AUR 2014 Research Poster Abstracts

Research posters are located in Grand Ballroom V. Each poster will be presented by its author during *AMA PRA Category 1 Credit*™ poster sessions scheduled for 7:00–8:15 AM, Wednesday and Thursday. The day and time follow the presentation number. Presenting author is identified by institution name, city, and state (or country if not United States or Canada). Presentations by trainees (residents, medical students, or 1st-year fellows) are noted in **purple**.

Cardiopulmonary Radiology

(R-07) Wednesday • 7:00 AM
Use of Pulmonary Embolism Rule-Out Criteria to Rule Out Pulmonary Emboli in Emergency Department Settings: Data to Decrease Use of CT Pulmonary Artery Scans

Arun Nagaraju, BS, *University of Michigan Medical School, Ann Arbor, MI*; Jadranka Stojanovska, MD; Ruth C. Carlos, MD, MS; Steven Kronick, MD, MS; Jeffrey S. Desmond, MD; Ella A. Kazerooni, MD, MS; et al *(anag@umich.edu)*

PURPOSE: Pulmonary embolism (PE) is a common suspected diagnosis for patients presenting to the ED with chest pain/dyspnea. Many factors contribute to the overutilization of imaging for suspected PE in the ED, resulting in low diagnostic yield. The PE rule-out criteria (PERC) are a sensitive tool used to determine pretest probability of PE for patients in the ED; when used with low clinical gestalt for PE, PERC reduce the probability of VTE to below 2%. We aimed to determine both the percentage of CTPA exams that could have been avoided and the frequency with which a PE diagnosis would be missed if PERC were applied in our ED patient population with suspected PE to determine eligibility for undergoing a CTPA examination.

METHOD AND MATERIALS: A prospective cohort study of consecutive adult ED patients undergoing CTPA for suspected PE was conducted at our institution from 2/12 to 8/13. PERC scores were calculated from data in the medical records. *PERC negative* was defined as meeting zero of eight PERC criteria. *PERC positive* was defined as having at least one criterion met. The CTPA was scored as positive or negative from review of the radiology report. Sensitivity, specificity, PPV, NPV, and positive and negative LRs of PERC-positive and PERC-negative subjects were calculated. The differences between PE-negative and PE-positive patients and PERC score were determined by using Fisher exact test.

RESULTS: Of the 557 patients who underwent CTPA for suspected PE (age, 54 ± 18 years; range, 18–97 years; 63% female), the overall prevalence of PE was 9.7%. Of the 82% of subjects who were PERC positive, 11% were diagnosed with PE. Of the 18% of subjects who were PERC negative, 0.04% were diagnosed with PE, and 96% had no PE. The sensitivity of PERC-positive status for PE was 92.6%, with specificity 17%, PPV 10%, NPV 96%, positive LR 1.15 (confidence interval, 1.05–1.25), and negative LR 0.38 (0.14–1.00).

CONCLUSION: PERC-positive subjects in the ED have a higher post-test probability of PE at 11%, compared to PERC-negative subjects at 4%. Applying the PERC-positive standard to our ED (a quaternary health system with an NCI-designated cancer center) was 92.6% sensitive for the detection of PE. Using PERC-negative status as a rule-out exam would have eliminated 97 of 557 (17%) of CTPA examinations and missed four of 54 (7.4%) subjects with PE diagnosed by CTPA.

Education

(R-18) Thursday • 7:00 AM
Medical Student Misconceptions regarding Radiology and Direct Patient Care: Where We Stand and How to Improve

Ashley Altman, BA, *Allegheny General Hospital, Pittsburgh, PA*; Matthew S. Hartman, MD *(Aca29@drexel.edu)*

PURPOSE: Many medical students hold misconceptions about the field of radiology when it comes to physician-patient interaction. A substantial reason why medical students fail to recognize the degree to which radiologists interact with patients is due to improper exposure to radiologic subspecialties involving the greatest amount of direct patient care. This is important because it influences career choices of 3rd-year medical students who may be considering a residency in radiology.

METHOD AND MATERIALS: A 24-question survey regarding the structure of individual radiology clerkships was submitted to AMSER members electronically.

RESULTS: To test our hypothesis, we sent out a survey to AMSER radiology clerkship directors, and we received a >50% response rate. Our data show that 34.8% of medical students in their introductory clerkship spent less than 11% of their total time watching radiologists interact directly with patients, with the majority of time spent in independent study, lectures, and reading films. We also found that only 52.2% of students rotate through mammography and interventional radiology; of those who do, an average of 1 day is spent in mammography, and 2 days are spent in interventional radiology. Interestingly, more students spend time in fluoroscopy and ultrasound (69.6%).

CONCLUSION: Our data show that clerkship directors should be encouraged to change students' schedules in order to incorporate more time in mammography and interventional radiology, as this will broaden students' conceptions about the practice of radiology in modern medicine.

(R-19) Wednesday • 7:00 AM
Mobile Technology: A Novel Approach to Evaluate and Improve the Quality of Resident Didactic Curriculum

Leonardo I. Valentin, MD, *Baylor College of Medicine, Houston, TX*; Rohit Ramanathan, MD; Sarfaraz Sadruddin, MD; Pedro J. Diaz-Marchan, MD

PURPOSE: The purpose was to take advantage of mobile technology to (1) evaluate the quality of resident conferences on a daily basis and develop a mechanism by which the residents' feedback can reach the program director and faculty in an effective manner and (2) improve didactic curriculum based on rapidly available data on lecture effectiveness.

METHOD AND MATERIALS: Three diagnostic radiology residents developed a QR code system, which allows residents to scan a given code from their smartphones, iPads, or computers. The QR code connects the residents to an evaluation that (1) allows them to identify the noon didactic activity and presenter (ie, attending or resident) and (2) prompts them to answer five questions related to the quality of the speaker, the presentation, and the benefit of the presented material. Data are registered in a spreadsheet, and visualization is then generated using a Google API (Google, Mountain View, CA) and is submitted to the radiology chief residents. Data are then presented to the program director at monthly Resident Council meeting. The program director then shares feedback with the individual faculty at Administrative Council meetings on how to improve quality of their presentations.

RESULTS: This is an ongoing project that will take place for 4 months between November 2013 and February 2014. The results will be analyzed in time for the 2014 AUR meeting in Baltimore. Beta version of the system registered 394 resident entries, with greatest participation coming from 1st-year residents, who received an orientation at the beginning of the year.

