WAVELENGTHS 2019

technologists transforming the future of medical imaging

WORKSHOP AND SYMPOSIUM APRIL 26 & 27 2019
WAVELENGTHS 2019 is comprised of a pre-symposium research workshop and a full-day symposium for imaging technologists to build their skills and showcase works-in-progress, quality improvement projects, innovations in practice and completed research.

2019 is our inaugural year for offering this research workshop and full-day symposium that recognizes the growing interest in cultivating quality improvement and research competencies among imaging technologists. Imaging technologists from all modalities are invited to participate as speakers and participants in what will be a dynamic opportunity for sharing knowledge and building professional networks.

Our keynote speakers include Ms. Catherine Wang, Vice President of Clinical Operations and Diagnostic Partnerships at University Health Network, Sinai Health Systems and Women’s College Hospital and Dr. Narinder Paul, Chair/Chief, Department of Medical Imaging in the Schulich School of Medicine & Dentistry, Western University and its teaching hospitals, London Health Sciences Centre and St. Joseph’s Health Care London.

The symposium will also provide opportunities for students, researchers, patients, educators and health professionals, health service leaders, from all disciplines to:

- Share knowledge, ideas and best practices for imaging and service delivery
- Present current research interests, questions and findings
- Learn more about imaging scholarship and research happening locally, nationally and internationally

ABOUT WAVELENGTHS 2019
Dear Participants,

Welcome to the inaugural WAVELENGTHS symposium – a symposium for imaging technologists, by imaging technologists. Three years ago, the Michener Institute integrated with UHN and the new Michener Institute of Education at UHN was launched. Locating a school within a hospital network was a first in Canada and has afforded many opportunities, not least of which is closing the gap between education, clinical practice and research. Soon we will also be launching a new Research Institute for Health Care Education whose main mission is cultivating academic practice across the professions. We are delighted that WAVELENGTHS2019 is the first symposium to be sponsored by the Research Institute for Health Care Education!

The idea for this symposium came from members of our community – Mr. Marc Potvin, Manager of Partnerships and Procurement and Mr. Alex Gontar, Faculty Radiological Technology at the Michener; and Dr. Narinder Paul, former Division Chief, Thoracic Imaging, at UHN and current Chair/Chief, Department of Medical Imaging in the Schulich School of Medicine & Dentistry, Western University and its teaching hospitals in London, Ontario. Their collective vision was to bring together the imaging community by hosting a symposium where technologists could share their works-in-progress, quality improvement projects and research and WAVELENGTHS was born.

Your response to our call for abstracts was overwhelming. We received almost fifty submissions and thanks to you, we have an exciting and interesting program with topics ranging from ergonomics-in-practice, communication between technologists, patients and other professions, impact of new technology including artificial intelligence, changing practices and the health system.

Our Key-Note Speakers are leaders in the field of imaging technology locally and internationally and include Dr. Narinder Paul, Ms. Catherine Wang, Mr. Paul Cornacchione from Ontario, Canada; and Mr. Ronen Bercovitz and Mr. Salim Bader from Tel Aviv, Israel.

On behalf of the WAVELENGTHS2019 Planning Committee, the Michener Institute for Education at UHN and the Research Institute for Health Care Education, we welcome you to WAVELENGTHS2019. We hope the symposium provides opportunities for you to meet your peers, exchange lessons learned and new ideas and to build relationships and community.

Sincerely,

Ann Russell, PhD
Senior Director,
Learning, Innovation and Research
KEYNOTE & INVITED SPEAKERS

Dr. Narinder Paul is Professor and Chair of Medical Imaging at the University of Western Ontario in London, Ontario, Canada. He is also the city wide Chief of Medical Imaging in the London Hospitals and a Scientist at both Lawson and Robarts Research Institutes.

He did his early training in England before moving to Canada permanently in 2000, where he became the Division Head in Thoracic Imaging at the University Health Network and Mount Sinai Hospitals, Toronto. Dr. Paul has 107 peer-reviewed publications, 164 refereed abstracts and his research interests include image optimization, ultralow dose cardiothoracic CT and lung perfusion CT. He worked closely with research scientists from Toshiba Medical Systems and Carestream Health for many years in Toronto, with the last two years focused on digital tomosynthesis, dual energy and dynamic imaging (CSH) and lung perfusion (TMS).

Ronen Bercovitz is the Director of National School of Medical Imaging at the Sheba Medical Center in Israel, a combined program with the Bar Ilan University. In his current position, he Re-created the new and innovated program for Radiographers in Israel.

Ronen is the co-founder and Academic Director at the National Training Center for Imaging Professions. He is also served as a Clinical Instructor in the MRI unit and considered a national source of knowledge in the field of Magnetic Resonance Imaging. In recent years, he has been advising Academic Institutions on Technological Education and assisted to build their curriculum.

He is an active partner in MRI researches and scientific publications and has lectured at conferences in Israel and worldwide such as RSNA, ECR, jENS. Ronen is an educator and focuses on technological innovation and professionalism in medical imaging.

Salim Bader is the chief radiographer at the Sheba Medical Center. The hospital is considered as a largest in the Middle East and recently rated by the Newsweek as one of the top ten hospitals in the world. In addition, Salim is the director of the National Center for Training in Imaging.

In the past, Salim has held a number of positions, including Chief Radiographer of the Hillel Yaffe Medical Center and later, as a Deputy Chief Radiographer of the Sheba Medical Center. Salim is an active partner in the establishment of the National School of Imaging. Today, the school is run by Ronen Bercovitz as a director.

Salim is working to promote the profession at the national level. As part of his role, Salim combines new technologies at Sheba Medical Center, which requires him to be technologically updated and develop skills according the needs.

Salim is working to raise a new different generations of radiographers when the patient in the center. He believes that the profession must be adapted to reality in order to survive all the global changes.

Catherine Wang is the Vice President of Clinical Operations and Diagnostic Partnerships at University Health Network, Sinai Health Systems and Women’s College Hospital. In this role, she is the executive lead for the Joint Department of Medical Imaging, Canada’s largest academic radiology program that spans across UHN, Sinai Health and Women’s College Hospital. She also serves as the executive lead for UHN’s Laboratory Medicine Program as well as Microbiology, a partnership between Sinai and UHN.

Catherine is appointed at the University of Toronto, Faculty of Medicine as Assistant Professor for the Department of Medical Imaging.

Earlier in her career, Catherine has had progressive management roles within the rehab, paediatric and acute care sectors. She has served the McGuinty government as the Senior Policy Advisor for Cabinet Office as well as worked within the Ministry of Health.

Her focus throughout her career has been on quality improvement for patients at the hospital and system-level.
# AGENDA

## FRIDAY APRIL 26

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<td>3 pm - 6 pm</td>
<td>RESEARCH WORKSHOP</td>
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<td>The ABCs of Academic Practice</td>
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<td>6 pm - 6:15 pm</td>
<td>OPENING ADDRESS</td>
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<tr>
<td></td>
<td>Dr. Narinder Paul – City-Wide Chief, Dept. of Medical Imaging, London Health Sciences Centre &amp; St. Joseph’s Health Care Chair, Department of Medical Imaging, Western University</td>
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<tr>
<td>6:15 pm - 8 pm</td>
<td>POSTER ROUNDS AND WELCOME RECEPTION</td>
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<td>7:30 am - 8:30 am</td>
<td>BREAKFAST</td>
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### ORAL PRESENTATIONS SESSION 1

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<td>Yili Wang – Sunnybrook</td>
<td>Ivy Chan-Dinevski &amp; Queyn Ho – JDMI (MSH)</td>
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<td>Improving language service access for patients with limited English proficiency in the outpatient department</td>
<td>Inserting PICCs at the patient’s bedside using Bard’s Sherlock 3CG Diamond Tip Confirmation (TCS) confirmation system at Mount Sinai Hospital</td>
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<td>Tracy Wakeford – JDMI (MSH)</td>
<td>Danfeng Zhao, Nicole Bennett, &amp; Kathy Hilario – JDMI (UHN)</td>
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<td>Prepping for Success: Improving the communication of patient preparatory instructions for CT colonography</td>
<td>A case report of a severe panic attack during MR imaging: What does the literature say about how to spot it, and how to stop it</td>
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<td>Sidsel Pedersen &amp; Virginia Sanders – Southern Alberta Institute of Technology</td>
<td>Jin Huang – JDMI (UHN)</td>
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<td>Sex, Identity, Gender, Expression form- Pilot Project</td>
<td>Best practice and novel approaches to liver MRI: A comprehensive review of the modern literature</td>
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<td>Derek Lo, Daria Comsa, &amp; Doug Moseley – Southlake Regional Healthcentre</td>
<td>Roger Boyle &amp; Shaun Dias – JDMI (UHN)</td>
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<td>Establishing guidelines for quality assurance and clinical application of metal artifact reduction (O-MAR) software in Radiation Therapy</td>
<td>Using communication strategies to support engagement, performance, and outcomes in hospitals</td>
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<td>Jean Nash – JDMI (UHN)</td>
<td>Aruna Mahabir – JDMI (UHN)</td>
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<td>Patient as observer; Practical steps to launching a hand hygiene quality assurance program in the medical imaging outpatient setting</td>
<td>The use of magnetic seeds in breast lesion localization</td>
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<td>Kerry Knickle &amp; Jordan Holmes – Michener</td>
<td>Ravi Menezes – JDMI (UHN)</td>
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<td>I can’t give you the results – But here is what I can do…</td>
<td>Multi-hospital implementation of Rapid MRI protocols: Impact and lessons learned</td>
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| 11:30 am - 12 pm | **INVITED SPEAKER**  
Paul Cornacchione – Senior Director, Imaging Operations, The Joint Department of Medical Imaging, Sinai Health System, University Health Network, Women’s College Hospital  
*Changing the paradigm of imaging: Imaging driving patient care* | Auditorium |
| 12 pm - 1 pm   | **LUNCH**  
Cafeteria & Annex 222                                               |            |
| 1 pm - 1:45 pm | **PATIENT PANEL**  
Jack Ireland (Patient Partner), Chris Stigas (Patient Partner), Ann Russell (Facilitator) | Auditorium |
| 2 pm - 3:15 pm | **ORAL PRESENTATIONS SESSION 2**  
**Quality Improvement Stream**  
Auditorium  
Laura Bjerring, Brookelyn Rice, & Nan Okun – BORN  
*Nuchal translucency quality assurance (NTQA) in Ontario*  
Jia Youngheng, Maan Kulsoom, Rudi Boci, Wasim Javed, Scott Boerner, & Sangeet Ghai – JDMI (UHN)  
*Thyroid biopsy sonographer specialist; Long term outcomes of a quality initiative to reduce wait times and improve adequacy rates*  
Shahvir Irani, Nancy Talbot, & Jean Nash – JDMI (UHN)  
*Achieving pin-point accuracy; Medical radiation technologists’ use of ultrasound guidance for peripheral intravenous access of challenging vasculature*  
Nancy Talbot – JDMI (UHN)  
*Implementation of quantitative liver imaging – MR elastography*  
Tina Hui – JDMI (UHN)  
*Ensuring data quality and integrity in financial management reporting for medical imaging operations* | Auditorium  
Ling Yu – Sunnybrook  
*Water as neutral oral contrast versus positive oral contrast agents in oncology staging abdominopelvic CT: evaluation of pre-scan wait time, patient experience and cost analysis*  
Mark Zaidi, Trevor McKee, & Brad Wouters – STARR  
*Use of image analysis to quantify hypoxia and proliferation relative to vessel distance*  
Karyn Brunet – JDMI (UHN)  
*A technologist’s experience with clinical research; pneumothorax visualization in ICU patients using portable chest radiography and enhancement software*  
Nicole Cancelliere & Victor Pereira – JDMI (UHN)  
*How technology is transforming the role of the technologist*  
Maala Sooriyakanthan & Wendy Tsang – JDMI (UHN)  
*Alterations in left atrial and left ventricular myocardial function in mixed aortic valve disease* |
| 3:15 pm - 3:30 pm | **BREAK**                  |            |
| 3:30 pm - 4 pm  | **ORAL PRESENTATIONS SESSION 3**  
**Education**  
Auditorium  
Noor Hesson – William Osler Health System  
*The role of computer-aided diagnosis (CAD) in the diagnosis and characterization of thyroid nodules when combined with conventional ultrasound: a literature review*  
Sheena Chung – JDMI (WCH)  
*The challenges of relying on patient-reported medical history in a breast imaging program* | Auditorium  
| 4 pm - 5 pm    | **INVITED INTERNATIONAL SPEAKERS**  
Ronen Bercovitz – Director, National School of Medical Imaging, Sheba Medical Centre, Tel Hashomer, Israel  
*A new education model for image technologist at Sheba Medical Centre*  
Salim Bader – National School of Medical Imaging, Sheba Medical Centre, Tel Hashomer, Israel  
*The opportunities and risks associated with artificial intelligence in the imaging profession* | Auditorium  
| 5 pm - 5:30 pm  | **CLOSING KEYNOTE SPEAKER**  
Catherine Wang – Vice President of Clinical Operations and Diagnostic Partnerships at the University Health Network, Sinai Health Systems and Women’s College Hospital  
*Catherine Wang* | Auditorium  
| 5:30 pm - 5:45 pm | **CLOSING REMARKS**  
Auditorium |            |
STATEMENT OF WHAT IS KNOWN/GAPS
3D Printing is an exciting tool in medicine since it has shown to be useful in medical education and for surgical planning. However, 3D printing is not commonplace in medical imaging (MI) departments. One of the main obstacles to widespread usage of 3D printing in MI is that most 3D printable raw materials are not radiologically accurate when the scanned images are visualized. To solve this issue and to run a successful 3D printing program in MI, successful collaboration by a multi-disciplinary team is required. One of the key members of this team is the medical radiation technologist (MRT). MRTs with skills including knowledge and experience in 3D volume rendering, anatomic segmentation and knowledge of multi-modality imaging protocols can help drive innovative solutions with the use of 3D printing technology.

