Radical Views...

from the Department of Radiology

Volume 9, Number 8

FEBRUARY 2017

Beth Israel Deaconess Medical Center

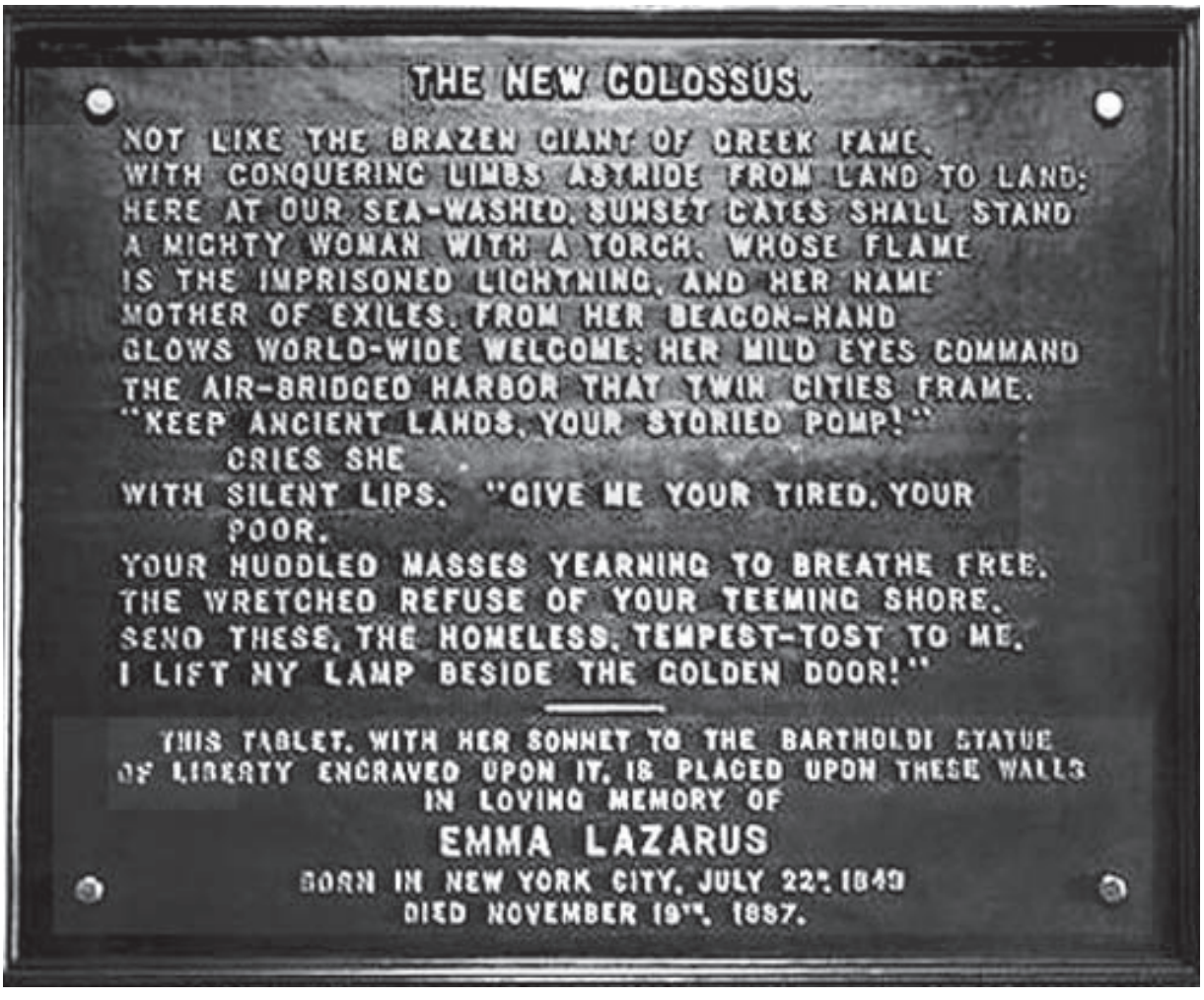
HARVARD MEDICAL SCHOOL TEACHING HOSPITAL

FROM THE CHIEF

Jonathan B. Kruskal, MD PhD

One bright light during the month of January was our official launching of the **Radiology Center for Outcomes Research and Improvement (rCORI)**, aimed at harmonizing, coordinating and branding our many outstanding efforts in technology development, quality and safety, and outcomes research. We have a formidable track record of teaching, clinical operations and research in these three domains of health services research, and our own rCORI aims to bring our own staff and their collaborators under this umbrella to create a center to be proud of. In the past month alone, we have seen three manuscripts on health Services research come out of current staff in our department (*see Pubcallout on pg. 10*), a recent grand rounds was presented by Pari Pandharipande, MD MPH, a luminary in technology assessment in radiology who spoke on "Imaging and Physician Decision-Making: Insights Gained from Decision Science" and and I am thrilled to share the news that **Koenraad Mortele** is a co-investigator on an NIH grant on "Patterns & Determinants of Inappropriate Diagnostic Imaging" (*see pg 2*). Much of our research already focuses on relevant themes of Health Services Research and the Center will help support and coordinate investigators in developing their research in these areas. During the initial stages of establishing this Center, I have created a small steering committee (that includes **Ammar Sarwar** and **Etta Pisano**) to help guide and further develop a vision, a mission statement, and to establish goals for the next year. I am very excited that we have taken this step and look forward to sharing updates with you as we get off the ground.

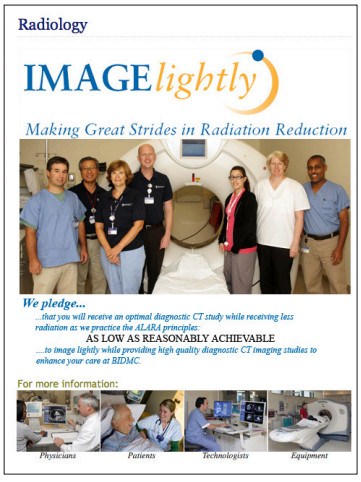
As we go forward, and given the other events in the month of January, this is a good opportunity to reflect on the contributions of our multinational community and how such diversity has led to such excellence.



Poem by Emma Lazarus immortalized on the plaque at the base of the Statue of Liberty, New York Harbor, November 2, 1883.

Olga Brook, MD
Clinical Director of CT

In Jan 2017, we were pleased to be awarded an **Image Wisely Pledge Certificate** for efforts in promoting safety in Medical Imaging. Committed to best care practices by providing the lowest possible radiation exposure to our patients while maintaining superior diagnostic imaging quality, we established the **CT Quality group** that includes Vassilios Raptopoulos, Vice Chair of Clinical Services, Da Zhang, CT physicist, Carol Wilcox, senior CT tech, Matt Palmer, Director of Physics, Tim Parritt, CT manager, Robert Butler, CT supervisor at Chestnut Hill, Muna Ibrahim, Needham senior CT tech, Bill Hallett, Needham Director of Operations, and myself, Olga Brook, Clinical Director of CT, to closely monitor and manage CT radiation exposure. The task of monitoring radiation exposure is very complicated due to vast variety of clinical CT applications for different patient populations performed on numerous CT scanners from various vendors that use different dose reporting formats. Our solution was an in-house CT dose-tracking infrastructure built by Da Zhang, Larry Barbaras, Carol Wilcox, Rajeev Krishnapillai, Matt Palmer and Olga Brook. The system collects and mines radiation dose structured reports (RDSR) received from CT scanners in real time. The resulting database of protocol and dose information gives us the ability to perform comprehensive reviews of the data, comparison among different scanners and against national benchmarks, ongoing immediate outlier monitoring and inclusion of dose summary information into the radiologists' reports. In addition to immediate detection of outliers on all protocols, we have completed detailed focused review of high volume protocols such as non-gated chest pain, mesenteric CTA, non-contrast head CTs and others, to standardize our practice among different scanners and 50+ CT technologists. These reviews resulted in improved quality and appropriate radiation exposure for our patients. Thanks to this system we now have enough data to evaluate some rarely used protocols.



Congratulations Koenraad Mortele:

NIHCM Foundation Awards $345K in Investigator-Initiated Research Grants

Washington, DC January 9, 2017

NIHCM Foundation has awarded seven new grants totaling $345,000 to support investigator-initiated health services research. The winning studies were selected for their potential to improve the health care system and their strong research design.