CONCLUSION: Using mobile technology to generate timely and anonymous evaluations of the faculty involved in resident didactics is expected to be effective in optimizing the resident curriculum. Channeling the residents' feedback from the chief residents to the program director, who in turn discusses it with the individual faculty members, may improve the quality of the conferences and allow the residents to be more involved in their education.

(R-23) Wednesday • 7:00 AM
Does Rank Order of Radiology Residency Applicants Predict Future Success?

Robert B. Percarpio, MD, *Dartmouth-Hitchcock Medical Center, Lebanon, NH*; Alan H. Siegel, MD; Willo Sullivan; Jocelyn D. Chertoff, MD, MS

PURPOSE: Significant resources are expended in the process of interviewing and ranking applicants for the residency match in diagnostic radiology. The purpose of this study is to determine whether our department's process to create the rank list for the match positively identifies residents who will succeed in their residency.

METHOD AND MATERIALS: Data on past radiology residents (n = 73) from Dartmouth-Hitchcock Medical Center (DHMC) over the last 20 years were collected. The data collected included National Resident Matching Program rank, gender, age, degrees, USMLE scores, ACR In-Service Exam scores, and type of preliminary internship. Blinded to these data, veteran staff radiologists who have worked at DHMC for a minimum of 20 years (n = 8) were asked to rate each resident as average, above average, or below average with regard to his or her perceived performance during residency. These ratings were then compared to the resident's rank position in the match and the additional collected data.

RESULTS: Regression analysis showed a very low degree of positive correlation between matched rank position and perceived performance during residency. It also showed low positive correlation between a resident's USMLE Step 1 and 3 scores and the resident's perceived performance during residency. The greatest positive correlation was between USMLE Step 2 scores and staff ratings. Interestingly, a negative correlation existed between age and ratings. Analysis showed no statistical difference between the ratings of matched residents and residents that scrambled, transferred, or took a position outside the match.

CONCLUSION: Preliminary analysis shows that there is little positive correlation between an applicant's rank in the match and his or her performance during residency.

(R-26) Thursday • 7:00 AM
Electronic Audience Response in a Radiology Medical Student Elective: Benefit of Free-Text Response over Multiple-choice Response?

Richard H. Burke, MD, *Loyola University Medical Center, Maywood, IL*; Jonathan Carnell, MD; Jennifer E. Lim-Dunham, MD; Laurie Lomasney, MD; Gregory Gruener, MD

PURPOSE: The purpose was to demonstrate improved short-term retention of lecture material presented to medical students during a series of radiology didactic lectures by implementing a free-text (FT) audience response system (ARS) in comparison to conventional multiple-choice question (MCQ) ARS.

METHOD AND MATERIALS: We provided each medical student in our radiology elective with an iPad by which either FT or MCQ ARS would be administered. Over the course of a 1-month elective, there were 20–25 lectures, each containing 3–5 question prompts, and the question format was alternated by month between FT and MCQ. Over the course of four rotations, a total of 12 students in the FT and 10 in the MCQ ARS groups have participated. There were 47 students who took part in the radiology elective the year prior to the implementation of ARS, but who took the same pre- and posttest final exam and served as our baseline "control" group. Our outcomes were based on the average difference between pre- and postrotation exam scores. We compared the FT and MCQ ARS groups to one another, as well as to the historical control group that was not subjected to any ARS intervention.

RESULTS: The utilized ARS system proved problematic, with intermittent technical failure limiting consistent implementation. However, our outcome data suggest improved short-term retention when combining FT ARS and MCQ ARS groups versus pre-ARS exam scores, a 6.3% increase. Average outcomes for the FT ARS group (23.1%) were 4.3% higher than those for the MCQ ARS group (18.8%), but sample sizes were insufficient to generate statistically significant results.

CONCLUSION: Despite limitations, our data support improved short-term retention of didactic lecture content, corroborating previous studies. While data acquisition is ongoing, we do see a trend toward improved outcomes in the FT ARS over the MCQ ARS groups.

(R-28) Thursday • 7:00 AM
The Era of Overnight Attending Coverage: A Challenge for Resident Education

Robert K. Hang, MD; Nolan J. Kagetsu, MD*; Mustafa Syed, DO, *St Luke's-Roosevelt Hospital Center, New York, NY (rhang@chpnet.org)*

PURPOSE: The purpose of this study is to determine resident patterns of overlooked pathology in abdominal and pelvic computed axial tomography (CT) scans that led to improper patient discharge prior to overnight attending coverage, as well as to emphasize the educational importance of retrospectively analyzing these data.

METHOD AND MATERIALS: At an urban health care network diagnostic radiology residency program, all overnight independent resident dictations of abdominal and pelvic CTs during a 2–calendar year span from 2011 through 2012 were included in a retrospective analysis. Erroneous radiology resident reports with subsequent patient discharge prior to significant attending corrections were reviewed, with missed findings categorized by organ and patient impact.

RESULTS: A total of 169 resident reports encompassing 180 missed findings had substantial oversights. The most overlooked organ systems were the gastrointestinal tract (33%), urinary system (17%), and the reproductive organs (17%). A majority of the gastrointestinal missed findings were segmental colitis or acute appendicitis. Thirty-five of the missed findings were considered critical findings that required admission, further workup, or intervention, of which 18 (51.4%) were within the gastrointestinal tract, with three leading to appendectomies. None of the critical misses led to patient mortality.

---

* Faculty financial disclosures are located in the Faculty Index.

CONCLUSION: In reviewing resident reports and tracking patient follow-up prior to attending coverage, educational programs may recognize salient abnormalities and the resultant patient impact of findings radiology residents had difficulty identifying. These resident blind spots, not just on an individual level but also on a collective basis, may indicate potential gaps in a curriculum. Thus, analysis of retrospective data to determine institutional trends may be an effective method to enhance and tailor education.

(R-29) Wednesday • 7:00 AM

The State of Radiologic Teaching Practice in Preclinical Medical Education: Survey of American Medical, Osteopathic, and Podiatric Schools

Kristine Blackham, MD, *Case Western Reserve University, Cleveland, OH*; Zachary Rubin *(kristine.blackham@uhhospitals.org)*

PURPOSE: Imaging is a crucial part of patient care, yet literature on preclinical radiology education focuses on radiology within anatomy education. Exposure to contextual aspects of radiology practice, including ordering examinations, radiation safety, and integration of clinical information, is also important. This study assesses the radiology preclinical curriculum in North American allopathic, osteopathic, and podiatric medical schools.

