FINAL PROGRAM

February 14 – 17, 2019

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Dear Delegates,

On behalf of the School of Health Information Science and the Conference Steering Committee, we are pleased to welcome you to the Information Technology and Communications in Health (ITCH 2019) conference. We have a wide range of presentations from researchers, practitioners, students and innovators in health informatics and health information technology from around the world. Our theme this year is “From Research to Practice: Improving Usability, Safety and Patient Outcomes with Health Information Technology”. As we all know, health information technologies are revolutionizing and streamlining healthcare and their uptake is rising dramatically. However, in order to effectively design, develop and implement health technologies, academic, industrial and government partnerships need to be nurtured, developed and strengthened to improve the usability and safety of our technologies as well as to determine if these new technologies lead to improved patient outcomes.

The conference takes a multi-perspective view and approach to determine how health technologies can be improved to ensure patient outcomes and sustained use by health professionals. Solutions range from improvements in usability and training, to the need for new and improved design of information systems, user interfaces and interoperable solutions, to governmental policy, mandates and initiatives.

The conference follows the tradition of ITCH from its first instantiation in 1986, where it offered a Canadian colloquium with an international flavor addressing the impact of information technology on community health. This small, successful gathering was the predecessor of the Information Technology in Community Health conferences which followed in 1987, 1988, 1990, 1992, 1994, 1996, 1998 and 2000. In 2007, we expanded the conference scope to cover Information Technology and Communications in Health (ITCH), and we have been hosting ITCH conferences every two years since.

Over the years we have seen the conference grow and develop with presenters from Asia, Europe, Africa, the Middle East, South America and from throughout North America. We are delighted to welcome you back to Victoria, British Columbia for our 15th gathering and for one of the largest British Columbia based conferences focused exclusively on health technology!

We hope you enjoy the conference, and thank you for contributing to the important work that we all do!

Sincerely,

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Conference Co-Chair

Alex Kuo PhD
Conference Co-Chair
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Conference Badges
Please wear your name badge at all times to ensure admittance to the Opening Reception, conference sessions, and the Gala dinner.

Proceedings
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Student Posters
Private judging of the student posters will take place between 2:00 – 5:00 pm Thursday, February 14, in the Harbour Room of the Ocean Pointe Resort. The posters will be open to the public at 5:00 pm. The winners will be announced that evening. The posters will remain on display all day Friday and Saturday.

Professional Posters
The practitioner (non-student) posters are on display Thursday evening and all day Friday and Saturday in the Harbour Room.

Registration and Information Desk
Registration desk staff will be available to assist you with information and to sell West Coast Gala Dinner tickets and tickets to the ITCH 2019 Legacy Art Gallery Reception. They can also answer your questions about Victoria. The Registration Desk will be open throughout the conference.

Opening Reception
The opening wine and cheese reception will take place in the Harbour Room Thursday, February 14 between 5:00 – 7:00 pm. The winners of the student poster contest will be announced shortly after 5:00. At this time delegates are encouraged to view the student and practitioner posters.

West Coast Gala Dinner
Join us for a relaxing evening on Friday, February 15 starting with a cash bar at 6:30 pm followed by a bountiful gourmet West Coast buffet to tantalize your taste buds at 7:00. There are sign-up sheets for dinner seating at the conference Registration Desk.

Entertainment will be provided by Spiral Swing -- Playing swing, Latin and light jazz from the great American songbook. Sponsored by Jitsu Technologies.

If your registration includes a ticket for the West Coast Gala, it is included with your nametag. If you do not wish to use your ticket, please return it to the Registration Desk so we may give it to one of our volunteers.

ITCH 2019 Legacy Art Gallery Reception
On Saturday, February 16 you are invited to attend a reception at the Legacy Art Gallery, 630 Yates Street, a 12 minute stroll from the Ocean Pointe Resort. You may purchase tickets online or (cash or cheque only) at the Registration Desk.
James Coward Keynote Lecture, Friday, February 15 | 8:45 am

Dr. Sabine Koch is the Strategic Professor of Health Informatics at Karolinska Institutet in Stockholm, Sweden and the Director of its Health Informatics Centre. Dr. Koch received both an MSc and a PhD degree in Medical Informatics from Ruprecht-Karls University Heidelberg, Germany. Her early research was in dental informatics, especially dental imaging and IT supported integrated care concepts for dental offices. Her fields of interest include models for collaborative care, especially home care, human factors/usability and evaluation of information systems. Dr. Koch’s current research focuses on a socio-technical perspective to integrating health, social and self care. Her research also includes guideline-based clinical decision support and information visualization for enhanced decision making.

Dr. Koch is the President-elect of the International Medical Informatics Association (IMIA) and Editor-in-Chief of Methods of Information in Medicine. She is a frequent member of the Scientific Program Committees for different international conferences in the field, she is an Associate Editor of Applied Clinical Informatics and a member of the editorial board of the International Journal of Medical Informatics.

Steven Huesing Keynote Lecture, Saturday, February 16 | 8:45 am

Yu-Chuan (Jack) Li has been a pioneer of Medical Informatics research in Asia. He served as a Vice President of Taipei Medical University (TMU) (2009-2011). He is the Dean of the College of Medical Science and Technology and a Distinguished Professor of the Graduate Institute of Biomedical Informatics since 1998. He obtained his MD from TMU in 1991 and his PhD in Medical Informatics from University of Utah in 1994. Due to his achievement in establishing EHR exchange models among hospitals and his dedication to IT applications in patient safety and care, he was awarded the Ten Outstanding Young Persons of the Year in 2001. He has been Principal Investigator of many national and international projects in the domain of Electronic Health Record, Patient Safety Informatics and Medical Big Data. He is author of 130 scientific papers and 3 college-level textbooks.

Jack became an elective fellow of the American College of Medical Informatics (FACMI), (2010), the Australian College of Health Informatics (FACHI), (2010), a founding member of the International Academy of Health Sciences Informatics (IAHSI), (2017) and also the President of Asia Pacific Association for Medical Informatics (APAMI) from 2006 to 2009. Currently, he is the Editor-in-Chief of two internationally renowned journals - Computer Methods and Programs in Biomedicine and the International Journal for Quality in Health Care. His main areas of expertise are: AI in Medicine, Patient Safety Informatics, and Medical Big Data Analytics.
Thomas Payne is a primary care internist, Professor of Medicine and the Medical Director for Information Technology Services at University of Washington Medicine. He is Past Board Chair of the American Medical Informatics Association (AMIA).

Dr. Payne’s major professional interest is the use and evaluation of clinical computing systems, especially electronic health records (EHRs) in patient care, clinical research, and quality improvement. He graduated from Stanford University and received his medical degree from the University of Washington. He completed his residency in medicine at University of Colorado and an NLM fellowship in Medical Information Science at Massachusetts General Hospital and the Harvard School of Public Health. He is an attending physician at UW Medical Center and Harborview Medical Center.

He chaired the AMIA EHR 2020 Task Force and is currently on the faculty of the AMIA Clinical Informatics Board Review course. He is the Associate Director of the UW Medicine Center for Scholarship in Patient Care Quality and Safety, where he partners with colleagues from the UW, Washington School of Medicine and College of Engineering to explore ways to write better and more accurate clinical notes and apply natural language processing tools to the content of notes.

Keynote Lecture Titles

Sabine Koch “Consumer Health Informatics – Opportunities, Challenges and Trends”
Jack Li “Artificial Intelligence for Safer and Earlier Medicine”
Thomas Payne “The Electronic Health Record as a Catalyst for Quality Improvement in Patient Care”
Workshops Abstracts: Thursday
9:00am – 10:30am


Description
Patients and the public have vital perspectives as key stakeholders in the health system. The value of engaging patients and the public is increasingly being recognized by health system planning and delivery organizations and by health researchers. We invite you to come and learn about this dynamic and evolving field and consider how it applies to your role in digital health.

The workshop will begin with a primer outlining the various interpretations of the term “patient engagement”. It will then feature Greg’s Story: Falling through the Cracks. Greg Price died from a highly treatable form of cancer when gaps in communication resulted in delays in diagnosis, referrals and ultimately treatment. Greg’s sister, Teri, will share her family’s experience of working with the Health Quality Council of Alberta to analyze the gaps and to make recommendations for system change. Dr. Kendall Ho and one of his patient partners, Colleen McGavin, will then describe how patient engagement is tightly integrated into research and brings great benefits to the TEC4Home clinical project, a 4-year randomized-controlled trial to determine if home health monitoring can safely support heart failure patients transitioning from acute care to the community and to avoid re-admission to hospital. Dr. Kim McGrail, Scientific Director of Population Data BC and the Data Director for the BC SUPPORT Unit will discuss a research project using public deliberation methods to determine appropriate governance for uses of data sets that link many different sources; for example, hospital, physician, genomic, early childhood, workplace and patient-reported information. The workshop will include a description of the framework used by the BC SUPPORT Unit to coach health researchers who wish to engage patient partners. Plenty of time will be allowed for audience questions and discussion.

Learning Objectives
- Understand the different ways patients, families and the public can be engaged
- Understand the value-add of engaging patients, families and the public in research and health policy
- Understand four key factors that should be considered for successful engagement: building relationships, training, support and evaluation.
- Gain insight to inform your engagement efforts: what works and pitfalls to avoid

Presenters
- Dr. Kendall Ho, University of British Columbia, Canada
- Colleen McGavin, BC SUPPORT Unit, Canada
- Dr. Kim McGrail, BC SUPPORT Unit, Canada
- Teri Price, Greg’s Wings Projects, Canada

1 BC SUPPORT (Support for People and Patient-Oriented Research and Trials) Unit: Part of Canada’s Strategy for Patient-Oriented Research (SPOR) led by the Canadian Institutes of Health Research (CIHR)
B: Organizational Approaches to Health Information Technology Quality and Safety

Description
Technology-induced errors are a significant and important issue to address when designing, developing, implementing and maintaining health information technologies. For organizations, this is a complex process and is characterized by the need to fully map out and understand how and where current technologies are introducing errors, including where there is a potential for new types of errors to emerge (as in when a new technology is introduced into the care environment or software is updated to include new features, functions and workflows). Here, organizations must understand their own strengths and weaknesses and apply techniques and approaches that can prevent and mitigate technology-induced errors. These approaches can draw on current accepted approaches and need to be tailored to the technologies used in the organization from a safety and from a corporate governance perspective. This workshop will introduce participants to quality and safety issues (involving technology-induced errors) and will help individuals develop their own organizational strategies for addressing these quality and safety issues.

Learning Objectives
Participants will:
1. List out the common types of technology-induced errors that arise from user interface, workflow and interfacing of systems issues within and across organizations.
2. Describe the most commonly used approaches (to preventing and mitigating technology-induced errors) that are used internationally.
3. Contextualize one’s organizations’ approach to error management and situate it within an international context.
4. Consider the strengths, weaknesses, opportunities and gaps of one’s organizations’ current safety approaches.
5. Develop a plan to extend existing organizational approaches and fill in gaps that are present in one’s organizational strategy for technology safety.

Presenters
- Elizabeth Borycki, University of Victoria, Canada
- Andre Kushniruk, University of Victoria, Canada
- Yalini Senathirajah, University of Pittsburgh, United States of America
C: Improving Patient Outcomes with Big Data: Privacy and Ethical Issues

Description

Big data is a complex phenomenon of technical advances in storage capacity, computational speed, the low cost of data collection and predictive analytics. Artificial Intelligence (AI) is a key to unlocking the value of big data, and machine learning underpins and facilitates AI. All three concepts combine to result in big data analytics, the properties of which challenge compliance with information privacy principles that have led to recent significant legislative changes in data protection. Further, the use of profiling and automated decision-making made possible by machine learning and AI go well beyond privacy protections. There is rising consensus that a digital ethics framework is needed to provide modern terms for identifying, analyzing and communicating new human realities with existing and foreseeable technological changes.

The workshop will progress as follows:

1. Presentations
   a. Big Data challenges the right to privacy: Review of private and public body privacy legislation including the EU General Data Protection Regulation (GDPR) -
   b. Big Data challenges ethics in human-related research: Ethical Review Boards –
2. Case study – One example being considered is Cambridge Analytica: What we learned
3. Presentation
   a. Will a new ethical framework work with Big Data? Introducing Digital Ethics -
4. Discussion of how applied digital ethics could protect human rights and support Big Data analytics in a health and social context.

Learning objectives

Participants will be able to:

1. Understand the misalignment between Big Data and privacy legislation.
2. Be aware of the limitations of research ethics in Big Data analytics.
3. Examine the concept of digital ethics and its potential application in Big Data analytics.

Presenters

- Paulette Lacroix, PC Lacroix Consulting, Canada
- Caitlin Lemiski, Office of the Information and Privacy Commissioner for BC, Canada
- Eike Kluge, University of Victoria, Canada
D: Building a Provincial Home Health Monitoring (HHM) Service

Description

Virtual care solutions such as Home Health Monitoring are demonstrating improved patient outcomes through user-friendly health information technology. In this workshop we aim to share knowledge and information about the implementation of a provincial virtual care service in Canada and to engage local and global clinical, operational and academic leaders in the compilation of recommended strategies for widespread adoption and expansion of a virtual care service.

Through a tri-partnership, the British Columbia (BC) Ministry of Health, BC Health Authorities, and TELUS set out to improve population health, enhance patient and provider experience of care and reduce health system costs through the provision of virtual care. HHM in BC targets specific populations with chronic health conditions, and allows healthcare providers to remotely monitor patients to identify issues and changes, and to intervene in a timely manner. HHM enabled care engages clients and their families by educating them about their chronic conditions and symptoms, helping patients to avoid unnecessary emergency department visits and lengthy hospitalizations. A clinical monitoring protocol comprises the care model, workflows, HHM monitoring interview (patient biometric and non-biometric health assessment questions), evaluation and technology. Through an online interactive screen, these monitors also can “ask” patients simple questions about their health and healthcare needs and can provide basic education about illness, treatment, health, and wellness. A clinician accesses the data through a web-based interface. HHM implementations in BC have demonstrated the following results:

- 85% reduction in ED visits
- 93% reduction in hospital admissions
- 94% reduction in hospital length of stay
- 93% patient satisfaction with the HHM service
- $12,500 (approx.) in cost avoidance per patient from reduced inpatient, emergency and other provincially-insured services 3 months pre/post HHM (for heart failure)

Learning Objectives

1. Summarize challenges and lessons learned about successful delivery of a provincial home health monitoring (HHM) program in multi-party partnership.
2. Collaborate on evaluation methodology concerning technology-enabled health care.
3. Identify opportunities for expansion and strategies for organizational adoption of HHM.

Presenters

- May Tuason, TELUS Health, Canada
- Natasha Thambirajah, BC Ministry of Health, Canada

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2 2017 Island Health HHM Evaluation
E: Changing App “Behavior” to Change Health Behaviors

Description
Health intervention research has used a number of approaches to try to influence user health behaviors. The Behavior Change Technique Taxonomy (BCTT) is one method to classify the behavior change techniques (Michie et al., 2013). The BCTT includes 93 distinct behavior change techniques. The BCTT has been found to be successful in identifying the critical techniques that are present within interventions (Michie, et al., 2013). Most of the studies that have applied this taxonomy have focused on in-person interventions.

Our team has been applying the taxonomy to telehealth and mobile health applications. Mobile health applications offer unique opportunities for the delivery of behavior change techniques that may not be possible with live in-person interventions. Our preliminary findings indicate many health apps have been developed with little attention to the successful techniques for behavior change. Findings such as these may be contributing to low sustained use of health apps and the limited evidence of health outcome improvement. Our team has developed prototype health apps incorporating behavior change techniques to explore if this improves willingness to use and perceived usefulness.