STATEMENT OF THE CLINICAL ISSUE/RESEARCH TOPIC
MRTs rely heavily on phantoms to perform testing on existing and newly developed imaging equipment. Additionally, phantoms are widely used by MRT students to learn anatomy and practice image acquisition skills without irradiating real patients. Commercially available phantoms such as an abdominal CT phantom made of urethane and epoxy base resins are available for usage. However, they have major disadvantages including lacking the realistic appearance of actual anatomical organs. In addition, current phantoms are not modular, since users are not able to remove, replace and manipulate the organs contained within. These disadvantages hinder their usage and the learning opportunities for students.

In this study, two MRTs in collaboration with a radiologist and a medical engineer utilized 3D printing to develop a low-cost, modular, anthropomorphic phantom. The goal was to improve the limitations of currently available phantoms and use the 3D printed phantom for clinical imaging purposes.

STATEMENT OF STUDY METHODOLOGY/CLINICAL INNOVATION
An abdominal model with radiological characteristics mimicking actual scanned organs was needed to evaluate digital tomosynthesis, without having to irradiate patients. Two MRTs in collaboration with a radiologist and a biomedical engineer designed and constructed a low cost, 3D printed, tissue realistic modular abdominal phantom. The phantom was comprised of a liver, colon, pancreas, kidneys, spleen with surrounding muscular and fatty tissue. The MRTs had prior experience in anatomic segmentation software (Vitrea®, Vital Images), 3D modelling software (Blender v.2.78) and access to a low-cost 3D printer. Organs were printed out of ABS plastic with the fused deposition modeling (FDM) method using a combination of anonymized patient specific CT scan data.
Student Self Evaluation of Technical and Behavioural Competencies in the Ultrasound Program

Cathy Babiak, Emily MacLeod, Catharine Gray

STATEMENT OF WHAT IS KNOWN/GAPS
Self-assessment activities are used frequently in healthcare education. It is a valued skill that is required for practice by many Regulatory Colleges. In the literature, these activities are commonly analyzed to investigate their validity and/or accuracy, and rarely to gain more insight into the patterns of students’ perceptions of their progress mastering competencies. Understanding more about student self-perceptions may enable educators to identify and plan around typical areas of over- and under-confidence.

Most health professions require both technical competency and behavioural skill proficiency related to communication and ethics. Previous work identified that medical students’ self-assessments tend to underestimate their technical/procedural proficiency and overestimate their proficiency in behavioural/clinical skills. However, investigations into differences in self-evaluation ratings of technical and behavioural competencies over time have not been examined.

STATEMENT OF THE CLINICAL ISSUE/RESEARCH TOPIC
In 2015 the Ultrasound program at the Michener Institute of Education at UHN complete self-assessments, (technical and behavioural), routinely starting in week 3, during their two semesters of clinical placement. Data from assessments completed during the 2016/17, 2017/18, and 2018/19 academic years was analyzed.

DESCRIPTION OF IMPACT/EXPECTED FINDINGS
Our initial results show that students perceive themselves as steadily gaining competency in both behavioural and technical skills throughout the semester, but that they perceive their behavioural competencies to be closer to mastery at the start of the semester than their technical competencies. These results offer insights to both school and clinically-based educators about the typical trajectory of student self-perception of competency mastery. Clinical educators are rarely given the opportunity to gain perspective on broad trends of student performance, and may feel more confident identifying anomalous student-self evaluations given this information.

Spotlight on CT Dose Optimization

Cowin Burton, Mary May

STATEMENT OF WHAT IS KNOWN/GAPS
• CT protocols and image quality should be under constant review and incorporated into a continual learning process that is embedded into your organization
• Are your CT protocols consistent around image quality and radiation dose?
• Protocol review, is it possible to do annually?
• Does anyone have a clear and understandable process around protocol change management? and does this process work fast enough to ensure we keep up with these agile times?
• What do you do with all the information you obtain?

STATEMENT OF THE CLINICAL ISSUE/RESEARCH TOPIC
• Radiation dose in CT protocols, image quality, protocol management and continual learning for technologists

STATEMENT OF STUDY METHODOLOGY/CLINICAL INNOVATION
Creating a flexible and reliable process for monitoring, correcting, trailing and reviewing image quality in CT against radiation dose - the ultimate goal is a protocol per individual patient

DESCRIPTION OF IMPACT/EXPECTED FINDINGS
If you look at radiation dose from a more holistic approach you should expect to find that:
• affects can be felt across all stakeholders from patient to technologist to radiologist to organizational reputation
• technologist continuing education is a large piece of the project and will lend itself to greater engagement and confidence
• radiologists communication and protocol review are vital pieces that will help drive the agenda
• a very clear protocol change management process is vital
• patient specific protocols are becoming the way of the future, one size does not fit all

How to Lead a Journal Club Meeting
Holly Chun

STATEMENT OF WHAT IS KNOWN/GAPS
The journal club is well established among various medical professions where peers learn about research and clinical practices. A successful example, Twitter Journal Club, provides a venue for imaging techs worldwide to learn from each other. Due to the geographic and time differences, the club adopts the online format. Locally, imaging techs can meet face to face, adding a social function to the academic event.

The JDMI Journal Club is an initiative by the Joint Department of Medical Imaging (JDMI) Practice Council. During each council meeting, council members discuss an article. Recently, the MRI team at the Toronto Western Hospital (TWH, part of the JDMI) also started their local journal club.

The journal club, a century-old concept, may still be unfamiliar among imaging techs. Some techs who are interested may need help with leading a meeting.

STATEMENT OF THE CLINICAL ISSUE/RESEARCH TOPIC
To be producers of research, we first need to be consumers of research. Learning to critique articles is the first step of becoming a researcher. The journal club, therefore, encourages the emerging researchers by digesting (discussing) journal articles. During the process, participants learn about the various areas of conducting research, writing a journal article, and critiquing an article.

There are many facets to a journal club. I will present a few considerations of appraising an article, for instance, research methodology, statistical tests, result presentations and discussions, ethical issues, and of course the take-home message.

STATEMENT OF STUDY METHODOLOGY/CLINICAL INNOVATION
I will share my personal experience of three journal clubs for medical imaging technologists which operate at different levels:
• Twitter Journal Club: A monthly journal club that enjoys an international audience.
• JDMI Practice Council: Council members discuss an article during the council’s bimonthly meeting.

Our vision and commitment to improving life for all lies at the heart of everything we do. By partnering to focus on what matters, together we can deliver intelligent, high-quality solutions. With Canon Medical, true innovation is made possible.
Every writer must perform the challenging task of managing citations and references. Using a reference management app can significantly reduce the tedious work, increase accuracy, and improve productivity. However, some students are unfamiliar with their functions and how to use them.

STATEMENT OF THE CLINICAL ISSUE/RESEARCH TOPIC
An author must cite references and compile a reference list for a manuscript. Frequently, the writer curates a lot of material and chooses citations among the collection. A reference management app can simplify the tasks of maintaining and using references.

A user of a reference management app can import the information of a publication, such as the authors’ names, journal name, publish year, and DOI; and sort each entry into different folders for easy retrieval. Furthermore, the writer can cite as they write. The app will format the manuscript to the selected style, such as APA or Chicago, in real-time. Then, the app can generate a reference list. Finally, the user can remove all dynamic fields and save a permanent document with citations and references formatted to the required publication style.

The objective of this presentation is to promote awareness and usage of these apps in the audience by introducing their functions.

STATEMENT OF STUDY METHODOLOGY/CLINICAL INNOVATION
I will discuss two different reference management apps: RefWorks and Mendeley. Users of the University of Toronto can create an account using their university credentials and learn how to use it in library sessions. Mendeley is provided by Elsevier, a major publisher of medical journals, including the Journal of Medical Imaging and radiation sciences. Other apps exist, each with their pros and cons. I choose these two apps because I am an experienced user and I can share my experience with the audience.

I will demonstrate some basic utilities of each app. Some examples of functions include importing and managing references into the database, citing references while writing, and compiling of a reference list. These cloud-based apps can be accessed from any computers that can access the Internet. Mendeley users can even download a mobile app on their cellphones.

DESCRIPTION OF IMPACT/EXPECTED FINDINGS
After the introduction, the audience will be aware of these tools that can improve productivity and increase accuracy.

Safely Scanning MRI Patients with a Cardiac Pacemaker
Michael Comeau

STATEMENT OF WHAT IS KNOWN/GAPS
Currently in Canada there are 10’s of thousands of patients who have a MRI conditional pacemaker. Many of these patients require an MRI that is considered essential to their care. Historically cardiac pacemakers have been contraindicated for to undergo MRI exam and this patient population has been declined access to MRI exams. Over the last few years there have been advances in pacemakers and there are now several MRI conditional devices on the market. If the conditions listed by the manufacture and hospital policies are met is safe to proceed with the MRI scan. Without meeting listed conditions the device is considered not MRI safe and therefore contraindicated for MRI.

STATEMENT OF THE CLINICAL ISSUE/RESEARCH TOPIC
The Toronto General Hospital is the world leader in cardiac MRI by volumes with 4000 cardiac MRI exams scheduled each year. It made sense that we started to provide service for this population as MRI can often be standard of care for many health issues. There are many publications and hospital policies on both the topic of what to do and how to handle MRI requests when a patient has a MRI conditional pacemaker. The goal here is to share safe practices and processes and hopefully encourage other sites to start accepting this patient population in the routine practices.

STATEMENT OF STUDY METHODOLOGY/CLINICAL INNOVATION
My process review will include The Toronto General Hospitals current review and process for approving and safely scanning patients with a conditional pacemaker. Having an MRI conditional pacemaker is not a green light to proceed. Some area of concern include; is there an alternate imaging modality that can provide appropriate information, conformation on the pacemaker insertion date, are there any abandon leads left behind from previous pacemakers, confirmation from a cardiologist that the patient is not pacemaker dependent, do the pacer leads match the pacemaker device. I will cover the overall approval process, including verify the device’s conditions, documenting, scheduling, day of exam including a cardiologist support and the pre and post exam requirements.

