Systems, this new standard allows for bidirectional communication between medical devices, supporting medical-grade data quality, remote control, cybersecurity and non-proprietary, standardized communication. Many advantages of intelligent system integration in a clinical environment can be achieved by taking into account workflow observations, as well as interactions of surgical and intensive care staff among each other and with medical devices, instruments and infrastructures. Because the system requirements are minimal, it allows for implementation into most existing hospital IT infrastructures. This reduces the operating and management effort and enables scalability simply by selecting powerful standard components. This IEEE coordinated work to publish such standard for open communication will prevent silo solutions that lead to additional costs for both the device manufacturers and care providers.

10:30 am – 12:00 pm
Concurrent Sessions

C1
Meeting Room:
Room 106FG

Mandatory Reporting to Health Canada by Hospitals

Chair: Andrew Ibey (Children's Hospital Eastern Ontario/ The Ottawa Hospital)

Presenter: Colleen Turpin (Health Canada)

The objective of this presentation is to present the new regulations and supporting resources for mandatory medical device incident reporting by hospitals. Following the formal presentation, there will be an opportunity for attendees to ask questions regarding the new regulations and implementation.

12:00 pm – 1:30 pm
Lunch and Trade Show *Room 118*

1:30 pm – 3:00 pm
Continuing Education Course

CE3
Meeting Room:
Room 106H

Biomed Workshop Shop3D

Instructor: Felix Izraitel (Shop3D)

A 1.5 hour introductory course for 3D printing, including basis of 3D printing, popular desktop printer options, how to prepare a print, consideration between quality and time, and 3D printing specific considerations on design.

1:30 pm – 3:00 pm
Concurrent Sessions

A2
Meeting Room:
Room 106E

Medical Device Development

Moderator:
Prof. Xudong Cao (University of Ottawa)

Automatic C-Arm Positioning Using Multi-Functional User Interface

Mustafa Haiderbhai (University of Ottawa), Dr. Jesus Guerrero-Turrubiates (University of Ottawa), Vinod Gutta (University of Ottawa), Prof. Pascal Fallavollita (University of Ottawa)

C-arm positioning is a critical step of the surgical workflow. The traditional method is often time consuming and results in additional radiation exposure to the patient and surgical staff. We propose a user interface that allows surgeons to interact with a simulated X-ray 3D reconstruction of the patient's anatomy. Optimal views chosen by the surgeon with the simulated X-ray are used to calculate the C-arm position required to achieve that view. The proposed system uses pre-operative CT data to generate a 3D model, and inverse kinematics with 6 degrees of freedom to calculate the C-arm joint parameters. Day of surgery patient position variations are factored in through registration methods using the Kinect. Quantitative results were validated by comparing outputs with ground truths, and results indicate our method can output C-arm position values close to the truth considering the limitation of working with truncated values. Automatic positioning reduces radiation by minimizing typical positioning errors. Future work will include the integration of radiation exposure measurements and visualization into the user interface.

Preliminary Kinematic and Kinetic Evaluation of a Modular Microprocessor-Controlled Stance-Control Knee-Ankle-Foot Orthosis

Kyle Daines (University of Ottawa, Ottawa Hospital Research Institute), Johnny Farah (University of Ottawa, Ottawa Hospital Research Institute), Dr. Natalie Baddour (University of Ottawa), Chris Duke (Blatchford and Sons Ltd.), Jawaad Bhatti (Blatchford and Sons Ltd.), Dr. Edward D. Lemaire (University of Ottawa, Ottawa Hospital Research Institute)

Stance-control knee-ankle-foot orthoses (SCKAFO) permit free knee motion during swing and knee flexion resistance during stance for individuals with knee-extensor muscle weakness. Microprocessor-controlled SCKAFO use electronic sensors and control algorithms to dictate when knee flexion resistance engages or disengages. Many SCKAFO require full leg extension to engage flexion resistance, and provide no support at other knee angles. This research presents a preliminary biomechanical evaluation of a novel local sensor-based (i.e., thigh, knee) variable knee-flexion resistance microprocessor SCKAFO (VSCKAFO) that was designed to address these limitations while maintaining stance-control functionality across various gait modes. Five able-bodied male participants were fit with the VSCKAFO and device settings were adjusted to each participant during an accommodation period. A lower body, six degree-of-freedom marker set (30 markers) was affixed to each participant. Kinematic data were collected for stand-to-sit and stair descent in a motion lab with a 10-camera Vicon system. Kinetic data were recorded for stand-to-sit with two force plates. Inertial measurement unit data were also recorded from sensors on the instrumented orthosis. It was found that the novel VSCKAFO sufficiently resisted knee flexion during weight-bearing stair descent and stand-to-sit activities. Successful biomechanical analysis with able-bodied individuals supports further testing with persons who have knee-extensor muscle weakness.

1:30 pm – 3:00 pm
Concurrent Sessions

A2
Meeting Room:
Room 106E

Medical Device Development

Moderator:
Prof. Xudong Cao (University of Ottawa)

Speed and Force Validation of an Improved Intravaginal Dynamometer Design

Catriona Czyrnyj (University of Ottawa), Dr. Eric Lanteigne (University of Ottawa), Samantha Boucher (University of Ottawa), Yousef Bader (University of Ottawa), Ana Brennan (University of Ottawa), Dmitry Lomovtsev (University of Ottawa), Megan Vandermolen (University of Ottawa), Prof. Linda Mclean (University of Ottawa)

Intravaginal dynamometry can provide reliable and objective assessment of the active and passive properties of the female pelvic floor muscles (PFMs) and associated connective tissues. This work presents a new automated intravaginal dynamometer (IVD) designed to address the limitations of many devices described in the literature, and provides a preliminary mechanical characterization and validation of the system. The new IVD includes dual (anterior and posterior) force measurement probes, minimalistic actuators to reduce IVD size and weight, off-the-shelf components optimized for cost and performance, integrated concurrent electromyography recordings, and an easy-to-use graphic user interface (GUI). IVD load measurements were validated against an Instron® Universal Tester (0-28N) and probe opening speeds were validated using video analysis. A linear regression model was used to quantify the input/output relationship in both cases (α=0.05). While the IVD exhibited -0.828 N bias in load measurements, there was a definitive linear relationship between IVD and Instron® force measurement, with a slope of 0.950 and an excellent model fit. The linear relationships between the GUI set speed of arm opening and true speed measured by video analysis were also excellent, slopes ranged from 0.874-0.980. The bias and the standard deviation of the bias of speeds ranged from -3.987mm/s to -0.809mm/s and 2.817mm/s to 1.207mm/s, respectively, generally decreasing in magnitude with increasing diameters. While fit was still excellent, speed of opening exhibited lower validity (i.e. lower slopes) at smaller apertures, which may be due to inertia effects. The IVD design presented here demonstrates valid force and speed values during bench testing.

Device Development Process Incorporated to Modify a Medical Device for Optimized Use in a Hyperbaric Chamber

Daniel Driedger (Providence Healthcare)

The unique and extreme environment of hyperbaric oxygen therapy presents limitations to the use of electronic medical equipment. The decision to accept a device into a Class A chamber requires a rigorous process of risk analysis to attain an extremely high level of confidence of safety, functionality and compliance. Incorporating a systematic process used in device development and modelling the environmental considerations for the chamber environment, provided a pathway to modify a medical device (IV pump) that was able function as 'normal' to the end-user and be validated to the standards for use of medical devices in a hyperbaric chamber. Due to the small market aspect of hyperbaric medicine there may be few or no medical devices that are compliant. Modification or adaptation may be required to conform with safe use in order to introduce a device into the chamber habitat of elevated pressure, increased oxygen density and limitations of power consumption. Assessing failure modes and determining the outcome with respect to patient safety and the occupants of the confined space of the chamber is critical to a robust solution.

1:30 pm – 3:00 pm
Concurrent Sessions

B2
Meeting Room:
Room 106D

Clinical Informatics and Patient Safety

Chair: Mario Ramirez (The Hospital for Sick Children)

Evidence Based Assessment Of New Medical Technology Through Test Of Change Case Of Patient Monitoring In Nicu Unit

Jean Ngoie (NHS Tayside,Department of Medical Physics & University of Dundee, Dundee, Scotland, UK)

Traditional or 'off the shelf or out of box' method of acquisition of medical devices and technology is currently being challenged by clinical users. Currently there is a need for flexibility in acquisition patient monitoring systems that is tailored to clinical needs of the healthcare organisation. Driven by accreditation, regulation, and technology, clinical practices are constantly changing. To align with the National Health Service Scotland (NHSS) transformation strategy, Clinical Engineering is recommending test of change prior to major acquisitions of medical devices with organisation wide clinical impact. Future technology need to be safely tested in clinical settings to gain knowledge of its capability, the innovation that are likely to have a positive impact on patient outcome and the value for money. Evidence should be provided to justify the investment.

The purpose of this paper is to open up a discussion and share ideas on how test of change can predict the efficacy of a technology prior to acquisition. It provides insight about efficiency, deficiencies, current practices, changes that are required, and issues that may arise during the acquisition, implementation, go live and beyond.