This workshop will expose participants to the BCTT. Participants will identify behavior change techniques in existing interventions and explore how the BCTT can be used in intervention development. The workshop will offer participants the opportunity to develop low-fidelity prototypes of health app intervention using the BCTT. Participants will receive information on BCTT training resources and mobile app prototyping software. This workshop would be of interest to mobile health app developers and health intervention researchers.

Learning Objectives
1. Describe the Behavior Change Technique Taxonomy (BCTT)
2. Distinguish individual Behavior Change Techniques used in example interventions
3. Apply the BCTT in intervention designs
4. Discuss the unique opportunities and limitations of mobile health applications using the BCTT
5. Design a prototype mobile health intervention using BCTT

Presenters
- Marcy Antonio, University of Victoria, Canada
- Ashley Garnett, University of Victoria, Canada
- Karen Courtney, PhD, RN, University of Victoria, Victoria, BC, Canada

Reference

Acknowledgement
This project was supported by grant number R01HS022889 from the Agency for Healthcare Research and Quality. The content is solely the responsibility of the authors and does not necessarily represent the official views of the Agency for Healthcare Research and Quality.
F: Usability of Hospital Information Systems - Challenges for the Future

Description
To get the audience acquainted with the topic, the presenters will demonstrate how usability aspects can be investigated on a national level. The presenters will show examples from four countries (Finland, Germany, Denmark and Canada) and present results from recent questionnaires on the usability of hospital information systems (HIS) from a user perspective. The results will be compared and similarities as well as differences will be worked out: what is country-specific, what seems to be an issue anywhere? The importance of usability aspects in selecting, developing and improving a hospital information system will be discussed with the participants.

Learning objectives
Upon completion of this workshop, participants have gained further knowledge of the importance of usability issues in HIS. The participants will learn what aspects are especially important to the users and should be carefully considered in selecting, developing and/or improving a hospital information system.

Presenters
- Christian Juhra, University Hospital Münster, Germany
- Johanna Kaipio, Aalto University, Finland
- Christian Nøhr, The Maersk Mc-Kinney Moller Institute, University of Southern Denmark

Reference

G: AI and Machine Learning in Healthcare: From Hype to Impact

Description
AI and machine learning offer great promises for healthcare and many health organizations are eager to adopt such technologies. However, to realize the promises of AI and create real impact is no easy task. What is hype and what is the real potential of AI for healthcare? How can AI adoption be an integral part of organizational transformation, helping physicians, nurses, and hospital administrators improve their performance without adding workload? What can AI do for patients? How to use AI to transform the existing Electronic Health Records (EHR)? How to assess the costs, benefits, and feasibility of AI adoption?

This workshop is intended to address these issues. The main topics include:

1. The state of AI and AI-related technologies: Machine learning, machine image recognition, natural language processing, AI conversational agents, etc.
2. AI and AI-related technologies in healthcare
   • Machine learning on medical images;
   • Diagnostic and predictive analytics;
   • next EHR: AI-powered EHR—From “systems of records” to “systems of intelligence” and “systems of engagement”;
   • Natural language processing of descriptive health data (e.g., physician’s notes);
   • AI for productive patient engagement (e.g., mHealth, AI health assistants);
   • AI for medical genomics and drug development.
3. Showcase of AI integration in health organizations
4. Existing AI tools, platforms, and services: AI platform APIs, Machine Learning as a Service, EHR vendor’s machine learning add-ons, etc.;
5. Security, safety, and ethics of AI in healthcare
7. Hands-on experience with two approaches to machine learning (deep learning and rule-based semantic analysis).
8. Case discussion: Participants are encouraged to bring their own AI plans and projects for discussion, sharing experiences and lessons learned.

Learning Objectives
This is an introduction to AI and machine learning for health-related professionals and organizations. The target audience is health Informatics specialists, health IT professionals, healthcare administrators and leaders. The main learning objects of the workshop are to:

1. Understand the variety of AI and related technologies, particularly their benefits and limitations, as well as the context of proper use.
2. Gain insights on how to evaluate, adopt, and integrate AI and related technologies into healthcare systems for improving hospital performance and patient care.

Presenters
• Mei Chen, Cogilex R&D Inc, Quebec, Canada
• Michel Décar, Cogilex R&D Inc., Quebec, Canada
H: Influencing Public Policy: Individual Citizens Can Promote Usable Health Information Technology Safety

Description
In 2015 at ITCH, we identified the reasons why laws and regulations govern access to health information, restrict access to public health information, and the nature of emerging risks of breaching privacy. In 2017 we revisited the privacy protection side of information privacy and access to identify reasons for slow progress in improving privacy protection. For 2019, we propose to address the access side. The workshop will progress as follows:

1. Brief presentations
   - GDPR as a game-changer: what it changes and what it does not change
   - FOI: how to apply it, what to expect in return, and what to do with that information (how to attract media attention and work with journalists)
   - Public health informatics as a focal point, and the power of presenting stories (stories trump data, tribalism trumps stories)
2. Illustration with a completed case study
   - Example to be determined from the book “Social Policy, Public Policy: From Problem to Practice”
3. Discussion of a current issue as second case study

Learning Objectives
1. Summarize impact of the recently enacted General Data Protection Regulation (GDPR) as a game-changer;
2. Understand the use of formal Freedom Of Information and other informal ways to request public documents that trace the development of governance body decisions;
3. Discuss strategies to engender public support by working with the media; and
4. Analyze real-life case studies.

Presenters:
- Paulette Lacroix, PC Lacroix Consulting, Canada
- Kathryn Gretzinger, (UBC Graduate School of Journalism, Canada
- David Birnbaum, UBC School of Population & Public Health, Canada
**Workshops Abstracts: Thursday**  
**1:30pm – 3:30pm**

I: Evaluating Patient Access to eServices and Health Information – Leading examples informing a national measurement strategy

**Description**
Internationally, patients increasingly have the opportunity to view their own health information and engage the health system virtually through eServices like messaging, eBooking and virtual visits. Online access to health information is increasingly available in Canada, but the extent and type of access varies across provinces. Access to eServices remains sparse. Evaluations of the implementation and impact of patient’s access to their health information and use of eServices suggest improvements in value-based outcomes for Canadians and the health system. Evidence also suggests great variability in value depending on the solutions used, patients targeted and contexts in which they are implemented. There also remains notable gaps in evidence across specific settings of care and a need for greater rigor in methods used for these evaluations.

The inevitable expansion of these kinds of services demands a more structured approach to deploying availability across the health system, measuring citizen and clinician uptake, and evaluating effects on health care services use and outcomes. The breadth and complexity of the needed research and evaluation requires collaboration across stakeholder groups and across Canada. This workshop will bring together expert presenters to provide a view of the current state, and will seek to engage participants around establishing a national framework and defined measurement approaches applicable to current and future initiatives nationwide.

**Learning Objectives**
- Gain an understanding of the current evidence base and gaps related to patient access to their information and eServices, with a focus on outcomes for Canadians and the Health System
- Learn about a few leading Canadian examples of completed evaluations, with a focus on methodology and implications for measurement going forward
- Engage in a discussion about the priority areas for investigation and ideal characteristics of a national measurement strategy to monitor progress towards outcomes
- Explore opportunities to accelerate this work, including networking with researchers, leveraging existing/ongoing measurement or data sets, natural experiments, etc.

**Presenters**
- Chad Leaver, Canada Health Infoway, Canada
- Kim McGrail, University of British Columbia, Canada
J: Increasing Usage and Safety of Medication Alerting Systems by Improving Their Usability

Description
Medication alerting systems (e.g., drug-drug interactions pop-up alerts) can change prescribers’ behavior by helping them avoid errors and ultimately, improve the quality of the medication management process. Nonetheless, despite great improvements during the last decade, these tools still suffer from usability defects. Usability issues have the potential to create consequences such as incorrect clinical decisions, decreasing patient safety, and users rejecting the alerting systems. Therefore, the usability of medication alerting systems warrants special scrutiny, with the aim of avoiding usability-induced use errors.

This workshop aims to present and discuss with the attendees the knowledge and the methods available to design new medication alerting systems with as few usability defects as possible or identify usability defects in existing systems so that they can be resolved, and the systems improved. First, a short introduction will depict issues related to the usability of medication alerting systems. Second, the fundamentals of usability and of the user-centered design process will be explained. Third, the usability knowledge relevant to design medication alerting systems (usability criteria and evidence-based usability design principles) will be presented. Fourth, participants will be introduced to the heuristic evaluation method. Finally, the attendees will practice heuristic evaluation by assessing screenshots of actual alerting systems [provided by the attendees] and/or fictitious mockups.

Learning objectives
The workshop will provide the attendees with knowledge and methods to help them identify usability defects in medication alerting systems, explain why they are problematic, and generate recommendations to fix them.

Presenters
- Romaric Marcilly, Lille Academic Hospital, France
- Helen Monkman, University of Victoria, Canada
- Sylvia Pelayo, Lille University, France
Linking Knowledge Sources and Patient Records, Using Clinical Coding

Linking sources of clinical knowledge with the Electronic Health Record, is a relatively 'quick win' for improving the usability of the EHR and supporting clinical decision making, with associated benefits for clinical safety and patient outcomes. This workshop provides hands-on experience with the open source cityEHR, a structured electronic health record, in which all clinical information is stored as HL7 CDA (XML) documents.

Using a structured record allows clinical coding to be applied at any level of clinical detail, either as the information is gathered (pre-ordinated) or after it has been stored in the record (post-ordinated). The structured, coded XML record can then be linked to knowledge sources using the Resource Description Framework (RDF), an established XML-based meta data standard. RDF allows any accessible knowledge source to be annotated with clinical codes, so that the link can be made between coded clinical information for an individual patient and coded clinical knowledge.

The workshop will be a mixture of presentation, discussion and hands-on exercises with the cityEHR. Attendees can participate in the hands-on elements in one of three ways:

1. Download and install cityEHR on their own laptop or PC
2. Access a local cityEHR server through a web browser on their laptop or PC
3. Follow the demonstration by the workshop leader

Learning Objectives

By participating in this workshop, attendees will:

- gain hands-on experience with an open source, structured EHR
- understand the relationship between ISO-13606, HL7 CDA and SNOMED CT
- create or modify their own clinical information models (ISO-13606/HL7 CDA)
- apply clinical coding (SNOMED-CT) to the models
- locate relevant clinical knowledge sources on the web
- learn about RDF and its role in Linked Data and reasoning systems
- apply clinical coding to the knowledge sources, using RDF
- create sample records to observe the linkage of clinical information and knowledge

Presenter

- Dr John Chelsom, Seven Informatics, United Kingdom
The State of Science in Health Information Exchange Description

According to the Office of National Coordinator for Health Information Technology in the United States, “health information exchange” (HIE) allows doctors, nurses, pharmacists and other care providers and patients to appropriately access and securely share patient’s vital medical information electronically, [thus] improving the speed, quality, safety and cost of patient care.”\(^3\) Similarly, the pan-Canadian Clinical Interoperability Steering Committee recently published an action plan to accelerate the interoperability of digital health solutions in Canada, with the vision to “improve the quality of patient care through the effective sharing of clinical information among health care organizations, clinicians and their patients.”\(^4\) While the need to share health information across organizational boundaries seems obvious, the current state of evidence on HIE adoption, use, and impact is less clear. Since HIEs are expensive sociotechnical endeavors that require an enormous amount of time and resources, it is prudent to demonstrate the value of HIE to justify the investments.

Learning Objectives

In this workshop, we will discuss what we know, do not know, and want to know about health information exchange (HIE). To do so, we will examine current HIE approaches, use, impact and lessons. This will include a review of published evidence on HIE to date, comparison of HIE status in Canadian jurisdictions, HIE best practice examples, outstanding issues and future work ahead.

The target audience for this workshop include policy/decision makers, care providers and eHealth practitioners who are involved in HIE planning, implementation, support and evaluation. The workshop should also be of interest to researchers, educators, students, patients and the public at large who wish to learn more about HIE. The format of this workshop will be interactive in nature, with plenty of opportunities for the audience to share their questions, ideas and experiences regarding HIE within and outside of their surroundings.

Presenters

- Francis Lau, University of Victoria, Canada
- Jeff Barnett, University of Victoria, Canada

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\(^3\) HealthIT.gov. What is HIE? n.d. URL: https://www.healthit.gov/topic/health-it-and-health-information-exchange-basics/what-hie ; Jun 20, 2018

Thursday, February 14, 2019

8:30 am Registration and Muffins and Coffee

9:00 – 10:30 Concurrent Workshops

Organizational Approaches to Health Information Technology Quality and Safety (B)
  Elizabeth Borycki, University of Victoria, Canada
  Andre Kushniruk, University of Victoria, Canada
  Yalini Senathirajah, University of Pittsburgh, USA

Improving Patient Outcomes with Big Data: Privacy and Ethical Issues (C)
  Paulette Lacroix, PC Lacroix Consulting), Canada
  Caitlin Lemiski, Office of the Information and Privacy Commissioner for BC, Canada
  Eike Kluge, University of Victoria, Canada

Patient Engagement – What, Why & How (A)
  Kendall Ho, University of British Columbia, Canada
  Colleen McGavin, BC SUPPORT Unit, Canada
  Kim McGrail, BC SUPPORT Unit, Canada
  Teri Price, Greg’s Wings Projects, Canada

Building a Provincial Home Health Monitoring (HHM) Service (D)
  May Tuason, TELUS Health, Canada
  Natasha Thambirajah, BC Ministry of Health, Canada

10:30 – 10:45 Break

10:45 – 12:15 Concurrent Workshops

AI and Machine Learning in Healthcare: From Hype to Impact (G)
  Mei Chen, Cogilex R&D Inc, Canada
  Michel Décary, Cogilex R&D Inc., Canada

Usability of Hospital Information Systems - Challenges for the Future (F)
  Christian Juhra, University Hospital Münster, Germany
  Johanna Kaipio, Aalto University, Finland
  Christian Nøhr, The Maersk Mc-Kinney Moller Institute, Denmark

Sponsored by CGI

Arbutus foyer
Thursday, February 14 workshops cont’d

10:45 – 12:15  **Concurrent Workshops**

**Changing App “Behavior” to Change Health Behaviors** (E)  
Marcy Antonio, University of Victoria, Canada  
Ashley Garnett, University of Victoria, Canada  
Karen Courtney, University of Victoria, Canada

**Influencing Public Policy: Individual Citizens Can Promote Usable Health Information Technology Safety** (H)  
Paulette Lacroix, PC Lacroix Consulting, Canada  
Kathryn Gretsinger, UBC Graduate School of Journalism, Canada  
David Birnbaum, UBC School of Population & Public Health, Canada

12:15 – 1:30  Lunch  Arbutus foyer

1:30 – 3:30  **Concurrent Workshops**

**The State of Science in Health Information Exchange** (L)  
Francis Lau, University of Victoria, Canada  
Jeff Barnett, University of Victoria, Canada

**Increasing Usage and Safety of Medication Alerting System by Improving Their Usability** (I)  
Romaric Marcilly, Lille Academic Hospital, France  
Helen Monkman, University of Victoria, Canada  
Sylvia Pelayo, Lille Université, France

**Evaluating Patient Access to eServices and Health Information – Leading Examples Informing a National Measurement Strategy** (I)  
Chad Leaver, Canada Health Infoway, Canada  
Kim McGrail, University of British Columbia, Canada

**Linking Knowledge Sources and Patient Records, Using Clinical Coding** (K)  
Dr John Chelsom, Seven Informatics, United Kingdom

2:00 – 5:00  Private judging of the student poster contest. **Closed to public and registrants**  Harbour Room  
Sponsored by Canada Health Infoway