METHOD AND MATERIALS: An online survey of teaching methods, radiology topics, and projected ideas was developed. The Association of American Medical Colleges (AAMC), American Association of Colleges of Osteopathic Medicine (AACOM), and American Association of Colleges of Podiatric Medicine (AACPM) listings of Web sites for all U.S., Canadian, and Puerto Rican schools were used for contact information for deans of education and directors of anatomy or radiology courses. Letters were sent via e-mail to 198 schools, with a link to the anonymous survey.

RESULTS: Ninety-five of 198 surveys were completed (48%). Radiology curricula were integrated with other topics (92%) and taught by anatomists (49%) and radiologists (55%). Topics included anatomy correlation (35%), MSK (13%), chest (12%), abdominal (11%), and neuro (8%). General topics like physics (3%), modality differences (6%), radiation safety (2%), and contrast use and safety (2%) are seldom taught. Average time spent teaching radiology per week was 2 hours, lecture; 1 hour, Web/online; 3 hours, small-group case discussion; and 2.25 hours for other activities (mostly reviewing images in labs). Various electronic resources were used; however, social media are rarely used (7%). Assessments were MCQ (88%) with radiographs and structures to identify (94%). Most schools planned an innovative teaching method within next 5 years (63%). Challenges were lack of time in the curriculum (71%), lack of resources (31%), and lack of radiology faculty participation (30%). 91% reported the curriculum did not model the curriculum suggested by AMSER.

CONCLUSION: A 48% survey response rate of medical schools reveals the current state of preclinical radiology teaching: Curricula are nonstandard, integrated into other courses, and predominantly used for anatomy correlation. Other important contextual principles of the practice of radiology are seldom taught.

(R-31) Wednesday • 7:00 AM

Bridging the PACS-induced Radiology-Clinician Interaction Gap by Incorporating a PGY-4 Radiology Resident into the General Pediatrics Team: Is There Support, and What Is the Benefit?

Randall L. Heller III, MD, BS, *University of Missouri-Kansas City, Kansas City, MO*; Lisa H. Lowe, MD; Jared S. Halpin, MD *(hellerr@umkc.edu)*

PURPOSE: In the past, clinical services rounded in radiology, allowing residents to learn core competencies such as communication skills, patient care, and systems-based practice. However, with the introduction of PACS, this interaction has become far less frequent. To bridge this gap, we developed a rotation incorporating upper-level radiology residents (RRs) into daily pediatric rounds. The purpose of this study is to determine RR satisfaction and perceived value of the rotation.

METHOD AND MATERIALS: Over 2 years, 12 RRs (10 PGY-4s and 2 PGY-3s; average training level of PGY RR, 4.2 years) spent 4 weeks rounding daily on the floor with general pediatrics. RR responsibilities included (1) daily presentation of imaging studies, (2) guidance for future exams, (3) review of other imaging, and (4) teaching imaging indications and interpretation. RRs were surveyed to assess their experience.

RESULTS: Response rate was 100% ($n = 12$). All RRs found the experience to be definitely (83.3%) or somewhat (16.7%) useful in improving core communication and consultation skills. 100% of RRs felt that the rotation was definitely (75%) or somewhat (25%) useful to increase their knowledge of general pediatrics. The majority (91.7%) reported that the rotation increased their understanding of the clinician's imaging needs. 100% of RRs were either satisfied (8.3%) or very satisfied (91.7%) with the rotation, and 100% responded they would do the rotation again, given the opportunity. When asked if they would like a similar rotation on another clinical service, 75% responded definitely, and 25% said probably yes. RRs felt that members of the pediatrics team became more knowledgeable about radiology studies and indications as a result of having a RR on rounds (83.3% responding definitely and 16.67% probably yes).

CONCLUSION: RRs who rotated with general pediatrics were highly satisfied with their experience. All felt it improved their core communication and consultation skills, as well as knowledge of general pediatrics. The rotation improved their understanding of the clinicians' imaging needs and the pediatric team members' knowledge of imaging findings and indications. All would choose to repeat the same or a similar clinical rotation if possible.

(R-32) Thursday • 7:00 AM
Improving Our PRODUCT: A Preprocedural Checklist for Fluoroscopy Studies

Jessica R. Leschied, MD, *University of Michigan Hospital and Health Systems, Ann Arbor, MI*; Daniel I. Glazer, MD; Janet E. Bailey, MD; Katherine E. Maturen, MD★ *(jleschi@umich.edu)*

PURPOSE: Radiologists play an essential role in protecting patient safety while optimizing image quality. For exams using ionizing radiation, radiation exposure to patient and operator should be kept as low as reasonably achievable (ALARA). We developed a fluoroscopy preprocedural checklist to keep operators cognizant of the ALARA principle and provide practical information on performing dose-conscious GI/GU studies.

METHOD AND MATERIALS: IRB exemption was obtained for this project. Two consecutive classes of 1st-year residents were studied. Prior to the educational intervention, year 1 (7/2011–6/2012) residents ($n = 9$) at the end of their R1 year completed an anonymous questionnaire including five content questions and six perception questions about fluoroscopy physics/safety. For the year 2 (7/2012–6/2013) group, two senior radiology residents designed a checklist in the form of a mnemonic (PRODUCT), with each letter indicating an important step in safe fluoroscopy tower operation. The checklists were placed in easy view of the resident operators in each procedure room and reviewed weekly during faculty-led teaching sessions at the fluoroscopy tower. The year 2 residents ($n = 9$) then completed the questionnaire at the end of their R1 year. Fluoroscopy times were collected for esophagrams performed during years 1 and 2. Mean values were compared with t tests.

RESULTS: Residents performed similarly on fluoroscopic safety content questions in both years, with 77%–100% of respondents answering correctly on all questions. However, residents in year 2 self-reported increased awareness of radiation safety and fluoroscopy tower operation on five of six perception questions, although this trend was not statistically significant. Fluoroscopy time for esophagrams decreased following the implementation of the checklist (year 1: $n = 422$, mean, 207 ± 103 seconds; year 2, $n = 596$, mean, 179 ± 94 seconds; $P < .005$).