DESCRIPTION OF IMPACT/EXPECTED FINDINGS
The demographics of patients with conditional pacemakers continues to grow as people are living longer. There are now 5.9 million Canadian seniors, compared to 5.8 million Canadians 14 and under. This is due to the historic increase in...
the number of people over 65 — a jump of 20 per cent since 2011 and a significantly greater increase than the five per cent growth experienced by the population as a whole. Seniors are more likely to require a conditional pacemaker over other age groups. I hope to encourage other MRI centres to start accepting this unique patient population into their routine practices.

**ABSTRACT**

Background: In 2017, UHN was facing ultrasound outpatient wait times of beyond 3 months. With multiple hospital programs continuing to grow, the limited capacity was forcing UHN patients to be diverted to other hospitals or clinics. In addition, inpatient and cancer clinic add-on requests were increasing across Toronto Western (TWH), Toronto General (TGH) and Princess Margaret (PMH) sites.

**METHODOLOGY**

An environmental and needs assessment was conducted to understand gaps in service delivery and options for new operational models. The following deliverables were implemented:

1. Environmental and needs assessment performed to understand gaps in service delivery
2. Operational strategies to decrease wait times and address increasing volumes and demands
3. Change management techniques to coordinate between multiple stakeholders to ensure smooth transition
4. Assessments completed to ensure deliverables are addressing service gaps

**RESULTS**

The number of Princess Margaret add-ons that were previously transferred to Toronto General significantly decreased as a result of an optimized booking schedule at Princess Margaret. Add-ons performed at TGH decreased by 64% and patients were able to receive their diagnostic scans on-site.

**CONCLUSIONS**

The implementation of evening appointments and streamlining access has greatly decreased the ultrasound outpatient wait times. This process has diverted the UHN requests back to UHN, addressing capacity and access pressures.

Next steps will include the continual monitoring of wait times to achieve departmental targets of 14 days. Also, the expansion of the same access program at the Toronto Western Site into the evening hours to accommodate primary care requests and to avoid or reduce emergency visits. In addition, an expansion of the current evening program at Princess Margaret is being planned to further increase capacity.

**OBJECTIVES**

What Attendees will learn:
secure and reliable method, three-quarters by email. As a result, average turnaround time decreased by 23% with the elimination of manual intervention to troubleshoot fax issues. The complexity of workflow process steps was reduced by 30% and clear accountability was created under one team. As well, through the clean-up initiative, 1390 physician records were reviewed and were updated as required. Finally, additional benefits were realized, which include enhanced care coordination and critical care communication, cost savings, auditing mechanisms, and easier to read reports. This data may be within a margin of error of 2-4%.

Service-Learning in Imaging and Radiologic Sciences Education in the United States
Mari King, Denis Anson, Leamor Kahanov

STATEMENT OF WHAT IS KNOWN/GAPS
Although some imaging and radiologic sciences educators in the U.S. use service-learning as a teaching strategy, an understanding of service-learning as a component of the curriculum is lacking. While service-learning is identified as a high-impact practice, the application in imaging and radiologic sciences has not been systematically explored. To expand the breadth and depth of understanding, the researchers used responses from faculty to assess the current status of service-learning in imaging and radiologic sciences education in the U.S.

STATEMENT OF THE CLINICAL ISSUE/RESEARCH TOPIC
The study investigated faculty integration of service-learning into education and the perceived effect on professional and personal experiences and those of imaging and radiologic sciences students. The research questions investigated include: When and how are imaging and radiologic sciences faculty using service-learning? What community issues are being addressed? Which reflection strategies are imaging and radiologic sciences faculty using? What personal and professional impacts have faculty experienced? What student learning and development outcomes have faculty observed to occur frequently? How are faculty using service-learning as the scholarship of engaged pedagogy? What are the major obstacles/challenges to using service-learning as a teaching strategy? What types of support are most valuable for developing and implementing service-learning?

STATEMENT OF STUDY METHODOLOGY/CLINICAL INNOVATION
The researchers accumulated contact information for all Diagnostic Medical Sonography, Nuclear Medicine Technology, Radiation Therapy and Radiography faculty in the U.S. that could be obtained from accrediting agencies or that was publicly available from accrediting agency or institutional websites. The faculty email list included 2,351 educators. Data were collected through an online survey instrument that was anonymous and confidential. In 2017, following IRB approval, personalized invitations to participate were emailed to all faculty members on the list. Responses were recorded as each item was answered, which allowed us to process even partially completed surveys. Data collected were stored in a MySQL database and analyzed using SPSS 22. The analysis primarily included descriptive statistics of the raw data, using frequencies and percentages for categorical data. Mindmaps were also created from responses to open-ended “other” questions for qualitative analysis.

DESCRIPTION OF IMPACT/EXPECTED FINDINGS
Users reported service-learning outcomes of increased professionalism, leadership, career skills, empathy, and community awareness for faculty. Lack of time was a major deterrent for both themselves and students, as well as logistics. While lack of funding was reported as a barrier, it was ranked as relatively minor. The most profound professional effects of service-learning reported by users were an awareness of the community and relationships between the faculty and the community and students. Faculty also indicated improved professional effectiveness, both in terms of knowledge and application, through service-learning. Respondents indicated that service-learning assists with a larger goal to provide experiences that are relevant to the world students will encounter after graduation. They perceived additional benefits for themselves and their students in understanding the community and community members with more richness, ultimately improving critical soft-skills of practice.

Technologist’s Coral billing and workload documentation
Harry Le, Amy Bisquera, Suzie Martyns

STATEMENT OF WHAT IS KNOWN/GAPS
Technologists have been documenting missing or incorrect billing and workload codes in Coral. Billing example, an MRI head procedure must have both X421 multislice and X425 repeat in order to get paid. If and when the technologist documents only X421 code, then the ministry will not pay, which will result in revenue loss. Workload example, the correct documentation for transjugular liver guided biopsy must have both IR221 a workload of 120 minutes and MI930 adult conscious sedation 10 minutes. If and when the technologist documents only MI930 code, then the service recipient workload statistics get undervalued. Documenting wrong/missing workload codes impacts service recipient activities, which is reflected in the monthly statistics.

STATEMENT OF THE CLINICAL ISSUE/RESEARCH TOPIC
Technologists choosing incorrect billing codes result in revenue loss for all modalities. Incorrect/missing workload codes result in inaccurate monthly statistics.

STATEMENT OF STUDY METHODOLOGY/CLINICAL INNOVATION
Proper and correct billing and workload code documentation. Incorrect versus correct example diagrams and screenshots will be presented.

DESCRIPTION OF IMPACT/EXPECTED FINDINGS
Ministry’s payment denial for missing or incorrect billing codes. Incorrect workload codes result in incorrect monthly statistics.
Incorrect documentation of billing and workload codes affect revenue loss, which in turn cause operational budget constraint. Example #1: delayed patient care (prolonged wait time) Example #2: freeze in hiring or staff reduction

**Scanning contraindicated Deep Brain Stimulator patients on 3 Tesla MRI – a single centre experience**

Bryan Li, Alexandre Boutet, Andres M. Lozano

**STATEMENT OF WHAT IS KNOWN/GAPS**

MRI has become the gold standard for most neuro-imaging exams. Unfortunately for many patients this is hazardous as certain implants are deemed contraindications. Deep Brain Stimulator (DBS) is an electronic neuro-implant that fits this criterion. DBS has gained increasing popularity in neurology, but due to the concern of excessive heating most DBS patients are being turned away from potentially lifesaving 3 Tesla (3T) MRIs. Therefore, it is crucial to investigate whether patients with these devices can be scanned safely in a well-controlled 3T environment.

**STATEMENT OF THE CLINICAL ISSUE/RESEARCH TOPIC**

In vitro data has indicated a range of SAR deposition and heating figures for DBS devices undergoing 3T pulse sequences. This in vivo study examines the safety of scanning a large cohort of real patients with select DBS devices under specific 3T settings, despite being against the manufacturer’s guidelines. It also evaluates the impact of DBS-hardware produced artefacts on the quality of these exams.

**STATEMENT OF STUDY METHODOLOGY/CLINICAL INNOVATION**

In this prospective study (REB#14-8255), 69 patients with select DBS implants underwent 3T MRIs with the DBS turned on from October 2016 to October 2018 (population mean age 58.12, 39 males). T1-weighted anatomical and GRE-EPI functional MRI (fMRI) sequences were imaged. Adverse events and acute changes on MRI images were tracked.

Post-exam, semi-automated segmentation method was used to quantify the DBS hardware-related artefactual loss of fMRI signal at the electrode contacts and wire coils. Segmented artefacts were then transformed into common space to define the shadowed brain areas and the values were analyzed.

**DESCRIPTION OF IMPACT/EXPECTED FINDINGS**

No MRI-related adverse events occurred for any of the DBS patients who underwent this controlled 3T MRI, and no acute changes were shown on MRI images.

Artefacts produced by the DBS-hardware were mostly located distally at the electrode contacts and in the fronto-parietal area. The average electrode contact artefact diameter was 9.4 + 1.6 mm, and 2.1 + 0.7% of the intracranial volume was obscured by metallic artefact.
The development of psychomotor skills and the confidence associated with performing professional tasks are key milestones for health sciences students. Traditionally, these students are provided with lectures, readings, and limited simulation and hands-on training to ensure that this training translates into strong professional competence.

Due to heavy course loads it is difficult to provide one-on-one training for all students and to ensure that this training translates into strong professional competence.

We have created an e-learning module to be used in conjunction with traditional didactic education for a common healthcare skill: venipuncture. There is limited research on the effectiveness of e-learning modules in developing psychomotor skills for health sciences students and practitioners; thus our goal was to evaluate the effectiveness of our supplemental e-learning module in traditional didactic programs.

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driven by technologists to ensure that the resulting criteria would reflect what image quality meant to technologists.

Each set of criteria were evaluated in a national survey of CAM-RT and Ultrasound Canada members, who agreed that they were clear, reflected core elements of image quality in their modality and were relevant to a range of practice settings.

SUMMARY
JDMI has implemented a Technologist Peer Review program that provides an open forum for technologists to discuss and learn. The program has since been spread to St. Michael’s Hospital. The use of a multi-site, technologist-driven process resulted in the development of criteria for six modalities that will be applicable to a wide variety of healthcare organizations and practice settings.

OBJECTIVES
Panelists will include technologists across the partner sites as well as an implementation team member. They will discuss their experience as peer review participants and organizers. Audience members who attend this session will learn about:
1. How a technologist performs an image quality review
2. The development of the modality-specific image quality criteria
3. The impact of a Technologist Peer Review Program on peer-to-peer learning

Establishing a concise and unified PET/MR requisition process
Sangkyu Moon, Rosanna Chan

STATEMENT OF WHAT IS KNOWN/GAPS
Currently there is no concise and formal procedure to obtain all the necessary participant and study information needed for a research PET/MR exam. From the moment a research participant is consented for a study, there are many steps leading up to the exam. Study eligibility, scanner and radiopharmaceutical availability and patient preparation all need to be addressed before a participant arrives for their exam. The purpose of this work is to design and evaluate a novel requisition form to be implemented for a research PET/MR exam.

STATEMENT OF THE CLINICAL ISSUE/RESEARCH TOPIC
As a multimodality imaging system, the PET/MR scanner requires patient preparation for both the MRI and PET exam. Claustrophobia, medical allergies, improper patient prep, and MRI safety screening failures can all prematurely terminate a PET/MR exam. Currently study cancellation due to lack of proper patient information constitutes approximately 13% of all failed exams. It is important to detect potential screen failures prior to the day of exam, as same day cancellations can be very costly in terms of the cost of the radiopharmaceutical and lost time on the scanner. The challenge with the current patient booking process is that it lacks efficiency and effectiveness. Currently exam requests, patient preparation instructions and patient screening are all separate documents. A concise and unified requisition form that incorporates the necessary participant and study information, as well as a safety checklist and patient prep would substantially improve the efficiency of exam requests.