3:30 – 5:00  **Free time**

5:00  Opening Reception  Welcoming remarks by Jamie Cassels, President of the University of Victoria.  Harbour Room  
Winners of the student poster contest will be announced.
### Friday, February 15, 2019

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<th>Time</th>
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<td>8:00 am</td>
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<td>Muffins and Coffee</td>
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<td>8:30</td>
<td>Introduction of keynote speaker</td>
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<td><strong>JAMES COWARD KEYNOTE LECTURE</strong></td>
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<tr>
<td></td>
<td>Sabine Koch, MSc, PhD&lt;br&gt;Karolinska Institutet, Sweden&lt;br&gt;“Consumer Health Informatics – Opportunities, Challenges and Trends”</td>
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<tr>
<td>9:45 – 10:15</td>
<td>Break</td>
<td>Sponsored by Pacific Blue Cross</td>
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<td>10:15 - 12:15</td>
<td><strong>Concurrent Paper Sessions</strong></td>
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<tr>
<td>Big Data and Data Mining</td>
<td>“A Hadoop/MapReduce Based Platform for Supporting Health Big Data Analytics”</td>
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<td>Alex Kuo, University of Victoria, Canada</td>
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<td>“Factors Associated with Increased Adoption of a Research Data Warehouse”</td>
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<td>Ahmad Baghal, UAMS College of Medicine, USA</td>
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<td>“Electronic Physician Profiles: Developing an Interactive Web-based Report for Physicians at Island Health”</td>
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<td>Lisa McEwen, Island Health, Canada</td>
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<td>“Insight into Health Care Outcomes for Persons Living with Mid to Late Stage Heart Failure Using Health Data Analytics”</td>
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<td>Christo El Morr, York University, Canada</td>
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<td>Interoperability</td>
<td>“eSource for Standardized Health Information Exchange in Clinical Research: A Systematic Review”</td>
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<td>Maryam Garza, University of Arkansas, USA</td>
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<td>“FHIRForm: An Open-source Framework for the Management of Electronic Forms in Healthcare”</td>
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<td>Bellraj Eapen, McMaster University, Canada</td>
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<td>“Canadian Validation of German Medical Emergency Datasets”</td>
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<td>Josh Koczerginski, University of British Columbia, Canada</td>
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<td>“Data Migration from Operating EMRs to OpenEMR with Mirth Connect”</td>
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<td>Jing Lin, University of British Columbia, Canada</td>
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</table>
Concurrent paper presentations cont’d

10:15 – 12:15

Healthcare Modeling and Simulation
Moderator: Abdul Roudsari

“Modelling Keyword Search Strategy: Analysis of Pharmacovigilance Specialists’ Search of MedDRA Terms”
Romaric Marcilly, Lille Academic Hospital, France

“Applying the Effective Technology Use Model to Implementation of Electronic Consult Management Software”
Blake Lesselroth, University of Oklahoma, USA

“Using Simulation Technology to Improve Patient Safety in Airway Management by Practicing Otolaryngologists”
Adrian Gooi, University of Manitoba, Canada

“Using a Markov Chain Model to Analyze the Relationship Between Avoidable Days and Critical Care Capacity”
Darren Hudson, University of Alberta, Canada

12:15 – 1:00
Buffet lunch
Harbour Room

Concurrent Paper Sessions

Electronic Health Records
Moderator: Abdul Roudsari

“Estimating Clinical Trial Bleeding Events Using Electronic Health Record Data”
Eric Eisenstein, Duke University, USA

“Data Profiling in Support of Entity Resolution of Multi-institutional EHR Data”
Maryam Garza, University of Arkansas, USA

“Development of an Interprofessional Educational Electronic Health Record”
Glynda Rees, British Columbia Institute of Technology (BCIT), Canada

“Evaluative Outcomes in Direct Extraction and Use of EHR Data in Clinical Trials”
Amy Nordo, Pfizer, USA
**Patient Engagement and Patient Centered Care**

*Moderator: Karen Courtenay*

- **“Digital Process Innovation for Patient Centred Cancer Symptom Management”**
  Craig Kuziemsky, University of Ottawa, Canada

- **“Evaluation of Technology Use in an Inter-disciplinary Patient-centered Health Care Team”**
  Berglind Smaradottir, University of Agder, Norway

- **“Encouraging the Use of eHealth Services: A Survey of Patients’ Experiences”**
  Johanna Kaipio, Aalto University, Finland

- **“Designing Health Information for Mutual Empowerment in the Joint Journey of Patients and Healthcare Professionals”**
  Avi Parush, Israel Institute of Technology, Israel

**Artificial Intelligence**

*Moderator: Yuri Quintana*

- **“Linking Health Records with Knowledge Sources Using OWL and RDF”**
  John Chelsom, Seven Informatics, UK

- **“Data for Adherence Decision Support”**
  Simon Diemert, Critical Systems Labs Inc, Canada

- **“Surgeon and Assistant Point of View Simultaneous Video Recording”**
  Adrian Gooi, University of Manitoba, Canada

- **“An Ontology Approach for Knowledge Representation of ECG Data”**
  Nicoleta Zouri, Ryerson University, Canada

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3:00 – 3:15  **Break**  Arbutus Foyer
### Mobile Technology and Telehealth

**Moderator:** Danica Tuden

**Arbutus A**

- **“Advancing Telehealth Nursing Practice in Oncology: Factors Affecting Nurse Use of Electronic Symptom Management Guidelines”**  
  Elizabeth Borycki, University of Victoria, Canada

- **“Review of Mobile Apps for Prevention and Management of Opioid-Related Harm”**  
  Monica Aggarwal, University of Toronto, Canada

- **“Describing Telenurses’ Decision Making Using Clinical Decision Support: Influential Factors Identified”**  
  Danica Tuden, University of Victoria, Canada

- **“Effectiveness of e-learning in a Medical School 2.0 model: Comparison of Item Analysis for Student-Generated vs. Faculty-Generated Multiple-Choice Questions”**  
  Adrian Gooi, University of Manitoba, Canada

### National & International Strategies, Policy and Frameworks

**Moderator:** Blake Lesselroth

**Arbutus B**

- **“Developing a Preliminary Conceptual Framework in Knowledge Translation and Health Information Technology for Transparency in Policy-Making (the KhITT framework)”**  
  Anastasia Mallidou, University of Victoria, Canada

- **“Design for a Canadian Digital Health Policy & Practices Observatory”**  
  Karim Keshavjee, University of Toronto, Canada

- **“Ghosts in the Machine: Identifying the Digital Health Information Workforce”**  
  Kathleen Gray, University of Melbourne, Australia

- **“From Siloed Applications to National Digital Health Ecosystems: A Strategic Perspective for African Countries”**  
  Karl Stroetmann, empirica Communications & Technology Research, Germany

- **“An Informatics Framework for Maternal and Child Health (MCH) Monitoring”**  
  Yuri Quintana, Harvard Medical School, USA
Friday, February 15, 2019 Concurrent paper presentations cont’d
3:15 – 5:15

**Health Information Technology Safety and Quality**

**Moderator:**
Yalini Senathirajah

“*Training as an Intervention to Decrease Medical Record Abstraction Errors Multicenter Studies*”
Meredith Zozus, UAMS College of Medicine, USA

“A Qualitative Evidence Synthesis of Adverse Event Detection Methodologies”
Melody Penning, UAMS College of Medicine, USA

“Analysis of Anesthesia Screens for Rule-based Data Quality Assessment Opportunities”
Zhan Wang, University of Arkansa, USA

“Uncovering the Mysteries of Electronic Medication Reconciliation”
Kristina McDonald, Island Health, Canada

“Rule-Based Data Quality Assessment and Monitoring System in Healthcare Facilities”
Zhan Wang, University of Arkansa, USA

6:30
Cash bar
Arbutus Foyer

7:00
West Coast Gala Dinner
Entertainment by Spiral Swings
Arbutus Ballroom
– sponsored by Jitsu Technologies
### Saturday, February 16, 2019

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<td><strong>STEVEN HUESING KEYNOTE LECTURE</strong></td>
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<td><strong>Jack Li, MD, PhD</strong></td>
<td>Taipei Medical University, Taiwan</td>
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<td><strong>“AI for Safer and Earlier Medicine”</strong></td>
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<td>9:45 – 10:15</td>
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<td>10:15 – 12:15</td>
<td><strong>Concurrent Paper Sessions</strong></td>
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<td><strong>Electronic Health Records</strong></td>
<td>“Realizing Quality &amp; Experience Benefits through EHR Adoption &amp; Use: A Conceptual Model”</td>
<td>Gurprit Randhawa, Island Health, Canada</td>
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<td>“Strategies in Electronic Medical Record Downtime Planning: A Scoping Study”</td>
<td>Joe Walsh, University of Victoria, Canada</td>
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<td>“Next Generation EHRs – What Problems are these Systems Aiming to Solve?”</td>
<td>Thomas Schmidt, University of Southern Denmark, Denmark</td>
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<td>“EHR Usage Problems: A Preliminary Study”</td>
<td>Clément Wawrzyniak, Lille University, France</td>
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<td><strong>Human Factors and Usability Engineering</strong></td>
<td>“Approaches to Demonstrating the Effectiveness and Impact of Usability Testing in Healthcare Information Technology”</td>
<td>Andre Kushniruk, University of Victoria, Canada</td>
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<td>“Simulation of eHealth Scenarios with Role-play Supported by an Interactive Smartphone Application”</td>
<td>Berglind Smaradottir, University of Agder, Norway</td>
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<td>“The Use of Head-worn Augmented Reality Displays in Health Communications”</td>
<td>Kenny Hong, University of Manitoba, Canada</td>
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<td>“Applying a Pneumatic Interface to Intervene with Rapid Eating Behaviour”</td>
<td>Zuoyi Zhang, University of Manitoba, Canada</td>
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<td>10:15 – 12:15</td>
<td><strong>Personal Health Records and Patient Portals</strong>&lt;br&gt;<strong>Moderator: Gerry Bliss</strong>&lt;br&gt;“Guiding Improvements in User Experience: Results of a Mental Health Patient Portal User Interface Assessment”&lt;br&gt;Gillian Strudwick, University of Toronto, Canada&lt;br&gt;“Improving Access to Healthcare with On-line Medical Appointment System”&lt;br&gt;Winnie Leung, Information Systems, Australia&lt;br&gt;“Adoption Strategies for Electronic Patient Portals: Employing Advanced Data Mining and Analytics”&lt;br&gt;David Wiljer, University Health Network, Canada&lt;br&gt;“Patient and Family Member Readiness, Needs, and Perceptions of a Mental Health Patient Portal: A Mixed Methods Study”&lt;br&gt;Kevin Leung, Centre for Addiction and Mental Health, Canada&lt;</td>
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| 12:15 – 1:00 | **Concurrent Paper Sessions**<br>**Evaluation and Methodology**<br>**Moderator: Francis Lau**<br>“Death: The Simple Clinical Trial Endpoint”<br>Eric Eisenstein, Duke University, USA<br>“Using Digital Health to Support Best Practices: Impact of MRI Ordering Guidelines Embedded Within an Electronic Referral Solution”<br>Lori-Anne Huebner, The eHealth Centre of Excellence, Canada<br>“Use of Agile Project Methodology in Health Care IT Implementations: A Scoping Review”<br>Rav Goodison, University of Victoria, Canada<br>“Towards Developing an eHealth Equity Conceptual Framework”<br>Marcy Antonio, University of Victoria, Canada
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<td>1:00 – 3:00</td>
<td>Human Factors and Usability</td>
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<td>Andre Kushniruk, University of Victoria, Canada</td>
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<td>“Development of a Video Coding Scheme Focused on Socio-</td>
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<td>Yuri Quintana, Harvard Medical School, USA</td>
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<td>Ethics Privacy and Cyber</td>
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<td>Ross Koppel, University of Pennsylvania, USA</td>
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<td>&quot;Healthcare Data Are Remarkably Vulnerable To Hacking:</td>
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<td>Connected Healthcare Delivery Increases The Risks&quot;</td>
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<td>Nelson Shen, University of Toronto, Canada</td>
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<td>&quot;The eHealth Trust Model: A Patient Privacy Research</td>
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<td>Kenneth Moselle, Island Health, Canada</td>
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<td>&quot;Real-world’ De-identification of High-dimensional</td>
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<td>Transactional Health Datasets”</td>
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<td>Vidhi Thakkar, University of Toronto, Canada</td>
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<td>3:00 – 3:15</td>
<td>Break</td>
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Saturday, February 16, 2019 Concurrent paper presentations cont’d
3:15 – 5:15

Mobile Technology and Telehealth
Moderator: Helen Monkman

“Effects of Telenursing Triage and Advice on Healthcare Costs and Resource Use”
Hanne Gidora, Provincial Health Services Authority, Canada

“Factors Affecting Adherence with Telerehabilitation in Patients with Multiple Sclerosis”
In cheol Jeong, Icahn School of Medicine at Mount Sinai, USA

“Updated Mapping of Telemedicine Projects in Denmark”
Mie Kristensen, MedCom, Denmark

“System Dynamics in Remote Monitoring Service for Cardiovascular Implantable Electronic Devices”
Lisa Leung, University of Victoria, Canada

“Applying the Behavior Change Technique Taxonomy to Mobile Health Applications: A Protocol”
Ashley Garnett, University of Victoria, Canada

Patient Engagement and Patient Centered Care
Moderator: Jeff Barnett

“Development of the Patient Experience Questionnaire for Parents of Pediatric Patients (PEQP)”
Johanna Kaipio, Aalto University, Finland

“Tools for Engaging Patients on Patient Platforms”
Claudia Lai, University of Toronto, Canada

“Patient Empowerment: The Role of Technology”
Karim Keshavjee, University of Toronto, Canada

“ICT-Based Interventions for Women Experiencing Intimate Partner Violence: Research Needs in Usability and Mental Health”
Christo El Morr, York University, Canada

“Axe the Fax: What Users Think of Electronic Referral”
Mohamed Alarakhia, eHealth Centre of Excellence, Canada
### Saturday, February 16, 2019 Concurrent paper presentations cont’d

**3:15 – 5:15**

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<th>Health Information Technology Safety and Quality</th>
<th>“Development of Data Validation Rules for Therapeutic Area Standards Data Elements to Improve the Quality of FDA Submissions”</th>
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<tbody>
<tr>
<td><strong>Moderator:</strong> Blake Lesselroth</td>
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<td><strong>Panelists:</strong> Maryam Garza, University of Arkansas, USA</td>
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<td>“Nursing Informaticians Address Patient Safety to Improve Usability of Health Information Technologies”</td>
<td>Amy Williams, Island Health, Canada</td>
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<tr>
<td>“The Value of Patient-Peer Support in Improving Hospital Safety”</td>
<td>Shefali Haldar, University of Washington, USA</td>
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<td>“Reason for Use: An Opportunity to Improve Patient Safety”</td>
<td>Reicelis Casares Li, University of Waterloo, Canada</td>
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<tr>
<td>“Towards a Framework for Health Information Systems-induced Error: A Socio-technical and Lean Approach”</td>
<td>Maryati Yusof, National University of Malaysia, Malaysia</td>
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**7:00 pm**

Reception at the Legacy Art Gallery, 630 Yates Street

*A short 12 minute stroll over the bridge, or 5 minutes by taxi or the hotel shuttle*
### Sunday February 17, 2019

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<td><strong>DENIS PROTTI KEYNOTE LECTURE</strong></td>
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<td><strong>Thomas Payne</strong>, MD, FACMI</td>
<td>University of Washington, USA</td>
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<td><em>“The Electronic Health Record as a Catalyst for Quality Improvement in Patient Care”</em></td>
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<td><strong>Concurrent Paper Sessions</strong></td>
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<tr>
<td><strong>Smart Homes and Cities for Health</strong></td>
<td><strong>“Embedding Health Literacy Tools in Patient EHR Portals to Facilitate Productive Patient Engagement”</strong></td>
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<td>Mei Chen, Cogilex R&amp;D Inc., Canada</td>
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<td><strong>Smart Homes for Healthcare</strong></td>
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<td>Zhirui Li, University of Victoria, Canada</td>
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<td><strong>Smart Home Interactions for People with Reduced Hand Mobility Using Subtle EMG-signal Gestures</strong></td>
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<td>Yuriy Vasylkiv, University of Manitoba, Canada</td>
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<td><strong>Human Factors and Usability Engineering</strong></td>
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<td>Johanna Kaipio, Aalto University, Finland</td>
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<td><strong>Usability Analysis of Contending Electronic Health Record Systems</strong></td>
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<td>Mari Tyllinen, Aalto University, Finland</td>
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<td><strong>Challenges in Displaying Health Data on Small Smartwatch Screens</strong></td>
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<td>Ali Neshati, University of Manitoba, Canada</td>
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<td><strong>Thought Spot: Embedding Usability Testing into the Development Cycle</strong></td>
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<td>David Wiljer, University Health Network, Canada</td>
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New Trends in Health Informatics
Moderator: David Birnbaum

“Assessing the Alignment of Objectives, Instructional Activities, and Assessments in a Biomedical Informatics Curriculum”
Meredith Zozus, UAMS College of Medicine, USA

“Cancer Phenotype Development: A Literature Review”
Maryam Garza, University of Arkansas, USA

“Towards a Clinical Analytics Adoption Maturity Framework for Primary Care”
Jean-Philippe Stoldt, University of Victoria, Canada

12:15 – 1:15
Concurrent panels
What Happens When Things Go Wrong and What Can We Learn from Our Experiences? Arbutus A

Are We Ready for AI in Healthcare? Arbutus B

1:15
Closing Remarks Arbutus A

Thank you for attending ITCH 2019!