CONCLUSION: We observed a reduction in average fluoroscopy times and thus patient and operator radiation exposure after implementation of a resident-designed preprocedural checklist. Residents using the checklist also reported increased confidence and awareness of radiation safety in fluoroscopy compared to the comparison group.

(R-34) Thursday • 7:00 AM
Resident and Faculty Agreement on Screening Mammogram Reads: Using the Electronic Reporting System to Elicit Trends for Improved Resident Feedback and Teaching

Brandi T. Nicholson, MD★, *University of Virginia, Charlottesville, VA*; Heather Peppard★; Carrie M. Rochman, MD; Jennifer A. Harvey, MD★ *(bte6v@virginia.edu)*

PURPOSE: Milestones are how feedback is now given to residents in the Next Accreditation System (NAS). The purpose of our study was to use our electronic reporting system to obtain objective details related to screening mammograms for which the resident read was changed by the faculty (normal to abnormal, and vice versa) over time, in order to improve resident teaching and feedback.

METHOD AND MATERIALS: We used our electronic reporting system (MagView, Burtonsville, MD) to identify resident screening mammogram reads from April 2009 to current. Data included the total number of screenings read and the number and percent of total reads that were changed by the faculty. Studies changed from a callback (Breast Imaging Reporting and Data System [BI-RADS] 0) to normal (either BI-RADS 1 or 2) and studies changed from normal (BI-RADS 1 or 2) to callback (BI-RADS 0) were separated. The ratios of the number of changed reports to normal over those to callback were then calculated for rotation per resident.

RESULTS: We had 68 residents in our program during the study period, with data available for 57 (84%). Twenty-three completed one rotation (40%), another 23 did two (40%), 7 did three (12%), and 4 did four (7%), totaling 106 rotations. The average number of screening mammogram reads per rotation was 123 (range, 1–490). The average agreement between resident and faculty was 79% (range, 0–93%). The average agreement by PGY was 77%, 78%, 82%, and 79% (PGY 2, 3, 4, and 5, respectively). Of the 34 residents with two or more rotations, there were 34 instances of increased percent agreement with faculty reads, and 14 decreased over time. There were more instances of changing reads to normal than to a callback. The average ratio of changed reads to normal compared to callback was 2.27 times (range, 0.56 to 5.99). The ratio by PGY was 2.36, 1.72, 2.49, and 2.66 times (PGY 2, 3, 4, and 5, respectively). In only 26 of the 106 rotations (25%) in 19 residents (33%) did the ratio favor undercalling by the resident.

CONCLUSION: Residents tend to overcall on screening mammograms, but they also improve in their agreement with faculty over time. The number of changed screening mammogram reads can contribute to resident evaluation and feedback in the Next Accreditation System.

Health Services for Radiology

(R-39) Wednesday • 7:00 AM

Incidence of Intravenous Contrast Extravasation: Comparing Rates in Outpatients, Inpatients, and Emergency Department Patients, with a Focus on Deep Brachial Access

Borko Kereshi, MD, *Medical University of South Carolina, Charleston, SC*; Andrew D. Hardie, MD

PURPOSE: Deep brachial intravenous (IV) catheter placement under ultrasound guidance has been published as a reasonable procedure for emergency department patients with difficult vascular access. However, there is a high reported incidence (5%) of fluid extravasation. To date, no studies have assessed deep brachial IV performance for use with CT contrast. The purpose was to assess the relative risk for contrast extravasation with a deep brachial IV catheter placed by emergency department personnel, compared to antecubital IV catheter during power-injected CT.

METHOD AND MATERIALS: A departmental practice quality improvement was performed to assess the rate of IV catheter extravasation for all CT examinations during a 1-year period. All IV injections during this time were recorded, including the site of placement and whether there was contrast extravasation. Anonymized data were analyzed to identify the rate and relative risk of contrast extravasation by catheter type.

RESULTS: A total of 10,750 total injections were performed, with 82 extravasation events (0.8%). There were 51 extravasations of antecubital IVs from 8599 placed (0.6%). For 123 deep brachial IVs placed, there were eight extravasations (6.5%). The relative risk of a deep brachial IV was 9.4, compared to 0.4 for antecubital placement.

CONCLUSION: Deep brachial IV catheters placed by emergency department personnel under ultrasound guidance demonstrated a markedly higher rate of contrast extravasation than antecubital IV catheters. For power-injected CT, it is recommended to avoid the use of deep brachial IV catheters whenever possible.

(R-42) Thursday • 7:00 AM

Inpatient Imaging Studies in Patients with a Diagnosis of Intracranial Subarachnoid Hemorrhage

Brian W. Bresnahan, PhD* *University of Washington Harborview Medical Center, Seattle, WA*; Daniel Hippe*; Wendy Cohen

PURPOSE: The purpose was to evaluate factors related to inpatient imaging patterns in those undergoing intravascular treatment for subarachnoid hemorrhage (SAH).

METHOD AND MATERIALS: Inpatients undergoing intravascular treatment for SAH in a Level I Trauma Center were selected during a 1-year period. Patients were classified in diagnosis-related groups (DRGs) 20 and 21, corresponding to patients with major (MCC) and nonmajor complications and comorbidities (CC), respectively. Total length of stay (LOS), DRG category, time in the ICU, inpatient imaging use, and hospital administrative data were used. Data were described for multimodality imaging counts and assessed using multivariate Poisson regression to account for multiple interrelated factors.

RESULTS: During 12 months, 77 patients with MCC (DRG 20) and 38 patients with CC (DRG 21) underwent intravascular treatment for SAH. All patients were admitted to the ICU. Overall, the MCC group underwent more imaging studies (22 ± 9 vs 11 ± 6; $P < .001$) and had longer total LOS (mean: 22 vs 18 days; $P = .002$). When total LOS was controlled for in Poisson regressions, the MCC group underwent nine more imaging studies than the CC group on average ($P < .001$) (7 x-ray, 1.6 CT, and 0.4 other studies). Also from the multivariate model, an average of 3.6 additional studies were performed per 1-week increase in total LOS ($P < .001$). DRG-based severity and total LOS explained 52% of the variability in total imaging utilization in these SAH patients. Statistically adjusting for LOS in the ICU indicated the MCC group also had longer ICU stays than the CC group (mean: 14 vs 12 days; $P = .002$). Controlling for ICU LOS, the MCC group underwent 7.8 additional imaging studies in the ICU compared with the CC group ($P < .001$). However, subsequent to discharge from the ICU, significant differences in imaging use were not observed ($P = .7$) when controlling for the remaining days until discharge.