STATEMENT OF STUDY METHODOLOGY/CLINICAL INNOVATION
The novel PET/MR requisition will take the form of a PDF document with onscreen editing options. The form will incorporate a tailored MRI safety questionnaire, patient preparation instructions, and day of exam instructions. Some fields will be mandatory, and will include simplified screening questions for MRI safety, and relevant participant clinical history including: body habitus, medical allergies, and claustrophobia. Participation preparation instructions included in this form will contain information regarding sedative medications if needed, and patient prep prior to the day of exam (i.e. dietary and medication restrictions, bowel preparation etc.). To assess the feasibility of using a centralized electronic document, this requisition will be piloted by 5 study coordinators for 20 patients. Each coordinator will also receive an anonymous survey to rate the efficiency and effectiveness of the new requisition using a 5-point Likert scale.

DESCRIPTION OF IMPACT/EXPECTED FINDINGS
It is anticipated that the study coordinators will report more fluid coordination in patient booking and screening compared to previous. This will likely result in improved communication between the study team and the PET/MR staff. Furthermore, with the inclusion of patient education material in this form, patients should have a clearer understanding of what they need to do to prepare for the exam, and what will happen on the day of. Thus, the implementation of this purposefully-designed form should both improve patient and staff experience, and result in departmental efficiencies.

Enhancing Care Coordination and Flow by Attending Bed Management Meetings
Hayley Panet

ABSTRACT
A new practice at Princess Margaret Cancer Centre is to have the JDMI site manager attend the daily bed flow meetings with the inpatient managers. The daily bed flow meetings help bring situational awareness and identifies the capacity of the organization in a structured way. Having JDMI representation during these brief discussions helps to build collaborative relationships. The outcomes have been reduced barriers for JDMI services for both treatment and discharge limiting cases to enhance hospital discharge rates. Hospital capacity and JDMI activity is reported within the department to improve staff awareness. In addition, potential order entry errors are caught upfront and rectified in a timely manner and escalated as appropriate to reduce unnecessary delays in scheduling. This structure enhances the patient care coordination while improving both patient and staff experience.
OBJECTIVES
Identify 2-3 things that the attendee will learn from viewing/listening to your material

- Strategies to collaborate and enhance hospital operations
- Relationship management
- Improving situational awareness and communication between inpatient/hospital teams and JDMI teams

In an oncology setting, patients are often discharged with medications including chemotherapy and analgesics administered by a continuous ambulatory delivery device (CADD) infusion pump. The patients arrive for MRI exams as outpatients and traditionally had the exam cancelled until the scheduling could be coordinated with a nurse to maintain the pump.

STATEMENT OF THE CLINICAL ISSUE/RESEARCH TOPIC
Our facility went through a transition to phase out IV nurse resources that historically assisted with the disconnection and reconnection of CADD pumps for MRI exams. This opened an opportunity to expand the role of the MRI technologist to include the knowledge to maintain CADD pumps.

STATEMENT OF STUDY METHODOLOGY/CLINICAL INNOVATION
An education program was developed between MRI and our Nursing educator in Chemotherapy day care department.

The program included an MRI Safety standard of practice document on various CADD pumps, hands on training with pumps, elearning and review of policy on safe handling and disposal of cytotoxic/hazardous material, as well as final sign off.

DESCRIPTION OF IMPACT/EXPECTED FINDINGS
This training program is being monitored and assessed to determine technologist comfort with the process. Following this, the opportunity to translate this knowledge to other MRI sites is possible, thereby reducing the number of patients that arrive for MRI exams are are cancelled on day of.

STATEMENT OF WHAT IS KNOWN/GAPS
A Safety Coach educates and reinforces error prevention tools and safety behaviours to peers on a daily basis. They provide 5(positive):1(corrective) feedback, share stories and learnings from safety events. As well as, encourage staff to report incidents and near misses. Safety coaches also promote innovative ways to engage staff in learning new tools.

STATEMENT OF THE CLINICAL ISSUE/RESEARCH TOPIC
Safety Coaches can help prevent errors by detecting and correcting the individual or the system’s weaknesses. It helps create safe actions, habits, and a safe culture for the workplace as well as patients. Encouraging staff to have a double check their work ensures errors are not made.

STATEMENT OF STUDY METHODOLOGY/CLINICAL INNOVATION
A safety coach’s tool kit includes safety behaviour tools and error prevention tools. The most important tool is good coaching, including being proactive, discreet, helpful, and consistent.

When coaches set an example for employees, the employees will follow. Being a safety coach, you have to be able to start conversations with team members to make use of teachable moments.

DESCRIPTION OF IMPACT/EXPECTED FINDINGS
Building employee accountability will make safety behaviours into good work habits. Safety coaches give feedback to the hospital to determine where in our systems and processes improvements need to be made. The more incidents that are reported, the more we can work to make improvements to our workplace. By reducing clerical errors, we ensure patient information is kept in the right hands.
between production periods on low volume days and later, staff left unsupported for longer periods of time. Email was inefficient for group messaging; some staff did not have access to their work emails offsite and replies were fragmented between different responders. Similarly, text messaging did not afford the flexibility to communicate rapidly as a group and some staff had limited phone plans. Still, staff desired a means to perform daily huddles even off duty to assess the next day in order to feel adequately prepared.

**STATEMENT OF STUDY METHODOLOGY/CLINICAL INNOVATION**

The issues at hand led towards the use of a readily accessible technology. Since all staff had access to a mobile phone and Wi-Fi, WhatsApp messenger was proposed as a possible solution. A group chat was created and all staff were trained to use the basic features of the application. As a group, it was decided that images of the prepared production carts and brief summaries of tasks required for production were sufficient for production staff to make their assessments. Participation was made voluntary and timings of interactions were not fixed, as they occurred outside of work hours. However, the sender could see if messages had been received as well as read by the required participants and act further if absolutely necessary. The use of this has since evolved through the use of Continuing Improvement (PDSA) cycles to include communication for casual staff and added opportunities for use of UHN Caring Safely Tools for efficient communication.

**DESCRIPTION OF IMPACT/EXPECTED FINDINGS**

Throughout the course of development, the basic process of providing next day summaries have remained consistent. Staff enjoyed the fact that notification settings could be adjusted if staff were away and did not want to be disturbed, but individuals could be tagged and alerted if necessary. Furthermore, senders liked being able to see that recipients had accessed the information. Since this solution has been implemented, staff has been able to react positively and work more collaboratively to overcome a number of obstacles including several extended supply shortages and extreme fluctuations in production volumes to temporarily accommodate additional demands from other hospitals. Overall this simple e-tool has increased staff confidence and operational efficiency.

**POSTER**

Ascites Distorts Trabecular Bone Score and Hip/spine Bone Mineral Density

Queenie Wong, Madeline Dwyer, Diana Yau

**STATEMENT OF WHAT IS KNOWN/GAPS**

Osteoporosis is a skeletal disorder characterized by the degradation of bone resulting in increased risk of fracture. Bone mineral density (BMD) and trabecular bone score (TBS) derived from dual energy X-ray absorptiometry (DXA) scans are used to diagnose osteoporosis through measurement...
Ascites, an accumulation of transudative fluid in the peritoneal cavity, is prevalent in 12-55% of patients with chronic liver disease. Osteoporosis is a disease characterized by low bone mass and deterioration of bone quality which can lead to an increased risk of fracture. Bisphosphonates are a family of drugs used to treat osteoporosis. They inhibit and slow down bone resorption and also allow the bone building cells to work more effectively. Unfortunately, studies have shown some association between long term use of bisphosphonates and the incidence of atypical femoral fractures (AFF). But it has been shown that the risk of AFF diminishes significantly after drug withdrawal. AFF can be differentiated from typical osteoporotic femur fractures by the presence of several distinctive radiographic features that can sometimes be visualized from a hip dual energy X-ray absorptiometry (DXA) image. One of the major features that may be seen in AFF patients is the localized periosteal or endosteal thickening of the lateral cortex.

**STATEMENT OF STUDY METHODOLOGY/CLINICAL INNOVATION**

Bone mineral density (BMD) test is done on a regular basis on patients who are taking bisphosphonate treatment to evaluate its effectiveness. If a technologist is able to identify the special radiographic features of AFF on a hip DXA scan and consults with the reporting doctor, an X-ray can be ordered to rule out AFF. This may help to prevent or reduce future complete femoral fracture incidence for patients on long term bisphosphonate treatment. In fact, the DXA scanner manufactured by Hologic Inc. has a special scan mode called Single Energy Beam (SE) Femur scans that can be used as a preliminary screening tool for AFF in patients at risk. The SE femur scan is relatively sensitive and uses much lower radiation compared to conventional X-ray. It can be done during the same visit when the patients are having their DXA scans.

**DESCRIPTION OF IMPACT/EXPECTED FINDINGS**

By learning to identify the AFF radiographic characteristics as a technologist and together with special software like the Hologic® SE femur scan, it is possible to detect AFF at its early stage. This helps prevent a complete femoral fracture from happening, and also allows physicians to adjust their osteoporosis treatment plan accordingly.

**STATEMENT OF WHAT IS KNOWN/GAPS**

Patient understanding and cooperation is essential for accurate diagnosis in CT imaging. The current model of patient education prior to CT imaging involves a brief verbal explanation of the exam. This may cause suboptimal image quality due to failure to follow instructions stemmed from anxiety/confusion. Suboptimal imaging could negatively impact radiological findings and cause extra radiation exposure to patients. In turn, this could lead to decreased patient satisfaction. Research shows accessible patient-friendly material can reinforce patient knowledge, gain cooperation and alleviate fears (Blanck & Marshall, 2011). A written comprehensive set of CT instructions were therefore proposed for development to compliment the current verbal education system. Innovative ways in educating patients prior to CT imaging may improve clinical outcomes, quality of care and patient satisfaction (Practice-Based Research and Innovation Strategic Plan, 2012-2017).

**STATEMENT OF THE CLINICAL ISSUE/RESEARCH TOPIC**

1. Develop a written patient education tool outlining the
processes and instructions before, during and after CT imaging

2. Achieve a minimum of 15% CT out-patient satisfaction rate increase from baseline with tool implementation

3. Increase patient awareness, cooperation and health literacy pertaining to CT imaging

4. Create a overall positive shift in attitude in staff and patient and improve quality of care in medical imaging

STATEMENT OF STUDY METHODOLOGY/CLINICAL INNOVATION
Step 1: Needs assessment: patient and staff interviews, patient surveys, literature and policy reviews were conducted to identify areas for potential improvement

Step 2: Establish baseline: patient surveys were collected prior to building education tool to assess general attitude, health literacy, baseline satisfaction and level of cooperation during CT imaging

Step 3: Build education tool: a written education tool was created based on previous steps and it had been edited and revised by mentor, patient care coordinator, CT supervisor and patient education manager

Step 4: Peer review and test run: the education tool had been reviewed by medical imaging staff and patients undergoing CT imaging - further revisions were made to education tool

Step 5: Implement education tool: patients were given updated education tool prior to imaging

Step 6: Final data collection & analysis: patient surveys were collected post education tool and the results were compared with the previous survey result

DESCRIPTION OF IMPACT/EXPECTED FINDINGS
Written CT imaging education material is effective as a compliment to the current verbal education system as observed by 21% increase (i.e. from baseline) in overall patient satisfaction rate. Patients are less anxious, more cooperative, and more confident in CT imaging than before. The written education material is recommended for distribution and circulation upon patient arrival for CT scan in the medical imaging department at Sunnybrook Health Sciences Centre. 91% of all patients recognized the material as valuable. Machine voice and volume patient comprehension is improved by 11% (82% pre-material vs. 93% post-material). Increased patient awareness of IV dye injection and possible side effects by 10% (86% pre- vs. 96% post-) 60% of patients feel anxious about the pending CT scan, 81% of patients feel relieved post education material. 89% of patients found the education material to be easy to understand and its length to be appropriate etc.
Improving Language Service Access for Patients with Limited English Proficiency in the Outpatient CT Department

Yili Wang

STATEMENT OF WHAT IS KNOWN/GAPS

In the outpatient Computed Tomography (CT) imaging department at Sunnybrook Health Sciences Centre, patients with limited English proficiency (LEP) and healthcare providers often face significant challenges in communication during exams with contrast administration. While family members and bilingual staff can help interpret, there are concerns over patient confidentiality, accuracy of medical translation, and patient safety.