Please take the time to complete the brief post-conference survey at https://www.jitsutech.ca/157796
Panel Abstracts

What Happens When Things Go Wrong and What Can We Learn from Our Experiences?

Internationally, health information technology implementations have been both successful and have had set-backs. There exist a number of challenges that may be encountered when implementing health information technologies. These include challenges surrounding patient safety and quality, assessment of value for money, data integrity issues, privacy and security concerns as well as other challenges.

Our panelists will discuss the contributing factors and lessons learned arising from health information technology initiatives that have had both successes and set-backs to inform other future initiatives and enhance their success.

**Moderator:** Dr. Elizabeth Borycki
**Gerry Bliss** - President, Bliss Informatics Inc.
**Douglas Cochrane** – Chair, BC Patient Safety and Quality Council, British Columbia
**Sarah Riddell** – Senior Manager, Performance Audit at the Office of the Auditor General of British Columbia
**Jeanette Van Den Bulk** – Executive Director, Policy and Legislation, British Columbia Government

Are We Ready for AI in Healthcare?

Artificial Intelligence has become one of the most popular topics of debate and is being discussed in relation to everything from self-driving cars to robotics in the home. In healthcare, AI has already had a long history, with some of the first expert systems and original AI applications having been designed for healthcare. However, despite advances in the development of systems such as IBM Watson Oncology (for providing support in diagnosis and treatment of cancer) the question still remains of whether we are ready for AI in healthcare? And if we are, what forms will it take and how will it be disseminated? In addition, what dangers may come with advances in AI in healthcare and how can we mitigate against them to take advantage of advances in AI?

Our panelists will discuss advances of AI in healthcare and medicine from several different angles and answer our motivating question from their perspectives.

**Moderator:** Dr. Andre Kushniruk
**Dr. Karim Keshavjee** – Clinical Architect, CEO InfoClin Inc., Canada
**Dr. Jack Li** – Professor of Medical Informatics, Taipei Medical University, Taiwan
**Dr. Yuri Quintana** – Assistant Professor of Medicine, Harvard University, USA
Visitor Information

Tourism Victoria suggests the following classic Victoria attractions within walking distance:

**Bastion Square**

Part of the original Fort Victoria, the square sits in the heart of downtown overlooking the Inner Harbour and includes several notable late-19th Century landmarks:

- The Court House (designed by architect H.O. Tiedeman) was the first concrete building in Victoria, built in 1889.
- The Law Chambers, designed by F.M. Rattenbury, was built in the late 1800s.
- Burnes House, originally a hotel in 1882 (then a brothel and later a warehouse) was restored in 1967.
- Strousse Warehouse was built in 1885 as a supply centre for gold miners.
- The Board of Trade building was built in 1892 by A.M. Muir.

Be sure to pass through Helmcken Alley for a more sordid look at the square’s past. Once a jailhouse where executions took place and a graveyard for unclaimed bodies of prisoners, it is said to still be haunted since the prison’s demolition in 1885.

**Chinatown**

Chinatown in Victoria is the oldest Chinatown in Canada and the second oldest in North America after San Francisco's. Victoria's Chinatown had its beginnings in the mid-nineteenth century in the mass influx of miners from California to what is now British Columbia in 1858. It is home to Fan Tan Alley the narrowest commercial street in North America—just 0.9 metres (less than 3ft) wide at its narrowest. Originally a gambling district, you’ll now find a variety of interesting shops, restaurants and galleries.

**Royal BC Museum**

675 Belleville Street

See all of British Columbia at the Royal BC Museum, a world-class museum of natural and human history. Explore our permanent galleries and immerse yourself in tales of where we’ve been and where we are going. Discover things and people you never knew before at what TripAdvisor users have twice voted number one in the Top 10 Museums in Canada. Experience authentic artifacts and highly realistic settings -- from the Woolly Mammoth in his rocky, icy world to a tar-scented trip on the HMS Discovery. Stroll through Old Town’s wood-cobbled street and enjoy its shops, cinema and railway station. Visit royalbcmuseum.bc.ca for a current exhibition schedule.

**Fisherman’s Wharf**

1 Dallas Road

Just around the corner from Victoria’s Inner Harbour, Fisherman’s Wharf is a hidden treasure waiting to be discovered. This unique marine destination offers food kiosks, unique shops and eco-tour adventures in a working harbour setting. Wander down to the docks and check out the unique array of commercial, pleasure vessel, and float home moorage. Watch the commercial fishing vessels unload their wares and view wild seals.

END
A Hadoop/MapReduce Based Platform for Supporting Health Big Data Analytics

Alex Kuo\textsuperscript{a}, Dillon Chrimes\textsuperscript{b}, Pinle Qin\textsuperscript{c}, Hamid Zamani\textsuperscript{a}

\textsuperscript{a} School of Health Information Science, University of Victoria, Victoria, BC, Canada
\textsuperscript{b} Vancouver Island Health Authority, Victoria, BC, Canada
\textsuperscript{c} Faculty of Big Data, North University of China, Shanxi, China

Abstract. In this paper, we report our practical experience in designing and implementing a platform with Hadoop/MapReduce framework for supporting health Big Data Analytics. Three billion of emulated health raw data was constructed and cross-referenced with data profiles and metadata based on existing health data at the Island Health Authority, BC, Canada. The patient data was stored over a Hadoop Distributed File System to simulate a presentation of an entire health authority’s information system. Then, a High Performance Computing platform called WestGrid was used to benchmark the performance of the platform via several data query tests. The work is important as very few implementation studies existed that tested a BDA platform applied to patient data of a health authority system.

Factors Associated with Increased Adoption of a Research Data Warehouse

Ahmad Baghal\textsuperscript{a}, Meredith Zozus\textsuperscript{a}, Amanda Baghal\textsuperscript{b}, Shaymaa Al-Shukri\textsuperscript{a}, and Fred Prior\textsuperscript{a}

\textsuperscript{a} Biomedical Informatics, College of Medicine, University of Arkansas for Medical Sciences, Little Rock, AR
\textsuperscript{b} McWhorter School of Pharmacy, Samford University, Birmingham, AL

Abstract. The increased demand of clinical data for the conduct of clinical and translational research incentivized repurposing of the University of Arkansas for Medical Sciences’ enterprise data warehouse (EDW) to meet researchers’ data needs. The EDW was renamed the Arkansas Clinical Data Repository (AR-CDR), underwent content enhancements, and deployed a self-service cohort estimation tool in late of 2016. In an effort to increase adoption of the AR-CDR, a team of physician informaticist and information technology professionals conducted various informational sessions across the UAMS campus to increase awareness of the AR-CDR and the informatics capabilities. The restructuring of the data warehouse resulted in four-fold utilization increase of the AR-CDR data services in 2017. To assess acceptance rates of the AR-CDR and quantify outcomes of services provided, Everett Rogers’ diffusion of innovation (DOI) framework was applied, and a survey was distributed. Results show the factors that had impact on increased adoption were: presence of physician informaticist to mediate interactions between researchers and analysts, data quality, communication with and engagement of researchers, and the AR-CDR’s team responsiveness and customer service mindset.

Electronic physician profiles: developing an interactive web-based report for physicians at Island Health

Lisa M. Mcewen, Jay C. O’Donnell, Laura Lifoawing, David Matias, Brandon Wagar

Decision Support, Island Health, Victoria, British Columbia

Abstract. Evidence based measurement is accepted as an important aspect of quality improvement. Making this data available to physicians to support them in quality improvement and to inform their practice presents a broad range of challenges. Addressing these challenges requires a solution that allows physicians to leverage the data repositories in the Enterprise Data Warehouse to develop and use evidence based clinical measures using an interactive, user-friendly, and secure infrastructure. In this talk, we discuss key aspects of the development of an interactive web-based report for physicians at Island Health, and present the final product. Given the privacy and security issues surrounding this type of data, a mock profile will be presented, rather than true results for actual physicians. Here, we have developed an initial prototype of a physician level report delivered via Microsoft Power BI as a possible dynamic tool to share these important data.
Insight into Health Care Outcomes for Persons Living with Heart Failure Using Health Data Analytics

Christo El Morr\textsuperscript{a}, Liane Ginsburg\textsuperscript{a}, Seunghee Nam\textsuperscript{b}, Wendy Cheung\textsuperscript{c}, Heather Brien\textsuperscript{c}, Asmaa Maloul\textsuperscript{d}, Nancy Cohen\textsuperscript{e}, Helene La Croix\textsuperscript{f}, Susan Woollard\textsuperscript{g}

\textsuperscript{a}School of Health Policy and Management, York University, Toronto Ontario Canada
\textsuperscript{b}University of Toronto, Toronto, Ontario Canada
\textsuperscript{c}North York General Hospital, Toronto, Ontario Canada
\textsuperscript{d}Saint Elizabeth Health Care, Toronto, Ontario Canada

Abstract. The Integrated Funding Model (IFM) is designed to measure the impact of a bundled model of health care for patients with Congestive Heart Failure (CHF) for a period of 60 days post discharge. CHF is a primary reason for patient admissions. The goal of this study is to gain insight into the effectiveness of the IFM pathway intervention on health care outcomes for persons living with CHF, using Health data Analytics.

eSource for Standardized Health Information Exchange in Clinical Research: A Systematic Review

Maryam GARZA, MMC\textsuperscript{i}, Sahiti MYNENI, PhD, MSE\textsuperscript{b}, Amy NORDO, MMC\textsuperscript{i}, RN, CPHQ\textsuperscript{c}, Eric L. EISENSTEIN, DBA\textsuperscript{c}, W. Ed HAMMOND, PhD\textsuperscript{d}, Anita WALDEN, MS\textsuperscript{e}, Meredith ZOZUS, PhD\textsuperscript{d}

\textsuperscript{a}University of Arkansas for Medical Sciences, Little Rock, Arkansas
\textsuperscript{b}University of Texas Health Science Center at Houston, Houston, Texas
\textsuperscript{c}Duke University, Durham, North Carolina

Abstract. The availability of research and outcomes data is the primary limitation to evidence-based practice. Today, only a fraction of clinical decisions are based upon evidence derived from randomized control trials (RCTs), the gold-standard of knowledge discovery. At the same time, clinical trial complexity has steadily increased as has the effort required at clinical investigational sites. Direct use of electronic health record (EHR) data for clinical trials has the potential to

FHIRForm: An open-source framework for the management of electronic forms in healthcare.

Bell Raj Eapen\textsuperscript{a}, Andrew Costa\textsuperscript{b} Norm Archer\textsuperscript{a} and Kamran Sartipi\textsuperscript{2}

\textsuperscript{a}Information Systems, McMaster University
\textsuperscript{b}Clinical Epidemiology and Biostatistics, McMaster University

Abstract. Electronic Forms (E-Forms) for data capture are vital for most health information systems in public health and clinical research. Standardized electronic forms ensure accurate data collection, consistent form rendering, easy maintainability, and interoperability. Adopting an innovation research method we explore the challenges of standardized data capture in healthcare and offer a pragmatic solution. We appraise existing standards and software to propose the list of requirements for an ideal E-form framework. Our proposed solution leverages FHIRE specification and existing open-source software tools. We discuss how our open-source solution can be extended collaboratively and discuss its value using InterRAI instruments as examples.

Canadian Validation of German Medical Emergency Datasets

Josh KOCZERGINSKI\textsuperscript{a}, Kendall HO\textsuperscript{b}, Riley Golby\textsuperscript{a}, Elizabeth M. BORYCKI\textsuperscript{b}, Andre W. KUSHNIRUK\textsuperscript{b}, Judith BORN\textsuperscript{b}, and Christian JUHRA\textsuperscript{c}

\textsuperscript{a}Faculty of Medicine, University of British Columbia,
\textsuperscript{b}School of Health Information Science, University of Victoria,
\textsuperscript{c}University Hospital Muenster, Germany

Abstract. Medical Emergency Datasets (MEDs) are brief summarizations of an individual’s medical history, providing vital patient information to emergency medical providers. A recent German study \cite{1} evaluated whether MEDs are useful to local emergency physicians and paramedics, and which health data were relevant to their medical management. To validate of the German study internationally, Canadian physicians and paramedics were recruited to provide feedback on the utility of the German MEDs as well as their specific content. Original documents and surveys were translated to English directly, with a goal of collecting quantitative and qualitative feedback. Overall, physicians and paramedics found the MEDs to be useful in their evaluation of hypothetical medical scenarios. Most of the MED content was very useful, with some items appearing extraneous. The findings of this study will be used to inform future development of MEDs as well as to drive future research.
Data Migration from Operating EMRs to OpenEMR with Mirth Connect

Jing Lin\textsuperscript{a}, Kyle Ranslam\textsuperscript{b}, Fang Shi\textsuperscript{a}, Mike Figurski\textsuperscript{c} and Zheng Liu\textsuperscript{a}

\textsuperscript{a}Department of Electrical Engineering, University of British Columbia, Kelowna, BC, Canada
\textsuperscript{b}Department of Computer Science, Mathematics, Physics and Statistics, University of British Columbia, Kelowna, BC, Canada
\textsuperscript{c}Vistacan, Big White, Kelowna, BC, Canada

Abstract. Electronic medical records (EMR) are integral to the functionality of day to day operations in a clinic. EMRs perform functions like scheduling or hosting medical records used by physicians and other staff [1]. A certain time comes when it is necessary to upgrade or change EMRs to maintain efficiency in a clinic. The most arduous part of changing a clinic’s EMR is migrating the clinical data from the old EMR to the new. This paper explores the feasibility of data migration between two Electronic Medical Records using open source technologies. This enables smaller clinics to change EMRs when the need arises without incurring huge costs. Using Mirth Connect as a data integration engine and OpenEMR as the new EMR we successfully migrated data from our old EMR to OpenEMR.