NIHCM has made over $1 million in grants since the research grant program began in 2012. "The studies we're supporting are developing practical evidence that is actively improving the effectiveness and efficiency of the U.S. health care system," said NIHCM CEO Nancy Chockley. "This investment in evidence is critical to achieving a healthier America."

The latest round of grants will support the following project by Chief of Abdominal Imaging and Director of MRI, **Koenraad Mortele, MD**:

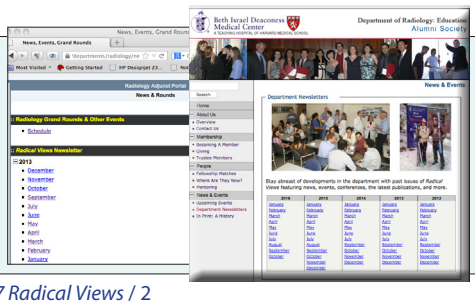
Patterns & Determinants of Inappropriate Diagnostic Imaging

This study will describe the magnitude and costs of inappropriate diagnostic imaging and estimate the influence of patient, physician and practice characteristics and of physician self-referrals. Researchers will also examine the impact of cost containment initiatives in Massachusetts, with findings expected to inform future efforts to reduce inappropriate care.

Researchers:
Gary Young, Northeastern University
Stephen Flaherty, Northeastern University
Koenraad Mortele, BIDMC, Harvard Medical School

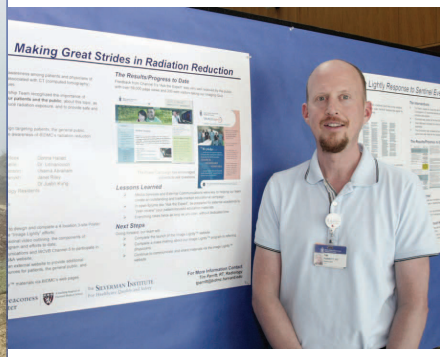
About NIHCM
The National Institute for Health Care Management (NIHCM) Foundation is a nonprofit, nonpartisan organization dedicated to improving the health of Americans by spurring workable and creative solutions to pressing health care problems.

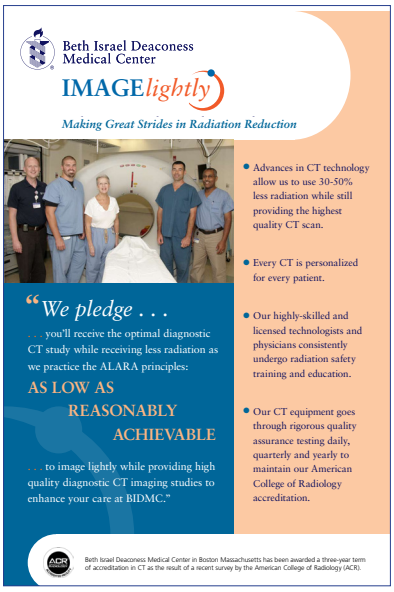
In case you missed an issue of Radical Views!
All back issues are available on the BIDMC portal under "News and Events":
https://portal.bidmc.org/Intranets/Clinical/Radiology/news.aspx
and ***we also have an outside link on the alumni site:***
http://radnet.bidmc.harvard.edu/education/newsletters.asp



These sites will always have the most current/revised versions so please keep checking as needed

Fond Farewell to CT Manager Tim Parritt



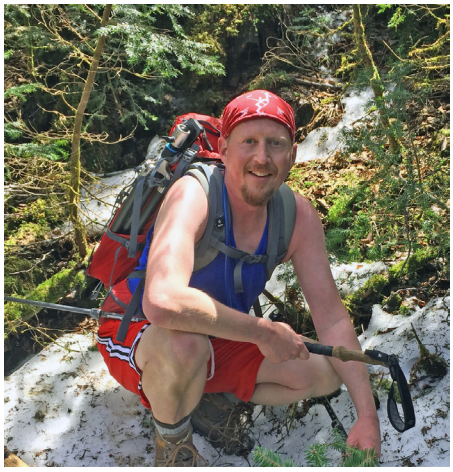


"It has been said that many people will have had multiple careers in their lifetime. For me, some people will have known me from my career in Hospitality; today, people know me for my career in Healthcare; and, tomorrow others will get to know me as an Artist".

- Tim

Please join me in saying "thank you" to CT Manager Tim Parritt for his dedicated service to our patients and staff. Tim will be leaving BIDMC on February 24 to hike the Appalachian Trail. For those who don't know Tim, he started his hiking career about five years ago. Tim and his partner planned a trip to Peru in 2013 to hike the Incan Trail to Machu Picchu. So in 2012, they started to train by hiking the 4,000 foot high peaks in the White Mountains of New Hampshire. There are 48 of these peaks. Let's just say that they really liked hiking because they have now done all 48 multiple times. You may have also noticed Tim's interested in art from his many displays in the Gallery conference room on the West campus. Tim has taken several classes at Mass Art and most recently is experimenting with photography. Tim's talents do not stop at art; he also has developed his leadership talents while here at BIDMC. He started in 2002 as a new supervisor in CT and advanced his career, learning and contributions through good times and tough times. Tim is a hardworking, dedicated and forever-learning leader and it has been a privilege to work with him for the past fifteen years. We will miss him and wish him the best of luck on the trail.

- *Donna Hallett*
  Sr. Director of Operations



Tim holds the record for displaying his photos and sculptures in the Gallery four times starting in 2011!

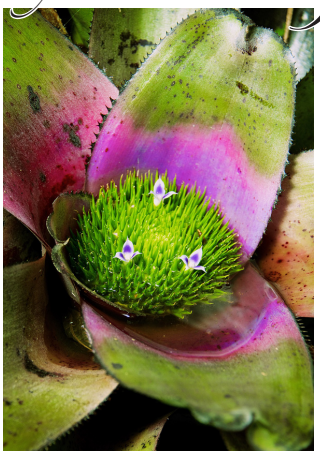
Radiology Calendar FEBRUARY 2017

Check for the most up-to-date schedule at: **https://apps.bidmc.org/departments/radiology/residency/conferences/displayMonth.asp**

Mon	Tues	Wed	Thurs	Fri
Weekly **Mon** Section Meetings: 3:00-4:00 ED section meeting [ED annex, WCC]		Weekly **Wed** Section Meetings: 11:00-12:00 MSK clinical conference 12:00-1:00 CardioThoracic, GI/GU Oncology 3:00-4:00 Mammo [TCC-484]	Weekly **Thurs** Section Meetings: 12:00 - 1:30 Abd [WCC-354] 12:00-1:00 MSK	*Note that as of July 2016, our 12 noon Friday Grand Rounds will now be in the **Rabkin Board Room**, Shapiro-10, East Campus *(except when noted otherwise)*
		1 7:30 - 8:15 Pediatric brain (Neel Madan) 8:15 - 9:00 Pediatric spine (Neel Madan) 12:00-1:00 Neuro case conference (Neuro fellows)	2 7:30 - 8:15 Stroke Imaging (Rafael Rojas) 8:15 - 9:00 Emergency Pelvic Ultrasound (Robin Levenson)	3 7:30 - 8:15 Review of ED Lecture Series Pre-Test (Chief Residents) 12:00 - 1:00 (TBD)
6 7:30 - 8:15 C-spine Trauma (Sejal Shah) 8:15 - 9:00 T/L-spine Trauma (Sejal Shah)	7 7:30 - 8:15 ED lecture series (Elisa Flower) 8:15 - 9:00 ED lecture series (Elisa Flower) 12:00-1:00 Neuro case conference (Neuro fellows)	8 7:15-8:00 US meeting [WCC-304A] 7:30 - 8:15 RUQ pain (Robert Kane) 8:15 - 9:00 Scrotal Ultrasound (Robert Kane) 12:00-1:00 Neuro case conference (Neuro fellows)	9 7:30 - 8:15 Upper Extremity Trauma (Colm McMahon) 8:15 - 9:00 Lower Extremity Trauma (Mary Hochman) 3:00-4:00 West MedRads - Sr. Resident, West Body CT [Clouse]	10 12:00 - 1:00 Grand Rounds: The Future of The Chart Biopsy: Structured Reporting Vs Natural Language Processing (Michael Zalis)
13 7:30 - 8:15 Spinal Infection (Pritu Mehta) 8:15 - 9:00 Chest Trauma (Sejal Shah) 12:00-1:00 MRI meeting [Ansin 2]	14 7:30 - 8:15 ED lecture series (Elisa Flower) 8:15 - 9:00 ED lecture series (Elisa Flower) 10:30-11:30 NMMI meeting [GZ-103]	15 7:30 - 8:15 Pelvic Trauma 1 (Robin Levenson) 8:15 - 9:00 Pelvic Trauma 2 (Robin Levenson)	16 7:30 - 8:15 Post-Operative Abdominal Emergencies (Bettina Siewert) 8:15 - 9:00 Bowel Obstruction and Ischemia (Bettina Siewert)	17 7:30 - 8:15 Blunt Abdominal Trauma 2 (Robin Levenson) 12:00 - 1:00 Chief Rounds (Sean Burn, Janeiro Achibiri, Maureen Frederick , John Cavanaugh)
20 Presidents Day	21 8:00 - 9:00 Physics (TBD) 8:00-9:00 IR Meeting [West Recovery]	22 8:00 - 9:00 Physics (TBD) 12:00-1:00 Neuro case conference (Neuro fellows)	23 8:00 - 9:00 Physics (TBD) 3:00-4:00 West MedRads - Sr. Resident, West Body CT [Clouse]	24 7:30 - 8:15 Nutrition and Its Impact on General Resident Wellness. (Jessica Burch, RD) 12:00 - 1:00 Grand Rounds: Unconscious Bias (Sheri-Ann Bowie-Burnett)
27 7:30 - 9:00 Body (TBD)	28 7:30 - 9:00 Body(TBD) 10:30-11:30 NMMI meeting [GZ-103]			