CONCLUSION: Major complications and total LOS are strong independent factors in determining imaging use in SAH inpatients. Variability in use was found among those with identical DRGs and stay lengths. SAH inpatients diagnosed with MCC had substantially more x-rays, highly associated with longer ICU stays.

(R-43) Wednesday • 7:00 AM

Radiology Trauma Activation: Radiology as a Communication Center in the Setting of a Mass Trauma Disaster Scenario

Kimberly Kallianos, MD, *University of California, San Francisco, San Francisco, CA*; Marc C. Mabray, MD; Valentin Lance, MD; John-Paul J. Yu, MD, PhD; Thomas Urbania, MD; Esther L. Yuh, MD, PhD; et al

PURPOSE: We aim to demonstrate the critical role that radiology plays in a disaster scenario through discussion of the events surrounding the July 6, 2013 airline crash at San Francisco International Airport. We will discuss the role of radiology as a central hub for patient triage and present the organization of a multidisciplinary grand rounds conducted by radiology to coordinate patient care.

METHOD AND MATERIALS: Following the July 6 crash, 53 patients were evaluated at San Francisco General Hospital, a Level I Trauma Center. A hospital-wide disaster protocol was activated, including activation of the radiology department.

RESULTS: Activation of the radiology department included increasing the number of in-house radiology residents from one to three; the arrival of six attending radiologists from the chest, musculoskeletal, abdominal, interventional, and neuroradiology sections; and increasing the number of technologists and support staff in response to the volume of studies. Outpatient MRIs and CTs were rescheduled in order to ensure scanner availability for trauma patients. The radiology department played a central role in the disaster event by acting as a hub for efficient communication and coordination of care. A hospital-wide grand rounds was organized by radiology to facilitate multidisciplinary communication and appropriate patient triage, including review of all patients and documented injuries. Staff from the emergency department, trauma surgery, neurosurgery, orthopedic surgery, intensive care, and pediatrics attended the grand rounds, which was conducted by radiology in the main reading room.

CONCLUSION: Radiology plays a critical role in a disaster scenario as a communication center for multidisciplinary collaboration and patient triage. Appropriate activation of the radiology department is a necessary part of a hospital disaster plan. We model grand rounds conducted by the radiology department as a method of communication and triage in a mass trauma disaster setting.

(R-44) Thursday • 7:00 AM

Increasing Radiation Doses to Trauma Patients over Time

Ashwin Hegde, MD, *University of Nebraska Medical Center, Omaha, NE*; Jennifer Oliveto, MD; Jonathan Vonk; Michel Wagner, MD; Chris Wichman, PhD

PURPOSE: The purpose of this study is to quantify the total effective dose trauma patients receive throughout their hospital admission, categorize them according to their injury severity score (ISS), and evaluate the trend over a decade.

METHOD AND MATERIALS: This retrospective study in a Level I Trauma Center included all adult patients who were admitted for trauma directly to the institution between 2001 and 2010: a total of 8175 trauma admissions. Radiographic study metadata were collected on each selected patient for all exams that were performed between the time of trauma admission and the time of discharge. Effective dose measured in millisieverts (mSv) was estimated for 416 distinct radiographic studies using published average effective doses for adults. Patients were then categorized according to their ISS so that traumas of a similar severity were compared over time. The aggregate was separated by year in which the patient received treatment. Statistical analysis was performed to evaluate the change in total effective dose year by year, in 2001 versus 2010, and with the aggregate of 2001–2005 against the aggregate data of 2006–2010.

RESULTS: When comparing the years sequentially, only two had significant changes, which were increases from 2004 to 2005 and 2007 to 2008. The mean total effective dose in 2005 was up to 5.5 mSv higher than in 2004; the mean dose in 2008 was up to 7.2 mSv higher than in 2007. The mean dose in 2001 was 14.9 mSv, compared to 24.6 mSv in 2010. The mean doses for 2001–2005 were all 18.5 mSv or less; for 2006–2010, the mean doses were all 19.3 mSv or higher. The proportions of patients classified by ISS were all statistically equivalent.

CONCLUSION: Trauma patients in this Level I Trauma Center have had a slightly increasing total effective dose from 2001 to 2010. Our data have shown that while the relative severity of trauma has not significantly changed, the total effective dose to the patient has increased. While it is difficult to determine why there has been an increase in radiation dose, it is important to see the overall trend of increased medical radiation. Therefore, efforts to decrease radiation dose to trauma patients should be employed when possible.

(R-45) Wednesday • 7:00 AM
A Sedentary Workplace as Occupational Hazard: Is Radiology Endangering the Radiologist?

David L. Lamar, MD, PhD, *University of Washington, Seattle, WA*; Shirley Chou, MD; Jonathan R. Medverd, MD; Jonathan O. Swanson, MD *(dlamar@uw.edu)*

PURPOSE: Sedentary occupational behavior is an increasingly recognized risk factor, independent of one's physical activity levels, for adverse health outcomes. Among physicians, the radiologist, with his or her darkrooms and workstations, may be uniquely vulnerable to these risks. We hypothesized that radiologists lead more sedentary workdays than their physician colleagues in other specialties and, using personal activity monitors, sought to quantify this difference.

METHOD AND MATERIALS: Physician members of our academic radiology department were asked to estimate workplace sedentary behaviors. To obtain objective measures, personal activity monitors (Fitbit One; Fitbit, San Francisco, CA) were distributed to radiologists from all subspecialties and training levels and to pediatric and medicine residents. Participants were monitored for 1 workweek. Total steps taken, total sedentary time, and number of sedentary episodes during the workday were assessed.

RESULTS: Among surveyed radiologists (*n* = 94), 79% reported at least 6 hours of sitting per workday, with most estimating 8+ hours. Activity monitor data support these estimates and reveal a disparity in workplace activity among radiologists (*n* = 40) and pediatric and medicine residents (*n* = 20 each). Radiologists take fewer steps per day (2881 vs 4353) and per hour (304 vs 395), spend more time per day sitting (6.4 vs 4.5 hours), and experience a higher number of prolonged sitting episodes (5.1 vs 3.3). These results even suggest that radiologists lead more sedentary work lives than average American nonphysician office workers. Those radiologists involved in procedural subspecialties (ie, IR or fluoroscopy) approach the activity levels of the nonradiology physicians. Additionally, there is a trend toward higher activity levels among attending-level radiologists compared to residents and fellows.