Modeling keyword search strategy: analysis of pharmacovigilance specialists’ search of MedDRA terms

Romaric MARCILLY\textsuperscript{a}, Laura DOUZE\textsuperscript{a}, Cedric BOUSQUET\textsuperscript{b} & Sylvia PELAYO\textsuperscript{a}

\textsuperscript{a}Univ. Lille, INSERM, CHU Lille, CIC-IT/Evalab 1403 - Centre d’Investigation Clinique, EA 2694, F-59000 Lille, France
\textsuperscript{b}INSERM, U1142, LIMICS, F-75006; Sorbonne Universités, UPMC, Univ. Paris 06, Paris; Univ. Paris 13, F-93430, Villetaneuse, France

Abstract. In the information retrieval task, searching and choosing keywords to form the query is crucial. The present study analyzes and describes the keywords’ search strategy into a thesaurus in the field of pharmacovigilance. Two ergonomics experts shadowed 22 pharmacovigilance specialists during their daily work. They focus on the strategies for searching and choosing MedDRA terms to build pharmacovigilance queries. Interviews of four pharmacovigilance specialists completed the observations. Results highlight that, for unusual or complex searches, pharmacovigilance specialists proceed iteratively in three main phases: (i) preparation of a list of terms and of evaluation criteria, (ii) exploration of the MedDRA hierarchy and choice of a term, and (iii) evaluation of the results against the criteria. Overall, the search and the choice of keywords within a thesaurus shares similarity with the information retrieval task and is closely interwoven with the query building process. Based on the results, the paper proposes design specifications for new interfaces supporting the identification of MedDRA terms so that pharmacovigilance reports searches achieve a good level of expressiveness.

Applying the Effective Technology Use Model to Implementation of Electronic Consult Management Software

Blake LESSELROTH\textsuperscript{a}, Kathleen ADAMS\textsuperscript{b}, Ginnifer MASTARONE\textsuperscript{b,c}, Stephanie TALLETT\textsuperscript{b}, Scott RAGLAND\textsuperscript{b}, Amber LAING\textsuperscript{d}, and Jianji YANG\textsuperscript{b,c}

\textsuperscript{a}University of Oklahoma, Tulsa, Oklahoma, USA
\textsuperscript{b}VA Portland Healthcare System, Portland, Oregon, USA
\textsuperscript{c}Oregon Health Sciences University, Portland, Oregon, USA
\textsuperscript{d}Huntington, West Virginia, VA Medical Center, USA

Abstract. Theoretical models of technology acceptance are critical to scope projects, select interventions, and measure adoption. We describe use of the Effective Technology Use (ETU) model in the design and deployment of software supporting electronic consult management. We applied the model to four project phases: (1) needs assessment; (2) software design; (3) deployment; and (4) uptake assessment. In this paper, we describe how we used the ETU to plan stakeholder meetings, conduct usability simulations, and organize findings from a qualitative analysis to identify implementation facilitators and barriers.
Using Simulation Technology to Improve Patient Safety in Airway Management by Practicing Otolaryngologists

Connor SOMMERFELDa, Grace SCOTTb, Kevin FUNGc, Lily HP NGUYEND, Norbert VIALLETa, Ellen DEUTSCHf, and Adrian GOOIa,e

a Northern Ontario School of Medicine
b Western University
c McGill University
d McGill University
e University of Manitoba
f Children’s Hospital of Philadelphia

Abstract. Objective: Simulation technology provides a safe environment to learn crisis resource management in stressful clinical scenarios, such as the acute airway. While a number of surgical simulation studies have assessed trainees, there remains a paucity of data on simulation benefits for practicing physicians. The objective of this study was to investigate the impact of a simulation symposium on airway management for practicing otolaryngologists.

Methods: Questionnaires (5-point Likert and open-answer questions) and interviews were distributed and conducted at a simulation symposium on airway management held at an annual meeting. Results: The majority of participants had no prior experience in simulation (62.5%). The data suggested a strong increase in comfort with airway management scenarios (2.93 to 4.09 (p<0.001)). Participants reported the symposium as relevant (4.68) and useful (4.67), with increased confidence about their knowledge of crisis resource management and team training (4.53). Qualitative data suggested great educational value for technical skills and communication strategies. Conclusion: Simulation with feedback may provide an opportunity for the practicing otolaryngologist to fulfill Continuing Medical Education and Professional Development requirements. This symposium allowed practicing otolaryngologists, including those in the community, to learn, develop, and refresh technical and communication skills while fulfilling certification requirements.

Using a Markov Chain Model to Analyze the Relationship Between Avoidable Days and Critical Care Capacity

Dr. Darren HUDSONa,b, and Dr. Gurmeet SINGHb

a University of Victoria
b University of Alberta

Abstract. Hospital capacity strain is ubiquitous, and a significant stressor in critical care. Avoidable days (AD) are frequently used as a metric of capacity. Using a Markov chain model, we studied the relationship between AD and surgical cancellations in a cardiovascular ICU. The model varied the probability of discharging a patient to study this effect over a pool of 108 simulated patients with length of stay data reflecting the actual population. The model behaved as expected with decreasing AD with increasing probability of patient discharge. However, there was no effect on the surgical cancellation rate. We conclude that there is no relationship between AD and critical care capacity as measured by surgical cancellation rate.

Estimating Clinical Trial Bleeding Events Using Electronic Health Record Data

Eric L. EISENSTEINa , Daniel WOJDIYLAa, David F. KONGa

a Duke Clinical Research Institute, Durham, NC

Abstract. Clinical trials conducted for regulatory approval may include outcomes that are informative but not routinely collected in clinical practice. This situation can be problematic when pragmatic clinical trials (PCT) seek to use electronic health record (EHR) data to test the effectiveness of medical products and services in actual practice settings. We use TIMI bleeding events to illustrate how a complex clinical trial endpoint can be implemented using EHR data. While we were able to demonstrate that our EHR-defined bleeding events were associated with differences in patient clinical outcomes, we are not confident that these measurements could be replicated in other locations with consistent reliability and validity. We believe the development of PCT endpoint definitions is an important issue that should be addressed by medical and informatics professional societies, regulators and the medical products industry.
**Data Profiling in Support of Entity Resolution of Multi-institutional EHR Data**

Pei WANG, PhD\(^a\), Daniel PULLEN, PhD\(^b\), Maryam GARZA, MMCi\(^b\), Anita WALDEN, MS\(^c\), Meredith ZOZUS, PhD\(^d\)

\(^a\) University of Arkansas for Medical Sciences, Little Rock, Arkansas
\(^b\) University of Arkansas at Little Rock, Little Rock, Arkansas

Abstract. Information Quality (IQ) is a core tenant of contemporary data management practices. Across many disciplines and industries, it has become a necessary process to improve value and reduce liability in data driven processes. Information quality is a multifaceted discipline with many degrees of complexity in implementation, especially in healthcare. Data profiling is one of the simpler tasks that an organization can perform to understand and monitor the intrinsic quality of its data. This case study demonstrates the application of core concepts of data profiling to entity resolution of multi-institutional Electronic Health Record (EHR) data. We discuss the benefits of using data profiling to better understand quality issues and their impact on entity resolution and how data profiling might be augmented to increase utility to clinical data.

**Development of an Interprofessional Educational Electronic Health Record**

Glynda REES\(^a\), Janet MORRISON\(^a\), Kamal AHUJA\(^a\), Joseph ANTHONY\(^b\), Nina BLANES\(^d\), Elizabeth M. BORYCKI\(^e\), Lisa BOWER\(^f\), Cheryl ISAACK\(^g\), Robert KRUGER\(^a\), Andre KUSHNIRUK\(^b\), Jason MIN\(^b\), Carmen MOORE\(^j\), Patricia VISOSKY\(^d\), Leanne CURRIE\(^b\)

\(^a\) British Columbia Institute of Technology, BC, Canada
\(^b\) University of British Columbia, BC, Canada
\(^c\) University of Victoria, BC, Canada
\(^d\) Douglas College, BC, Canada
\(^e\) Vancouver Coastal Health Authority, BC, Canada
\(^f\) Interior Health Authority, BC, Canada

Abstract. This paper identifies issues relating to academic health record systems and outlines a project currently underway to develop an open source educational clinical information system to better support interprofessional health education.

**Evaluative Outcomes in Direct Extraction and Use of EHR Data in Clinical Trials**

Amy NORDO, MMCi, RN, CPHQ\(^a\), Eric L. EISENSTEIN, DBA\(^b\); Maryam GARZA, MMCi\(^c\); W. Ed HAMMOND, PhD\(^d\); and Meredith Nahm ZOZUS, PhD\(^d\)

\(^a\) Pfizer Inc, Apex, NC; \(^b\) Duke Clinical Research Institute, Durham, NC; \(^c\) Duke Center for Health Informatics, Durham, NC; \(^d\) University of Arkansas for Medical Sciences, Little Rock, AR

Abstract. Use of electronic health record (EHR) data in clinical trials has long been a goal for researchers. However, few demonstrations and fewer evaluative studies have been published. The variability in outcome choice and measurement hinders synthesis of the extant literature. In collaboration with a contemporaneous systematic review of EHR data use in clinical trial data collection, we analyze reported outcomes and recommend a standardized measure set for the evaluation of human safety, data quality, operational efficiency and cost of eSource solutions.

**Digital Process Innovation for Patient Centred Cancer Symptom Management**

Craig E. KUZIEMSKY\(^a\), Reza EYNAKCHI\(^a\), Lindsay Jibb\(^b\), and Dawn STACEY\(^b,c\)

\(^a\) Telfer School of Management, University of Ottawa
\(^b\) School of Nursing, Faculty of Health Sciences, University of Ottawa
\(^c\) Clinical Epidemiology Program, Ottawa Hospital Research Institute

Abstract. Digital process innovation in healthcare enables us to enhance functionality beyond what is enabled in physical process execution. However, the movement from paper artifacts and manual processes to the use of information and communication technologies (ICTs) to support healthcare delivery is challenging because system design requirements for digital processes can be much less structured and more difficult to define than for physical processes. This paper addresses the above issue and presents on our research in converting paper-based cancer
symptom management practice guides to digital format for use by patients. We provide an overall architecture and three system design considerations for digital process innovation to support patient centered cancer symptom management.

Evaluation of Technology Use in an Inter-disciplinary Patient-centered Health Care Team
Berglind F. SMARADOTTIR\textsuperscript{a} and Rune W. FENSLI\textsuperscript{b}
\textsuperscript{a}Clinical Research Department, Sørlandet Hospital Trust, Norway
\textsuperscript{b}Department of Information and Communication Technology, University of Agder, Norway

Abstract. Health care services are facing challenges with carrying out individualised treatment to an ageing population prone to chronic conditions and multi-morbidities. The research project Patients and Professionals in Productive Teams aims to study different patient-centered teamwork service models. This paper presents an evaluation on the technology support in a patient-centered health care team providing services to elderly people with chronic conditions and multi-morbidities in the transition from hospital to a home setting. The team had employees both from a university hospital and municipal health services. Qualitative research methods were applied in the evaluation of the technology use and information flow. The results showed that two information systems were used, that were not integrated and caused double manual work and registrations by the health care professionals. A benefit was that information sharing was improved between the hospital and municipal health care services, but the constraint was added workload.

Encouraging the Use of eHealth Services: A Survey of Patients’ Experiences
Nina KARISALMI\textsuperscript{a}, Johanna KAPIO\textsuperscript{a} and Sari KUJALA\textsuperscript{a}
\textsuperscript{a}Department of Computer Science, Aalto University, Finland

Abstract. To promote eHealth services effectively, it is important to understand what motivates people to use these services and how they can be further supported. Our aim was to explore user experiences with eHealth services from the viewpoint of patients with chronic illnesses. The survey data included responses from 397 patients actively using eHealth services in Finland. Most of them had positive experiences using the services. We found that these positive experiences and the perceived benefits of eHealth services encouraged patients to continue using the services. In order to bolster the use of eHealth services, patients and other potential users must be informed about the new services and how to access them. Healthcare personnel play a key role in introducing eHealth services to patients and instructing them on their use.

Designing Health Information for Mutual Empowerment in the Joint Journey of Patients and Healthcare Professionals
Avi PARUSH\textsuperscript{a}
\textsuperscript{a}Israel Institute of Technology, Haifa, Israel

Abstract. The practice of patient-centric empowerment with health information delivered through various channels is widespread and often effective. While empowering patients improves the sharing of power between patients and healthcare professionals, it can also inadvertently disempowers healthcare professionals. This paper proposes an approach to the design of health information with the aim of mutually empowering patients and healthcare professionals. The approach consists of mapping a joint journey, identifying the intersecting information points serving both patients and healthcare professionals, and designing the information in a shareable and mutually empowering fashion.

Linking Health Records with Knowledge Sources using OWL and RDF
John CHELSOM\textsuperscript{a,b} and Naveed DOGAR\textsuperscript{a,c}
\textsuperscript{a}Seven Informatics, Oxford, UK.
\textsuperscript{b}University of Victoria, Canada.
\textsuperscript{c}University of Oxford, UK.

Abstract. This paper describes a method by which the Web Ontology Language (OWL) can be used to specify a highly structured health record, following internationally recognised standards such as ISO 13606 and HL7 CDA. The structured record is coded using schemes such as SNOMED, ICD or LOINC, with the coding applied statically, on the basis of the predefined structure, or dynamically, on the basis of data values entered in the health record. The highly structured, coded record can then be linked with external knowledge sources which are themselves coded using the
Resource Description Framework. These methods have been used to implement dynamic decision support in the open source cityEHR health records system. The effectiveness of the decision support depends on the scope and quality of the clinical coding and the sophistication of the algorithm used to match the structured record with knowledge sources.

Data for Adherence Decision Support

Simon DIEMERT\textsuperscript{a}, Jens WEBER\textsuperscript{b,c}, and Morgan PRICE\textsuperscript{b,c}, Jordan BANNMAN\textsuperscript{c},
\textsuperscript{a}Critical Systems Labs Inc.
\textsuperscript{b} Department of Computer Science, University of Victoria
\textsuperscript{c} Department of Family Medicine, University of British Columbia

Abstract. Technological interventions aimed at addressing medication non-adherence have shown some promise but do not deliver the full potential of an Internet of Things based Adherence Decision Support (ADS) system due, in part, to a lack high-resolution definition and measure of adherence. This paper presents a novel methodology and pilot study aimed at collecting data to support an AI-based measure of adherence. The pilot study results demonstrate the viability of the methodology and that a full-scale study could provide meaningful data to support an AI-based ADS system.

Surgeon and Assistant Point of View Simultaneous Video Recording

Danielle WENTZELL\textsuperscript{a}, Joseph DORT\textsuperscript{b}, Adrian Gooi\textsuperscript{c}, Patrick Gooi\textsuperscript{a,b} and Kevin WARRIAN\textsuperscript{b}
\textsuperscript{a} Cloudbreak Eye Care, Calgary, Canada
\textsuperscript{b} University of Calgary, Calgary, Canada
\textsuperscript{c} University of Manitoba, Winnipeg, Canada

Abstract. Video recording has become a very common practice in surgery and is one of the paramount methods to teach proper surgical techniques. Traditionally it has been limited by a variety of factors including cost, the need for constant camera reposition, and the use of external photographers, which is both costly and labor-intensive. We describe the use of dual modified point of view (POV) GoPro head mounted cameras to record synchronized POV surgery for the purpose of training surgical assistants. POV cameras are inexpensive, easy to use and manipulate. The GoPro camera was mounted using a head strap on both the surgeon’s and surgical assistant’s head, providing different optimal views. We used the GoPro Hero4 Silver for the surgeon and the GoPro Hero3+ Black Edition for the assistant. The lens used was optimized for our purposes. With the modified camera for the primary surgeon, the magnification was satisfactory in recording of fine details, and provided a usable depth of field and field of view. We found that using two synchronized POV GoPro head mounted cameras was an innovative way to record otolaryngology surgery and provided excellent video footage which can be used for the education of both surgeons and surgical assistants.