STATEMENT OF THE CLINICAL ISSUE/RESEARCH TOPIC

Studies have shown that language barriers are associated with significantly less health education, worse interpersonal care, and lower patient satisfaction when compared to English-speaking patients. Ad hoc interpreters, such as family members, bilingual staff, are more likely to make interpretation errors of clinical consequence compared to professional language interpreters, which can include omitting questions about drug allergies. This makes the CT department especially susceptible to suboptimal interpretation, since iodinated contrast is administered routinely during CT exams.

STATEMENT OF STUDY METHODOLOGY/CLINICAL INNOVATION

The purpose of this project was to improve perception of quality of care by LEP patients after using professional interpreter services. The aim was to increase the percentage of patients who rate themselves high in understanding and comfort in communication by 20% by March 1st, 2019.

A documentation process was created to identify patients with LEP in electronic Radiology Information System (RIS), so that language interpretation services could be arranged for follow-up CT exams. Surveys for staff, patients proficient in English, and LEP patients were conducted to evaluate the state of current language service practices and perception of different aspects of quality of care, such as understanding and comfort in communication. Post-intervention surveys were conducted on LEP patients and staff following interpreter-assisted CT procedures.

DESCRIPTION OF IMPACT/EXPECTED FINDINGS

Compared to English-proficient speakers, a significantly lower percentage of LEP patients perceived to have good understanding and comfort in communicating with healthcare providers (95% vs 5%; 100% vs 19%). 80% of staff also have low perception of quality of care when serving LEP patients. Professional interpreters were scheduled between November 2018 and March 2019 and patient and staff satisfaction surveys were conducted post procedure. Results show significant increases in perception of quality of care in understanding and comfort in communication.
By identifying and addressing the gaps in language services unique to patients with LEP, this project reflects Sunnybrook’s commitment to patient-centred care and fosters an environment of trust between the hospital and our multicultural community. Staff and LEP patients will be able to engage in accurate and meaningful interactions, thus truly empowering patients in their healthcare journey.

**Prepping for Success: Improving the Communication of Patient Preparatory Instructions for CT Colonography**

Tracy Wakeford

**INTRODUCTION**

A CT Colonography (CTC or virtual colonoscopy) is a CT procedure that is designed to specifically examine the large bowel, and is a viable alternative for those patients who cannot complete a traditional colonoscopy. CTC requires intensive and very specific patient preparation (prep) that differs significantly from colonoscopy prep. A large cohort of patients arrive at the CTC appointment not properly prepped to complete the exam. This results in frequent delayed, cancelled and rebooked appointments which extends the number of days of prep time required for patients, delays diagnosis, and increases wait times for an already in-demand procedure. The aim of this quality improvement project was to identify and address causative practice gaps, and educate and empower patients to successfully prepare for their CTC exams. This will hopefully lead to a decrease in the number of delayed/cancelled, repeated, or suboptimal exams. This quality improvement project identified several opportunities to improve the content and format of patient education material for CTC, and created several solutions to numerous inter-professional communication challenges. Although data collection is still ongoing, patient feedback is already very positive, and we anticipate that this project will improve patient and staff experience, and reduce the number of suboptimal exams.

**METHODS**

This quality improvement project consisted of several phases. Firstly, interviews were conducted and feedback questionnaires were distributed to all stakeholder staff members (Technologists, Radiologists, In-patient Nurses and support staff) to determine the current state of patient preparation adherence and the challenges faced when communicating patient prep needs between the professions. Secondly, surveys were designed and distributed to CTC out-patients, to collect feedback before and after the implementation of new patient education material. Thirdly, documentation of delayed/cancelled, repeated, or suboptimal exams was reviewed from the Radiological Information System, before and after the implementation of the new patient education material.

**RESULTS**

All plan-do-study-act quality improvement cycles were completed as planned. Stakeholder staff feedback indicated that inadequate patient information resulted in many of the challenges noted above, but that there were also procedure-specific interdisciplinary communication challenges. The information gathered from patient surveys was used to guide the layout and content of new patient education forms. These incorporated a new step-by-step check list for the patient and were translated into multiple languages to improve accessibility. The content of the departmental CTC webpage was also updated and refreshed, and information was harmonized with National standards. A new CTC specific requisition form was designed and implemented to address communication gaps at time of exam referral. Communication tools and simple procedural checklists were designed, and provided to the nurses on the in-patient floors. Analysis of the number of delayed/cancelled, repeated, or suboptimal exams is ongoing, but will be complete by March.

**CONCLUSIONS**

This quality improvement project identified several opportunities to improve the content and format of patient education material for CTC, and created several solutions to numerous inter-professional communication challenges. Although data collection is still ongoing, patient feedback is already very positive, and we anticipate that this project will improve patient and staff experience, and reduce the number of suboptimal exams.

**Sex, Identity, Gender, Expression form- Pilot Project**

Sidsel Pedersen, Virginia Sanders

**STATEMENT OF WHAT IS KNOWN/GAPS**

The gender landscape is changing and as such situations occur where transgender and non-binary patients may be misgendered prior to or during an diagnostic imaging exam. Misgendering may negatively effect the patient in several ways, and can also lead to outing patients in a public space, leaving them vulnerable to harassment. Furthermore there are cases where misgendering may lead to incorrect placement of gonadal shielding (during x-ray exams) or not ascertaining pregnancy status of a patient. Providers cannot depend on gender markers.

There is currently a gap in the method used to question patients prior to an exam with ionizing radiation, as only females are asked questions related to pregnancy status. Also there is currently no standard questions being asked to ascertain location of reproductive organs to ensure correct shielding.

More education regarding gender identity and expression would benefit technologists and provide a safer space in diagnostic imaging for all patients.

**STATEMENT OF THE CLINICAL ISSUE/RESEARCH TOPIC**

The study looked to determine patient acceptability and compliance of completing the SIGE Form (Sex, Identity, Gender, Expression) prior to having a diagnostic imaging exam.

The SIGE Form was created to better ensure that technologists were gaining the correct information to ensure patient safety during an xray exam.

The SIGE Form was developed by the authors (Pedersen, S and Sanders, V) and published in the Journal of Medical Imaging and Radiation Sciences (Dec 2018 Vol 49)
Establishing Guidelines for Quality Assurance and Clinical Application of Metal Artifact Reduction (O-MAR) Software in Radiation Therapy

Derek Lo, Daria Comsa, Doug Moseley

STATEMENT OF WHAT IS KNOWN/GAPS
During CT simulation, metal and other high density implants in the field of view can cause severe artifacts that obscure targets and affect radiation therapy planning. Metal Artifact Reduction for Orthopedic Implants (O-MAR, Philips Healthcare) has been shown to improve image quality by recovering structure delineation, correcting CT number accuracy and decreasing image noise. However, application of O-MAR does not perform successfully in some clinical situations and it is contraindicated by the vendor. Currently, there is a lack of professional guidelines for commissioning, routine quality assurance (QA) testing of the software and for radiation therapists during clinical application of O-MAR.

STATEMENT OF THE CLINICAL ISSUE/RESEARCH TOPIC
Development and implementation of guidelines should be in place during commissioning, routine quality assurance and clinical application of O-MAR for radiation therapy during CT simulation. Here, we will develop a dedicated phantom for O-MAR testing, a testing suite for routine quality assurance and concise clinical guidelines for radiation therapists.

Patient As Observer: Practical Steps to Launching A Hand Hygiene Quality Assurance Program in the Medical Imaging Outpatient Setting

Jean Nash

ABSTRACT
As a multi-hospital medical imaging department with 500+ staff performing 450,000+ imaging exams annually, we are faced with the daily challenge of ensuring compliance with hand hygiene policies. To quantify compliance, the “Patient As Observer” approach to auditing staff hand hygiene was selected based on its cost effectiveness, easy translatable to clinical practice and the opportunity to engage and empower our patients.

The “Patient As Observer” program was designed based on recently published literature and aligned with an existing program at one of our five hospitals. Departmental executive and practice leaders were tasked to create a single program inclusive of our technologists, nurses, physicians, students and support staff. A target of 90% compliance was set to meet standards published by the World Health Organization. Processes to facilitate hand
hygiene were implemented once best practice standards were defined. The program was created involving design of the patient audit form, development of a volunteer training package and communication leading up to and post launch.

While the "Patient As Observer" program was developed with input from all the hospitals involved, the launch was phased by location over an 8 month period of time. During the audit time period February 2015 to June 2017, 1384 patient audit forms were collected. Overall, patients told us our hand hygiene compliance rate was 75.6%. That this number varied significantly by hospital and by specialty. Challenges encountered with the program included difficulty retaining volunteers, the workload associated with collecting and transcribing paper surveys, and difficulty sustaining patient engagement.

The "Patient As Observer" method has provided a cost effective method to audit staff hand hygiene practices in a large department, spread over five hospitals. Although there have been challenges maintaining commitment to the program, strategies are being developed to re-energize the program.

OBJECTIVES
1. Distinguish between traditional hand hygiene audits performed by peers in a healthcare environment with patient as observer methodology.
2. Evaluate effectiveness in the medical imaging outpatient environment and practical applications to differing sized departments.
3. Discuss challenges and mitigation strategies to sustaining a patient as observer program.

Inserting PICCs at the Patient’s Bedside using Bard’s Sherlock 3CG Diamond Tip Confirmation (TCS) confirmation system at Mount Sinai Hospital

Ivy Chan-Dinevski, Quyen Ho

STATEMENT OF WHAT IS KNOWN/GAPS
Peripherally Inserted Central Catheters, also known as “PICC” lines, are very common procedures ordered for patients in hospital who need to have long term IV access for medications or nutrients. There is currently only one IR/Angio Suite in our department to accommodate all IR procedures. Therefore, the bedside PICC program was introduced to help alleviate the workload in the IR suite and to improve patient care as patients do not have to wait for days to get their PICC line inserted.

STATEMENT OF THE CLINICAL ISSUE/RESEARCH TOPIC
Statement as above in “Statement of what is Known/Gaps”

STATEMENT OF STUDY METHODOLOGY/CLINICAL INNOVATION
1. Using Ultrasound guidance to identify and locate the vein of interest.
2. Using Sherlock device as a navigation system instead of traditional fluoroscopy to guide the PICC to the desired location.
3. Using ECG to identify peak P-waves when PICC tip is in the distal 1/3 of the SVC, which is the ideal position.
4. Eliminating the need of radiation to patient (i.e. chest x-ray post-insertion).

DESCRIPTION OF IMPACT/EXPECTED FINDINGS
1. Patient orders are put into the system but the physicians have not had a chance to speak to patient.
2. Ultrasound imaging quality has room for improvement as this is a 3-in-1 unit. Image quality is not comparable to traditional Ultrasound machine (i.e. Sonosite). It gets difficult to visualize veins which are too deep or when patient is edematous.
4. Longer procedure time due to scheduling, positioning patient and equipment, setting up the sterile field.
5. Patient who has known a-fib might need a portable chest x-ray image performed at the end of the procedure to confirm PICC tip placement.
6. Patient who has pacemaker or port-a-cath, history of mastectomy or chest surgery must have PICC inserted on the opposite arm.

A case report of a severe panic attack during MR imaging: What does the literature say about how to spot it, and how to stop it.

Danfeng Zhao, Nicole Bennett, Kathy Hilario

WHAT IS KNOWN/GAPS
A panic attack (PA) is defined as the abrupt onset of intense fear, accompanied by multiple physical symptoms (e.g. chest pain, sweating) and psychological symptoms (e.g. derealization, depersonalization). Severe PAs are significantly associated with either inward aggression (self-hurting) or outward aggression (attacking others).

CLINICAL ISSUE/RESEARCH TOPIC
Various aspects of an MRI exam can trigger a PA (e.g. worry about disease outcomes, noise, confinement). A PA in the MRI room is not only psychologically distressing for the patient, but may result in poor quality imaging or incomplete examinations, and may hold the potential for physical danger for patients and staff. Surprisingly, there are very few publications that have examined this distressing and dangerous phenomenon in the MRI practice setting.