In this case study, Neonatal Intensive care unit (NICU) is used assess the introduction of an integrated patient monitoring system into NHS Tayside. The approach taken to conduct the test of change is discussed, documented lessons learned are highlighted. Innovative changes in clinical practices that may allow improvement in effectiveness of patient monitoring with wider impact on the entire organisation are presented. This exercise brought together a large number of stakeholders. Including those who are still interested in the old way of working, to come together and be part of the evaluation. As a result, a final paper will be presented with request for funding to the senior management for the next capital cycle.

1:30 pm – 3:00 pm
Concurrent Sessions

B2
Meeting Room: Room 106D

Clinical Informatics and Patient Safety

Chair: Mario Ramirez (The Hospital for Sick Children)

Investigating Vibration Levels in a Neonatal Transport System

Prof. Jim Green (Carleton University), Prof. Robert Langlois (Carleton University), Prof. Adrian Chan (Carleton University), Roger Selzler (Carleton University), Fadwa Darwaish (Carleton University), Andrew Ibey (Children's Hospital of Eastern Ontario), Cheryl Aubertin (Children's Hospital of Eastern Ontario), Kim Greenwood (Children's Hospital of Eastern Ontario), Dr. Stephanie Redpath (Children's Hospital of Eastern Ontario)

The first standardized Neonate Patient Transport System is currently being deployed in the Province of Ontario. The equipment has been designed to meet various transport safety regulations;however, there is concern that this new equipment may result in elevated vibration of the patient. The research presented in this paper is part of our on-going efforts to understand and mitigate vibrations in the Neonate Patient Transport System. Our previous investigations focused strictly on indoor transportation of patients. Moving to actual road transport has presented challenges,due to the many confounding variables including driver behavior and road conditions. We therefore intend to transition to a controlled environment,using an industrial shaker table. This study reports on our efforts to instrument a ground ambulance and patient transport equipment to collect baseline accelerations to be used to drive the shaker table and verify accurate simulation of actual patient transport. Results indicate significant vibrations at low frequencies, resulting from both the underlying vehicle dynamics and the response of the patient transport equipment.

Investigations into Concerning Incidence of Over-Infusions in Lower Mainland B.C. Health Authorities

Brendan Gribbons (Lower Mainland Biomedical Engineering), Sarah Hawley (Vancouver Coastal Health Nursing Professional Practice), Emily Rose (Vancouver Coastal Health Quality and Patient Safety)

Lower Mainland Biomedical Engineering (LMBME) has investigated a concerning incidence of over-infusions in Lower Mainland British Columbia Health Authorities. Extensive investigations have been conducted and the root cause of the majority of over-infusions has been unable to be determined; however, programming errors have been ruled out. As a result of the inability to determine root cause for the majority of over-infusion incidents, additional investigation methods were undertaken including a Failure Modes and Effects Analysis as well as a Systematic Systems Analysis. The analysis resulted in no commonalities being identified across all incidents. Many failure modes were able to be ruled out but root cause was still not able to be confidently determined. Two failure modes remain of particular interest due to the fact that they were not able to be ruled out for any incidents. The first failure mode involves any obstruction behind the module or platen door of the pumping modules. The second failure mode involves a a device malfunction due to unknown error (e.g. software fault resulting in pump pumping faster than programmed rate). A malfunction of this nature has never been reproduced by LMBME or any other organization to LMBME's knowledge. Risk mitigation to date has mostly involved user-education to reinforce proper set-loading procedures and strategies for preventing the highest risk causes of over-infusions from manifesting. Experience thus far has demonstrated that human-oriented risk controls have not been an effective means for reducing the frequency of over-infusions. The investigation team is now focusing on system-oriented risk controls which are hoped to be more effective.

1:30 pm – 3:00 pm
Concurrent Sessions

B2

Meeting Room:
Room 106D

Clinical Informatics and Patient Safety

Chair: Mario Ramirez (The Hospital for Sick Children)

Investigations into Concerning Incidence of Over-Infusions in Lower Mainland B.C. Health Authorities
Brendan Gribbons (Lower Mainland Biomedical Engineering)

The presentation will take the audience on a journey of over 10 months of investigations into a high incidence of over-infusions in Lower Mainland B.C. Health Authorities. The investigations identified a significant quality defect in the Alaris pump tubing sets which resulted in a recall of potentially affected tubing lots.

C2

Meeting Room:
Room 106FG

Bed Entrapment Issues

Chair: Kelly Kobe (Alberta Health Services)
Presenter: Elaine Wong (Health Canada)

The objectives of this presentation are to provide an overview of the post-market surveillance approach, from signal detection to risk management, for medical devices within Health Canada and to present a case study on hospital bed entrapment.

3:15 pm – 4:00 pm

Keynote Address:

Meeting Room:
Room 106ABC

Gender Balance in Biomedical Engineering

Dr. Monique Frize, Distinguished Research Professor and Professor Emeritus, Carleton University

Current levels of involvement of women in the field of biomedical engineering will be presented and strategies to increase women's participation will be explored. The speaker will provide examples from her viewpoint on the impact of BME works that contributed to society and health care.

4:00 pm – 6:00 pm
Opening Reception *Room 118*

5:30 pm – 6:00 pm
Speed Networking with Students *Room 106FG*
Note: registration required in advance of event

THURSDAY, MAY 23, 2019

7:30 am – 8:30 am
Registration and Continental Breakfast *Atrium*

8:30 am – 10:00 am
Continuing Education Course

CE4
Meeting Room: Room 106H

Electrical Safety->Defibrillator/AED Course

Instructor: Anas Sherif (DATrend)

A 1.5 hour course on electrical safety of defibrillator and AED, including Defib/AED Terminology, Defib/AED Testing Standards (AAMI/IEC), Defibrillation, Pacing, & AED Testing Auto Sequences with Phase 3, completing a PM utilizing the Phase 3.
Equipment will be provided for small groups to use during "hands-on" portions of the training class

8:30 am – 8:45 am *106ABC*

Conference Opening & Welcoming Remarks

Kim Greenwood, Organizing Committee Chair

8:45 am – 10:00 am

Keynote Address:
Meeting Room: Room 106ABC

From Scoliosis Treatment Simulators to the Montreal TransMedTech Institute

Dr. Carl-Éric Aubin
Professeur titulaire, Dép. génie mécanique & Institut de génie biomédical, Polytechnique Montréal
Directeur exécutif et scientifique – Institut TransMedTech
Chercheur et Chef, Axe Santé musculosquelettique, réadaptation et technologies médicales, CHU Sainte-Justine
Directeur adjoint – Technopôle en réadaptation pédiatrique & innovation appliquée, Centre de recherche du CHU Sainte-Justine

TransMedTech Institute: an open interdisciplinary innovation ecosystem for the development of next generation medical technologies
Medtech development: driven by users and the dynamics of needs, up to the innovative product implemented in the health system
Technologies that change the treatment trajectory of children with complex spine deformities

10:00 am – 10:30 am
Refreshment Break & Trade Show *Room 118*

10:30 am – 12:00 pm
Concurrent Sessions

A3 & B3
Meeting Room:
Room 106E

Poster Presentations

Moderator:
Prof. James R. Green (Carleton University)

A Mixed Reality Technology as a Supplemental Tool for Cardiovascular System Learning

Jeffrey Lao (University of Ottawa), Dr. Sheila Gonzalez-Reyna (University of Ottawa), David Burbidge (Carleton University), Christelle Dombou (University of Ottawa), Mark Salama (University of Ottawa), Prof. Mina Zeroual (University of Ottawa), Prof. Michel Désilets (University of Ottawa), Prof. Pascal Fallavollita (University of Ottawa)

Learning anatomy and physiology is a difficult task for students entering the field of Health Sciences and Medicine. While cadavers and textbooks are the current standard for teaching anatomy, potential alternative is the utilization of mixed reality technologies. These technologies have the ability to augment human anatomy models directly onto the user, who can then interact with them in a 3D environment. Our proposed technology, known as the Magic Mirror, was assessed in the Anatomy and Physiology I lecture at the University of Ottawa. Data from surveys was collected based on a five-point Likert Scale. Surveys focused on student interaction with the Magic Mirror technology as well as their thoughts about how it compared to learning the cardiovascular system versus traditional Atlas textbooks. Final results demonstrated a strong positive assessment of the Magic Mirror which offers the potential to continue improving the technology for future implementation in anatomy curricula

A Comparison of Depth Sensors for 3D Object Surface Reconstruction

Vinod Gutta (University of Ottawa), Dr. Edward D. Lemaire (University of Ottawa), Dr. Natalie Baddour (University of Ottawa), Prof. Pascal Fallavollita (University of Ottawa)

The ability of depth cameras like Kinect to capture a scene's depth information in three-dimensions, along with 2D color RGB images, in real-time makes marker-less human motion capture a potential option for applications such as rehabilitation, robotics, education, etc. Various depth sensor technologies are commercially available, and selecting the appropriate depth sensor is highly dependent on the desired application. This research compared Kinect V2, Astra Pro, and RealSense D415 depth sensing technologies for object surface reconstruction within an interior daily living environment. Intel RealSense D415 was resistant to interference with multiple sen-sors and point cloud data at 1m range was more accurate than Kinect V2 and Astra Pro.