An Ontology Approach for Knowledge Representation of ECG Data

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Abstract. The number of features that can be extracted from ECG signals has increased with the advancement in signal processing techniques. At the same time, there is an increase in research efforts to support efficient and effective analysis and interpretation of these signals. In this paper, we propose the use of ontology for knowledge representation and discovery of ECG data. Given the lack of a widely acceptable standards, the use of ontology can support the establishment of common understanding of the kind of knowledge that can be extracted from the ECG data and shared among various heterogeneous systems. The proposed ontology is both platform and application independent. Furthermore, it is possible to enrich the proposed ontology with new knowledge that may not explicitly be expressed in the data.
Advancing Telehealth Nursing Practice in Oncology: Factors Affecting Nurse Use of Electronic Symptom Management Guidelines

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Abstract. Oncology, telehealth nursing practice is growing. There has been an increased use of telehealth systems to support patients living with cancer in the community. In this study we explore the impact of integrating electronic symptom management guidelines (eSMGs) and electronic health records (EHRs) upon oncology, telehealth nursing practice. Ten nurses participated in clinical simulations and post-clinical simulation interviews. Participants identified that several factors that influenced the use of SMGs including nursing experience and experience in using the eSMGs.

Review of Mobile Apps for Prevention and Management of Opioid-Related Harm

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Abstract. Opioid-related harm is a major public health concern in Canada and abroad. There is a growing market of mobile apps that focus on preventing and managing opioid-related harm. The use of mobile health technologies is a promising intervention that can assist with addressing the problem. The aim of this paper is to examine the current state of the mobile app market with respect to prevention and management of opioid-related harm. This will involve a review currently available opioid apps for the major operating systems (iOS, Android, Windows CE and BlackBerry OS) and examine the number of released apps, service providers, operating systems, target user groups, purpose of app, range of features, location, use of evidence, interface, languages, cost and licensing model, and user ratings.

Describing Telenurses’ Decision Making Using Clinical Decision Support: Influential Factors Identified

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Abstract. Objective: Understand the cognitive processes of telenurses’ decision making with the use of health information systems (HIS), specifically Clinical Decision Support Systems (CDSS). In addition, identify the factors that influence how telenurses use CDSS. Methods: Eight telenurses were recruited to manage two call scenarios in a clinical simulation. The call encounters were video recorded and the phone calls were audio recorded. The screens were also recorded to capture the HIS navigation. After the call was completed, the recordings were played back for the telenurse and discussion ensued regarding any issues with the system; this encounter was also recorded for further analysis. Results: Several factors were identified that influenced how telenurses made decisions while using the CDSS. It was found that the decision ladder model could be applied to describe telenurse strategies while using CDSS. The purpose of this paper is to describe the emerging factors that influence telenurses’ decision making during a clinical simulation study in a telenursing call centre.

Effectiveness of e-learning in a Medical School 2.0 model: Comparison of Item Analysis for Student-Generated vs. Faculty-Generated Multiple-Choice Questions

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Abstract. Background Early reports in the literature describe using student-generated questions as a method of student learning as well as augmenting question exam banks. Reports on the performance of student-generated questions versus faculty-generated questions, however, remain limited. This study aims to compare the question performance of student-generated versus faculty-generated multiple-choice questions (MCQ). Objectives To determine if student-generated questions using mobile audience response systems and online discussion boards have
similar item discrimination scores as faculty-generated questions. **Methods** A team-based learning session was used to create 113 student-generated multiple-choice questions (SGQs). A 20 question MCQ quiz was presented to a second year medical school class made of 10 randomly selected SGQs and 10 randomly selected faculty-generated multiple-choice questions (FGQs). Item analysis was performed on the test results. **Results** The data showed no statistical difference in the point-biserial scores between the two groups (average point-biserial 0.31 students vs 0.36 faculty, \( p=0.14 \)), with 90% of student-generated and 100% of faculty-generated questions meeting a cut-off of point-biserial score >0.2. Interestingly, student-generated questions were statistically more difficult than the faculty-generated questions (Item Difficulty score 0.46 students vs 0.69 faculty, \( p=0.003 \)). **Conclusions** This study suggests that student-generated compared to faculty-generated MCQs have similar item discrimination scores, but are perhaps more difficult questions.

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**A Preliminary Conceptual Framework in Knowledge Translation and Health Information Technology for Transparency in Policy-Making (the KhITT framework)**

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**Abstract.** A preliminary conceptual framework on knowledge translation and health information technology is proposed for transparency in policy-making process. Three domains and ten recommendations/dimensions are briefly described.

**Design for a Canadian Digital Health Policy & Practices Observatory**

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**Abstract.** Canada has struggled to make digital health a reality. We identified 6 key issues that appear to impede progress: 1) an inability to coordinate the actions of a rapidly evolving set of stakeholders, 2) patients who lack the ability and resources to play a meaningful role in health system decision-making, 3) world-class innovation that doesn’t reach the market, 4) an inability to kick-start interoperability projects that can catalyze system transformation, 5) an inability to procure early-stage innovative technologies at scale, and 6) an inability to share data seamlessly across organizational silos for patient coordination and care, health system management and research. We propose a set of policies and practices that can help Canada assess, monitor and provide feedback to stakeholders and citizens on how well they are progressing toward seamless digital health.

**Ghosts in the Machine: Identifying the Digital Health Information Workforce**

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**Abstract.** In descriptions of digital health the role of human agency and the work of managing and governing health information and communication technology is often invisible. This paper reports preliminary results of a scoping review of the literature and a national workforce census, undertaken as part of a research program to shed light on the responsibilities and the contributions of the health information workforce. The global literature is not a good indicator of the actual proportion of health informaticians, health information managers, health librarians or other health professionals who are engaged in health information work in Australia. While the research interest in health information work of all descriptions is increasing, the practice of health information work is neither highly skilled nor easily identifiable in findings of an Australian census. Reforming this workforce may be a key to translating digital health rhetoric into measurable improvements in health system performance.
From siloed applications to national Digital Health Ecosystems: A strategic perspective for African countries

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Abstract. Substantial investment in digital solutions for improved health services has occurred in recent years in Africa. Digital Health provides for proven, beneficial applications in many different areas of health systems. It supports the transformation of healthcare delivery, and its potential is seemingly boundless. However, the deployed systems are in silos, and interoperability and integration are largely missing. There is no timely information for easy and quick decision making: there is no ability to track service levels across the whole health sector. What is missing is an integrated information system across all healthcare facilities nationwide. Such a Digital Health Ecosystem, the holistic application of information and communications technologies, services and applications, will support health systems and improve healthcare delivery, coordination and integration across providers. Based on global experience in resource-constraint contexts, core steps necessary to develop and implement such an ecosystem are explored, and four fundamental building blocks and their elements are developed. The results presented are succinctly integrated into six statements on lessons learned and recommendations.

An Informatics Framework for Maternal and Child Health (MCH) Monitoring

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Abstract. Most cases of maternal deaths could be avoided with timely access to quality healthcare, but a key challenge in addressing quality of care in maternal health, is the lack of accurate data. We present a review of the difficulties of collecting and analyzing maternal health data. We propose a comprehensive informatics monitoring framework to track progress on the achievement of the international targets and priorities toward ending preventable maternal mortality and improving maternal and child health, that at the same time builds capacity at institutional and country level to collect indicators and to generate actionable and comparable knowledge that facilitates analysis, research, and evidence-based decision making.

Training as an Intervention to Decrease Medical Record Abstraction Errors Multicenter Studies

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Abstract: Studies often rely on medical record abstraction as a major source of data. However, data quality from medical record abstraction has long been questioned. Electronic Health Records (EHRs) potentially add variability to the abstraction process due to the complexity of navigating and locating study data within these systems. We report training for and initial quality assessment of medical record abstraction for a clinical study conducted by the IDeA States Pediatric Clinical Trials Network (SPCTN) and the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) Neonatal Research Network (NRN) using medical record abstraction as the primary data source. As part of overall quality assurance, study-specific training for medical record abstractors was developed and deployed during study start-up. The training consisted of a didactic session with an example case abstraction and an independent abstraction of two standardized cases. Sixty-nine site abstractors from thirty sites were trained. The training was designed to achieve an error rate for each abstractor of no greater than 4.93% with a mean of 2.53%, at study initiation. Twenty-three percent of the trainees exceeded the acceptance limit on one or both of the training test cases, supporting the need for such training. We describe lessons learned in the design and operationalization of the study-specific, medical record abstraction training program.
**A Qualitative Evidence Synthesis of Adverse Event Detection Methodologies**

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**Abstract.** The detection of adverse events (AE) and their relationship to data quality issues through processes or medical error is not currently understood. In order to study the relationship between adverse events and data quality it is necessary to capture as many AE as possible and computational methods will be necessary to handle the large volumes of patient data. The need for adverse event detection methodology has been repeatedly noted but standard AE detection methods are not in place in the US. At present, there are several widely enforced strategies for AE detection but none are both highly successful and computational. In order to maximize AE detection, we have conducted a qualitative evidence synthesis of these approaches. The categorization of the circumstances of the event as well as the resulting patient safety problem and the method of detection provide a means to synthesize AE detection solutions. This has resulted in a set of 130 AE detection algorithms in 9 circumstances categories and 41 patient safety problem categories. This work begins the effort of consolidation of current safety metrics in an effort to produce a common set of safety measures.

**Analysis of Anesthesia Screens for Rule-based Data Quality Assessment Opportunities**

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**Abstract.** A rules-based data quality assessment system in electronic health record was explored through compilation of over six thousand data quality rules and twenty-two rule templates. To overcome the lack of knowledge sources and identify additional rules or rule templates, thirty-three anesthesia (perioperative period) EHR screens were reviewed. We analyzed the data elements appearing on anesthesia screens and relationships between them to identify new data quality rules and rule templates relevant to anesthesia care. We present the review process as well as new rules and rule templates identified. We found decomposition and analysis of EHR screens a viable mechanism for acquisition of new data quality rules and proved the number of rules likely tractable and their management scalable.

**Uncovering the Mysteries of Electronic Medication Reconciliation**

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**Abstract.** Island Health Authority ordering providers and staff continue to experience challenges related to electronic medication reconciliation. A Think Tank was created to seek a deeper understanding of the reasons why end users were experiencing challenges with documenting home medications, managing conversion failures, and writing prescriptions. Strategies to improve configuration, education, and process are underway.

**Rule-Based Data Quality Assessment and Monitoring System in Healthcare Facilities**

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**Abstract.** Measuring and managing data quality in healthcare has remained largely uncharted territory with few notable exceptions. A rules-based approach to data error identification was explored through compilation of over 6,000 data quality rules used with healthcare data. The rules were categorized based on topic and logic yielding twenty-two rule templates and associated knowledge tables used by the rule templates. This work provides a scalable framework with which data quality rules can be organized, shared among facilities and reused. The ten most frequent data quality problems based on the initial rules results are identified. While there is significant additional work to be done in this area, the exploration of the rule template and associated knowledge tables approach here shows rules-based data quality assessment and monitoring to be possible and scalable.
Realizing Quality & Experience Benefits through EHR Adoption & Use: A Conceptual Model

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Abstract. A conceptual model of EHR adoption and use is presented, which details the components necessary to realize both quality and experience benefits. The model was developed based on a review of the conceptual and theoretical frameworks related to technology adoption/use and quality in health care. It includes 42 constructs, six key constructs, three antecedents, four moderator variables, and two key benefit areas (i.e., quality and experience) at the micro, meso, and macro levels. The model has been operationalized through identification of over 130 metrics for measuring the constructs. The model may be used to inform planning, decision-making, and evaluation of EHR implementations and benefits realization. It is recommended that the EAU model be further tested.

Strategies in Electronic Medical Record Downtime Planning: A Scoping Study

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Abstract. PURPOSE: This review will identify dominant themes, common to published articles that discuss downtime planning in a clinical setting. These common themes will represent key considerations for healthcare organizations’ comprehensive downtime plans. METHOD: A scoping study was performed using search results from PubMed, CINAHL and Medline. The 4 articles meeting the inclusion criteria were analyzed for common themes and findings. RESULTS: Four common themes were found in the included articles: 1) Communications plans, 2) Procedure review and revision, 3) Managing system availability and 4) Preparing staff for handling incidents. CONCLUSION: Organizations must have comprehensive downtime plans available to ensure continuity of patient care during the periods of limited availability. A comprehensive downtime plan that includes these four strategies can become the framework for a set of organizational procedures that ensures the best possible access to vital patient information before, during, and after a downtime event.

Next generation EHRs – What Problems are these Systems aiming to solve?

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Abstract. EHRs elicit an array of different aspirations all underpinned by the widely held conviction that they can deliver benefits for patients, clinicians, researchers, IT vendors, policy-makers and society as a whole. While technocentric visions abound, reflection on their history, the challenges evident in their design, implementation and evaluation and the limited evidence of their beneficial impacts over time is instructive. From a socio-technical perspective EHRs appear to be a set of ‘wicked problems’ unlikely to be resolved in favor of one position or another, but rather requiring judgement, nuance and negotiation around the kinds of problems we want these systems to solve. This paper presents some perspectives on important potential features for next generation EHRs and on the types of problems that these systems could aspire to solve. The focus is not on prediction but rather on actively shaping the kind of future that we desire and how EHRs will support its achievement.

EHR usage problems: a preliminary study

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Abstract. Electronic health record (EHR) systems were initially developed to improve health care delivery by facilitating the healthcare professionals’ access to electronically-stored patient information, but problems are regularly reported in the literature. We present here a preliminary study conducted at a 950-bed university hospital. They have implemented an EHR in 2012 to remove their paper-based system. After few years, physicians complain that the EHR is “too complex”, “too slow”, “unsatisfying”, and “which interacts with too many health software”. This preliminary study was based on individual interviews inspired from critical incident technique with 9 hospital professionals (physicians and pharmacist) to establish a global diagnostic of the EHR’s usability failures/difficulties and their potential impacts. Results show that professionals faced to many constraints impacting their work but more importantly the patient care, with recent outstanding examples. This work is a first step of a larger study to help the hospital to map usability failures, their context of use and associated risks/impacts, and to provide solutions to fix it.
Approaches to Demonstrating the Effectiveness and Impact of Usability Testing of Healthcare Information Technology

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Abstract. In recent years the usability of health information systems has come to the fore as a major issue, with many reported examples of problems with the usability of systems such as electronic health records and other health information technologies (HIT). In response a range of usability engineering methods have emerged to help in the design and evaluation of HIT. Many studies have shown the importance of usability testing methods that include full video recording of user interactions, such as the method known as low-cost rapid usability testing. However, such approaches have been considered by many as being too costly to carry out and some have argued that they may take too long to be used for practical input into improving applications and systems. In this paper we demonstrate several approaches we have taken for proving the cost-effectiveness and benefit of conducting principled usability testing. It is argued that such studies are needed to inform system design and evaluation and for proving to healthcare management the need for properly conducting such studies before releasing HIT.

Simulation of eHealth Scenarios with Role-play Supported by an Interactive Smartphone Application

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Abstract. The transformation and digitalization of health services foresees a need for recruiting individuals with the combined knowledge of technical and health sciences. Education of young people in the domain of eHealth is an important contribution in the on-going digital transformation process. In this context, the research project High School Students as Co-researchers in eHealth aims to introduce technology-supported health care scenarios and research methods to young students in the Southern region of Norway. As a part of the project, simulation of eHealth scenarios was made in a clinical research laboratory together with high school students and experienced researchers. In the simulation, role-play was used to carry out the scenarios. To inform the roles, the tasks and their associated actions, an interactive smartphone application was used. This paper presents the simulation procedure and how the interactive smartphone was developed and used to guide the scenarios.