STUDY METHODOLOGY/CLINICAL INNOVATION
The purpose of this project was to describe the onset of a severe PA experienced by a patient receiving a spinal MRI at our hospital, and to highlight the presenting features of a severe
Best practices and novel approaches to Liver MRI: A comprehensive review of the modern literature

Jin Huang

WHAT IS KNOWN/GAPs
Liver MRI is one of the most common applications in abdominal MR imaging. MRI is considered the most comprehensive and definitive noninvasive diagnostic tool for evaluating the liver and characterizing lesions.

CLINICAL ISSUE/RESEARCH TOPIC
Abdominal MRI is exciting and challenging, but can also be intimidating, as there are many sources of physiological motion that need to be accounted for during imaging. Also, there are many technical parameters, imaging options and pulse sequences that need to be considered to create the optimal diagnostic image.

STUDY METHODOLOGY/CLINICAL INNOVATION
A comprehensive review of the modern literature was performed to identify the theoretical underpinning of best practices and highlight novel approaches to MR examination of liver lesions.

Impact/expected findings: Key concepts identified in the literature included:

1. Parallel imaging is essential, allowing breath-hold sequences to address continuous physiological motion from respiration, cardiovascular pulsation and bowel peristalsis, and allowing the application of advanced principles such as diffusion weighted imaging (DWI).

2. True FISP/FIESTA sequences, with image contrast depending on T2/T1 ratio, employ flow compensation gradient schemes in all three axes, empowering these sequences to “freeze” physiological motion and provide intrinsically high SNR and spatial resolution.

3. T2w images mainly employ fast and ultrafast spin echo (SE) sequences with different TE to optimize tissue/lesion contrast, and ultrafast sequences such as SSFSE/HASTE with heavy T2 weighting are excellent for the characterization of fluid-containing structures and lesions.

4. T1w images use fast gradient echo (GE) sequences, fast SE T1w sequences are almost never used in liver MRI.

5. Principles of DWI and ADC are used to provide insight into the cellular structure of liver lesions, identifying hypercellular regions that are commonly associated with malignancy.

6. In-phase and opposed-phase imaging exploits chemical shift between fat and water protons to evaluate fatty deposits in the liver.

7. Dynamic imaging with contrast enhanced MRI has become a vital part of standard liver imaging, with different lesions enhancing in different phases.

In conclusion, most liver lesions will be characterized effectively if the MR protocol includes T2w, T1w in-phase and opposed-phase, and T1w dynamic images with and without hepatocyte agents. The introduction of novel physiology-based MRI techniques such as DWI, MR spectroscopy and elastography will further elevate the role of MRI in the diagnosis of liver lesions.
surveys, there are opportunities to improve how they communicate, engage and build trust with their workforce.

Studies indicate engaged workers receive up to 25-per-cent higher job performance ratings (source), and are more likely to receive promotions, while employers benefit from higher performing staff, lower turnover, absenteeism and fewer worker and patient safety incidents (Gallup study).

Studies have also shown that when hospitals create an engaging and high-performance-oriented work experience, they not only improve patient satisfaction but also quality of care outcomes.

By improving communication, engagement and transparency with staff, hospitals will be able to achieve better performance and outcomes.

**STATEMENT OF THE CLINICAL ISSUE/RESEARCH TOPIC**

Building engagement in hospitals can be challenging for several reasons, including:

- organization size/ dispersion
- overworked staff/ limited capacity
- limited resources (budgetary, people etc.)
- gap between leadership/corporate and front line

However, passionate staff can work with colleagues, leadership and when possible, communications to develop engagement initiatives and highlight successes by considering the following:

a) Who is the Audience?

b) What strategic focuses or goals does this initiative align with?

c) Who can help support this initiative?, and;

d) How do we plan for successful engagement?

**STATEMENT OF STUDY METHODOLOGY/CLINICAL INNOVATION**

Communications Strategies - Because we most often see success in self-led or grass roots initiatives – it’s important to know there are key stakeholders willing to support your plan.

Additionally, as we think about potential resources for support, we can brainstorm other groups with like-minded goals and strategize opportunities to work together (ie. other departments, safety and leadership teams, professional societies, Communications and Public Affairs etc.).

The key is, we always look to have a group of passionate involved team members to help guide and support our initiatives.

As far as mapping out our plan, we like to keep things as simple as possible, with four key criteria.

1. Objective
   What are you trying to accomplish?

2. Strategy
   How are you going to connect with your audience and get them to care?
3. Tactics
What are you actually going to do? How will people get the message?

4. Key message
Simply put, in one sentence – What do you want people to know?

DESCRIPTION OF IMPACT/EXPECTED FINDINGS
What successful engagement looks like like Mini case-study on JDMI’s Exceptional Moments video series (w/ 2 min video).

1. Objective
   - Highlight the role medical imaging plays in patient experience.

2. Strategy
   - Have MRTs share stories where they make a difference in a patient’s hospital visit.

3. Tactics
   - Create a video series where MRTs read patient compliments submitted in recognition of their care, and expand on what that means to them as health professionals.

4. Key message
   - MRTs are leaders in care and experience for patients.

LEARNING OBJECTIVE: Listeners will learn strategies to develop successful engagement initiatives within their teams, departments, and organizations and improve performance and outcomes.

The use of Magnetic Seeds in Breast Lesion Localization
Aruna Mahabir

INTRODUCTION
Approximately 30% of screening detected breast cancers are non-palpable, thus must be localized under image guidance to assist with surgical planning. Localization allows breast surgeons to (i) efficiently identify lesions intraoperatively and (ii) resect the lesion with an appropriate margin of surrounding tissue, to ensure negative margins while maintaining optimal cosmetic results. Traditionally, hook-wires have been used in lesion localization, however innovative micro technology exists that could potentially impact practices for this procedure. Magnetic Seeds are non-radioactive seeds that may be inserted under image guidance up to 30 days prior to surgery. They are associated with decreased surgical time, improved margin rates, and improved patient experience.

OBJECTIVES
- To describe some useful techniques for breast lesion localization in pre-operative surgical planning, specifically:
  - Hook-wire localization
  - radioactive seeds
  - Magnetic Seeds
- To gain an understanding of the benefits of using Magnetic Seeds over traditional methods of breast lesion localization
- To present interesting clinical case studies of Magnetic Seed guided-Breast Lesion localization performed at our institution

METHODS
Our institution performed the first Magnetic Seed guided-Breast Lesion localization surgery in Canada in 2018. Our extensive experience with Breast lesion localization via (i) hook-wires and (iii) Magnetic Seeds will be discussed. Comparisons between hook-wires, radioactive seeds and Magnetic seeds will be presented. A comparison of Patient Experience with hook-wire localization and Magnetic Seed localization will be presented. Several interesting cases studies of both benign and malignant lesions localized with Magnetic Seeds will also be presented.

RESULTS AND CONCLUSIONS
Hook-wire localization is the traditional technique to localize non-palpable breast lesions. These are inserted under mammography or ultrasound guidance by a Breast Radiologist to guide surgeons intraoperatively for accurate surgical excision. As the location of the hook-wire must be approximated using the post insertion mammogram images, the possibility of positive pathology margins is greater with hook-wires than Seeds. This has direct implications to cancer care management and patient care. Magnetic seeds are non-radioactive seeds that can be inserted under image guidance up to 30 days prior to surgery, with no displacement seen. The magnetic signature can be detected by a specialized probe intraoperatively by breast surgeons, reflecting the exact position of the lesion, thus improving the pathology margin rate, decreasing surgical time, and increasing patient experience and outcomes.

Multi-Hospital Implementation of Rapid MRI Protocols: Impact and Lessons Learned
Ravi Menezes

BACKGROUND
Hospitals throughout Ontario continue to struggle with wait times for MRI exams, largely due to demand exceeding capacity. In recent years, 80% of MRI volumes are for non-urgent (P4) patients, of which 50% are referred from community-based primary care physicians.

RAPID MRIS
To address this issue, the Toronto Central LHIN partnered with the Joint Department of Medical Imaging (JDMI) to launch the MRI Optimization Model Project, a multi-faceted approach aimed at managing wait times through the reduction of inappropriate MRI demand and improving capacity by increasing throughput of non-urgent MRI exams. Women’s College Hospital, St. Joseph’s Health Centre and Michael Garron hospital were chosen as three implementation sites. This project consisted of three complimentary interventions; one of which was known as Rapid MRI Protocols and initially required:
• Identification of existing protocols where acquisition times allow for a reduced booking time
• Assessment of current protocols and clinical referral indications for opportunities to reduce image acquisition time and creation of new express protocols, while maintaining image quality

IMPLEMENTATION
Planning was initiated in September 2017 and involved collaboration with MRI technologists and radiologists at the participating sites to prepare for anticipated changes to workflow, staffing and scheduling. Rapid MRI protocols were operational from April 2018, and technologists remained involved in implementation and monitoring by periodically participating in surveys and group discussions aimed at understanding the impact on their workflow and patient care.

RESULTS
Across all three sites, 3,144 rapid protocols were completed during the evaluation periods (Apr-Oct, 2018), representing a savings of 524 MRI hours. MRI patients per hour and volumes increased relative to the previous year. Feedback collected from technologists highlighted the importance of employing a two-tech staffing model during rapid shifts, batch scheduling to minimize coil changes and identification of delays due to patient factors like mobility issues and claustrophobia.

CONCLUSIONS
Rapid MRI protocols were implemented at three sites, and hospital-level changes were observed. The process of collecting feedback from technologists has resulted in recommendations that participating sites can use to sustain changes or used by new sites to guide their own implementation.

OBJECTIVES:
Panelists will include technologists across the partner sites and an implementation team member.

Audience members who attend this session will learn about:
1. The impact of Rapid MRI procedures on technologist workflow and patient care
2. Recommendations for implementing Rapid MRI procedures
3. The role of Rapid MRI procedures in increasing MRI capacity at the system level

PANELLISTS:

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<thead>
<tr>
<th>NAME</th>
<th>INSTITUTE</th>
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<tr>
<td>Emita Latif</td>
<td>Joint Department of Medical Imaging</td>
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<tr>
<td>Tracie Draffin</td>
<td>St. Joseph’s Health Centre</td>
</tr>
<tr>
<td>Karen Bodolai</td>
<td>Joint Department of Medical Imaging</td>
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</tbody>
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1 Based on JDMI Referral data in FY 15/16
2 Journal of the American College of Radiology, Volume 7, Issue 6, June 2010, Page 466
includes the importance and role of a departmental strategy in driving patient care. The development and role of key strategic enablers in the execution of such initiatives is also discussed. The talk will also highlight the value of data in monitoring project outcomes.

LEARNING OBJECTIVES
1. Understand the use of a strategy at the departmental level
2. Identify the role of an integrated project management team
3. Identify the role of data in developing and monitoring project and patient outcomes
4. Provide examples of extended practice roles used to drive initiatives

SUMMARY
UHN Patient Partners, Chris Stigas and Jack Ireland, will share their personal experiences with us so that we can learn first-hand from them what is like for them to be a patient undergoing an imaging test. The challenges and opportunities Chris and Jack face on a daily basis will be explored through the lens of imaging. Participants will have an opportunity to ask questions and reflect on best practices from the patient perspective.

STATEMENT OF WHAT IS KNOWN/GAPS
Nuchal translucency has been a part of Prenatal Screening in Ontario since 2001, and sonographers have played a huge role in providing the majority of pregnant women with excellent quality risk prediction for Down syndrome. However, many Ontario sonographers have not been a part of the internationally recognized QA programs after their initial certification, for example, with the Fetal Medicine Foundation UK. Both internationally and nationally, authorities have recommended that anyone providing NT measurements be a part of a formal NTQA program, as it has been noted that without it, measurement quality and therefore quality of screening deteriorates over time. Many Ontario imaging departments are beginning to implement NTQA measures to ensure high quality screening. However, a province-wide mandatory NTQA program is needed to ensure consistency in accurate screening throughout Ontario.