10:30 am – 12:00 pm
Concurrent Sessions

A3 & B3
Meeting Room:
Room 106E

Poster Presentations

Moderator:
Prof. James R. Green (Carleton University)

HoloRehab: a Mixed Reality System For Tele-Rehabilitation

Dr. Sheila Gonzalez-Reyna (University of Ottawa), Abiel Algravez (University of Ottawa), Dr. Jesus Guerrero-Turrubiates (University of Ottawa), Prof. Pascal Fallavollita (University of Ottawa)

Motor rehabilitation on patients who suffered from stroke, osteoarthritis and other causes of motor disability can be very expensive for both the hospital and the patient. Remote rehabilitation can help overcoming these expenses, however, the patients still need the advice and assistance of a therapist during their rehabilitation sessions. In this paper, we propose the design and implementation of a mixed reality system for tele-rehabilitation. Our proposed HoloRehab system implements the rehabilitation exercises in an attractive way using gamification. During rehabilitation sessions, the physiotherapist will see a 3D hologram of the patient that will be displayed on a Microsft Hololens device. This document aims to describe the software design and implementation of the proposed HoloRehab system

Modelling and Simulation of an Ultrasonic Tethering Smart Wheelchair System for Social Following

Theja Ram Pingali (University of Ottawa, Ottawa Hospital Research Institute), Dr. Edward D. Lemaire (Ottawa Hospital Research Institute, University of Ottawa), Dr. Natalie Baddour (University of Ottawa)

Distracted navigation causes 20% of all powered wheelchair accidents. In social situations, wheelchair users must divide their attention between navigating the chair and conversing with an accompanying person. These conversations could lead to increased mental stress and distractions from maneuvering the chair. This project aims to eliminate the need to manually control a powered wheelchair when moving and conversing with an accompanying person, by controlling the wheelchair's path to follow beside a person. This includes identifying and determining the person's pose to control wheelchair navigation. The proposed ultrasonic tethering system was developed and simulated on Matlab and Simulink using models for ultrasonic sensors, amplification and filtering circuits, and a processing unit. Unlike infra-red sensors and cameras that are highly dependent on environmental light conditions, ultrasonic sensors are inexpensive and independent of environmental conditions. Simulation results determined wheelchair direction based on the accompanying person's pose, suggesting that ultrasonic tethering can be used for side-by-side following. The simulation results can be used to determine circuit component parameters for developing an ultrasonic tethering prototype.

10:30 am – 12:00 pm
Concurrent Sessions

A3 & B3
Meeting Room:
Room 106E

Poster Presentations

Moderator:
Prof. James R. Green (Carleton University)

Integration of a Mobile Application using Medical Infrared Imaging to Improve the Effectiveness of Physiotherapy Treatments

Dr. Julia Faerber (NHS Tayside, Department of Medical Physics, Dundee, Scotland, UK), Jean Ngoie (NHS Tayside, Department of Medical Physics & University of Dundee, Dundee, Scotland, UK)

Medical Infrared thermography (MIT) has been identified as a promising solution to locate inflammation within the human body. Infrared thermography is anon-radiating and non-invasive method which provides information about physiological functions related to the mapping of the body's thermal radiation. In this project, we investigate the use of a mobile phone combined with a low cost, high resolution infrared camera and the advanced image processing toolbox from MATLAB as a basic diagnostic tool for location and detection of thermal abnormalities (abnormally high or low body surface temperature) in musculoskeletal conditions. The three aims of this project are: First, to design a functional thermal imaging mobile application for patient rehabilitation and therapy assessment. Second, to use pre and post treatment thermal images to assess the effectiveness of the therapy. Finally, to use deep learning techniques to simplify the process of identifying abnormalities by automatically learning similarities and differences of features within images to predict the best treatment for future patients. In this paper the development of the mobile app as a proof of concept is reported with the future aim to use deeplearning algorithms. The application will be used to help physiotherapists inNHS Tayside (Scotland) to enhance their best practice.

An Examination of the Brain Trauma in Novice and Midget Ice Hockey: Implications for Helmet Innovation

Dr. Andrew Post (University of Ottawa), Clara Karton (University of Ottawa), Dr. Michael Robidoux (University of Ottawa), Prof. Michael Gilchrist (University College Dublin), Prof. Blaine Hoshizaki (University of Ottawa)

Ice hockey helmets are currently not designed for youth players, but rather reduced in size to fit smaller heads. As a result they are not as effective for youth protection. In order to target youth specific helmet protection and innovation, there needs to be an understanding of what characteristics contribute to brain trauma in youth ice hockey. The purpose of this research was to compare the frequency and magnitude of head contact events that occur in Novice and Midget ice hockey age categories. 30 Novice and 30 Midget youth boys' ice hockey games were analyzed to determine the frequency of event type, velocity of contact, and location of contact for head impacts. These events were then reconstructed in laboratory using physical and finite element modelling to determine the maximum principal strain of the events. The results identified that the Novice category helmet design should be focused on reducing impact from hard surfaces, while Midget focused on impacts from collisions with players and the glass.

10:30 am – 12:00 pm
Concurrent Sessions

A3 & B3
Meeting Room:
Room 106E

Poster Presentations

Moderator:
Prof. James R. Green (Carleton University)

The Use of a VOC Sensor to Measure Freshness of Fruits

Tiffany Cameron (University of Prince Edward Island), Jordan Sampson (University of Prince Edward Island), Rodolfo Nino-Esparza (University of Prince Edward Island), Marc Thibodeau (University of Prince Edward Island), Tristan Cayaoyao (University of Prince Edward Island), Dr. Ali Ahmadi (University of Prince Edward Island)

With North America having one of the larger food wastages by consumers, there is a need for a system that will bring awareness to the state of the food, to reduce food waste. Fruits have been known to release volatile organic compounds (VOC) throughout their lifecycle, a VOC measuring device has been applied to measure the freshness level. A banana, cocktail tomatoes and a yellow pepper were used as samples. Although a correlating trend between the samples could not be determined, the variance in measurement readings for each sample showed promising results.

Switching Electronic Health Record Systems: Effects on Rounds and Perceived Impact on Communication and Workflow in a Paediatric Critical Care Unit

Alanna Bateman (University of Toronto), Jessica Tomasi (North York General Hospital), Anne-Marie Guerguerian (The Hospital for Sick Children), Peter Laussen (The Hospital for Sick Children), Patricia Trbovich (University of Toronto)

The overall objective of this study was to explore the impact that switching electronic health record (EHR) systems has on daily bedside rounds in a paediatric critical care unit. Naturalistic observations were used to contextualize rounds and to characterize how EHRs are used during rounds. Semi-structured interviews occurred in two phases. In phase one, interviews were conducted with clinicians to elicit detailed perceptions of rounds, and to understand how EHRs were used during rounds. Six months after the implementation of a new EHR system, phase two interviews were conducted to understand perceptions on how the new EHR system had impacted communication and workflow during rounds. Thematic analysis was performed on the qualitative notes from observations and interviews to identify patterns based on the data collected. Results of thematic analysis indicate that switching EHRs has an impact on how clinicians prepare for rounds, access information during rounds and document patient care goals during rounds. The results from this study will inform the design of interventions to improve daily bedside rounds in future work

10:30 am – 12:00 pm
Concurrent Sessions

A3 & B3
Meeting Room:
Room 106E

Poster Presentations

Moderator:
Prof. James R. Green (Carleton University)

Early Feasibility Study of an Electronically Controlled Gravity Feed Infusion Set for Intravenous Fluids in Adults

Philippa Makobore (Uganda Industrial Research Institute), Martha Mulerwa (Uganda Industrial Research Institute), Hudson Kagoda (Uganda Industrial Research Institute), Mathew Ocheng (Uganda Industrial Research Institute), Paul Niyitanga (Uganda Industrial Research Institute), Miriam Wegoye (Uganda Industrial Research Institute), Donald Muhanguzi (Uganda Industrial Research Institute), Dr. Morris Rutakingirwa (Makerere University), Prof. David Meya (Makerere University)

A first in human single arm clinical study was conducted to determine the utility and safety of an Electronically controlled gravity feed (ECGF) infusion set, a low cost gravity feed infusion controller designed to improve intravenous administration of fluids and medication in resource constrained settings. The primary objective of this study was to estimate the accuracy and safety of the ECGF device in delivering a constant flow rate for therapies between 5 -100 drops/min in a sample adult population.12 participants with an indication for intravenous fluid therapy that met the inclusion criteria and provided written informed consent were enrolled from the infectious diseases ward at Mulago National Referral Hospital, Kampala, Uganda and were all placed on the ECGF device for one infusion therapy. Patient physiological parameters were recorded over a period of 48 hours. Maximum and minimum percentage variations Ep (max) and Ep (min) for analysis periods T1 (second hour) and T2 (last hour) showed a percentage error within ±7% for all 12 patients. Physiological parameters for study participants over the 48 hour period were stable as would be expected from a correct infusion therapy.The ECGF device was able to maintain flow rates within acceptable error during intravenous therapy and provide an appropriate level of safety for adult patients owing to its sensitivity in sounding alarms in the event of flow rate deviations. The ECGF has shown potential in improving the standard of care for intravenous therapy in resource limited settings.Keywords— Clinical study, safety, intravenous fluids, infusion controller, device.