The Gallery presents a 3rd show by Peter Gross, MD

Photographer & Recently Retired Breast Imager



Come & enjoy an armchair travel to the wonders of New Zealand with Peter

If you would like to show in the Gallery, please contact Medical Editor Donna Wolfe (4-2515)

February 2017 GRAND ROUNDS:

Friday, February 10, 2017
12 noon - 1:00 PM • Shapiro-10

The Future of the Chart Biopsy: Structured Reporting vs Natural Language Processing

Michael E. Zalis, MD - Abdominal Imager, MGH; Associate Professor of Radiology, HMS

Drawing on work that began over five years ago at Mass General Imaging to help improve patient care, radiologist Michael Zalis and Mitch Harris co-founded QPID™ Inc. to help manage electronic health records (EHR). The recently launched company uses software developed at Mass General Imaging to retrieve and integrate EHR data into clinical practice. [Reported Feb 14, 2013]

His bibliography and experience related to his Grand Rounds talk at BIDMC include:

Yee J, Chang KJ, Dachman AH, Kim DH, McFarland EG, Pickhardt PJ, Cash BD, Bruining DH, **Zalis ME**. The Added Value of the CT Colonography Reporting and Data System. J Am Coll Radiol. 2016 Aug;13(8):931-5. PMID: 27260486.

Zalis M, Harris M. Advanced search of the electronic medical record: augmenting safety and efficiency in radiology. J Am Coll Radiol. 2010 Aug;7(8):625-33. PMID: 20678732.

Alkasab TK, Harris MA, **Zalis ME**, Dreyer KJ, Rosenthal DI. A case tracking system with electronic medical record integration to automate outcome tracking for radiologists. J Digit Imaging. 2010 Dec;23(6):658-65. PMID: 19760294; PMCID: PMC2978883.

Lin A, Harris M, **Zalis M**. Initial observations of electronic medical record usage during CT and MRI interpretation: Frequency of use and impact on workflow. AJR Am J Roentgenol. 2010 Jul;195(1):188-93. PMID: 20566815.

Friday, February 24, 2017
12 noon - 1:00 PM • Shapiro-10

Unconscious Bias

Sherri-Ann Bowie-Burnett, MD, MPH - Director, Multicultural Affairs*, Endocrinologist, MGH; Assistant Professor of Medicine, HMS

Dr. Burnett-Bowie holds three leadership positions devoted to increasing diversity and inclusion. *As Associate Director of the MGH Center for Diversity and Inclusion, Director of Multicultural Affairs for the Department of Medicine, where she co-chairs the DOM's Diversity and Inclusion Board, and Faculty Assistant Dean of Student Affairs in the Office of Recruitment and Multicultural Affairs at HMS, it is clear that teaching and increasing diversity and inclusivity are central to her mission.

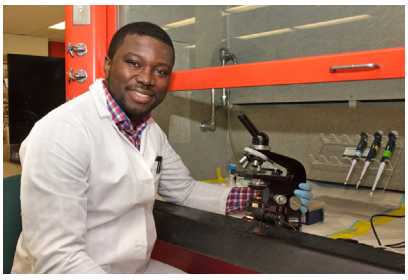
Dr. Burnett-Bowie received her MPH from the Harvard School of Public Health, her MD from the University of Pittsburgh School of Medicine and completed her residency in internal medicine and fellowship in endocrinology at Massachustetts General Hospital.

She has received multiple local and national grants to support her clinical investigation and local awards for both excellence in teaching and the promotion of diversity and inclusion.

**The MGH Center for Diversity and Inclusion (CDI) has developed several cross-cultural initiatives to enhance the quality of patient care at Mass General. As the population becomes more racially and ethnically diverse, health care providers will continue to care for more patients from different cultures and backgrounds. One of the biggest challenges will be communication across cultures. CDI has developed several cross-cultural initiatives including courses, medical grand rounds and a film series. CDI is also partnering with several MGH departments in education and training initiatives centered toward improving the work environment for physicians and nurses, and the quality of patient care.*

We are delighted to have Dr. Bowie-Burnett share her insights with us at Grand Rounds.

WELCOME NEW RESEARCH FELLOW: David Mwin, PhD to our Minimally Invasive Tumor Therapy Lab (Dana-7)



Dr. David Mwin completed a PhD in Infection, Immunity and Inflammation at the University of Leicester, UK, and comes to us most recently from BWH where he served as a research fellow. He also earned a BSc in Applied Biology with first class honors from the University for Development Studies in Tamale, Ghana. With his worldwide experience in research skills including novel molecular tools, he joined the Minimally Invasive Tumor Therapy Lab which studies the physical and physiological principles of radiofrequency ablation for tumor therapy e.g., improving its effectiveness using nanoparticle and liposomal treatments in Dec 2016. In Oct 2016, Muneeb Ahmed, VIR Chief and Director of the Lab, was awarded an NIH R01 grant for "Modulating systemic pro-oncogenic effects of focal image-guided tumor ablation" and we look forward to Dr. Mwin's contribution to this major project. His hobbies include playing soccer and basketball, volunteering for charitable causes, and reading legal fiction, as well as learning to use the ever evolving IT-world to enhance human safety and property security, and mobile health delivery and research.

WELCOME NEW FACULTY:

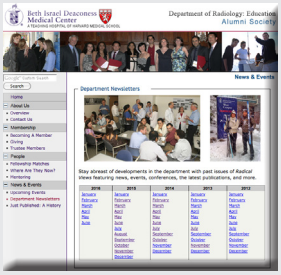
Patricia Balcacer De la Cruz, MD - joins the Abdominal Imaging section and specializes in Body MRI. She comes to BIDMC from Yale New Haven Hospital where she practiced teleradiology and emergency as well as radiology and biomedical imaging as a Clinical Instructor. Dr. Balcacer graduated from the Universidad Nacional Pedro Henríquez Ureña, Santo Domingo, Dominican Republic and completed her radiology residency at Detroit Medical Center, Wayne State University School of Medicine and fellowship training in both abdominal imaging and MRI at Yale New Haven Hospital. An avid academic radiologist, she comes to BIDMC with five research/quality projects and her work has been presented at numerous national conferences. In 2015, her poster, *MRI of Cervical Cancer: Staging, Prognostic Implications and Pitfalls*, presented at the Society of Abdominal Radiology in San Diego was selected as one of the Top 15 Posters by the Website Education Committee for permanent posting on the SAR website.

Parisa Lotfi, MD - joins the Breast Imaging section and comes to BIDMC most recently from Brigham & Women's Faulkner Hospital, Jamaica Plain.

She earned a BA in Psychology at George Washington University, Wash., DC and her MD at the Medical College of Virginia in Richmond. Upon completion of her fellowship in Body Imaging at Northwestern University School of Medicine and radiology residency at the Michael Reese Hospital, University of Illinois, Chicago, where she served as an attending (2002-2003), she came to Boston as a radiologist at BWH in 2003. Her experience on both the Radiology Leadership Council and as leader for the Multi-disciplinary Tumor Board at the Faulkner led her to embark upon the Leadership Program at the Harvard Business School/BWH and she has enjoyed speaking worldwide on breast imaging at international conferences and DFCI-sponsored events.