CONCLUSION: As anticipated, radiologists at all training levels at our institution spend much of their workday sitting and exhibit more sedentary workplace behavior than physicians from other specialties. In light of emerging data highlighting the risks of inactivity, even independent of physical activity levels, our results highlight the importance of limiting workplace sitting wherever possible.

Informatics

(R-08) Thursday • 7:00 AM
Using Spaced Repetition Learning to Enhance Radiology Clerkships

Akshay Goel, BS; Ashesh A. Thaker, MD; Tessa S. Cook, MD, PhD, *University of Pennsylvania, Philadelphia, PA*

PURPOSE: Radiology education in the medical student curriculum can be challenging due to its passive nature, with students typically shadowing radiologists in the reading room during the clinical workday. We examine the utility of spaced repetition learning (SRL) note cards in improving a student's understanding of anatomy as exhibited in radiology studies and enhancing the student's overall clerkship experience.

METHOD AND MATERIALS: SRL note cards were designed using radiographs and CT and MRI examinations of the head, neck, chest, abdomen, pelvis, and extremities. Important structures were labeled on multiple images and loaded into a software that enables spaced repetition learning (Anki). Students in the introductory radiology clerkship at the Perelman School of Medicine at the University of Pennsylvania were randomized into two groups. One group received SRL note cards developed using a software tool (Anki), while the other group underwent the traditional clerkship experience alone. At the beginning of the clerkship, students completed a 50-question Web-based pretest that required them to identify labeled structures on a subset of the images in the note-card set. At the end of the clerkship, they completed a posttest. The same structures were presented in the pre- and posttests, but students received the structures in a random order both times. Students also completed an end-of-clerkship survey to garner their opinions on the SRL tool.

RESULTS: Preliminary analysis of the first group of students (*n* = 12) demonstrates a significant difference between the two groups' improvement from the pretest to posttest. The SRL note-card group showed an average improvement of 10 ± 9.1 points, and the conventional group showed an average improvement of 2 ± 3.8 points (*P* = .04).

CONCLUSION: Ongoing data collection and analysis are being performed to assess the impact of SRL on the medical student radiology clerkship. Our goal is to increase student engagement in the learning process and hasten their familiarity with radiologic anatomy.

(R-10) Thursday • 7:00 AM
On-Call Resident Outside Study Overreads: Our Department's Experience Streamlining Work Flow and Improving Resident Supervision while Providing a New Source of Revenue

Sean T. Walker, MD, *University of Nebraska Medical Center, Omaha, NE*; Martin H. Goodenberger, MD; Matthew DeVries, MD

PURPOSE: The interpretation of outside studies submitted to our department by referring clinicians presented a challenge, given the increased emphasis on resident supervision. The problem presented was to ensure that these interpretations, often performed by residents during call hours, were supervised according to ACGME requirements.

METHOD AND MATERIALS: Through a resident quality improvement project, a retrospective survey of senior residents found that an estimated 0–10% of outside studies submitted for resident interpretation during call hours were given a final staff report. Residents estimated they would overread 5–10 of these studies per week of night-float call duty. A new electronic work flow was implemented utilizing EPIC, our recently updated hospital electronic medical record, and our department's McKesson PACS-driven work flow system. After 4 months, a query for all orders placed into EPIC for outside overread consults was performed to evaluate if these studies had been supervised. Results from a separate search through our PACS archive were sent to our billing department to obtain related charges and payment information.

RESULTS: After 4 months, 158 outside consult studies were requested in EPIC. Fifty-two of these studies were interpreted by residents during call hours; 51/52 (98.1%) also had an attending final report. A separate search through the PACS archive yielded 52 studies that were followed through our hospital billing system. The department had received reimbursement for 19.5% of the total charges, with approximately 47% of total charges still pending. No charges were found for 22/52 (42%) of these studies at the time of analysis. One year of data will be collected for final analysis and presentation.

CONCLUSION: Implementation of an electronic PACS-driven system for the interpretation of outside studies not only resulted in improved resident supervision that meets the requirements outlined by the ACGME, but also has the potential benefit to increase department revenue. Other potential benefits include a more streamlined work flow for residents, staff, and referring clinicians, as well as access to additional metrics (eg, the number of repeat exams performed).

(R-11) Wednesday • 7:00 AM

Evolving the "Hot Seat" Case Conference System in Response to the New Boards: Role of an Audience Response System and Multiple-choice Questions

Oliver Edwards, BA, MD, *University of Utah Health Science Center, Salt Lake City, UT*; Marta E. Heilbrun, MD *(oliver.edwards@hsc.utah.edu)*

PURPOSE: After 2014, diagnostic radiology residents will achieve board certification via multiple-choice question (MCQ) examinations, rather than an oral exam. In light of these changes, it is critical to assess how programs prepare residents for the examinations. The purpose of this project is to gather baseline data regarding radiology resident and radiology faculty opinions about the value of the "hot seat" noon case conference.

METHOD AND MATERIALS: An anonymous survey was administered via e-mail (SurveyMonkey; Palo Alto, CA). The survey separately contacted residents and teaching/clinical faculty. Questions assessed conference format, satisfaction, value, and purpose of the current "hot seat" noon conferences, MCQs, and audience response systems (ARSs). Finally, an open-ended question was asked to elicit free-text suggestions related to improving the noon case conference.

RESULTS: Response rates were higher for residents (20/24; 83%) than faculty (23/41; 56%). Eighty percent of residents and 70% of faculty responded that they were slightly, moderately, or extremely satisfied. Faculty believe more than residents that case conference prepares residents for board exams (78% vs 35%) and to be practicing radiologists (100% vs 65%). Both groups believe that the resident who is on the "hot seat" learns the most but that there is value in listening to others take cases. All residents (100%) report at least some degree of inattentiveness during conference; 60% of free-text responses suggested that ARS/MCQs would address such inattention. Faculty respond that case conference is conducive to an ARS (78%) and would incorporate ARS (61%) into conference; 56% have never used an ARS; 20% had used ARS ≥5 times. On a 5-point scale where 1 = strongly agree and 5 = strongly disagree, faculty are mostly ambivalent that cases should be presented as MCQs, that MCQs limit assessment of resident knowledge, or that they would use an ARS (average score: 3.4, 2.8, and 2.5, respectively).