Novel Concept of a Lower-Limb Rehabilitation Robot Targeting Bed-Bound Acute Stroke Patients

Nick Berezny (Carleton University), Dr. Dariush Dowlatshahi (Ottawa Hospital Research Institute, University of Ottawa), Dr. Mojtaba Ahmadi (Carleton University)

A novel concept for a stroke rehabilitation robot is presented, which incorporates ideas gathered after conducting fieldwork at a local hospital with five therapists. Data collected from the hospital and from recent stroke rehabilitation guidelines revealed key insights which generated ideas for a new device based in part upon our previous robot, the Virtual Gait Rehabilitation Robot (ViGRR). The new concept differs from existing rehabilitation robots in that it can be used independent of the therapist, who often have very limited schedules. Other issues are addressed, such as combating a lack of motivation or attention found in some patients. Future trials are discussed, including clinical trials measuring functional outcomes as well as less common metrics such as user engagement.

10:30 am – 12:00 pm
Concurrent Sessions

A3 & B3
Meeting Room:
Room 106E

Poster Presentations

Moderator:
Prof. James R. Green (Carleton University)

Influence of Ultrasound Image Acquisition Setup and Region of Interest Size on the Grey-Scale Echo Intensity Values of Ultrasound Images Using a Muscle Phantom

Prof. Luis Eduardo Maggi (University of Ottawa/ Faculty of Health Sciences/School of Human Kinetics,), Dr. Wagner Coelho De Albuquerque Pereira (Federal University of Rio de Janeiro/ COPPE/Biomedical Engineering Program), Wantuir Carlos Ramos Junior (University of Ottawa/ Faculty of Health Sciences/School of Human Kinetics), Prof. Linda Mclean (University of Ottawa), Prof. Ryan Graham (University of Ottawa/ Faculty of Health Sciences/School of Human Kinetics)

The influence of ultrasound equipment setup and region of interest (ROI) size on the grey-scale brightness values of ultrasound images was investigated using a muscle phantom. The effects of focus, gain, depth, zoom and ROI size were verified. The Echo Intensity (EI) was estimated using the ImageJ software. No important differences on the average of brightness with focus and zoom changes were found. EI rose linearly with gain increase and decreased linearly with increasing depth selected on the equipment. EI decreased logarithmically with the increase in size of the ROI. We propose dividing EI values by each respective gain as an alternative to reduce the influence of gain changes on EI. Other alternatives must yet be investigated regarding depth influence. This work is intended to help researchers make decisions on which parameters can influence their measurements, and thus, improve their interpretations.

10:30 am – 12:00 pm
Concurrent Sessions

A3 & B3
Meeting Room:
Room 106E

Poster Presentations

Moderator:
Prof. James R. Green (Carleton University)

Cross-Subject Conditional Shift Estimation for Generalized Electroencephalography-Based Mental Workload Assessment

Isabela Albuquerque (Institut national de la recherche scientifique-EMT), João Monteiro (Institut national de la recherche scientifique-EMT), Olivier Rosanne (Institut national de la recherche scientifique-EMT), Dr. Tiago Falk (Institut national de la recherche scientifique-EMT)

A frequent barrier to applying electroencephalogram (EEG) based mental workload models to real-world settings is the high cross-subject variability often observed in the correlates used for assessing mental workload. Models are usually subject-specific and present poor generalization when training and testing datasets are disjoint with respect to represented individuals. Additionally, the overhead in terms of time and cost required to collect training samples to build user-specific models makes EEG-based mental workload assessment unpractical. Domain adaptation (DA) techniques, in turn, constitute methods aimed at enabling models to generalize across data sampled from different conditions (e.g., subjects, channels, headsets). DA methods have been studied in depth in recent years and applied across various domains. To our knowledge, however, this has not been the case for EEG-based mental workload systems, thus cross-subject variability remains an open issue. A common DA strategy corresponds to learning invariant data mappings with respect to the domain, so that a predictor model learned on top of these representations will only consider information relevant to the task at hand. However, such methods rely on the covariate-shift assumption, which considers that the conditional label distribution for each data point is the same for source and target domains. When such assumption does not hold, there is a tradeoff between learning invariant representations and obtaining a small prediction error in both domains. In this case, we say there exists a conditional shift between source and target domains. In this work, we take an initial step towards devising and applying domain adaptation techniques based on learning invariant representations to EEG data. We introduced a method to estimate the cross-subject conditional shift based on theoretical results from the recent literature. We apply the devised strategy to verify conditional shift on data collected from a set of 10 subjects for binary mental workload assessment.

10:30 am – 12:00 pm
Concurrent Sessions

A3 & B3
Meeting Room:
Room 106E

Poster Presentations

Moderator:
Prof. James R. Green (Carleton University)

Validation of an Analytical Cochlear Model Using Synchrotron-Radiation Imaging

Luke Helpard (Western University), Dr. Seyed Rohani (Western University), Dr. Hanif Ladak (Western University), Dr. Sumit Agrawal (Western University)

The cochlea is the primary organ of hearing where acoustic signals are transduced into electrical impulses by sensory cells for the brain to interpret. Cochlear implant (CI) surgery is a procedure where an electrode array is inserted in the cochlea to stimulate the sensory cells directly and has been used to treat patients with severe-to-profound hearing loss. Cochlear anatomy varies greatly among patients, and selecting a CI electrode array length that matches the cochlear duct length (CDL) of individual patients can improve hearing outcomes. To overcome problems with the currently available techniques for CDL determination, a novel 3D individualized cochlear model (ICM), dependent on four cochlear distances, was proposed in the literature. The objective of this work was to validate the CDL measurements from the ICM using Synchrotron Radiation Phase – Contrast Imaging (SR-PCI) data.SR-PCI data from 11 cadaveric human cochleae were used to obtain reference measurements. CDL values generated by the ICM were evaluated in two conditions: when the number of cochlear turns (NCT) were automatically predicted by the ICM based on the four input distances (original model), and when the NCT were manually specified to the ICM based on SR-PCI data (modified model).When the ICM automatically predicted the NCT, the mean absolute error was 2.6 ± 1.6 mm, with only 27% (3/11) of the samples having an error in the clinically acceptable range of ±1.5 mm. When the NCT were manually specified based on SR-PCI data, the mean absolute error was reduced to 1.0 ± 0.6 mm, with 73% (8/11) of the samples having a clinically acceptable error. Although modelling the 3D morphology of individual cochleae effectively, the ICM requires tuning in the NCT estimation. To allow for consistent and accurate clinical implementation of the ICM, automation of the four input distances and NCT is required.

10:30 am – 12:00 pm
Concurrent Sessions

A3 & B3
Meeting Room:
Room 106E

Poster Presentations

Moderator:
Prof. James R. Green (Carleton University)

Evaluating the Biomechanical Performance of Running-Specific Prostheses for Children and Youth

Firdous Hadj-Moussa (University of Toronto), Dr. Jan Andrysek (Holland Bloorview Kids Rehabilitation Hospital)

The biomechanical performance of prosthetic limbs is essential in allowing children with lower-limb absence (due to acquired amputation or congenital defects) to engage in physical activities. Sport participation can have many benefits to social and physical well-being, as well as, overall quality of life. However, conventional prostheses have limited functionality which can hinder sport participation. Therefore, many prosthetic users wear advanced prostheses, such as running-specific prostheses (RSP). RSPs are commercially-available for children and youth, but there is little evidence on their biomechanical performance. In addition, much remains unknown regarding the application, optimization, function of RSPs for children and youth.The aim of this project is to evaluate and compare the biomechanical performance of RSPs and conventional prostheses for children and youth. Children and youth with lower limb absence will be recruited to perform different walking and running tasks on a force-measuring treadmill using motion capture technology to assess their gait. Biomechanical models will be developed and validated for a variety of RSP and conventional prosthesis models to analyze gait. The gait analysis will focus on clinically-relevant parameters such as speed, step frequency, ground reaction forces and loading asymmetries. In addition, other parameters that are relevant to the structural design of RSPs will be analyzed. This research will help establish the evidence base for the potential benefits of RSP prescription on the biomechanical performance for children and youth. These findings can inform the development of novel prostheses optimized for paediatric use. In turn, this work will help enable children and youth to participate in sports and to make better use of their prostheses leading to healthier and more active lifestyles.

10:30 am – 12:00 pm
Concurrent Sessions

A3 & B3
Meeting Room:
Room 106E

Poster Presentations

Moderator:
Prof. James R. Green (Carleton University)

Heart Rate as an Indicator of Helicopter Pilot Workload during Simulated and Airborne Flight

Jinu Kurian (National Research Council Canada), Andrew Law (National Research Council Canada), Sion Jennings (National Research Council Canada), Kris Ellis (National Research Council Canada)

Pilot cognitive overload can lead to degraded situational awareness and compromise aviation safety during critical phases of flight. Intelligent cockpit systems that continuously monitor pilot workload could improve flight safety by augmenting displays or controls when cognitive overload is detected. Several methods for monitoring pilot workload have been proposed, ranging from subjective ratings to physiological measures, some of which have been evaluated using ground based simulation but not validated in flight. Here, heart rate is evaluated as an indicator of pilot workload during both simulated and airborne helicopter flights.