***Stay in touch:* Join the BIDMC Radiology Alumni Society**
and receive our monthly Radical Views via our web link ➢
http://radnet.bidmc.harvard.edu/education/newsletters.asp

You can also contact Radical Views Editor Donna Wolfe at ***dwolfe@bidmc.harvard.edu*** *with updates, especially after completion of your fellowships!*



Rashmi J. Mehta, MD, MBA - joins the faculty following the completion of her fellowship here in breast imaging in Feb. 2017. She earned a BS in Biology & Classics at Albany Medical College and completed a combined MD/MBA Leadership in Medicine Program at Union College, Schenectady, NY. As Rashmi Jayadevan, she completed her radiology residency (including a mini-fellowship in breast imaging) at BIDMC in 2015 where she also served as Chief Resident as well as Vice President of the American Medical Student Association (2009-2010) and resident representative to address policy issues affecting young physicians at the Massachusetts Medical Society (2012-2013). She also completed a fellowship in pediatric imaging at Boston Chidren's Hospital before focusing on breast imaging and we welcome her return to BIDMC.

JVIR
Journal of Vascular and Interventional Radiology

Jeffrey L. Weinstein, MD
Interventionalist &
Associate Director, VIR
Fellowship

2nd year in a row!

Congratulations **Jeff Weinstein** for being selected as a 2016 Distinguished Reviewer for the Journal of Vascular and Interventional Radiology, for your outstanding service to JVIR in 2016.

JVIR[1]'s Distinguished Reviewers represent its distinguished class of volunteers who have been chosen for their service in 2016. They produced a large number of authoritative reviews, with consistent attention to detail, diplomacy, and speed. We honor your excellent work as well as your significant contributions to the journal.

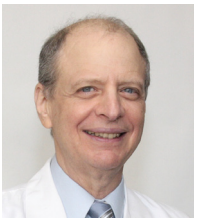
We hope you will be able to accept your award in person at the SIR 2017 Annual Scientific Meeting in Vancouver The award will be presented at the Reviewer Reception on Saturday, March 4, 2017 at the Marriott Marquis, Washington DC.

Once again, congratulations. On behalf of JVIR, we appreciate your contributions to the journal, and to the field of interventional radiology.

Kind regards,
Lindsey Huckabee
On behalf of Ziv Haskal, Editor-in-Chief
Journal of Vascular and Interventional Radiology

Radiology
Residency
Program:

Priscilla J. Slanetz, MD, MPH, FACR, Director



Ronald Eisenberg, MD JD, Assoc. Director

Anu Shenoy-Bhangle, MD, Assoc. Director

Teaching Tips:
Engaging the Adult Learner: Flipping and Team-Based Approaches

Adult learners are motivated and self-directed, bring life experience and knowledge to every teaching moment, are goal-oriented and practical, are relevancy-oriented, and desire respect[1]. Given these learning characteristics, teachers should adjust their teaching style to maximize learning. For radiologists, this translates into moving away from the traditional didactic lecture and instead embracing more collaborative and problem-based sessions where peers can work together, share ideas and experiences, and learn from each other. Two well-established techniques to promote active learning entail team-based learning (TBL) and flipped learning.

TBL is a technique where small groups of learners work together to solve real-life problems[2]. It combines pre-session work with in-class individual and team readiness, knowledge assessment and application of concepts to challenging scenarios. Team members foster an adult-learning environment by being prepared for every session. To be successful, TBL requires substantial planning and thought on the part of faculty, but done well, can be a very effective and engaging way to teach. If you are interested in learning more about TBL, consider attending the TBL workshop at the 2017 annual meeting of the Association of University Radiologists in Hollywood, Florida (May 8-11).

Flipped learning is another approach that engages learners and focuses on application of concepts rather than solely on knowledge transfer[3]. A flipped classroom requires the learner to prepare prior to the session by either reviewing a power-point presentation, a short video or a brief reading and then come to the classroom for an interactive session. At least in one study undertaken at three institutions, the flipped classroom approach outperformed traditional didactic lectures with regard to overall student performance and mastery of radiologic concepts[4]. From a practical standpoint, flipping a classroom requires the teacher to provide learners with a pre-session assignment that allows the learners to learn basic concepts at their own pace. The teacher then prepares an interactive session where learners are actively engaged in applying these concepts to a variety of cases. ***The primary purpose of the teacher is to facilitate learning rather than to impart knowledge.***

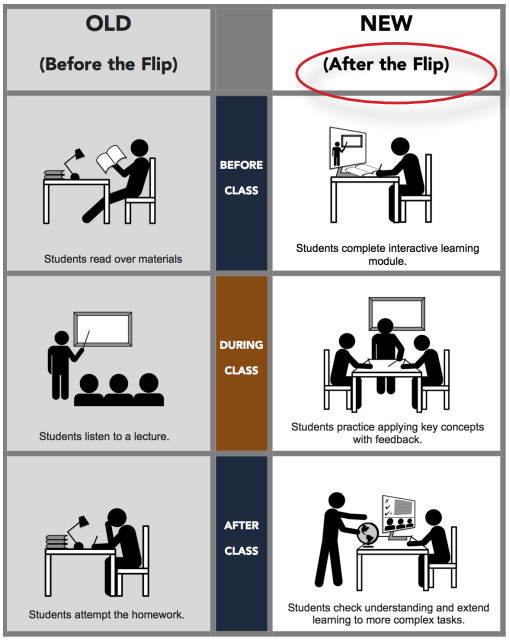
Both of these teaching styles embrace adult learning principles and promote the development of critical thinking in learners. Although not yet adopted at national meetings, given clear benefits in learning, it's time for us all to consider trying one of these approaches in our teaching. Why not give it a try? It might even be fun!

Case for TBL:
Team-Based Learning is a powerful & transformative teaching strategy

Low student Motivation	Team-Based Learning	High Student Motivation
Broadcast/Receive Mode of Instruction		Learner-Centered Mode of Instruction
Little/No Class Time for Application		Class Time Largely for Application
Student haziness on material's relevance to real-world problems		Material's relevance to real-world problems explicit

Out of Class	In class (1-1.5 hrs)	In Class (3-5 meetings)
Readings for preparations (30-50 pgs)	Readiness Assurance Process: Individual Test → Same test completed as a team → Appeals → Mini-lecture	Applications activities Teams work on a significant problem that requires them to make a significant choice. All teams work on the same problem and report simultaneously.

Structure of a team-based learning module



References:

1. Collins J. Education techniques for lifelong learning -- Principles of adult learning. RadioGraphics. 2004;24(5):1483-1489.
2. Parmelee DX, Michaelsen LK. Twelve tips for doing effective team-based learning. Medical Teacher. 2010;32(2):118-122.
3. Sharma N, Lau CS, Doherty I et al. How we flipped the medical classroom. Medical Teacher 2015;37:327-330.
4. O'Connor EE, Fried J, McNulty N et al. Flipping the classroom right side up. Academic Radiology. 2016;23(7):810-822.

Aideen Snell, MSW
Manager, Service Excellence Program
x72570
asnell@bidmc.harvard.edu

AIDEEN SNELL ON THE PATIENT EXPERIENCE

Radiology Action Planning Committee's Patient Engagement

February TIP of the Month with help from Mitch Rabkin*:

"People are too intimidated in terms of asking for things that they should rightly expect" so when we anticipate those needs, we go from good to great!