CONCLUSION: Residents and faculty see value in the current case conference system and have interest in adopting new systems using ARS and MCQs. A hybrid model may improve resident attention, prepare for the new boards, and improve overall satisfaction.

Interventional Radiology

AUR Trainee Prize: 2nd Place

(R-15) Wednesday • 7:00 AM

The Interventional CT and US Clinic: Patient Perceptions

Salim Abboud, MD, *University Hospitals Case Medical Center, Cleveland, OH*; Tanay Y. Patel, MD; Dean Nakamoto, MD*; Jeffrey Goletz, MD; Nami R. Azar, MD

PURPOSE: Our radiology department maintains a CT/US clinic to optimize preprocedural planning and workup of patients referred for image-guided interventions, including organ, lymph node, and mass biopsy. The study's goal is to evaluate our patients' perceptions of the CT/US clinic experience, and we predict that such visits will improve patients' perceptions of both radiology and the quality of their health care.

METHOD AND MATERIALS: We administered a survey to 33 consecutive patients seen in CT/US clinic. Questions included: (1) A radiologist is a medical doctor. (2) My radiology appointment has improved my understanding of the radiologist's role in health care. (3) Meeting with a radiologist has improved my understanding of my scheduled procedure. (4) Meeting with a radiologist has improved my understanding of my medical condition. (5) I believe that my radiologist appointment will improve the quality of my medical care. Patients indicated "True" or "False" for question 1. A 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) was used for questions 2–5. The survey was administered at the end of each clinic visit after the patient had been seen by both a radiology PGY-2 resident and attending physician. Survey completion rate and distribution of responses for each question were calculated.

RESULTS: Seventeen of 33 patients (52%) completed the survey. Fifteen of 17 patients (88%) identified a radiologist as being a medical doctor. Fourteen of 17 patients (82%) agreed or strongly agreed that the CT/US visit improved their understanding of a radiologist's role in health care (question 2). Sixteen of 17 patients (94%) indicated that they agreed or strongly agreed that the CT/US clinic visit improved their understanding of their scheduled procedure and medical condition (questions 3 and 4). Fifteen of 17 patients (88%) agreed or strongly agreed that the CT/US visit would improve the quality of their medical care (question 5).

CONCLUSION: Our survey suggests that meeting with a radiologist prior to image-guided procedures improves patients' perceptions of the quality of their medical care and promotes better understanding of the role of radiologists in medicine. Study limitations include small sample size and a lack of control group.

---

* Faculty financial disclosures are located in the Faculty Index.

Women's Imaging

(R-82) Thursday • 7:00 AM

Help or Hindrance? The Effect of Breast MR Imaging on Annual Screening Mammography in the Moderate-Risk Population of an Outpatient Imaging Center

Amanda Moyer, BS; John S. Farrell, MD, *Commonwealth Medical College, Scranton, PA*; Eleanor Gillis, MS; Gary Ihnat, BS; Josh McCambridge, BS; Kunal Dalal, BS; et al *(gihnat@tcmedc.org)*

PURPOSE: Screening breast MRI as an adjunct to annual mammography has been established as the optimal way to screen women who have a 20% or greater lifetime risk of breast carcinoma. However, there has been no clear consensus as to whether or not women who are at moderate risk for breast cancer (lifetime risk of 15%–20% per Gail score) should have yearly screening MRIs in addition to mammography. In this retrospective study, the mammogram schedules of moderate-risk patients who also have yearly MRIs were analyzed to determine if screening mammography following an MRI was delayed more than 1 year after the previous mammogram.

METHOD AND MATERIALS: Since 2003, a total of 1707 patients have undergone screening breast MRI examinations at an outpatient imaging center in northeast Pennsylvania, with 1049 patients reviewed to date using the EMR. Of these, 225 patients met the criteria of moderate breast cancer risk, with a Gail score of 15%–20%. The control group consisted of randomly selected patients with Gail score <15% receiving only yearly mammograms without intervening MRIs. Mammogram and MRI dates were recorded for both groups, and time intervals between screening studies were calculated using a custom program (MatLab v7.8.0; MathWorks, Natick, MA). The analysis allowed an interval of 450 days, instead of 365, to account for patient scheduling issues. Short-interval follow-up examinations (defined as less than 6 months/180 days between studies) were excluded from analysis.

RESULTS: At the time of submission, it was determined that for moderate-risk women, a screening mammogram that occurred after a screening MRI was delayed more than 450 days after the previous mammogram 42.46% of the time (95% CI, 0.318 to 0.539) compared to 28.5% of the time in the low-risk control group. The association between moderate-risk patients with adjunct MRI and increased interval duration to the next mammogram was determined to be statistically significant using Fisher's exact test ($P = .0196$).

CONCLUSION: The data analysis thus far demonstrates that for some moderate-risk patients, the addition of annual breast MRI examinations can adversely affect patient adherence to annual mammography schedules.

(R-86) Thursday • 7:00 AM

Comparing Prone and Supine Breast FDG PET/CT in Anatomical Disease Categorization for Locally Advanced Breast Cancer

Katrina F. Lambert, MD, *Vanderbilt University Medical Center, Nashville, TN*; Laurie Jones-Jackson, MD; Lori Arlinghaus, PhD; Vandana Abramson, MD; Anuradha Chakravarthy, MD; Jason M. Williams, PhD; et al *(katrina.f.lambert@vanderbilt.edu)*

PURPOSE: Supine fluorodeoxyglucose (FDG) positron emission tomography/computed tomography (PET/CT) is useful for initial staging of locally advanced breast cancer (LABC). Prone FDG PET/CT has been proposed as an adjunct to or replacement for supine scans in order to achieve better correlation with prone magnetic resonance imaging (MRI), but information is limited regarding congruity of prone and supine scanning. The purpose of this study was to determine if prone and supine FDG PET/CT scans provide consistent information on anatomical categorization of LABC.

METHOD AND MATERIALS: As part of an ongoing research study, 24 patients with newly diagnosed breast cancer underwent prone and supine PET/CT. Three radiologists performed independent review of all scans and categorized disease as breast only (BO)–unifocal, BO-multifocal, BO-multicentric, or breast plus axillary (BA) involvement and assessed the number of involved lymph nodes (LNs) for BA disease. Interobserver discrepancies were resolved at a consensus reading session. Disease categorization was compared on prone and supine scans for all patients. For patients with BA disease, the number of involved axillary LNs was also compared.