Two NRC test pilots performed target-tracking tasks on NRC's Bell 205 helicopter, with task difficulty defined by peak target velocity. At the end of each trial, the pilot subjectively rated his workload using the Bedford rating scale. Each test pilot completed trials in simulation and again in flight. Electrocardiograms (ECG) were recorded using BioSemiActiveTwo electrodes placed on the chest. Heart rate (HR) during each trial was derived offline from R-to-R intervals. A baseline heart rate was taken in a ten-second window immediately prior to each trial. Trial heart rates were normalized against the baseline to quantify the percentage change in HR.

Bedford workload ratings increased with task difficulty and were similar across simulated and airborne flights. In general, absolute HRs were lower during simulation trials than airborne trials for all workload conditions. Moreover, average absolute HRs were lower during high-workload simulation trials than low-workload airborne trials. However, when normalized with respect to baseline HR, percent changes in HR were similar for simulation and airborne trials. Heart rate typically changed by less than 2% during low-workload trials but increased by more than 2% during high workload trials. Based on these findings, heart rate normalization is necessary before using this measure for cognitive workload assessment.

10:30 am – 12:00 pm
Concurrent Sessions

A3 & B3

Meeting Room:
Room 106E

Poster Presentations

Moderator:
Prof. James R. Green (Carleton University)

Manufacturing of Microfluidic Device using Norland Optical Adhesive

Curtis Armstrong (University of Ottawa - Faculty of Engineering), Prof. Marianne Fenech (University of Ottawa - Faculty of Engineering)

In this Abstract a methodology for a less compliant microfluidic chip is presented using Norland Optical Adhesive (NOA). NOA is a thiolene-based resin with no solvents. UV light causes the NOA to harden and cure. This curing process creates good glass-to-metal, glass-to-glass and glass-to-plastic bonds and is easily reproducible. The less compliant chip has been shown to reduce response times (time for flow rate to be established) significantly, thus improving the results of the study or research being conducted.

Identification and Simulation of Factors Affecting the Performance of Electrochemical Biosensors

Omokhowa Agbojo (University of Calgary), Sultan Khetani (University of Calgary), Dr. Arindom Sen (University of Calgary), Dr. Amir Sanati-Nezhad (University of Calgary)

This study focuses on the optimization of bio-affinity detecting electrochemical sensors. COMSOL Multiphysics is used to create mathematical models for the determination of ideal incubation times and cyclic voltammetry parameters.

C3

Meeting Room:
Room 106FG

Cross Country Checkup / Across Canada Review

Chair: Jacque Gagne (Ministère de la santé, et service sociaux)

Panel Members:
ONTARIO: Andrew Ibey (Children's Hospital Eastern Ontario & The Ottawa Hospital)
BRITISH COLUMBIA: Martin Poulin (Vancouver Island Health Authority)
MANITOBA: Tidimogo Gaamangwe (Winnipeg Health Region)
ALBERTA: Kelly Kobe (Alberta Health Services)

Purpose:

- Provide a cross country view & update from each provincial region.
- Opportunity to learn & share best practices, efficiencies, and innovative ideas.

12:00 pm – 1:30 pm
Lunch and Trade Show *Room 118*

1:30 pm – 3:00 pm
Continuing Education Course

CE6

Meeting Room:
Room 106H

Endosope Inspection Training

Instructor: Nathan Laishram (Olympus)

Curriculum:

- Flexible/ Rigid Scope anatomy
- Care and Handling
- Damage recognition
- Inspection and Leak testing
- Common Repairs
- Q/A

1:30 pm – 3:00 pm
Concurrent Sessions

A4

Meeting Room:
Room 106E

Sensors and Instrumentation

Moderator:
Prof. James R. Green (Carleton University)

Heart Rate Detection Using a Multimodal Tactile Sensor and a Z-score Based Peak Detection Algorithm

Bruno Monteiro Rocha Lima (University of Ottawa), Luiz Sampaio Ramos (Military Institute of Engineering), Thiago Eustaquio Alves De Oliveira (University of Ottawa), Vinicius Prado Da Fonseca (University of Ottawa), Prof. Emil Petriu (University of Ottawa)

Tactile sensing is the foundation of interaction within the environment. Tactile systems are used to gather information from its surroundings. This research contribution is to present a new feature of a recently proposed multimodal tactile sensor. Data acquisition was conducted by the Robotic Operating System (ROS) and data processing used a Smoothed Z-score Peak Detection algorithm. The heart rate was calculated by the tactile sensor and compared to a commercially available wrist monitor. The sensor and the monitor presented the same results for each trial in rest condition with the exception of one, where it differed by 1 bpm (1.8%).

1:30 pm – 3:00 pm
Concurrent Sessions

A4
Meeting Room:
Room 106E

Sensors and Instrumentation

Moderator:
Prof. James R. Green (Carleton University)

Wearable Sensor Performance for Clinical Motion Tracking of the Lumbar Spine

Kristen Beange (Carleton University), Prof. Adrian Chan (Carleton University), Dr. Ryan Graham (University of Ottawa)

Inertial measurement units (IMUs) have potential to be integrated into clinical assessments of movement-related disorders of the spine. This study evaluated 2 Mbientlab MetaMotionR IMUs relative to Vicon motion capture equipment in tracking 3D spine motion during 35 cycles of constrained repetitive spine flexion-extension (FE) in 10 participants. Root-mean-square error (RMSE) was low in all anatomical planes (RMSE ≤ 2.43°). Pearson's correlation coefficient was strong in the FE and lateral bend (LB) planes (R ≥ 0.746), and weak-to-moderate in the axial twist (AT) plane (0.343 ≤ R ≤ 0.679). Additionally, there was very strong correlation between range of motion measurements in the FE plane (ICC_{2,1}= 0.99), and a wide range from weak to strong in the LB and AT planes (0.239 ≤ ICC_{2,1} ≤ 0.980). This study reveals that the IMUs perform well in tracking motion in the primary movement plane, and can be used for planar assessments of movement quality.

A Parametric Study of Lateral Flow biosensors for Measurement of Salivary Cortisol Concentration

Rodolfo Nino-Esparza (University of Prince Edward Island), Dr. Laurie Mcduffee (University of Prince Edward Island), Dr. William Montelpare (University of Prince Edward Island), Dr. Ali Ahmadi (University of Prince Edward Island)

A parametric study was performed to investigate the effects of lateral flow assay preparation and construction on measurement of salivary cortisol concentrations. It is shown that a higher concentration of anti-cortisol antibodies is more suitable for measurement of higher concentrations of cortisol. Moreover, it is shown that thinner control and test lines provide more consistent measurement.

1:30 pm – 3:00 pm
Concurrent Sessions

A4
Meeting Room:
Room 106E

Sensors and Instrumentation

Moderator:
Prof. James R. Green (Carleton University)

Infrared Imaging Tools for Necrotizing Enterocolitis (NEC) Diagnosis Guided by RGB-D Sensing

Yangyu Shi (University of Ottawa), Dr. Pierre Payeur (University of Ottawa,), Dr. Monique Frize (Carleton University), Dr. Erika Bariciak (CHEO)

Necrotizing enterocolitis (NEC) is a disease that leads to inflammation in the intestinal tissue of premature babies. In this paper, we present a novel automated image acquisition and processing system that integrates infrared and RGB-D sensors for NEC detection. Inter-sensor calibration and data registration are introduced to ensure the consistency of depth, color and infrared images captured by the multispectral sensor. Segmentation of a baby's torso area is automatically achieved over the infrared imagery while relying on depth and color data to entirely retrieve the region of interest. Analysis of thermal distribution over the whole area reduces the risk of missing key information due to manual intervention. Preliminary results obtained with this multispectral imaging approach for NEC diagnosis are encouraging.

1:30 pm – 3:00 pm
Concurrent Sessions

B4
Meeting Room:
Room 106D

Medical Device Performance Review

Chair: Brendan Gribbons (LMBME)

Evaluation of the Fluid Motion of the Blood Inside of the Artificial Heart

Maryam Khelghatibana (SimuTech Group Inc.)

Cleveland Clinic is developing a continuous-flow total artificial heart (CFTAH). This novel design operates without valves and is suspended both axially and radially by a balance of the magnetic and hydrodynamics forces. Recent chronic animal studies revealed varying degrees of thrombus forming around the right impeller blades.

No thrombus was seen around the left impeller blades. The goal for this study is to use computational fluid dynamics (CFD) to gain insight into the differences in the flow fields around both impellers and to leverage that knowledge in identifying an improved right impeller design that could reduce the potential for thrombus formation.

Clinical Laboratory Review of Large Automation in Two Healthcare Settings. Case of NHS Tayside, Dundee, Scotland and Niagara Health, Ontario.

Jean Ngoie (NHS Tayside, Department of Medical Physics & University of Dundee, Dundee, Scotland, UK), Dr. Bill Bartlett (University of Dundee, Dundee, Scotland)

This comparative study was conducted to understand the benefits of deploying a large laboratory automation in two different settings. It highlights future contribution of Clinical Engineering into Life Science through collaboration.

1:30 pm – 3:00 pm
Concurrent Sessions

C4
Meeting Room: Room 106FG

Clinical Engineering Topics

Chair: Dave Gretzinger (University Health Network & Sinai Health System)

A New Building in the Hospital – What IT Infrastructure Should we Recommend?