BIDMC HISTORY OF PATIENT ADVOCACY & THE PATIENT EXPERIENCE

"In this moment in healthcare, the challenges for those in the system are dynamically shifting and the perspectives, desires and needs of the healthcare consumer are putting positive and lasting pressures on how healthcare works that will shift [it] from where it has been to where it must go. At the heart of this transition are the ideas framing an experience era, where collaborative, consumer-focused and purposeful actions can and will lead to a healthcare system returning to its fundamental calling, that of human beings caring for human beings. In doing so we can change the nature of healthcare and reignite the purpose that brought people to this work..." (Jason Wolf "The experience era is upon us," Patient Experience Journal: Vol. 3 : Iss. 2 , Article 1)

At BIDMC this isn't something new, we have a rich history of improving care for all and being leaders in patient advocacy. BIDMC is often referred to as the "Harvard with a Heart" but what many may not know is that BIDMC was the first medical center in the country to implement a Patient Bill of Rights and Interpreter Services, to name a few:

1972 BIH creates a **Patient Bill of Rights** under the direction of President Mitchell Rabkin, MD*. This document is later used as a model for the Massachusetts Bill of Rights legislation of 1979

1979 BIH's **Interpreter Services** opens with the hiring of a Russian-speaking interpreter, one of the first such services to be established in New England. Today, BIDMC offers interpreter services in more than 70 languages, with some 125,000 in-person patient encounters each year

2008 BIDMC forms the first **Patient Family Advisory Council** (PFAC) in adult critical care, a group that offers unique patient perspectives previously available only in pediatrics

2010 BIDMC is one of the first three health care institutions in the country to adopt **OpenNotes**, which invites patients to read the notes their doctors write in PatientSite

2012 One of the first Radiology Departments in the country to install **electronic kiosks** to get in-the-moment feedback from patients regarding their experience with medical imaging and to dedicate a team of Patient Experience Ambassadors to utilize the feedback for action planning

2014 BIDMC is the first hospital in the nation to **measure emotional harm** as a preventable harm to improve the patient and family experience, and better the quality and outcome of care

(Learn about all of our other great "firsts!" at http://www.bidmc.org/About-BIDMC/A-History-of-Improving-Care-for-All.aspx)

These all speak to our commitment to patient advocacy and putting the needs of the patient first. So as many in healthcare transition their focus to the patient experience we can be proud of being a part of an organization with a solid foundation in caring about the patient experience and a culture of *human first*. In Radiology we continue to be committed to creating better communication and a consistent experience for our patients across the department. Input from our patients emphasizes how important this is to them, how it quells their anxiety and lets them know 'they're still on the right road'. Therefore, insuring this happens during every patient and staff interaction is a priority in Radiology to improve the patient experience.

Excerpts from
Origins of BIDMC Ethics Programs:
An Oral History with Dr. Mitchell Rabkin

"People are too intimidated in terms of asking for things they should rightly expect"

"Did away with open wards not to distinguish between the paying and welfare patients. Not going to have two classes of patients"

"People tend to be intimidated by the medical system, which gets more and more complicated all the time"

"Everybody has a story everybody has worth at every level – dignity of every person"

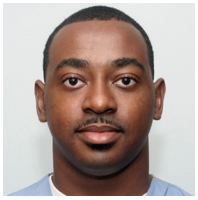
"Build more islands of excellence, connect them with causeways, and strengthen the whole thing"

A DNR was unheard of, "those were things medical doctors decided," the idea that the patient had a say was a very radical change

Staff should ask two questions:
1. How can I help this patient
2. In doing that, what can I learn?

KUDOS – Each month, we share the positive feedback we receive about staff members and ask you to join us in congratulating them; as always, we are especially proud to acknowledge an unprecedented constellation of staff for providing outstanding care and service!

Chestnut Hill Square



Roosevelt Poulard doesn't typically work out at Chestnut Hill. Our x-ray tech that was scheduled to work this day had a death in the family. I was scrambling for coverage with the holiday weekend upon us when Roosevelt offer to come to Chestnut Hill once his shift ended at the hospital. This is the 3rd or 4th time Roosevelt has stepped up and helped us out with staffing challenges.

Nuc Med & Molecular Imaging

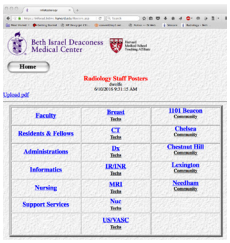
Thanks to **Nicole Ford** for her professional, caring service to a patient that facilitated saving them from having to make an extra trip into Boston for their imaging.

Dx Imaging

Robert Chotalal was the technologist assigned to a patient who presented for a Lumbar Puncture procedure. She was a first time patient to BIDMC, and was anxious because it was also her first Lumbar Puncture procedure. Robert was well prepared and he anticipated needs, which put the patient at ease.

REMINDER: Updated Radiology Technologist Rosters & Staff Posters are available on InfoRadiology in pdf format for viewing, downloading, and printing. Log in to the portal:

https://portal.bidmc.org/



If you don't already have InfoRadiology displayed in **My Applications**, click on the **Applications** tab and then under **Clinical**, click on **Inforadiology**. Log into Inforadiology, click on **Staff Posters Tab** to view/ download/print the most current Tech Rosters, etc.

Managers: Please contact Michael Larson at mlarson1@bidmc.harvard.edu to update rosters as needed

Updated Policy Notifications

Donna Hallett, BSc
Director of Operations

The following departmental policies, procedures, guidelines and directives (PPGD) have been added, edited or reviewed with no change. To ensure that you are up to date on the newest, most current information, please click on the link below to view the specific PPGD:
https://apps.bidmc.org/cms/dispManuals.asp

New or revised policies for MARCH 2017:

RAD-IV-1: Minimizing Nephrotoxicity from Iodinated Contrast

Changes:

- Minor format change to chart
- Included name description detail for LOCM and IOCM
- Changed Hydration recommendation from 1 hour before and 6 hours after to 2 hour pre and post for outpatients
- Added links to 2 reference policies "Patients on Dialysis" and "High Risks"

*10th ANNUAL SILVERMAN SYMPOSIUM

Wednesday May 3, 2017

The Silverman Institute for Health Care Quality and Safety sponsors an annual Symposium that features a Poster Session showcasing the process improvement efforts across the BID system.

Poster Submission Deadline Friday March 3, 2017 at 5:00p

Click below for templates and information to prepare a paper poster or ePosterboard presentation, AND/OR to submit your poster! https://portal.bidmc.org/Intranets/Administrative/Silverman-Institute-for-Health-Care-Quality/Divisions/PARC/Silverman-Symposium-Poster-Submission.aspx

If you have other questions or would like assistance preparing your team's poster, contact piprojects@bidmc.harvard.edu

PUBLICATION CALL OUT: BIDMC Radiology in AJR

Check out the latest issue of AJR.

The authors of all three of the health services research papers are in our department, and two of the studies come out of here. Also included in this issue is another paper by Ammar Sarwar and a letter by Ferris Hall. Not a bad month and *a great way to show our progressive disruptive intrusion into the world of health services research!*

- Jonny

Health Care Policy and Quality
Original Research:

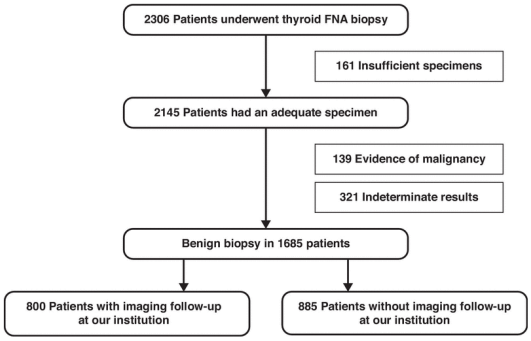
**Body MRI Fellow 2016-2017*

Imaging Surveillance in Patients After a Benign Fine-Needle Aspiration Biopsy of the Thyroid: Associated Cost and Incidence of Subsequent Cancer

David J. S. Becker-Weidman*, Neil Malhotra, David F. Reilly, Naveen Selvam, Laurence Parker, Levon N. Nazarian.
American Journal of Roentgenology | Dec 8, 2016
http://www.ajronline.org/doi/abs/10.2214/AJR.16.16691

OBJECTIVE. The objective of our study was to determine patterns and cost of imaging tumor surveillance in patients after a benign fine-needle aspiration (FNA) biopsy of the thyroid in a large teaching hospital as well as the rate of subsequent cancer detection.

MATERIALS AND METHODS. This cohort study was approved by the appropriate institutional review board and complied with HIPAA. All patients who had a benign thyroid FNA biopsy between January 1, 1999, and December 31, 2003, were identified from an institutional pathology database. We gathered information from electronic medical records on imaging tumor surveillance and subsequent cancer detection. Cost was determined using the facility total relative value unit and the 2014 Hospital Outpatient Prospective Payment System conversion factor.



RESULTS. Between January 1, 1999, and December 31, 2003, 1685 patients had a benign thyroid FNA biopsy, 800 (47.5%) of whom underwent follow-up imaging. These patients underwent 2223 thyroid ultrasound examinations, 606 ultrasound-guided thyroid FNA biopsies, 78 thyroid scintigraphy examinations, 168 neck CTs, and 53 neck MRIs at a cost of $529,874, $176,157, $39,622, $80,580, and $53,114, respectively, for a total cost of $879,347 or $1099 per patient. The mean length of follow-up was 7.3 years, during which time 19 (2.4%) patients were diagnosed with thyroid cancer at a cost of $46,281 per cancer. Seventeen (89.5%) were diagnosed with papillary carcinoma and two (10.5%) with Hurthle cell carcinoma.