The Use of Head-worn Augmented Reality Displays in Health Communications

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Abstract. The health industry is always seeking innovative ways to use technology to create or improve the experiences of their professionals. Such improvements are seen in a variety of areas including the analysis of relevant health data and the establishment of new ways of communicating medical education and training. Advancements in head-worn augmented reality displays (HWDs), such as the Microsoft Hololens, present a unique opportunity to leverage technology in the ongoing challenge of creating meaningful and novel educational experiences. This paper will review contemporary HWD technologies, how these technologies are being used to enhance the work-training environment, and how these technologies might enhance the communication of health professionals.

Applying a Pneumatic Interface to Intervene with Rapid Eating Behaviour

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Abstract. Higher eating rates are positively correlate with obesity. In this paper, we propose the design of a new eating utensil that can reduce eating rate by interfering with eater’s ability to eat quickly. This utensil can change its rigidity and shape by deflating itself to interfere with eating. In this study, a low fidelity proof-of-concept prototype device has been designed to provide physical resistance in order to help people reduce their eating rate. The proposed prototype could be used to demonstrate the feasibility of applying a pneumatically actuated shape-changing interface to embed physical resistance into an eating utensil.
Guiding improvements in user experience: Results of a mental health patient portal user interface assessment

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Abstract. Patient portals provide patients with electronic access to their health records. Since there has been limited use of patient portals in mental health settings, there is a lack of research regarding the usability of the technology amongst this patient population. The purpose of this study was to assess the usability of a mental health patient portal, and to provide the study site with design recommendations. Ten (n=10) participants completed a guided user interface assessment on laptops and tablet devices, along with a structured questionnaire. Findings revealed a number of modifiable aspects of the portal design to improve the usability of the technology for the end user.

Improving access to healthcare with on-line medical appointment system

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Abstract. Access to medical care is in many countries an obstacle to timely health care and new technological options for improving the access are not fully utilized. In this project Business Process Modelling and Notation (BPMN) is applied to obtain an efficient, flexible and low cost medical appointment system for a medium size medical centre.

Adoption Strategies for Electronic Patient Portals: Employing Advanced Data Mining and Analytics

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Abstract. Patient portals are becoming increasingly available at medical institutions, worldwide. Reporting of patient portal adoption strategies is scarce. A multi-institutional health network in Toronto, Canada is seeing great success with its portal adoption by patients, with an annual adoption rate of almost 65%. In the literature, annually adoption rates in Canada range between 5% and 10%. This significant difference and high adoption is attributed to a multifactorial approach that includes a dedicated operations team to engage with patients and staff, a co-design approach for portal development and more recently, new data-driven strategies to affirm and recommend promotion approaches. Advanced data mining and analytics are promising tools to help improve the adoption rate. This paper will describe five analytics tools used to describe and potentially improve patient portal adoption rates.

Patient and family member readiness, needs, and perceptions of a mental health patient portal: a mixed methods study

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Abstract. Patient portals are a form of technology that supports patients in accessing their health information, and other functions like scheduling appointments. The presence and utilization of patient portals in mental health contexts is relatively new. Despite research existing in the mental health literature that indicates that there may be benefits when patients have access to their mental health notes, there is limited information as to how best to implement portals, and support adoption among patients and their family members. Given this gap in literature, this
study aimed to identify patient and family readiness, needs, and perceptions of a mental health patient portal. Surveys were administered to patients (n = 103) and family members (n = 7) either in-person or over the phone by a Peer Support Worker. The sample of participants consisted of patients and family members affiliated with Canada’s largest mental health hospital located in Toronto, Ontario. Study results indicated that patients had the highest interest in the following portal functions: scheduling appointments, checking appointment times, and accessing their health record. Both patients and family members expressed their concerns about cybersecurity and potential privacy breaches. The results of this study, as well as the approach, can inform future patient portal planning and implementation activities at other healthcare organizations.

**Death: The Simple Clinical Trial Endpoint**

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dAbstract. Death, as a biological phenomenon, is well understood and a commonly employed endpoint for clinical trials. However, death identification and adjudication may be difficult for pragmatic clinical trials (PCT) that rely upon electronic health record and patient reported data. We propose a novel death identification and verification approach that is being used in the ToRsemide compArison with furoSemide FOR Management of Heart Failure (TRANSFORM-HF) PCT. We describe our hybrid approach that includes gathering information from clinical trial sites, a centralized call center, and National Death Index searches. Our methods detail how a possible death is triggered from each of these components and the types of information we require to verify a triggered death. Our different trigger / verification elements collectively define the TRANSFORM-HF PCT’s definition of a death event.

**Using Digital Health to Support Best Practices: Impact of MRI Ordering Guidelines Embedded Within an Electronic Referral Solution**

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dAbstract. Background: Between 2003 and 2012, the number of MRIs performed in Canada more than doubled to 1.7 million [1]. According to a 2010 Health Council of Canada report nearly 30% of MRIs were inappropriately ordered [2]. The use of diagnostic imaging referral guidelines has been shown to improve the appropriateness of imaging orders [3, 4].

Objectives: To identify the number of unnecessary pre-consult MRIs ordered for patients with knee pain. As well, the impact that new evidence-based clinical decision support (DS) guidelines embedded within the referral form has had on the number of unnecessary MRIs was investigated.

Methods: This study employed a retrospective design approach. Charts of all knee pain patients over the age of 55 who were referred for consultation to the 5 participating orthopedic surgeons during the study period were reviewed by three medical students.

Results: 270 patient charts were included in this study. MRI was ordered for 60 patients with only 56.7% having had a prior X-ray. Of the 60 ordered MRIs, 50 (84%) were considered inappropriate, while only 10 (16%) were appropriate. Our results were compared to previous results of a quality improvement study implemented at the same clinic. A substantial reduction of 12% in the number of pre-consult MRIs and a 5% increase in the number of ordered X-rays before consultation was demonstrated.

Conclusion: This work highlights the impact of including DS tools within an electronic referral form to support clinical best practices.

**Use of Agile Project Methodology in Health Care IT Implementations: A Scoping Review**

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Abstract. Health care organizations are investing in system solutions that can be leveraged across the continuum of care (i.e. electronic medical records (EMR’s); electronic health records (EHR’s); health information exchanges (HIE’s) and patient portals. The importance of these systems and how they have evolved over the past 30 years has been well researched. The value and benefits of these systems are therefore well known; however, it is estimated that

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most projects are typically 100% over budget and a year behind schedule [1, p. 2]. In this paper the authors examine what literature is available on agile project management methodologies in health care settings. A scoping review of the literature available specifically on agile methods use in implementing systems within health care was undertaken. Findings revealed there is very little literature available on agile project management methodologies used in health care IT systems implementations. The authors identify there is a strong need for research to look into project management methodologies and identify areas in the project lifecycle, where change is needed to increase clinical systems adoption.

**Towards Developing an eHealth Equity Conceptual Framework**

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**Abstract.** Early implementation of electronic health records and patient portals had great promise of addressing the widening disparities in health. However, recent research has found that not only are these disparities persisting, but the differences in health outcomes between populations are increasing. Addressing this gap specific to ehealth calls for attention to health equity. Health equity approaches reveal the systematic and societal structures that contribute to preventable and unjust outcomes for different populations. To conceptualize and apply a health equity approach within ehealth, we propose the eHealth Equity Framework (eHEF). Derived from the World Health Organization’s conceptual framework for actions on the social determinants of health, eHEF can be useful for public health practitioners, researchers, policymakers and information technology designers to keep health equity agenda at the forefront of all stages of health information technology lifecycle.

**Development of a Video Coding Scheme Focused on Socio-technical Aspects of Human-computer Interaction in Healthcare**

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**Abstract.** The objective of the work described in this paper was to develop a coding scheme focused on socio-technical issues and considerations for the analysis of video data collected in usability studies of health information systems. The usability and safety of health information systems such as electronic health records, decision support and patient facing applications has become a critical issue. Although a variety of studies and methods have appeared in the literature involving video-based analysis of human factors data from healthcare, few have reported on the coding scheme used to analyze the data. In this paper we describe how we have developed and continue to refine a video coding scheme that extends basic usability engineering by considering socio-technical aspects of system use that have become critical to assess in evaluating the effectiveness and efficacy of health information systems in real use.

**A Usability Evaluation of the InfoSAGE App for Family-Based Medication Management**

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**Abstract.** The design of a mobile medication manager within a broader family and elder-centric collaboration platform faces challenges of usability and wide applicability. To inform the development and use cases of eldercare apps, we present the preliminary results of a usability study of an iOS and Android app intended for both family members and aging adults for the mobile management of medication lists. Seven participants were recorded during the performance of eight typical use-case scenarios of the medication portion of the InfoSAGE app. Audio and video recordings were analyzed for themes and events. The aim of this paper is to help inform future design choices for eldercare mobile apps.
Early Usability Assessment of a Conversational Agent for HPV Vaccination

Muhammad AMITH\textsuperscript{a} Anna ZHU\textsuperscript{b} Rachel CUNNINGHAM\textsuperscript{c} Rebecca LIN\textsuperscript{d} Lara SAVAS\textsuperscript{a} Laura SHAY\textsuperscript{a} Yong CHEN\textsuperscript{f} Yang GONG\textsuperscript{a} Julie BOOM\textsuperscript{e} Kirk ROBERTS\textsuperscript{a} Cui TAO\textsuperscript{a,1}

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Abstract. With the emerging use of speech technology in consumer goods, we experimented with the application of conversational agents for the communication of health information relating to HPV vaccine. Research have stated that one-to-one contact between providers and patients have a variety of positive influences on patients' perception towards vaccines, even leading to uptake, compared to paper-based methods. We implemented a Wizard of Oz experiment that counsels adults with children (n=18) on the HPV vaccine, using an iPad tablet and dialogue script developed by public health collaborators, and for early testing of a prospective conversational agent in this area. Our early results show that non-vaccine hesitant parents believed that agent was easy to use and had capabilities needed, despite the desire for additional features. Our future work will involve developing a dialogue engine to provide automated dialogue interaction and future improvements and experimentation for the speech interface.

Putting Guidelines in the Hands of Patients: A Heuristic Evaluation of a Consumer Mobile Application

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Abstract. Preventive clinical practice guidelines are valuable. However, they are often difficult for primary care providers to implement in the time sensitive primary care setting and alternate approaches warrant exploration. An app called CANBeWell was developed in an effort to allow consumers to identify appropriate guidelines for themselves. Two investigators conducted a heuristic evaluation to identify potential eHealth literacy and usability issues. Several recommendations were made to make CANBeWell easier for consumers to use and understand. CANBeWell is a promising app for deploying preventive guidelines directly to health consumers. Usability testing is planned for the next iteration to ensure that this app meets the needs and capabilities of health consumers.

Healthcare Data Are Remarkably Vulnerable To Hacking: Connected Healthcare Delivery Increases The Risks

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Abstract. Healthcare data are attractive to cyber-criminals because they contain financial and personal data, can be used for blackmail, and most valuable, are ideal for fraudulent billing. They are also remarkably vulnerable to penetration because of the fluid and always-evolving nature of a patient’s medical care and because of the number of clinicians, facilities and transactions required to connect patient care across multiple settings. The addition of mobile healthcare devices and connected healthcare delivery systems (e.g. wearables, monitoring devices, cell phone images) makes healthcare data more attractive but also more vulnerable. Wide variations of digital health use patterns complicates design security solutions for each context or clinician. In this paper we propose a set of connected healthcare patterns, and then discuss security challenges and potential solutions for each of the connected health patterns.
The eHealth Trust Model: A Patient Privacy Research Framework

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Abstract. Patient privacy concerns are often cited as a barrier to health information exchange (HIE) implementations; however, the current understanding of patient perspective is limited due to a fragmented approach to patient privacy research. The limited evidence suggests that the patient privacy perspective is context-dependent and may involve benefit-risk tradeoffs. A standardized approach to the contextual factors would allow for more consistent assessment, providing a better understanding or explanation of the contextual factors influencing the patient privacy perspective and their attitudes towards HIE. This paper describes the development of the eHealth Trust Model—an evidence-based theory-grounded conceptual framework intended to guide future patient privacy research.

“Real-world” de-identification of high-dimensional transactional health datasets.

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Abstract. This paper presents a framework for addressing data access challenges associated with secondary use of high-dimensional transactional datasets that have been extracted from electronic health/medical records (EHRs). These datasets are subject to the data de-identification “curse of dimensionality” \cite{1} which manifests as substantial challenges to preserving analytical integrity of data contents when high-dimensional datasets must be de-identified and deemed free of Personal Information (PI) prior to disclosure. A large array of methods can achieve this objective for low dimensional datasets. However, these methods have not been scaled up to the types of high-dimensional data that must be sourced from the transactional EHR if the objective is specifically to generate products that can inform point-of-care clinical decision-making. The Applied Clinical Research Unit (ACRU) in Island Health is implementing a process that addresses key privacy challenges inherent in disclosures of high-dimensional transactional health data. This paper presents a schematic and abbreviated rendering of key principles and processes on which the ACRU approach is based.

Privacy and Policy Implications for Big Data and Health Information Technology for Patients: A historical and legal analysis

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Abstract. The consideration of privacy and policy implications for big data is essential to designing patient-centered health technology. A literature review demonstrated a significant gap to moving forward with information technology in healthcare. Ovid Medline and Google Scholar were searched to identify papers related to health technology, patient outcomes, and policy implications of Big Data. The findings of this research showed that despite a robust legal framework and clear outline of the legislation, there exists an innovative opportunity for health technologies to evolve and become patient-centered by integrating privacy and policy knowledge in health information technology. This historical legal analysis is valuable to health system leaders, decision-makers, health technology companies that are creating innovative platforms, and clinicians in both Canada and the United States.
Effects of Telenursing Triage and Advice on Healthcare Costs and Resource Use

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\textbf{Abstract.} Telenursing triage and advice services are continuing to expand both nationally and internationally. A primary role of telehealth nursing triage is to channel patients or clients towards appropriate levels of care, thereby reducing healthcare costs and freeing up resources. Purpose: The objective of this research is to: (a) present an overview of the current research, (b) describe the extent to which telenursing services are fulfilling this role, (c) identify gaps in the literature and (d) propose future research directions. Methods: The report consists of a scoping review of current literature based on the framework suggested by Arksey and O’Malley (2005). Results: Although the available research spans a variety of jurisdictions, which makes comparison difficult, there is some evidence that suggests telenursing services empower clients to access levels of care in keeping with the severity of their symptoms, as well as enabling clients to engage in self-care when appropriate. This in turn leads to cost savings for the broader health care system. Conclusion: More evaluation of telenursing programs is needed to identify consistent savings. Health outcomes should be a part of the research.

Factors Affecting Adherence with Telerehabilitation in Patients with Multiple Sclerosis

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\textbf{Abstract.} The goal of this study was to identify predictors of telerehabilitation adherence in patients with multiple sclerosis (MS). An adherence prediction model was based on baseline patient characteristics. Such a model may be useful for identifying patients who require higher levels of engagements in the early stages of home telerehabilitation programs. The resulting set of predictive features included education, patient satisfaction with the program, and psychological domain of the MS Impact Scale. Resulting prediction of high and low adherence had overall 80.0\% accuracy, 81.8\% sensitivity, and 77.8\% specificity. We concluded that the baseline patient information may be instrumental in personalizing levels of support and training necessary for active patient participation in telerehabilitation.