Mario Ramirez (The Hospital for Sick Children), Erwin Van Hout (The Hospital for Sick Children), Shah Yazdanian (The Hospital for Sick Children), Luiz Costa (The Hospital for Sick Children), Gary Nero (The Hospital for Sick Children)

The presentation will describe the process that was followed in coming up with the recommendation of the IT Infrastructure for the new Patient Support Building. A comparison between GPON and Structure Cabling will be covered.

AIM3.0 QA Program Development for CT X-Ray Systems

Douglas McTaggart (University Health Network)

This presentation deals with the development and implementation of a comprehensive CT QA Program at the University Health Network. AIM3.0 was developed to satisfy the needs for standardized annual testing of CT dose and image quality parameters. AIM3.0 Web Clinical and Engineering interface links will also be discussed.

A Hazard Alerts System

Mario Ramirez (The Hospital for Sick Children), Rocky Yang (The Hospital for Sick Children)

The presentation will go over the process that was followed to decide over a homemade Hazard Alerts and Recalls system vs using an off the shelf solution. Pros and cons for the possible solutions will be explored.

Medical Imaging Assets Replacement Prioritization

Sandeep Sadaram (Providence Health Care), Kyle Eckhardt (Providence Health Care), Maria Fredriksson (Providence Health Care)

Short Summary: A data driven approach was used to develop a planning tool that prioritizes medical equipment in need of replacement. A prioritization score is calculated for each asset based on data from a Computerized Maintenance Management System (CMMS) and supplementary information surveys completed by Biomedical Engineering and Clinical stakeholders. The purpose of the planning tool was to support decision making by providing consistent and relevant information to decision makers across multiple (26) hospital sites and health authorities (4). The advantage of this approach is that it can be applied to small-size equipment fleets or a specific subset of equipment such as patient monitors, anesthetic gas machines, etc. It is not intended to be applied across an entire site or an entire CMMS inventory. This tool was specifically developed for the prioritization of Medical Imaging equipment.

3:00 pm – 3:30 pm
Refreshment Break and Trade Show *Room 118*

3:30 pm – 5:00 pm
Continuing Education Course

CE7
Meeting Room:
Room 106H

Water Systems Standards

Instructor: Andrew Connell (High Purity Water Systems)

A 1.5 hour presentation on the various standards Lab, Dialysis and MDRD. Dialysis testing, false positives, hands on, containers etc.

3:30 pm – 5:00 pm
Concurrent Sessions

A5
Meeting Room:
Room 106E

Device Development and Physiology

Moderator:
Dr. Monique Frize (Carleton University, University of Ottawa)

Personalizing Tourniquet Pressures - SBP-Based Estimation Methods are Unsafe, Unreliable, and Inconsistent

Julie Kerr (Western Clinical Engineering Ltd), Dr. James A McEwen (University of British Columbia)

It is well established that unnecessarily high tourniquet pressures are associated with higher probability of patient injuries, and insufficient tourniquet pressures can lead to break-through bleeding and other complications. Measurement of a patient's limb occlusion pressure (LOP) through the use of an automatic personalized tourniquet system enables the simple and safe application of personalized tourniquet pressures, reducing the risk of tourniquet-related injuries. Doppler ultrasound may be used to measure LOP, however manual measurement of LOP by Doppler is time-consuming and error-prone if attempted by inadequately trained staff. Other methods based on systolic blood pressure (SBP) have been proposed in an attempt to indirectly estimate personalized tourniquet pressures. Such methods include: (1) setting tourniquet pressure as a function of the patient's SBP, (2) indirectly estimating LOP by using a formula based on SBP and a 'tissue padding coefficient'. Alternatively, non-personalized fixed tourniquet pressures are used, resulting in pressures that may be hazardously high or low. Data from a previous clinical study involving 143 patients was retrospectively analysed to compare the differences between measured LOP to the recommended pressures of the two SBP-based estimation methods. Results from method (1) using only SBP indicate a predicted bleed-through for 41% of patients, and results from method (2) using SBP and a coefficient indicate an estimated bleed-through rate for 62% of patients. Alternatively, using a non-personalized fixed pressure predicted no bleed-throughs, but resulted in unnecessarily high pressures that were on average 121 mmHg above LOP. This study demonstrates that indirect SBP-based estimation methods recommend unsafe, unreliable, and inconsistent tourniquet pressure settings when compared to the measurement and setting of tourniquet pressures by LOP. The next advances in tourniquet safety will come from widespread adoption of using personalized tourniquet systems to automatically measure LOP, and by personalizing safety margins to further reduce applied tourniquet pressure levels.

3:30 pm – 5:00 pm
Concurrent Sessions

A5
Meeting Room:
Room 106E

Device Development and Physiology

Moderator:
Dr. Monique Frize (Carleton University, University of Ottawa)

Hemodynamics Assessments of Ascending Thoracic Aortic Aneurysm – the Influence of Hematocrit with Fluid-Structure Interaction Analysis

Nick Yeh (University of British Columbia), Dr. Simon Rabkin (University of British Columbia), Prof. Dana Grecov (University of British Columbia)

Aortic aneurysm is one of the cardiovascular diseases with localized abnormal growth of a blood vessel with arisk of rupture or dissect. The precise pathological pathway for disease progression in aneurysm formation is not completely understood. In the current study, ascending thoracic aortic aneurysms are investigated using fully coupled fluid-structure interaction method with the focus to investigate the importance of changes in hematocrit under normotension and hypertension. Blood was modelled as incompressible flow within laminar regime with the use of the Quemada model to account for the effect of hematocrits. The anisotropic hyperelastic properties of the aortic wall were considered. Given the change in the degree of shear thinning from the non-Newtonian behavior of blood due to the change in hematocrit, the simulated result could provide valuable information in clinical practice. Indeed, our results suggested that with the increase in hematocrit, the shear stress distribution as well as the maximum shear stress magnitude along the arterial wall would increase significantly. The arterial wall stress distributions, however, remained unchanged with respect to the changes in hematocrit.

Visualizing "Cognitive Fingerprints" from Simple Mobile Game Play

Prof. Bob McLeod (University Of Manitoba), Prof. Kai Gutenschwager (University of Applied Sciences, Wolfenbüttel), Kyle Leduc-mcniven (University Of Manitoba), Mahmood Aljumaili (University Of Manitoba), Dr. Marcia Friesen (University Of Manitoba)

Serious Games and associated data analytics offer the potential of a complementary means of detecting early signs of mild cognitive impairment (MCI), which is often a precursor to more serious forms of dementia. As with all diseases and illnesses, the ability to mitigate the impact of the illness is directly correlated to early detection and intervention. In this work, a representative serious game is used to capture a "cognitive fingerprint" of a person's play, which is then used to analyze and visualize play. The objective of the research is to demonstrate that data collected from serious games may be used to detect cognitive difficulties that may be pre-symptomatic, and outside the scope of normal age related cognitive decline.

3:30 pm – 5:00 pm
Concurrent Sessions

B5
Meeting Room:
Room 106D

Project Management in Clinical Engineering

Chair: Timothy Zakutney (University of Ottawa Heart Institute)

Presenter: Mohcine El Garch (APIBQ President)

A fun way to introduce clinical engineering project management and share experiences
This session will introduce project management concepts with humor and a few examples in clinical engineering

C5
Meeting Room:
Room 106FG

Improving the Effectiveness of Medical Device Donations - Round Table

Chair: Dr. Bill Gentles (BT Medical Technology Consulting)

Presentation of Collaboration Santé Internationale, A special NGO, founded 50 years ago, in Quebec City, who supports the Development of Healthcare Program in developing countries

Pierre Defoy (Collaboration santé internationale)

The presenter will explain the resources (financial, human and material), describe the activities, present the partners, so that you can understand the way they work. The presenter will also explain their agreement with the Quebec Ministry of Health.

Haiti Dialysis Project

Aimee Riggs (Children's Hospital of Eastern Ontario)

Aimee Riggs-Willey and Mark Heathcote recently went in January to Haiti, Port-au-Prince, to help train technologists on two dialysis machine that was donated by the Children's Hospital of Eastern Ontario (CHEO). They were sponsored by a grant coming from the Clinical Engineering Society of Ontario (CESO). Their partner in Haiti was the hospital OFATMA who shared the cost of shipping and equipment materials as well as accommodating the technologists in Haiti. These are their experiences in making sure donations to low-resources countries are well performed.

5:00 pm – 9:00 pm
Awards Gala Dinner
Canadian Aviation and Space Museum
Shuttle pick up time from OCEC: 5:00 pm, 5:30 pm, 6:00 pm.
Return time from the Museum: 9:30 pm, 10:00 pm.

5:00 pm – 6:30 pm
Cocktails and self-guided tour of the Museum

6:30 pm – 9:30 pm
Dinner, Keynote, Awards Presentation and Entertainement

7:30 pm – 8:00 pm

Keynote Address

Artificial Intelligence, Signal Processing, and Wearables: Building Blocks for Healthcare Technologies of the Future

Tiago Falk, PhD, SMIEEE
Associate Professor, INRS-EMT
Director, MuSAE Lab

Advances in biosensor technologies have enabled the development of new low-cost wearable devices, which are now being explored for remote health monitoring applications. Advances in artificial intelligence, in turn, have resulted in algorithms capable of assisting clinicians improve diagnostic accuracy. Exploration of these elements in combination with advanced signal processing tools to develop healthcare technologies of the future for applications such as gait analysis of the elderly to predict/prevent falls, Alzheimer's disease diagnostics using videogames, and remote stress monitoring of nurses in hospitals will be showcased.