CONCLUSION. Over a 5-year period, about half of the patients who had a benign thyroid FNA biopsy underwent follow-up imaging at considerable cost with a small rate of subsequent malignancy.

TABLE 1: Costs of Follow-Up Imaging

Procedure	HCPCS Code	Facility Total RVU	Cost per Procedure ($)[a]	No. of Examinations	Total Cost ($)
Thyroid ultrasound	76536	3.28	238.36	2223	529,874
Ultrasound-guided thyroid biopsy	60100[b] + 76942[c]	4.00 (2.30 + 1.70)	290.69	606	176,157
Thyroid scintigraphy	78041[d]	6.99	507.98	78	39,622
Contrast-enhanced soft-tissue CT of the neck	70491	6.60	479.64	168	80,580
MRI of the neck	70543	13.79	1002.15	53	53,114
Total	NA	NA	NA	3128	879,347

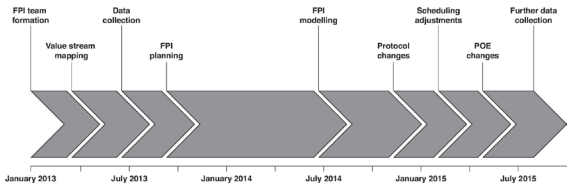
Note—HCPCS = Healthcare Common Procedure Coding System, RVU = relative value unit, NA = not applicable.
[a]Cost per procedure was calculated by multiplying the facility total RVU by $72.672, the Hospital Outpatient Prospective Payment System conversion factor for 2014 [24].
[b]Code for biopsy of thyroid.
[c]Code for echo guide for biopsy.
[d]Code for thyroid imaging with blood flow.

Health Care Policy and Quality Original Research:

Optimizing MRI Logistics: Focused Process Improvements Can Increase Throughput in an Academic Radiology Department

Jeremy J. O'Brien, **Jeremy Stormann**, **Kelli Roche**, **Ines Cabral-Goncalves**, **Annamarie Monks**, **Donna Hallett**, **Koenraad J. Mortele**

American Journal of Roentgenology | Dec 8, 2016
http://www.ajronline.org/doi/abs/10.2214/AJR.16.16680

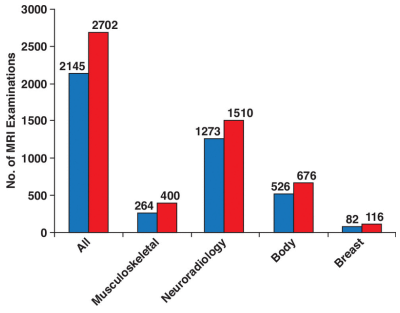


OBJECTIVE. The purpose of this study was to describe and evaluate the effect of focused process improvements on protocol selection and scheduling in the MRI division of a busy academic medical center, as measured by examination and room times, magnet fill rate, and potential revenue increases and cost savings to the department.

MATERIALS AND METHODS. Focused process improvements, led by a multidisciplinary team at a large academic medical center, were directed at streamlining MRI protocols and optimizing matching protocol ordering to scheduling while maintaining or improving image quality. Data were collected before (June 2013) and after (March 2015) implementation of focused process improvements and divided by subspecialty on type of examination, allotted examination time, actual examination time, and MRI parameters. Direct and indirect costs were compiled and analyzed in consultation with the business department. Data were compared with evaluated effects on selected outcome and efficiency measures, as well as revenue and cost considerations. Statistical analysis was performed using a t test.

RESULTS. During the month of June 2013, 2145 MRI examinations were performed at our center; 2702 were performed in March 2015. Neuroradiology examinations were the most common (59% in June 2013, 56% in March 2015), followed by body examinations (25% and 27%). All protocols and parameters were analyzed and streamlined for each examination, with slice thickness, TR, and echo train length among the most adjusted parameters. Mean time per examination decreased from 43.4 minutes to 36.7 minutes, and mean room time per patient decreased from 46.3 to 43.6 minutes (p = 0.009). Potential revenue from increased throughput may yield up to $3 million yearly (at $800 net revenue per scan) or produce cost savings if the facility can reduce staffed scanner hours or the number of scanners in its fleet. Actual revenue and expense impacts depend on the facility's fixed and variable cost structure, payer contracts, MRI fleet composition, and unmet MRI demand.

CONCLUSION. Focused process improvements in selecting MRI protocols and scheduling examinations significantly increased throughput in the MRI division, thereby increasing capacity and revenue. Shorter scan and department times may also improve patient experience.



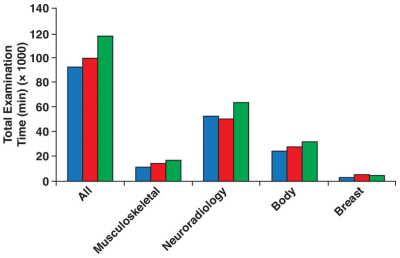


TABLE 3: Effect of Focused Process Improvements (FPIs) on Time, Capacity, and Quality Metrics

Metric	June 2013 (Before FPIs)	March 2015 (After FPIs)	*p*
Mean patient age (y)	57.4	54.8	< 0.001
Mean protocol timeslot (min:s)			
All examinations	43:24	36:41	< 0.001
Musculoskeletal	44:51	37:10	
Neuroradiology	41:40	33:24	
Body	47:04	41:44	
Breast	42:08	48:22	
Mean room time (min:s)	46:16	43:33	0.009
Mean division time (h:min:s)	1:31:22	1:28:19	0.041
Fill rate	0.864	1.088	< 0.001
Point of care testing			0.542
Overall	277	365	
Per examination	0.129	0.135	
Orbit screening MRIs (%)	0.29	0.37	0.589
Same-day cancellations			0.129
Overall	183	265	
Per examination	0.0853	0.0981	
Patient complaints			0.912
Overall	6	8	
Per examination	0.00280	0.00296	
Callback examinations			0.497
Overall	17	17	
Per examination	0.0079	0.0063	
Service calls to magnets			0.624
Overall	16	17	
Per examination	0.0075	0.0063	

TABLE 4: Estimated Effect of Focused Process Improvements on Revenue and Costs in the MRI Division

Practice Measure	Estimated Increase
Change in no. of examinations performed	557
Change in magnet use (h)	320.58
MRI revenue ($/mo)	$256,466.67
Costs ($/mo)	
Indirect fixed	
MRI scanner	$17,857.14
MRI room capital costs	$11,904.76
Direct fixed	
MRI service contract	$10,416.67
Direct variable	
Technician wages	$27,945.00
Contrast material and other supplies	$60,000.00
Advertising	Negligible
Administration	Negligible
Total[a] ($/mo)	$128,123.57

[a]Excluding overhead costs not listed.

Jeremy Stormann
Former MRI Tech

Kelli Roche
MRI Tech III

Ines Cabral-Goncalves
MRI Technical Dir.

Annamarie Monks
Former Chief Admin. Officer

Donna Hallett
Sr. Dir., Operations

Koenraad Mortele, MD - Chief of Abd Imaging, Dir., MRI

Health Care Policy and Quality
Original Research:

Electronic Kiosks for Patient Satisfaction Survey in Radiology

Johannes Boos*, Jieming Fang*, **Aideen Snell**, **Donna Hallett**, **Bettina Siewert**, **Roland L. Eisenberg**, **Olga R. Brook**.

American Journal of Roentgenology | Dec 22, 2016
http://www.ajronline.org/doi/abs/10.2214/AJR.16.16974

*CT Research Fellows 2015-2016

Johannes Boos
CT Research Fellow

Jieming Fang
CT Research Fellow

Aideen Snell, Mgr. Service Excellence

Donna Hallett, Sr. Dir., Operations

Bettina Siewert, MD Vice Chair, Quality

Ron Eisenberg, MD Cardiothoracic/MSK

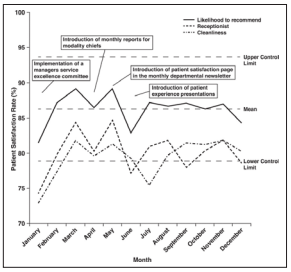
Olga Brook, MD Assoc. Dir., CT

OBJECTIVE. The purpose of this article is to analyze patient satisfaction surveys obtained via electronic kiosks in a tertiary-care academic radiology department to detect potential areas of improvement and to identify ways to improve survey response and completion rates.