Updated mapping of telemedicine projects in Denmark

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\textbf{Abstract.} Telemedicine is suffering from pilotitis. Only few initiatives manage to scale up to make significant impact. It is challenging to obtain good indicators for dissemination and use, and it is, therefore, difficult to provide evidence that telemedicine projects fulfil the prophecies of reducing cost, improving quality of care and providing equitable access to health care services. The telemedicine mapping project seeks to provide a national contemporary overview of telemedicine initiatives in Denmark. The project is introduced, challenges in keeping the database behind the map updated are presented and attempts to promote rapid update are discussed.

System Dynamics in Remote Monitoring Service for Cardiovascular Implantable Electronic Devices

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\textbf{Abstract.} This methodological paper describes how system dynamics was applied in evaluating the effect of remote monitoring (RM) of cardiovascular implantable electronic device (CIED) workload on clinical resource utilization. The development of a causal loop diagram and a stock and flow diagram and the construction of the simulation model for comparison of an in-person clinic group and RM clinic group are described.
Applying the Behavior Change Technique Taxonomy to Mobile Health Applications: A Protocol

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Abstract. The lack of standardized descriptors of behavior change facilitators in mobile health apps makes it difficult for clinicians and consumers to quickly evaluate the potential of a mobile health app. The Behavior Change Technique Taxonomy (BCTT) was developed to evaluate health interventions for the presence of behavior change techniques. This paper describes the methods used and methodological results in applying the BCTT to commercially available mobile health apps in the respiratory and sleep domains.

Development of the Patient Experience Questionnaire for Parents of Pediatric Patients (PEQP)

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Abstract. Patient experience (PX) is an important evaluation criterion for quality in healthcare. Compared to patient satisfaction, however less research has focused on the development of instruments to measure experiences of patients and their families. In the article, we describe the process of developing a PX questionnaire for the parents of pediatric patients in the context of children’s hospital and illustrate the questionnaire items for measuring PX. The phases of the development process included retrospective interviews, description of the themes influencing PX and the metrics for measuring PX, as well as iterative development of three versions of questionnaires including data gathering and factor analysis. The final versions of the surveys suggested for implementation at the hospitals include eight PX statements for the outpatient clinic and five statements for the ward. Compared to satisfaction surveys, the developed surveys emphasize the aspects of parent’s attitude towards the illness, support for families, and daily arrangements with a child patient.

Tools for Engaging Patients on Patient Platforms: A Classification Framework

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Abstract. This paper outlines a framework for identifying and classifying different types of patient engagement tools, available on online patient platforms, according to the flow of information and patient engagement concepts. We demonstrate the application of the framework using data collected from a purposive sample of eleven patient platforms, stratified by various attributes (for-profit/not-for-profit, single/multiple conditions, different conditions). This framework can help health care organizations in better understanding the processes supported by various tools, and thereby determining better ways to engage patients using web-based Platforms.

Patient Empowerment: The Role of Technology

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Abstract. Patient empowerment is a buzzword that has gained much currency in recent years. It is defined as a process that helps people gain control over their own lives and increases their capacity to act on issues that they themselves define as important. This paper outlines the problems faced by the current medical model of patient empowerment and proposes a unique framework for patient empowerment that provides guidance on how health technology supports or detracts from empowering patients and families. The paper provides an ethical lens for physicians, policymakers, patients, and families in the health care system to consider the central role of the principles of autonomy and justice in patient empowerment. This paper also discusses how technology can be used to further patient empowerment and patient-centeredness of health care systems.
ICT-Based Interventions for Women Experiencing Intimate Partner Violence: Research Needs in Usability and Mental Health

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**Abstract.** The aim of this systematic review is to summarize studies in different settings that used Information and Communication Technologies (ICT) to address intimate partner violence (IPV). We've conducted a systematic review using PRISMA guidelines using the following databases: PubMed, CINAHL, PsycINFO, and Web of Science. Inclusion criteria were ICT-based interventions addressing IPV, focused on women. 21 studies were identified in which ICT was found to be a suitable low-cost option for screening and disclosure of IPV, as well as for preventing IPV. More research is needed to use ICT for prevention and treatment of IPV, taking consideration new ICT environments such as virtual communities.

Axe the Fax: What Users Think of Electronic Referral

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**Abstract.** Long wait times for elective services are seen as one of the major challenges for Canadian healthcare. Canadians report that they wait longer for specialists than citizens in other countries. The main reason for this is that the referral process is poorly coordinated and leads to delays in care. Electronic referral (eReferral) is seen as a potential means of improving the referral process and enabling faster access to care. There is the potential for national implementation of eReferral in Canada to help achieve this aim. However, existing initiatives have encountered challenges with user adoption and users have continued to use fax. A validated tool was used to survey both users of fax as well as users of eReferral. These two groups of users were then compared. Most family physicians using fax were satisfied overall with the process. This highlighted how challenging any change of this engrained technology will be. There were, however, some significant areas were eReferral was superior to fax. This included response time, the overall quality of referral information, completeness of the information, the timeliness of the information, and the format and layout. There is an opportunity to leverage these findings to support the adoption of eReferral and help reduce wait times.

Development of Data Validation Rules for Therapeutic Area Standard Data Elements in Four Mental Health Domains to Improve the Quality of FDA Submissions

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**Abstract.** Data standards are now required for many submissions to the United States Food and Drug Administration (FDA). The required standard for submission of clinical data is the Clinical Data Interchange Standards Consortium (CDISC) Submission Data Tabulation Model (SDTM). Currently, 45 business rules and 115 associated validation rules exist for SDTM data. However, such rules have not yet been developed for therapeutic area data standards developed under the last reauthorization of the Prescription Drug User Fee Act (PDUFA V). The objective of this effort was to develop data validation rules for new therapeutic area data standards in four mental health domains, assess the metadata required to associate such rules with standard data elements, and assess the level of data validation possible for therapeutic area data elements.

Nursing Informaticians Address Patient Safety to Improve Usability of Health Information Technologies

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**Abstract.** With the introduction of Health Information technology, the potential for unintended consequences can occur. Island Health developed a Quality Assurance review process to evaluate and identify opportunities for system optimization, education and engagement, policy changes, as well as identify unintended consequences of Electronic Health Record (EHR) implementations. The Patient Safety Learning System was utilized to audit and evaluate reported safety events for system breaks and opportunities, practice and policy, as well as workflow implications. The findings were then reported to the reporter, leadership, and through governance structures. This process identified that 242
reported patient safety events in 1 year has resulted in 30 (13.7%) of these events leading to EHR System optimization. Ultimately Island Health’s Nurse Informaticists foster a culture of safety through their QA/QI Patient Safety event investigations which improve system usability and ultimately Patient Safety.

The Value of Patient-Peer Support in Improving Hospital Safety

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Abstract. Healthcare systems worldwide have dedicated several years, special attention, and action toward improving safety for their patients. Although many innovative technological solutions have helped providers reduce medical errors, hospitalized patients lack access to these solutions, and face difficulties in having a proactive role in their safety. In this paper, we examine how patient-peer support can be a valuable resource for patients in the context of hospital safety. Through semi-structured interviews with 30 patients and caregivers at a pediatric and an adult hospital, we identify the potential benefits of incorporating patient-peer support into patient-facing technologies. Facilitating such support can provide patients with new avenues for engaging in, and improving, the quality and safety of their hospital care.

Reason for Use: an Opportunity to Improve Patient Safety

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Abstract. The objective of this study is to understand how the reason for use (RFU) or the indication for medications are used, its effects on the decision-making process, the implications, and the willingness among prescribers, pharmacists, and patients to share RFU information. Methods, semi-structured interviews were conducted to retrieve the information needed from a total of 60 participants. Results, pharmacists, prescribers, and patients generally have positive opinions about including RFU information in their communications. Conclusion, there is a general agreement among participants that sharing RFU information will improve patient safety.

A Socio-technical and Lean Approach Towards a Framework for Health Information Systems-induced error

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Abstract. The evaluation of Health Information Systems (HIS)-induced medication errors is crucial in efforts to understand its cause, impact and mitigation measures when trying to minimize errors and increase patient safety. A review of evaluation studies on HIS-induced medication errors was carried out, which indicated the need to further structure complex socio technical aspects of the subject. In order to satisfy this requirement, a new framework was introduced for the evaluation of HIS-induced error management in clinical settings. The proposed HO(P)T-fit framework (Human, Organization, Process and Technology-fit) was developed after critically appraising existing findings in HIS related evaluation studies. It also builds on previous models related to HIS evaluation, in particular, the HOT-fit (Human, Organization, Process and Technology-fit) framework, error model, business process management, Lean method, and medication workflow. HOPT-fit incorporates the concept of fit between the four factors. The framework has the potential to be used as a tool to conduct a structured, systematic, and comprehensive HIS evaluation.

Embedding Health Literacy Tools in Patient EHR Portals to Facilitate Productive Patient Engagement

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Abstract. Many health care providers have opened their EHR systems to patients in order to increase information sharing and patient participation. Accessing to EHR has offered the promises of improving patient understanding,
engagement, and outcomes. Although patients generally appreciate the access to their health records, currently, most EHR systems are used as data storage and communication tools and their potential for promoting productive patient engagement have not fully developed. There is a need to develop and incorporate effective health literacy tools into EHR patient portals, helping patients interpret their health data, understand their medical conditions and treatment plans, make informed decisions, and take proper actions. We will examine the challenges that patients face in using EHR portals, then provide two innovative health literacy solutions for facilitating productive patient engagement: (a) an embedded semantic medical search engine that provides reliable and contextualized health information support, and (b) an integrated AI voice chatbot that answers patients’ questions and provides on-demand self-care advice. Other approaches that can add benefits to patients in the context of using EHR will also be described.

**Smart Homes for Healthcare**

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**Abstract.** Smart Homes may improve the care received by the elderly and those with disabilities that prevent them from conveniently accessing care from providers. This paper examines the structures and mechanisms of Smart Homes, explores the advantages and disadvantages for patients receiving care from the comfort of their own homes and describes a model that can be used to view the needs of patients involving Smart Home technologies.

**Smart home interactions for people with reduced hand mobility using subtle EMG-signal gestures**

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**Abstract.** Smart home technology is receiving significant attention. This is largely in response to an increase in the size of demographic those who require assistance due to reduced mobility, in particular, older adults. Smart home technology enables the assistance individuals with limited mobility need for their daily routines: these limitations can be addressed using modern ambient assisted living technologies. In particular we discuss the benefits of using electromyography (EMG) sensors to capture gestural input that would normally be difficult to sense in the absence of such sensors. With EMG, we can provide user control of a smart environment through the use of gestures based on muscle activity of the hands. This paper will focus on presenting the benefits of EMG technologies that can potentially assist individuals with hand mobility issues. We will describe the current state of EMG sensory technologies and their role in shaping gesture-based interaction techniques. We present our approach using such EMG signals and demonstrate their value in a smart home scenario. Finally we introduce the concept of subtle EMG gestures and build a better understanding of how we might improve accessibility for those with limited upper limb motion.

**Physicians’ Experiences on EHR Usability: A Time Series from 2010, 2014 and 2017**

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**Abstract.** The interest towards monitoring and guiding the development of healthcare information systems on a national level is increasing. In this paper, we report results from the three cross-sectional surveys on physicians’ experiences on usability of their electronic health record (EHR) systems in Finland. The research question was: How have physicians’ experiences on usability of their EHR systems evolved between 2010 and 2017? The data consists of responses to six usability statements from Finnish physicians working in public healthcare centres and hospitals. Among physicians working in healthcare centres, results between 2010 and 2017 show change for the worse. Among their colleagues in hospitals, results indicate slight improvement only in the domain of ease of use of the systems. In general, contrary to general expectations, the results do not show improvements between the years 2010, 2014 and 2017. In the future, we will continue the monitoring work in Finland on a national level from the viewpoint of physicians and other professional groups.
Usability Analysis of Contending Electronic Health Record Systems

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Abstract. In this paper, we report measured usability of two leading EHR systems during procurement. A total of 18 users participated in paired-usability testing of three scenarios: ordering and managing medications by an outpatient physician, medicine administration by an inpatient nurse and scheduling of appointments by nursing staff. Data for audio, screen capture, satisfaction rating, task success and errors made was collected during testing. We found a clear difference between the systems for percentage of successfully completed tasks, two different satisfaction measures and perceived learnability when looking at the results over all scenarios. We conclude that usability should be evaluated during procurement and the difference in usability between systems could be revealed even with fewer measures than were used in our study.

Challenges in Displaying Health Data on Small Smartwatch Screens

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Abstract. Using smartwatches for self-tracking purposes has become increasingly common. This tracking is possible as a result of the many sensors embedded in modern smartwatches including GPS, heart rate monitor, accelerometer, and gyroscope. The ability to obtain personal health-related data is one of the most compelling reasons to purchase such devices. However, form factor limitations create numerous challenges for users hoping to access and interpret the data available. Typically, users rely on a secondary device, such as a smartphone to view health data. The aim of our research is to identify methods to improve user consumption of health-related data directly on a smartwatch. To study and apply novel visualization approaches, several key challenges need to be addressed. We present these here along with our corollary methods of circumvention.

Thought Spot: Embedding Usability Testing into the Development Cycle

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Abstract. Usability testing is a vital component in the development of any digital innovation. Thought Spot, a mental health and wellness mobile application designed for and by transition-aged youth, underwent three distinct phases of usability testing (lab testing, field testing and heuristic evaluations). Testing highlighted that participants generally had a positive experience with the platform. Although some app functions were initially difficult for users, positive trends in learnability were observed. The key lesson learned from this process is the need for iterative testing timelines, concurrent with app development.

Assessing the Alignment of Objectives, Instructional Activities, and Assessments in a Biomedical Informatics Curriculum

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Abstract: The objective was to assess the alignment of course learning objectives, instructional activities, and course assessments in a Biomedical Informatics curriculum. Each syllabi in the curriculum was reviewed and scored according to a validated rubric with disagreements among reviewers adjudicated by consensus. Only low and moderate levels of alignment were identified. The results indicated the needs and goals of courses could be more effectively met with faculty investments in syllabi redesign and clarification to achieve course objectives. Root causes included word choice in learning objective statement as well as lack of consideration of instructional scaffolding by the course developer.
Cancer Phenotype Development: A Literature Review

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Abstract. EHR-based, computable phenotypes can be leveraged by healthcare organizations and researchers to improve the cohort identification process. The ability to identify patient cohorts using aspects of care and outcomes based on clinical characteristics or diagnostic conditions and/or risk factors presents opportunities to researchers targeting specific populations for drug development and disease interventions. The objective of this review was to summarize the literature describing the development and use of phenotypes for cohort identification of cancer patients. A survey of the literature indexed in PubMed was performed to identify studies using EHR-based phenotypes for use in cancer studies. Specific search criteria were formulated by leveraging a phenotype identification guideline developed by the Phenotypes, Data Standards, and Data Quality Core of the NIH Health Care Systems Research Collaboratory. The final set of articles was examined further to identify 1) the cancer of interest and 2) the different approaches used for phenotype development, validation and implementation. The articles reviewed were specific to breast cancer, colorectal cancer, ovarian cancer, and lung cancer. The approaches taken for phenotype development and validation varied slightly among the relevant publications. Four studies relied on chart review, three utilized machine learning techniques, one took an ontological approach, and one utilized natural language processing (NLP).

Towards a Clinical Analytics Adoption Maturity Framework for Primary Care

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Abstract. Clinical decision support systems are evolving with growing analytics capabilities towards pervasive use of artificial intelligence. Maturity models can guide the adoption of these new technologies in clinical practice to improve patient outcomes in primary care settings. Our literature survey identified the "Health Analytics Adoption Maturity Model" by Canada Health Infoway as a suitable basis for developing an adoption maturity framework with primary care focus. We follow a design-science research paradigm to develop a scientifically-validated mixed-method approach for assessing and guiding the evolution of clinical analytics capabilities in primary care. This paper summarizes the first phase of our research in progress.