STATEMENT OF THE CLINICAL ISSUE/RESEARCH TOPIC
Provincial audits demonstrate a consistent discrepancy between sonographer performance and what would be expected to be seen in a normal population with a tendency towards chronic under-measurement for most sonographers in Ontario. Without a provincial NTQA program, performance is continuing to decline which may jeopardize the current quality performance of first trimester screening in the province.

STATEMENT OF STUDY METHODOLOGY/CLINICAL INNOVATION
This presentation will review the current state of NTQA in the province, and discuss the components required to initiate a successful, mandatory Ontario-wide NTQA program.

DESCRIPTION OF IMPACT/EXPECTED FINDINGS
The NTQA program components discussed in this presentation will eventually become a mandatory component of maintaining an NT ID number for sonographers and physicians submitting and overseeing nuchal translucency measurements in Ontario.

Thyroid Biopsy Sonographer Specialists: Long Term Outcomes of a Quality Initiative to Reduce Wait Times and Improve Adequacy Rates
Yongheng Jia, Kulsoom Maan, Rudi Boci, Wasim Javed, Scott Boerner, Sangeet Ghai

PURPOSE
Thyroid nodules occur commonly in the general population, and ultrasonography (US)-guided fine-needle aspiration biopsy has become the standard for diagnosis. The increased volume of requests for this important test has led to long wait times. Moreover, inconsistent training and technique among those performing the biopsies at our institution (often delegated to rotating radiologist fellows and residents) resulted in cytology sample adequacy rates at the low end of the spectrum. The purpose of this project was to develop and implement a local program where selected sonographers would be trained to perform thyroid biopsies independently under the supervision of a radiologist, with the goal of improving efficiency and quality of service to our patients.

METHODS
After institutional approval and discussion with the relevant regulatory bodies, four sonographers successfully completed a training program and began to perform all thyroid biopsies, with a radiologist available for consultation as needed. In the pre-implementation period (January 2010 to April 2011), 1321 nodules were biopsied. In the post-implementation period (August 2011 to July 2012), 1347 nodules were biopsied. Wait times and sample adequacy rates were calculated for both time periods. This program has continued uninterrupted from 2012 to present day.

RESULTS
In the year after implementation of the Thyroid Biopsy Sonographer Specialist Program, wait times were significantly reduced from 80-90 days to 20-30 days compared to pre-implementation. The percentage of adequate samples showed a small, but significant improvement post-implementation from 74.6% to 78.6% (p 0.015). No major procedural complications occurred during any of the time periods. The percentage of malignant samples did not change.
in the year after implementation (5.1% versus 5.4% (p 0.823). In the years following 2012 this procedural innovation has continued to have a positive impact on the quality of service for thyroid patients. The adequate sample rate has substantially increased to 93.1%, and the percentage of malignancy and suspicious biopsy results has increased to 11.5%. Average wait time is now 13 days.

CONCLUSIONS
The delegation of thyroid US-guided fine-needle aspiration biopsies to Sonographers significantly reduced wait times, and substantially increased the adequate cytology sample rate and improving diagnostic accuracy. These service improvements continued to increase over a long term monitoring period.

OBJECTIVES: The attendee will learn about:
- the potential to improve care and quality by thoughtful procedure delegation
- the training required for Sonographers to perform US-guided thyroid biopsies

ACHIEVING PIN-POINT ACCURACY: Medical Radiation Technologists’ use of ultrasound guidance for peripheral intravenous access of challenging vasculature
Shahvir Irani, Nancy Talbot, Jean Nash

PURPOSE
Over 70% of patients that have an MRI performed at The Princess Margaret Cancer Centre also have an injection of contrast. This requires the insertion of an intravenous cannula (IV) into a peripheral vein (usually in the arm) immediately prior to the MRI. The MRTs(MR) are very proficient at inserting IVs, but the patient population at our cancer centre poses unique challenges. Most are older, suffer from scarred veins due to chemotherapy, and have limited vein access due to lymphedema. This can result in multiple attempts to insert an IV, causing additional pain, anxiety, bruising and a poor overall experience for the patient. For the MRTs, multiple IV attempts causes stress and a loss of confidence. All this culminates in unhappy patients, staff, scheduling conflicts, and delayed appointments that can delay diagnosis.

The use of ultrasound-guided IV requires less time and fewer attempts than standard techniques, even with challenging patients. Our department possesses a portable ultrasound (US) device. If training was provided for the MRT (MR), and the US equipment was used to assist during IV insertion for patients with challenging vasculature, there would be an opportunity to substantially improve current practice, positively impacting both the patient experience and operational effectiveness.

METHODS
This quality improvement project consists of several phases. Firstly, MRT (MR) were surveyed to determine staff engagement. Secondly, a training session for the staff was held. Participants were asked to complete a brief survey at the end of the didactic training session. This was followed by hands-on practice with a phantom and then a radiologist/designate observed as the trainees used the US-guided process on a patient that had given informed consent. Thirdly, the routine documentation regarding the number of attempts to insert an IV was collected from the RIS for the time period before and after the date set to start using the US. Fourthly, patients who received US-guided IV insertion were asked to provide their feedback on the IV insertion compared to their previous experiences.

RESULTS
The initial staff engagement survey indicated that 90% of MRTs felt US-guidance would improve the patient and Technologist experience. The majority felt that it would improve workflow, and that they would likely use it daily if it was available. 90% were interested in receiving training.

The training phase is now complete. It was led by a radiologist with experience using the technique. The session lasted for an hour, covered topics such as basic ultrasound theory, anatomy of blood vessels in the arm, mechanics of how to hold the probe, how to target veins, how to juggle the tasks required to visualize and target veins simultaneously, and basic troubleshooting techniques. Approximately 2/3 of the session was theory, and the remainder was focused on hands-on practice with a phantom. Informal feedback from the participants indicated that even though the learning materials were useful, and that actually using the ultrasound device with a phantom really helped bring everything together.

Those who completed the training have already used US-guidance multiple times. Thus far, the average number of IV attempts has reduced to 1.1 for these challenging cases, with successful US-guided insertion in approx. 10 minutes. Collection of the IV insertion attempt numbers is ongoing, but initial analysis is very positive. The formal review will be complete by the end of March. Patient feedback collection is ongoing, and will be complete by March.

CONCLUSIONS
The use of US to guide the placement of IVs for cancer patients with challenging vasculature holds great potential to improve current practice, positively impacting both the patient and MRT experience, and operational effectiveness.

OBJECTIVES
The attendee will learn about:
- The use of US to guide the insertion of IV for cancer patients with challenging vasculature.
- The training required for MRTs(MR) to perform US-guided IV insertion.
- The impact of US-guidance on the success rate of IV insertion in a cancer centre.
Implementation of Quantitative Liver Imaging-MR Elastography
Nancy Talbot

STATEMENT OF WHAT IS KNOWN/GAPS
MRI imaging is progressively moving towards quantitative imaging, and this is seen extensively in Liver Imaging. Over the last 10 years, increasing developments have occurred that non-invasively quantify Iron and Fat in the liver, as well as stiffness. Imaging techniques to measure the amount of Iron in the liver have been in use for 10 years and guides treatment for patients with iron overload. MR Elastography is the latest technique which allows liver stiffness to be assessed.

STATEMENT OF THE CLINICAL ISSUE/RESEARCH TOPIC:
MR elastography is a technique that non-invasively measures the amount of stiffness in the liver. Additional hardware and software are required, however the implementation from a technologist perspective does not have to overly difficult.

This technique can be critical for patient management as the stiffness of the liver is a bio marker for fibrosis, and can define treatment plans.

Currently MR Elastography has limited availability in Canada, with only a handful of systems in use. In the US, this technique has become standard of care in liver assessment for NASH (non alcoholic steatohepatosis)

With the importance of this technique, our question was how to implement this with a large team of technologists, in an environment where the patients would likely be scanned off hours with no senior technologist or radiologist supervision, while maintaining high standards of image quality.

STATEMENT OF STUDY METHODOLOGY/CLINICAL INNOVATION
At the initiation of scanning MR elastography as a research protocol, the vendor had no applications specialists with any experience. Radiologist and technologist collaboration was required to test out techniques on non patient participants to improve results.

Once we were able to produce reproducible images, five technologists were introduced to the technique and scanned research patients.

The training program consists of a 30 minute lecture provided by the radiologist to explain the disease processes, clinical requirements, and fundamental image acquisition expectations. This is followed by a 30 minute training session on the hardware which includes patient set up, as well as parameter modification of the active driver unit. The final 30min of the training, incorporates hands on scanning of a non patient participant to create images, assess quality, and make modifications as required.

Resources materials are created to support the training and support trouble shooting.

DESCRIPTION OF IMPACT/EXPECTED FINDINGS
There is a gap in the knowledge of the vendor applications specialists in regards to this technology. This training program is translatable to other sites that plan to implement elastography in their teams.
treatment plans, monitor the progress of cancer, as well as provide guidance for planning of other tests. Among the staging CT scans, abdominopelvic (AP) staging CT scans traditionally utilize positive oral contrast agents to aid radiological visualization. SHSC currently requires oncology out-patients to arrive 1.5 hours prior to scan time to ingest and digest the positive oral contrast to allow optimal opacification of the small and large intestines. Utilization of positive oral contrast agents could lead to oncology patient discomfort due to poor palatability, increased bowel irritability and increased risk of aspiration.

**STATEMENT OF THE CLINICAL ISSUE/RESEARCH TOPIC**

Fortunately, there is evidence suggesting water, a neutral oral contrast agent, is equally effective as positive oral contrast without compromising visualization of AP organs in oncology settings. Beginning 2018, the department of medical imaging at SHSC is introducing water in place of positive oral contrast in AP staging CT scans for eligible oncology out-patients. These patients will be instructed to drink a 1L of water prior to CT scans. This change in protocol is projected to affect patient wait time, patient experience, and cost to the department associated with the use of positive oral contrast agents. Currently, there are limited studies investigating the logistics associated with replacing positive oral contrast with water. The proposed research study will utilize this opportunity to analyze patient wait time, patient experience and cost benefits brought upon by the use of water as neutral oral contrast agent in oncology abdominopelvic staging CT scans.

**STATEMENT OF STUDY METHODOLOGY/CLINICAL INNOVATION**

In order to properly assess pre-scan wait time, patient experience, and cost related to oral contrast, two cohorts of oncology out-patients will be compared and analyzed. The first cohort consists of 163 oncology out-patients who would receive Omnipaque 300 as positive oral contrast prior to AP staging CT scans. The second cohort consists of 163 oncology out-patients who are eligible to receive water as neutral oral contrast prior to AP staging CT scans. For pre-scan wait time data collection, RA would tabulate the wait time from patient arrival until the start of CT scan for each patient in both cohorts. The wait time data is obtained through the departmental Radiology Information System. A patient survey will be created to analyze patient experience from both cohorts. Cost associated with positive oral contrast will be calculated by dose per patient during trial. This value will be entered by RA for each patient in both cohorts.

**DESCRIPTION OF IMPACT/EXPECTED FINDINGS**

This research study promotes an enhanced experience for patients undergoing AP staging CT scans, and cost-saving for hospitals in the long run. First, utilizing water as oral contrast in this study embeds the voice of patient. Past research studies have shown patient complaints of positive oral contrast in terms of taste and bowel intolerance. Water has been shown to be better accepted and is just as effective if not better in diagnostic abilities. This also leads to our organizational target of best possible patient experience by reducing average wait time. This is because water has a faster transient time in the GI system than positive oral contrast. This research project also promotes inter-professional collaboration to improve person-centered care as it requires the support and engagement from radiologists, nurses and CT technologist. Last by not least, the expense for positive oral contrast are significantly reduced as it produces a cost-saving effect.

### Use of image analysis to quantify hypoxia and proliferation relative to vessel distance

Mark Zaidi, Trevor McKee, & Brad Wouters

**STATEMENT OF WHAT IS KNOWN/GAPS**

The formation of hypoxic microenvironments within solid tumours is known to contribute to radiation resistance, increased metastasis, and an overall poor prognosis. It is crucial to understand the spatial and molecular mechanisms that contribute to tumour hypoxia formation to improve the efficacy of radiation treatment, develop hypoxia-activated prodrugs and increase patient survival.