MATERIALS AND METHODS. All patient satisfaction surveys submitted via electronic kiosks and via online surveys between January 2015 and January 2016 were included in this retrospective study. The surveys consisted of questions regarding the patients' overall experience, cleanliness of the department, and interactions with the receptionist, technologist, nurse, and physician. Ratings were assessed using a 5-point scale (where 1 denotes poor and 5 denotes optimal) with an option for free-text comments. The likelihood of recommendation was regarded as an indicator of satisfaction and was our primary evaluation metric. Surveys with less than optimal ratings were analyzed in detail.

RESULTS. Of 99,289 patients who visited the department, 6736 (6.8%) initiated surveys, and 4938 (73.3%) of those completed them; 4257 of 4865 (87.5%) patients reported optimal satisfaction. More patients responded via electronic kiosk compared with the online survey (4564/4938 [92.4%] vs 374/4938 [7.6%]; $p < 0.001$). The frequency of completion rate was lower for kiosks in changing and waiting areas compared with that for kiosks next to elevators (1509/2365 [63.8%] vs 3059/3927 [77.8%]; $p < 0.0001$). Cleanliness of the department (329/1656 [19.9%]) and courtesy of the receptionist (299/1656 [18.1%]) were the most frequent reasons for the lowest ratings. Wait time (61/278 [21.9%]) and communication (37/278 [13.3%]) were associated with the most frequent free-text complaints.

CONCLUSION. Survey kiosks led to a higher response rate than online surveys. The completion rate can be further improved by placing kiosks next to elevators. Cleanliness, wait time, patient-staff communication, and especially courtesy of the receptionist were found to be important factors for patient satisfaction.



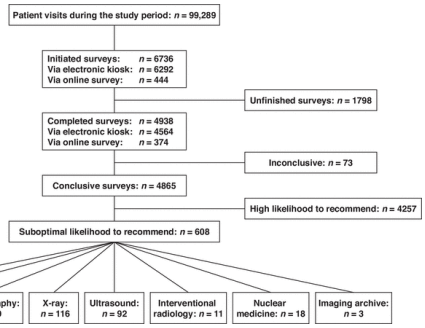


TABLE 1: Overview of Rating Frequencies per Modality of All Conclusive Responses

Modality	Total No. of Responses/ No. of Patients (%)	No. (%) of Total Responses (*n* = 4865)				
		Rating 1	Rating 2	Rating 3	Rating 4	Rating 5
Overall	4865/99,289 (4.9)	44 (0.9)	28 (0.6)	137 (2.8)	399 (8.2)	4257 (87.5)
CT	777/25,509 (3.1)	6 (0.8)	4 (0.5)	15 (1.9)	45 (5.8)	707 (91.0)
Archives	24/NA	1 (4.2)	0 (0.0)	1 (4.2)	1 (4.2)	21 (87.5)
Mammography	900/18,627 (4.8)	6 (0.67)	11 (1.2)	23 (2.6)	79 (8.8)	781 (86.8)
MRI	1207/13,220 (9.1)	19 (1.6)	6 (0.5)	45 (3.7)	109 (9.0)	1028 (85.2)
Nuclear medicine	180/6198 (2.9)	0 (0.0)	1 (0.6)	2 (1.1)	15 (8.3)	162 (90.0)
Interventional radiology	96/651 (14.7)	1 (1.0)	1 (1.0)	3 (3.1)	6 (6.3)	85 (88.5)
Ultrasound	788/23,917 (3.3)	6 (0.8)	4 (0.5)	20 (2.5)	62 (7.9)	696 (88.3)
X-ray	893/21,529 (4.2)	5 (0.6)	1 (0.1)	28 (3.1)	82 (9.2)	777 (87.0)

Note—No data for overall visits to the imaging archives were available. NA = not applicable.

TABLE 3: Frequency of Lowest Ratings of Each Categoric Question Among All 608 Surveys Without Optimal Satisfaction of 4865 Conclusive Surveys

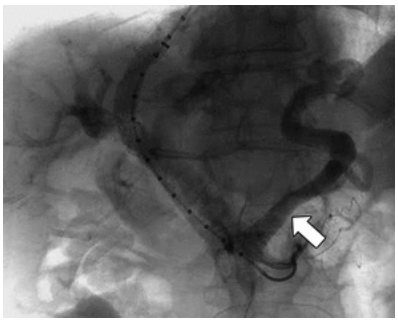
Question	Lowest Rating Nonoptimal (*n* = 1656)	Lowest Rating Overall (*n* = 4865)
Cleanliness	329 (19.9)	825 (17.0)
Receptionist courtesy	299 (18.1)	795 (16.3)
Receptionist experience	273 (16.5)	831 (17.1)
Overall experience	259 (15.6)	436 (9.0)
Technician experience	134 (8.1)	252 (5.2)
Technician courtesy	123 (7.4)	220 (4.5)
Staff courtesy	119 (7.2)	245 (5.0)
Physician courtesy	49 (3.0)	109 (2.2)
Nurse experience	37 (2.2)	80 (1.6)
Nurse courtesy	34 (2.1)	72 (1.5)

Note—Data are number (%) of responses. This shows which areas most frequently had the worst rating.

TABLE 4: Rates of Different Free-text Comments Categories in 608 Nonoptimal Surveys

Category	No. (%) of Comments (*n* = 278)	Percentage of All Visitors to Radiology Department (*n* = 99,289)
Wait time	61 (21.9)	0.06
Communication	37 (13.3)	0.04
Staff and procedure	34 (12.2)	0.03
Courtesy, privacy, and professionalism	34 (12.2)	0.03
Miscellaneous	28 (10.1)	0.03
Registration and check out	24 (8.6)	0.02
Changing room	21 (7.6)	0.02
Appointment scheduling	21 (7.6)	0.02
Location	10 (3.6)	0.01
Parking	8 (2.9)	0.008

Vascular and Interventional Radiology
Original Research



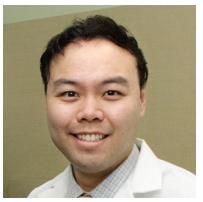
Comparison of Vascular Plugs and Pushable Coils for Variceal Embolization After TIPS

Ammar Sarwar, Anthony M. Esparaz*, Elliot B. Tapper, **Olga R. Brook**, Douglas Grunwald, Raza Malik, **Muneeb Ahmed**.

http://www.ajronline.org/doi/abs/10.2214/AJR.16.16012

*3rd Radiology Resident

Ammar Sarwar, MD VIR



Anthony Esparaz, MD, 3rd Yr Resident

Olga Brook, MD VIR/Abd/CT

Muneeb Ahmed, MD, Chief of VIR

OBJECTIVE. Transjugular intrahepatic portosystemic shunt (TIPS) with variceal embolization is routinely performed to treat variceal bleeding. Embolization using vascular plugs is reported, but outcomes are not known. Outcomes and material costs of embolization using vascular plugs and coils are compared.

MATERIALS AND METHODS. A single center's medical records of TIPS procedures (May 2003–December 2014) with variceal embolization were reviewed. Twenty patients with vascular plug embolization (age [± SD], 50 ± 10 years; seven men and 13 women; median Model for End-Stage Liver Disease [MELD], 20; interquartile range [IQR], 14–23) were compared with an age-, sex-, and MELD-matched cohort who underwent coil embolization (age, 50 ± 9 years; seven men and 13 women; median MELD, 17; IQR, 15–19; p = 0.52). Procedure details, primary outcome (rebleeding), secondary outcome (mortality), and costs were compared.

RESULTS. Vascular plug use was associated with a lower fluoroscopy time (49.05 minutes [IQR, 36–62] vs 68 minutes [IQR, 49–76]; p = 0.006) and total procedure time (255 minutes [IQR, 205–290] for vascular plugs vs 275 minutes [IQR, 230–330]; p = 0.05). Total volume of contrast agent used was similar (180 mL [IQR, 155–234] for vascular plugs vs 210 mL [IQR, 185–261]; p = 0.14). In patients with at least a 30-day follow-up, rebleeding rates (2/17 [12%] for vascular plugs vs 4/15 [27%]; p = 0.40) and mortality (2/17 [12%] for vascular plugs vs 4/15 [27%]; p = 0.66) were similar. Per procedure, vascular plugs cost significantly more than coils ($1292 ± $676 vs $228 ± $292, p < 0.0001).