7:30 am – 8:30 am
Registration and Continental Breakfast *Room 106FG*

8:30 am – 10:00 am
Continuing Education Course

CE8

Meeting Room: Room 106H

Ventilators (Philips V60 and V680) Workshop

Instructors: Yannick Martin & Melany Grondin (Philips)

A 3 hour Philips V60 and V680 Workshop that include overview of Ventilation Theory, ESYS & O2 Cell Calibration, Troubleshooting, Preventative Maintenance and Repairs, Device Cleaning & Sterilization. Also include demonstration the use of the Quick lung, the Certifier Plus and equipment needed for servicing the V680, Respi-Link software tool.

Instructors Yannick is a Field Service Engineer with extensive knowledge to share from his biomedical experience, and Melany is a Clinical Specialist /Respiratory Therapist who will share her clinical expertise.

8:30 am – 10:00 am
Concurrent Sessions

A6

Meeting Room: Room 106E

Rehabilitation and Biomechanics

Moderator:
Prof. Adrian Chan (Carleton University)

Effect of Lateral Resolution on Classifying Individual Finger Flexions using Ultrasound

Alexander Fernandes (Carleton University), Dr. Yuu Ono (Carleton University), Dr. Eranga Ukwatta (Carleton University)

B-mode ultrasound imaging has recently shown promise in achieving higher classification accuracies than surface electromyography for predicting discrete hand gestures and individual finger movements. This preliminary study investigates the performance in classifying finger flexions when reducing the lateral sampling interval resolution of a conventional clinical ultrasonic imaging probe with data collected from one subject. An experiment using spatial and temporal features, extracted from ultrasound radio-frequency (RF) signals are used with linear discriminant analysis to classify individual thumb, index, middle, ring and pinky finger flexion movements. The spatial lateral sampling interval is increased from 315 µm to 10 mm (reduction in lateral resolution) by averaging four groups of 32 consecutively acquired A-mode ultrasound rf signals from a 40 mm probe. The results for the four averaged rf ultrasound signals with a 10 mm lateral sampling interval had a score ranging between 77-91% with a classification accuracy of 84% for all five finger flexions. This classification accuracy was similar when using the acquired 315 µm lateral resolution and decreases to a classification accuracy of 32% for no lateral resolution, when the full 40 mm width is averaged into a single RF signal. The results show motivation for using a wearable multichannel ultrasound device for predicting individual finger flexions for prosthetic devices.

8:30 am – 10:00 am
Concurrent Sessions

A6
Meeting Room:
Room 106E

Rehabilitation and Biomechanics

Moderator:
Prof. Adrian Chan (Carleton University)

Comparison of a 6-year-old Child Finite Element Model to a Scaled Adult Model Using Simulated Fall Events For Three Levels of Surface Compliance

Dr. David Koncan (University of Ottawa), Dr. Anna Oeur (Georgia Tech College of Engineering), Prof. Michael Gilchrist (University College Dublin), Prof. Blaine Hoshizaki (University of Ottawa)

A newly developed finite element model of a 6-year-old child simulated the brain response to physical impacts onto low, moderate, and high compliance surfaces representing unhelmeted falls, helmeted falls, and well-padded conditions. Results for this model were compared against a scaled version of a currently available adult finite element model used in previous concussive research. The purpose of this study was to compare trends of response and assess how material property definitions, model geometry, and anatomical differences between models affect the peak strain response. The new 6-year-old model, showed lower peak maximum principal strains for low impact durations, but higher strains for moderate and long duration impacts. While both models had a tendency to produce similar values, the 6-year-old model still showed higher strains overall. For representative helmeted impacts, strains likely to cause a concussion were observed, even at a 3.0 m/s from the 6-year-old model. The newly developed model of a 6-year-old child showed different strain responses from a scaled adult model, identifying higher risk of concussive injury even in well-padded conditions.

8:30 am – 10:00 am
Concurrent Sessions

A6
Meeting Room:
Room 106E

Rehabilitation and Biomechanics

Moderator:
Prof. Adrian Chan (Carleton University)

Adapting Isokinetic Dynamometry for Individuals with Transtibial Amputations

Oscar Ortiz (University of New Brunswick), Ashirbad Pradhan (University of New Brunswick), Dr. Usha Kuruganti (University of New Brunswick), Dr. Victoria Chester (University of New Brunswick)

Transtibial amputations impact one's ability to perform activities of daily living. Continuous load bearing on the intact limb during ambulation and standing can lead to strength asymmetries in the lower limbs. Objective assessment of strength asymmetries in lower extremity muscles is critical as transtibial amputees are prone to several secondary conditions stemming from these musculoskeletal imbalances. Isokinetic dynamometry has been used to safely evaluate muscle asymmetries, but testing is usually performed using the participant's own prosthesis which can vary in available range of motion and suspension method. Furthermore, this methodology excludes those who are not prosthesis users. The purpose of this research was to design, build and test a transtibial adapter for dynamometry that can be used on the residual limb with or without a prosthesis for objective assessment of leg strength. Clinical feedback was sought from one transtibial amputee regarding the usability and comfort of the adapter while performing an isokinetic knee extension/flexion task. The participant was capable of completing the knee contractions without any reported pain or discomfort, suggesting that our prototype may be an option to adapt dynamometry for this population. Further research with the prototype with a larger sample and more contraction conditions is needed to further assess whether the design presented is a viable option to adapt dynamometry for transtibial amputees.

8:30 am – 10:00 am
Concurrent Sessions

A6
Meeting Room:
Room 106E

Rehabilitation and Biomechanics

Moderator:
Prof. Adrian Chan (Carleton University)

Effect of Patellofemoral Geometry and Simulated Tibial Tubercle Osteotomy on Patellar Stability

Dr. Allison Clouthier (University of Ottawa), Dr. Daniel Borschneck (Kingston General Hospital), Dr. Darryl Thelen (University of Wisconsin-Madison), Dr. Kevin Deluzio (Queen's University), Dr. Michael Rainbow (Queen's University)

Articular geometry is known to affect joint function and be correlated with pathology; however, its effect on treatment outcomes is not well understood. The influence of trochlear groove depth on lateral patella stability following simulated tibial tubercle osteotomy was investigated. A statistical shape model was used to produce knee models with trochlear groove geometries ranging from shallow to deep. A Monte Carlo approach was used and 750 musculoskeletal models were generated with varying trochlear groove depths and patellar tendon medial and anterior transfer distances. An overground walking trial was simulated for each model using the COMAK routine and a 200N lateral perturbation force was applied to the patella during early stance. The lateral displacement of the patella resulting from this perturbation was used as a measure of patellar stability. In knees with deep trochlear grooves, patella displacement due to the perturbation decreased with increased medial patellar tendon transfer, indicating increasing stability. However, in knees with shallow trochlear grooves, stability was maximized at ~1 mm of medial patellar tendon transfer, but decreased for patellar tendon insertions medial or lateral of this point. Additionally, the medial patellofemoral ligament was more important to maintaining joint stability for larger patellar tendon transfer distances in knees with shallow trochlear grooves. These results emphasize the importance of considering joint geometry in surgical planning.

8:30 am – 10:00 am
Concurrent Sessions

B6
Meeting Room:
Room 160D

Medical Device Innovation and Human Factors

Chair: Murray Rice (Mount Sinai Hospital and University Health Network)

Collaborative Development of Medical Devices: Qualitative Study of Communication Between Engineers and Medical Doctors

Aida Hassani (University of British Columbia), Dr. Sayra Cristancho (Western University), Dr. Laura Nimmon (University of British Columbia), Dr. Antony Hodgson (University of British Columbia), Dr. Sandra Jarvis-Selinger (University of British Columbia)

While research shows the importance of the interdisciplinary collaboration between medical doctors and engineers to successfully develop medical devices, there is scarce literature specifically exploring what makes these partnerships work. This paper examines the gap between engineers and clinicians by exploring the enablers, barriers and difficulties of their collaboration and communication through the qualitative case study method. Methods: This pilot study explores the experiences of two surgery residents and three engineers in training who have had the collaborative work experiences in medical device design. Data sources include interviews, lab observations, and interview notebooks. The interviews were conducted with engineering students at UBC who have had work experience with clinicians/residents and surgery residents who have had work experiences with engineers. Conclusion: While maintaining a successful collaboration is challenging, engineers and residents were both interested to continue collaboration and emphasized the importance of collaboration in designing medical devices. There is no question that there are hurdles in the communication between these two professional groups, such as knowledge deficiency, differing priorities and lack of sufficiently dedicated time; however, both groups found collaboration necessary and effective in the whole process of developing medical device technology.