**STATEMENT OF THE CLINICAL ISSUE/RESEARCH TOPIC**

This study aims to develop an image analysis pipeline to quantify hypoxia and proliferation relative to the distance from the nearest perfused blood vessel. Often, hypoxic status is assessed by averaging the mean intensity of a hypoxia marker such as EF5 within a tumor section. However, this fails to account for changes in hypoxia caused by transient occlusion of microvasculature. By administering a perfusion marker minutes prior to tumor excision, perfused vessels can be identified, and distance gradients of hypoxia and proliferation marker intensity can be generated.

**STATEMENT OF STUDY METHODOLOGY/CLINICAL INNOVATION**

Colorectal (HCT116) and pancreatic (PANC1, KP4) cancer xenografts were grown subcutaneously in immunocompromised mice. Excised tumours were embedded in OCT and subsequently sectioned. Immunofluorescent staining was done for DAPI (nucleus), EF5 (hypoxia), EdU (proliferation), CD31 (vessels), and Hoechst (perfusion), and scanned at 20X magnification. Image registration was done in MATLAB, and image analysis was performed in Definiens. Perfused blood vessels were detected based on CD31 and Hoechst stain intensity and morphology. Each cell detected using DAPI was assigned a “distance to the nearest perfused vessel” value. Mean EF5 and EdU intensity was measured in each cell and plotted against their distance to the nearest perfused vessel.

**DESCRIPTION OF IMPACT/EXPECTED FINDINGS**

The results of this analysis show a positive correlation with hypoxia and a negative correlation with proliferation, relative to vessel distance. This pipeline shows promise for potential use in clinical scenarios by assessing patient tumour hypoxic status and can be used to evaluate the efficacy of hypoxia-activated prodrugs or radiation sensitization prior to radiation treatment to promote a positive patient prognosis.
OBJECTIVES

Improvement was seen in less experienced readers. This software improved when using the enhancement software. The largest improvement was seen in the reader with least experience. Images were grouped for different complexity levels.

RESULTS

The diagnostic accuracy for pneumothorax increased for 4 of 5 readers (mean AUC from 0.846–0.957 to 0.88–0.971). The largest improvement was seen in the reader with least experience. No significant change was noted for the reader with the longest experience. The image complexity had no impact on the interpretation results.

CONCLUSIONS

Pneumothorax detection on portable chest radiography improved when using the enhancement software. The largest improvement was seen in less experienced readers. This software should be considered for routine use in all ICU patients, especially those patients suspected of having a pneumothorax.

OBJECTIVES

- To describe how participating in research can directly improve care for patients.
- To inspire other MRTs to get involved with research projects at their institutions.
Alterations in left atrial and left ventricular myocardial function in mixed aortic valve disease
Maala Sooriyakanthan & Wendy Tsang

STATEMENT OF WHAT IS KNOWN/GAPS
Patients with mixed aortic valve disease (MAVD), defined as combined moderate or greater aortic stenosis (AS) and moderate or greater aortic regurgitation, are known to have poorer outcomes compared to patients with isolated severe aortic stenosis. Previous studies examining left atrial (LA) and left ventricular (LV) myocardial function have demonstrated that patients with isolated severe AS have alterations in these parameters that affect their clinical outcomes. The impact of MAVD on LA and LV myocardial function is unknown.

STATEMENT OF THE CLINICAL ISSUE/RESEARCH TOPIC
Our aim is to characterize combined LA and LV myocardial mechanics in moderate MAVD patients compared to normals (Controls) and isolated severe AS patients.

STATEMENT OF STUDY METHODOLOGY/CLINICAL INNOVATION
We retrospectively identified 113 patients, 35 moderate MAVD, 33 severe AS, and 45 Controls, who underwent transthoracic echocardiogram. LA and LV body-surface-area indexed end-diastolic and end-systolic volumes and ejection fraction (EF) were calculated from the 4-chamber views using the method of disks. Simultaneous speckle-tracking longitudinal strain (LS) analysis of the LA and LV were performed on the apical 4-chamber view (EchoInsight, Epsilon) to obtain LV peak LS, heart rate corrected LV time-to-peak (TTP) LS, LA peak LS, LA contractile strain, LA conduit strain, and heart rate corrected LA TTP LS. The ratios between the LA and LV peak LS were calculated. ANOVA with post-hoc Tukey's test was used to compare groups. P<0.05 was considered significant.

DESCRIPTION OF IMPACT/EXPECTED FINDINGS
Moderate MAVD patients had significantly larger LV volumes compared to severe AS patients, who had values significantly larger than Controls (Table 1). Compared to controls, LV EF and LV peak LS were significantly reduced in moderate MAVD and severe AS patients but were not significantly different between these two groups. LA volumes were significantly increased, and LA peak, conduit, and contractile strains were significantly reduced in moderate MAVD patients compared to Controls and the severe AS group but there was no difference between Controls and severe AS patients. Overall, while moderate MAVD patients have greater chamber enlargement compared to severe AS patients, reductions in LA and LV EF and myocardial function were comparable. These changes may contribute to the poorer outcomes observed in MAVD patients. Future work would include examining severe aortic regurgitation and severe MAVD patients.

The Role of Computer-Aided Diagnosis (CAD) in the Diagnosis and Characterization of Thyroid Nodules when Combined with Conventional Ultrasound: A Literature Review
Noor Hesson

STATEMENT OF WHAT IS KNOWN/GAPS
Thyroid nodules are quite commonly found in the general population; however, the incidence of thyroid cancer can be found in 5-15% of the general population (depending on age, gender, and other risk factors). Ultrasound is the primary diagnostic modality used to diagnose and characterize thyroid nodules, and due to the ready availability and economic efficiency of imaging, thyroid nodules are being diagnosed (often incidentally) at higher rates. Conventional ultrasound parameters have been utilized to predict benignity or risk of malignancy in nodules and facilitate the decision making for intervention; however, no imaging characteristic is sufficiently reliable to confirm the nature of a nodule. As a result, many patients go on to have a fine needle aspiration (FNA) to confirm the nature of the nodule.

Advancing technologies and the rise of artificial intelligence has brought new possibilities to healthcare. Computer-Aided Diagnosis, in particular, is a system that is used to accurately and consistently interpret ultrasound images and features, such that unnecessary thyroid FNAs are reduced.

LEARNING OBJECTIVES
The audience will learn:
• A brief history of how technology has impacted the field of medical imaging
• How technology has influenced the Technologist role over the past century
• Our neurovascular research work will be used as an example of how AI and technological advancements may impact the way we work in the future
Several studies have reported on the diagnostic potential of CAD and possible benefits in a clinical setting; however, very few studies have investigated the role of this technology as an adjunct to radiologist reporting.

STATEMENT OF THE CLINICAL ISSUE/RESEARCH TOPIC
This literature review aims to report on the diagnostic performance of CAD and its value alongside radiologists, and whether this technology can reduce the need for radiological intervention such as FNA.

STATEMENT OF STUDY METHODOLOGY/CLINICAL INNOVATION
A systematic review of the literature was performed for the past 5 years. All databases within OVID were searched, as well as PubMed.

Prospective studies assessing the value of CAD with ultrasound in diagnosing thyroid nodules compared with conventional ultrasound were included.

Studies that compared the effectiveness of CAD to that of a radiologist were included.

Studies assessing rates of FNA following application of CAD were included.

Studies assessing other forms of artificial intelligence in ultrasound were excluded.

Studies that assess the usefulness of CAD in conjunction with other imaging modalities (CT, PET) were excluded.

Studies assessing single characteristics of nodules (calcifications, texture, vascularity) rather than overall image were also excluded.

DESCRIPTION OF IMPACT/EXPECTED FINDINGS
Preliminary results indicate that the CAD system demonstrates higher accuracy in detecting benign nodules than the experienced radiologist and similar accuracy in detecting malignant nodules. As a result, CAD may reduce the need for FNA intervention, but cannot eliminate the need for FNA in confirming malignancy. Additionally, CAD may be a viable method of generating a second opinion in clinical practice.

A new education model for image technologist at Sheba Medical Centre
Ronen Bercovitz

The history of the Israeli Radiologic Technologist (RT) as well as in other countries, was ones taught as an apprenticeship, “Look what I do and imitate me”. At first not as an academic profession, but as a technical worker with limited capabilities.

But over the years there have been three significant global changes with relevance to the world of medical imaging that we would like discuss at the "Wavelength 2019 - Symposium

1. IMAGING TECHNOLOGY - in the last years there was a remarkable development and innovation in the field of radiological imaging: CT, Ultrasound, MRI, Radiotherapy, Nuclear medicine and more.
2. **TEACHING TECHNIQUES** - The teaching/training methods have changed and become more advanced. The use of frontal lectures combined with online learning, medical simulations and student oriented clinical training especially the combining all.

3. **INTEGRATING AI WITH THE FUTURE OF RADIOLOGY TECHNOLOGISTS** - The artificial intelligence will change the future of work and collaboration between radiologists and radiologic technologist.

We will describe the way that led to the establishment of the most advanced school of RT’s in Israel, with its innovated teaching methods and integration of learning processes.

In Israel, for years, there was stagnation in the field of RT education. RT schools have been teaching the same learning material with the same methods both in content (“what to teach?”), and also in the (“how to teach?”) with no relation to technological changes, or acquisition of the state-of-the-art equipment.

The urgent need has aroused to train high-quality, professional personnel who would know how to operate the expensive and complicated equipment. The learning curve of RT’s is long and requires extensive training, continuing education and courses.

So after long time of planning, we decided to address these failures. Not by changing everything, but by dismantling the pitfalls into small components and assembling the parts in a different way.

- Change the relative importance of the topics: today and in the future, conventional X-ray diagnostics will decreased in favor of more advanced modalities, the new curriculum consists of 70% in favor of advanced technology.

- The teaching method of has changed: it consists of the “magic triangle of study”
  - Frontal learning -> Simulations - > Clinical Practice
  - Clinical practice: Each student undergoing an integrated validation consisting of a computerized record of all the activities with addition to every unit’s coordinator report (according to a specific forms).
  - Using this method we presume to effectively evaluate the students, both in their professional work and also their patient attitude.

- Finally we will try to address to the future role of the radiographer at the era of artificial intelligence, and the way that we, at the school and in Radiology department of the Sheba Medical Center promoting the integrative work of RT’s and physicians in clinical research, RT’s initiates and performs research side by side with the Institute’s physicians and present them at conferences around the world.In addition, in the last years RT’s began to processing and evaluating CT and MRI heart examination with doctors, thereby improving their personal level and adding skills to the RT profession.

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**The opportunities and risks associated with artificial intelligence in the imaging profession**

Salim Bader

**STATEMENT OF WHAT IS KNOWN/GAPS**

Recently AI occupies an important place in the world of medicine in general and radiology in particular. Radiologists treat this fact seriously as a real danger to the profession. Naturally, processes that affect the work of radiologists sooner or later will affect the work processes of the radiographers. Today, medicine treats the artificial intelligence world as a “black box” that contains many contents whose nature is unknown.

**STATEMENT OF THE CLINICAL ISSUE/RESEARCH TOPIC**

In my lecture, I will relate to the future of radiology from the perspective of radiographers, as well as topics that may have a practical impact on the future of the profession.

**STATEMENT OF STUDY METHODOLOGY/CLINICAL INNOVATION**

I will describe the benefits and risks as a result of the increasing use of artificial intelligence. How can intelligent use of artificial intelligence be used to promote the profession, but without any real damage to its existence? On the other hand, I will describe various scenarios that may threaten the profession.

**DESCRIPTION OF IMPACT/EXPECTED FINDINGS**

In conclusion, like radiologists, we must treat this period as an “game changer”. There is, of course, a fear of a negative impact on the very existence of our profession as cartographers. The big question is - will we lead the profession to a better future or, alternatively, the future will lead us to unwanted areas?

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Please mark in your calendars the dates for **Wavelngeths 2020**, which will be held on **April 24 & 25, 2020**. A call for abstracts will be sent out in the fall of this year, so please watch your emails!