CONCLUSION. The use of vascular plugs or coils has similar outcomes for variceal embolization after TIPS. The advantages of vascular plug use (i.e., reduced fluoroscopy or procedure time) may be offset by increased material cost, a trade-off that merits further study given current cost concerns in health care.

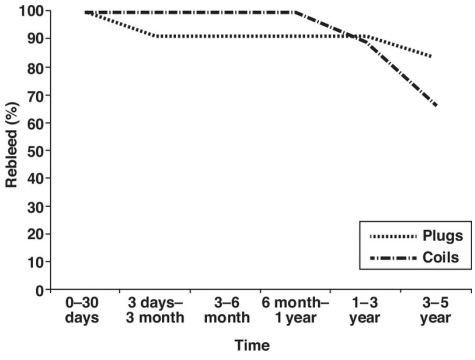


Fig 2. Kaplan-Meier curve chart shows rebleeding after vascular plug and coil embolization.

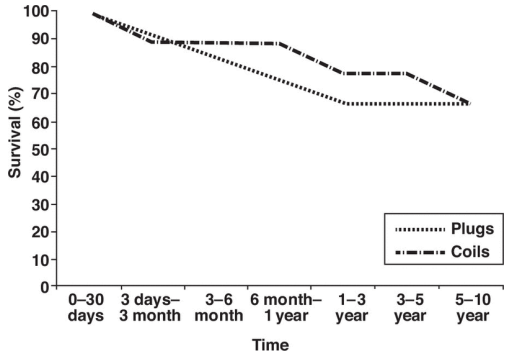


Fig 3. Kaplan-Meier curve chart shows mortality after vascular plug and coil embolization.

TABLE 1: Preprocedure Characteristics of Patients Undergoing Transjugular Intrahepatic Portosystemic Shunt (TIPS) Placement With Variceal Embolization Using Amplatzer Vascular Plugs or Coils

Characteristic	Vascular Plugs[a] (*n* = 20)	Coils (*n* = 20)	*p*
Sex (m/f)	7/13	7/13	1
Age (y) (mean ± SD)	50 ± 10	50 ± 9	0.97
Cause of cirrhosis			0.49
Alcoholic	12	13	
Hepatitis C	5	2	
Hepatitis B	0	1	
Nonalcoholic steatohepatitis	1	3	
Hemochromatosis	1	1	
Primary biliary cirrhosis	1	0	
MELD (median [IQR])	20 [14–23]	17 [15–19]	0.52
Pre-TIPS portosystemic gradient (mm Hg) (median [IQR])	15 [12.25–16]	18 [13.25–20]	0.25
Emergent TIPS (y/n)	6/14	7/13	0.74
Acute variceal bleeding during index admission (current/remote)	14/6	15/5	0.71
Pre-TIPS endoscopy (y/n)	18/2	19/1	0.14
Variceal type			
Esophageal	17	14	
Left gastric	6	7	
Ectopic	1 (duodenal)	2 (rectal)	
Blakemore tube (y/n)	7/13	2/18	0.13
On vasopressors (y/n)	9/11	5/15	0.18
Ventilated (y/n)	13/7	12/8	0.74

Note—MELD = Model for End-Stage Liver Disease, IQR = interquartile range.
[a]Amplatzer Vascular Plug manufactured by Covidien.

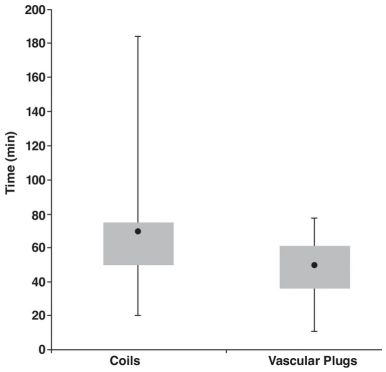


Fig 4. Box-plot shows total fluoroscopy time required for vascular plug and coil embolization. Black circles denote medians, gray boxes denote interquartile ranges, and vertical lines and whiskers denote overall ranges.

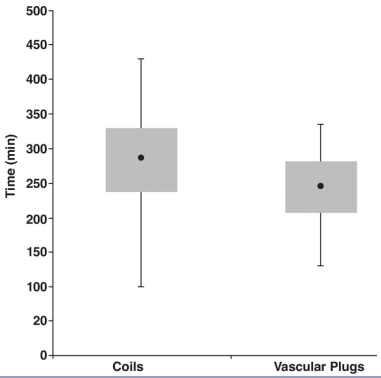
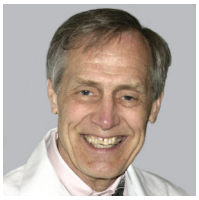


Fig 5. *[Left]* Box-plot shows total procedure time required for vascular plug and coil embolization. Black circles denote medians, gray boxes denote interquartile ranges, and vertical lines and whiskers denote overall ranges.



Ferris Hall, MD
MSK/Breast
Imaging 1971-2016

Epinephrine-Enhanced Knee Arthrography Revisited
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Letters

Epinephrine-Enhanced Knee Arthrography Revisited

The recent article by Fox et al. [1] describes a technique for performing CT arthrography of the knee immediately after MR arthrography when the latter examination is anticipated to be suboptimal or nondiagnostic because of metallic artifacts, claustrophobia, or other issues. Many of these patients had undergone surgery for suspected meniscal tears or retears. The protocol called for intraarticular injection of both gadolinium-based and iodinated contrast media with the subsequent MRI arthrogram preceding the CT arthrogram.

Fox et al. [1] concluded that

> although MR arthrography performed soon after the contrast injection had higher interreader agreement and greater accuracy, CT arthrography performed after a mean postinjection delay of 100 minutes was moderately accurate in the diagnosis of meniscal tears and can be used as an alternative procedure when MR arthrography cannot be completed.

Four decades ago, in the era of single- and double-contrast fluoroscopic arthrography, I described a technique for improving imaging detail by adding 0.35 mL of epinephrine to the injected solution to vasoconstrict the intraarticular synovia and thereby delay the dilution of contrast media, which at that time was hyperosmolar [2]. This double-blinded study, involving 10 radiologists assessing 10-minute-interval lateral radiographs, showed a highly significant improvement in contrast resolution and sharpness ($p < 0.001$), which was present even on the initial lateral radiograph obtained immediately after injection. I believe most knee arthrographers subsequently adopted this method.

The technique suggested by Fox et al. [1] will probably have limited application, but, for those using it, I would suggest the use of intraarticular epinephrine to enhance resolution on delayed images.

Ferris M. Hall
Harvard Medical School,
Beth Israel Deaconess Medical Center,
Boston, MA

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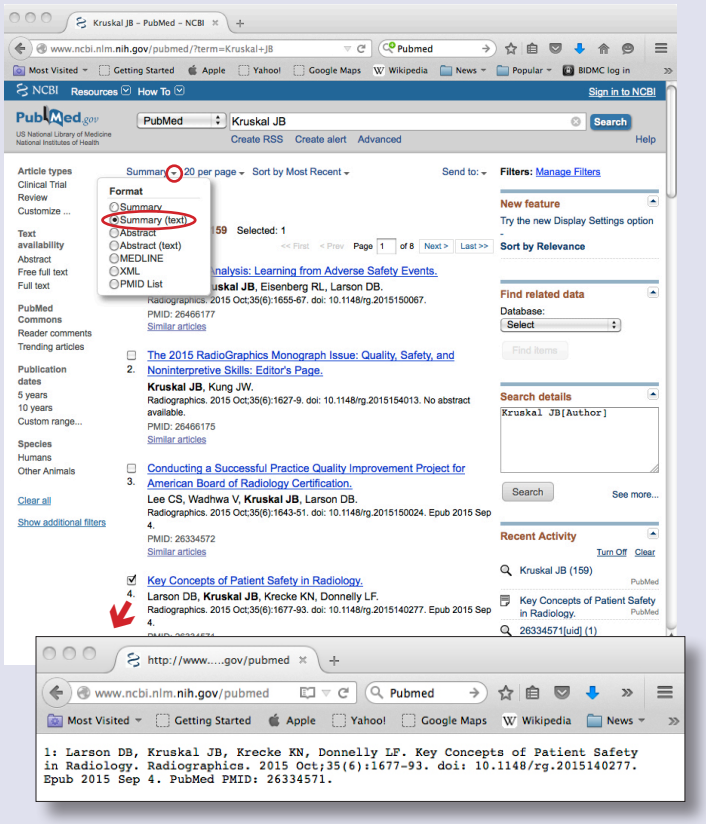

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