8:30 am – 10:00 am
Concurrent Sessions

B6
Meeting Room:
Room 160D

Medical Device Innovation and Human Factors

Chair: Murray Rice (Mount Sinai Hospital and University Health Network)

Failure Modes and Effects Analysis: Off-Label Use of Alaris Infusion Pump for Cerebrospinal Fluid Subarachnoid Drainage

Brendan Gribbons (Lower Mainland Biomedical Engineering), Matthew Burmister (Lower Mainland Biomedical Engineering), Shianne Buzikievich (Lower Mainland Biomedical Engineering), Dickson Ho (Lower Mainland Biomedical Engineering), Sarah Hawley (Vancouver Coastal Health Nursing Professional Practice), Emily Rose (Vancouver Coastal Health Quality and Patient Safety), Megan Fekete (Vancouver Coastal Health Neurosciences)

The presentation will summarize a failure modes and effects analysis which was conducted as part of a practice review of the off-label use of the Alaris infusion pump for cerebrospinal fluid subarachnoid drainage.

Applying Human Factors Methods to Inform the Implementation of a Novel Medical Device

Miguel Antonio (Island Health)

Usability testing was performed to identify usability problems with a medical device designed to detect respiratory depression. Personnel lacking formal human factors training developed and implemented the test plan. Quantitative usability test analysis involved measuring task completion time, success rate, and usability issue frequency. Qualitative data was collected via visual observations of the participants. Significant usability problems were identified with the following tasks: entering patient information, opening alarm settings, and adjusting alarms. The test results were used to improve the hospital's clinical training.

Clinician Engagement and Training on an Electronically Controlled Gravity Feed Infusion Set as a Precursor for Clinical Studies

Martha Mulerwa (Uganda Industrial Research Institute), Philippa Makobore (Uganda Industrial Research Institute), Hudson Kagoda (Uganda Industrial Research Institute)

User training is an important aspect in the implementation of medical technology to facilitate the safe use of new medical devices yet it is an ignored field in many settings especially resource limited settings. Carrying out clinical studies on new medical technology without end user training could compromise patients' and clinicians' safety, take up a lot of clinicians' time learning on the job and negatively affect study results. Clinician and hospital technician training on the Electronically Controlled Gravity Feed (ECGF) infusion set device was carried at Mulago National Referral Hospital as a precursor to clinical validation. 19 clinicians were trained and their feedback was collected through group discussions and structured questionnaires. Most clinicians found the ECGF to be user friendly, safe for use with the potential to simplify their work, save time and improve on patient safety. They also noted a need for an improvement on a few ergonomics.

8:30 am – 10:00 am
Concurrent Sessions

C6

Meeting Room:
Room 106FG

Provincial or Regional Preventive Maintenance Effectiveness : Round Table : BC, ON, QC, AB

Chair: Adeel Alam (Sinai Health System)

Speakers:
Tedford MacLaggan (Vancouver Island Health Authority)
Dave Gretzinger (University Health Network)
Kelly Kobe (Alberta Health Services)

Discuss the effectiveness of preventive maintenance on local or provincial levels.

10:00 am – 10:45 am
Poster Presentations and Refreshment Break *Room 106E*

10:45 am – 12:00 pm
Concurrent Sessions

A7

Meeting Room:
Room 106E

Recent Generation of Biomedical Professionals - Feedback Over Their Academic Program and Internship for Improvement

Chair: Marie-Ange Janvier (Children's Hospital Eastern Ontario)

B7

Meeting Room:
Room 106D

Z387 and the Standard Development Process

Chair: Adeel Alam, PMP, MHSc (Sinai Health System)

Speaker: Susan Taylor (CSA Group)

An introduction to the Z387, Safe use of electrosurgical medical devices and systems in health care standard, recent changes in the 2019 edition, and the standard development process.

10:45 am – 12:00 pm
Concurrent Sessions

C7
Meeting Room: Room 106FG

CMBES Supportability Challenge

Chair: Mike Capuano (Hamilton Health Sciences)

This event is intended to showcase vendors and their ability and willingness to support in-house biomedical engineering programs. Recent data shows that some manufacturers and distributors of medical devices are better than others when it comes to the supportability of medical devices (how the vendor helps to enable the on-site/in-house Biomed-CE department to work on their equipment). This is an opportunity for vendors to present and elaborate on how they traditionally support biomedical engineering programs and their latest offerings when engaging with hospitals. The winner of the CMBEC42 Supportability Challenge is granted bragging rights and a guaranteed booth at CMBEC43 at NO-CHARGE.
Vendor Participants:

- Acertara
- BOMImed
- Draeger Medical
- McArthur Medical Sales Inc.
- Medical PM
- Northern Optotronics Inc
- Spacelabs Healthcare Canada

12:00 pm – 1:30 pm
Lunch and CMBES Annual General Meeting *Room 106FG*

1:30 pm – 3:00 pm
Continuing Education Course

CE9
Meeting Room: Room 106H

Ultrasound Probe Repairs

Instructor: Taylor Bailie (Keir Surgical)

A 1.5 hour course on ultrasound probe repairs, including Probe testing, cleaning, full diagnostics, lens and head replacement, Cable sheath repair, Case repair, Connector repair, 3D / 4D probe repair, 3D / 4D oil filling, Cable whitening.
Range of US probe to validate with Keir Surgical for Medical Imaging.

1:30 pm – 3:00 pm
Concurrent Sessions

C8
Meeting Room: Room 106FG

How is CESOP Implemented Across Canada?

Chair: Mike Capuano (Hamilton Health Services)

Speakers:
Amir Gill (Facilities and Biomedical Engineering)
Krita Teeluckdharry (Niagara Health)
Bill Gentles (BT Medical Technology Consulting)

To share the experience of a biomedical engineering department's efforts to comply with the CMBES Clinical Engineering Standards of Practice.

3:00 pm – 3:30 pm
Closing Remarks, Paper Competition Awards *Room 106FG*

3:30 pm – 5:30 pm
Continuing Education Course

CE10
University of Ottawa

Session Basic 3D Workshop

Location: Room 107, STEM Complex, 150 Louis-Pasteur Private, Ottawa ON K1N 9A7
Offered by Makerspace @ Ottawa University

****Please note the Location is not at the Ottawa Conference and Event Centre****

Basic 3D Printing Workshop-In this workshop, you will learn the basics on how to design and 3D print objects. You will learn how to use basic 3D design software [TinkerCAD] to create a personalized object then followed by a step by step tutorial on how to 3D print your object on the various printers in the Makerspace. Please bring your laptops to this workshop to follow along with the activity. Internet connection required.
If you have not already, please make an account on Makerepo.com before coming to the workshop.

NOTES

NOTES

9 out of 10 times Invasive Aspergillosis is lethal

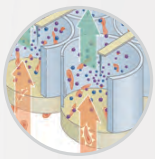
to immuno-compromised patients[1].

Aspergillus spp.

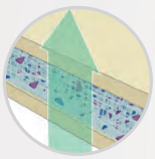
PLASMAIR™ equipped rooms have **12.6 times less infections**[2]

PLASMAIR™ HEPA-MD™ technology

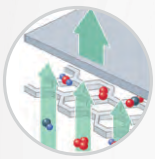
4 stages reactor



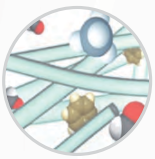
STAGE 1
Destruction of microorganisms.



STAGE 2
HEPA filtration.



STAGE 3
Elimination of oxidant chemical molecules.



STAGE 4
Adsorption of Volatile Organic Compounds and odours removal.

GET MORE INFO

www.scican.com/medical/plasmair

SciCan

[1] Sixt N, Dalle F, Lafon I, Aho S, Couillault G, Valot S, et al. Reduced fungal contamination of the indoor environment with the PLASMAIR™ system (Airinspace). J Hosp infect 2007; 65:156-162.
[2] Fernandez-Gerlinger MP, Jannot AS, Rigaudeau S, Lambert J, Eloy O, Mignon F, Farhat H, Castaigne S, Merrer J Rousselot P.
The PLASMAIR™ decontamination system is protective against Invasive Aspergillosis in neutropenic patients. Infect Control Hosp Epidemiol 2016; 37: 845-851.

CMBES/SCGB

Use this coupon and pass it on to your colleagues and industry friends for 25% off any new membership.

We are thankful that you joined us for CMBEC42!

By participating in our conference, we hope that you were able to engage in stimulating conversations, and also to:

- Network with colleagues from different provinces and hospitals.
- Share experiences with medical equipment that you were previously told were unique to your site.
- Discover new ideas through projects and research in the Clinical Engineering, or Biomedical Engineering field.
- Find information about new devices that would benefit your institution or department.

For continuing the conversation with professionals across the country, you can join CMBES and invite colleagues from work as well.

New members* can benefit from 25% off membership** dues if they join our society before June 30, 2019.

By using the discount coupon code CMBEC42promo in the online registration system (www.cmbes.ca), or contacting secretariat@cmbes.ca

Be part of Canada's premier society for engineering in medicine and biology today!

*New members would be considered as individuals who are joining CMBES for the first time, or who were members before but have not renewed within the last 5 years.

**For more information on the different types of membership, please visit: https://www.cmbes.ca/membership/categories-fees

CMBES/SCGB

Are you a Member of CMBES?

Leverage your membership benefits!

Not a Member of CMBES?

Join today to access many valuable membership benefits!

Questions?

cmbes.ca

Phone: +1-613-728-1759 | E-mail: secretariat@cmbes.ca