RESULTS: Anatomical disease categorization was consistent between prone and supine scans in 23 of 24 patients. In the remaining patient, disease was categorized as BO-multifocal on prone PET/CT and BO-unifocal on supine. In patients with BA disease, there were equal numbers of involved axillary LNs in 12 of 18 patients. Prone scanning generally resulted in a higher number of visualized LNs in the discordant patients.

CONCLUSION: Prone and supine FDG PET/CT scans yield consistent information regarding anatomical disease categorization in LABC. However, prone scanning yields a higher number of visualized LNs, which may have implications for evolving clinical prognostic models including involved LNs. Prone imaging warrants further exploration, given its presumed superior correlation with prone MRI.

(R-88) Thursday • 7:00 AM

Turnaround Time for Patient Notification of Image-guided Breast Biopsy Results: A Multicenter Survey

Charles W. McGuire, MD; Amy Patel, MD, *University of Kansas-Wichita, Wichita, KS*; Sohaib Mohiuddin, MD; Kamran Ali, MD; Saad Iqbal, MD; Lisa S. May, MD *(kumcw.radiology@gmail.com)*

PURPOSE: The purpose was to to identify (1) the current trends regarding turnaround times for patient notification of breast biopsy results across various breast centers and (2) variables that may affect turnaround times.

METHOD AND MATERIALS: An institutional review board–approved survey consisting of 15 multiple-choice questions was administered online (SurveyMonkey, Palo Alto, CA) to 1715 members of the Society of Breast Imaging over a 6-week period. Predictor variables included type of breast center, number of biopsies per day, on-site or off-site pathologist, and method for notifying patients. Associations were evaluated with Spearman's ρ and χ^2 tests using statistical software (SPSS Statistics version 20; IBM, Armonk, NY).

RESULTS: A total of 428 of 1715 members responded (25% response rate). Median turnaround time for notifying patients was 2 days. Most were from a hospital-based outpatient facility. Variables that trended toward statistical significance included the referring office taking 3 or more days to notify patients (59%), compared with mail (48%), phone (40%), or in-office visit (36%) at a breast imaging center or center of excellence; and longer notification time by a breast imaging center (52%) versus a center of excellence (42%). No significant association was found with the following factors: on-site versus off-site pathology, whether the biopsy was peer reviewed, and the number of biopsies performed per day.

CONCLUSION: Median turnaround time for reporting breast biopsy results to patients was 2 days, with variables trending toward statistical significance, such as *(a)* longer notification period if results were given by the referring office rather than by mail, phone, or in-office visit at a breast imaging center or center of excellence, and *(b)* longer notification times at standard breast imaging centers versus centers of excellence. Opportunities for quality initiatives in improving notification times of biopsy results may focus on direct notification to patients and adopting notification strategies used by centers of excellence.

AUR 2014 EDUCATION POSTER ABSTRACTS

Education posters are located in Grand Ballroom V. Each poster will be presented by its author during *AMA PRA Category 1 Credit*™ poster sessions scheduled for 7:00–8:15 AM, Wednesday and Thursday. The day and time follow the presentation number. Presenting author is identified by institution name, city, and state (or country if not United States or Canada). Presentations by trainees (residents, medical students, or 1st-year fellows) are noted in **purple**.

Abdominal Radiology

(E-01) Wednesday • 7:00 AM
Pearls and Pitfalls of Gadoxetic Acid (Eovist) in Hepatobiliary MR Imaging

Robert Tartaglione, MD, *Albany Medical Center, Albany, NY*; Samit Shah, MD; Michael E. Schuster, MD

LEARNING OBJECTIVES: 1. Describe and compare the pharmacokinetics of gadoxetic acid (Eovist; Bayer HealthCare Pharmaceuticals, Wayne, NJ) with conventional gadolinium-based contrast agents. 2. Discuss the pearls of gadoxetic acid in hepatobiliary MR imaging. 3. Discuss the potential pitfalls of gadoxetic acid in hepatobiliary MR imaging.

CONTENT DESCRIPTION: I. Pharmacokinetics of gadoxetic acid (Eovist) and conventional gadolinium-based contrast agents. II. Review of imaging pearls of gadoxetic acid in hepatobiliary MR imaging. A. Focal nodular hyperplasia versus hepatic adenoma. B. Choledocholithiasis and degree of obstruction. C. Bile leak. D. Sensitivity for small metastatic lesions. III. Review of imaging pitfalls of gadoxetic acid in hepatobiliary MR imaging. A. Cholangiocarcinoma versus cholangitis. B. Cholecystitis versus normal gallbladder in hepatic dysfunction. C. Atypical enhancement and washout pattern of hemangioma.

AUR Trainee Prize: 1st Place

(E-02) Thursday • 7:00 AM
MR-guided Prostate Biopsy: Pearls and Pitfalls Encountered in Establishing a Biopsy Program at a University-affiliated Medical Center

Nicole E. Curci, MD, *Metro Health System, Cleveland, OH*; Timothy P. Kasprzak, MD *(ncurci@metrohealth.org)*

LEARNING OBJECTIVES: 1. Describe the role of magnetic resonance–guided prostate biopsy (MRGB) in the diagnosis and staging of prostate cancer. 2. Describe the indications, complications, and follow-up guidelines related to MRGB. 3. Identify and discuss strategies for overcoming potential challenges to establishing an MRGB program at a university-affiliated medical center.

CONTENT DESCRIPTION: Prostate cancer is the most common cancer in men and the second most common lethal malignancy in men. Multiparametric MR imaging of the prostate is a powerful tool for the diagnosis and staging of prostate cancer. Transrectal ultrasound (TRUS)–guided sextant prostate biopsy is an established method of confirming the diagnosis of prostate cancer, but it is prone to undersampling. MRGB is an emerging technology that enables targeted biopsy of areas suspicious for prostate cancer, potentially increasing the sensitivity of biopsy in selected patients. Biopsy performed under MR guidance faces unique technical considerations, and institutional challenges may exist that can limit its utilization. We present an illustrative case and discuss our experience with establishing an MR-guided prostate biopsy program at our institution.

(E-03) Wednesday • 7:00 AM
Pictorial Review of Balanced Steady-State Sequence and Its Applications in Body MR Imaging

Jeremy B. Nguyen, MD, MS, *Tulane University, New Orleans, LA*; Montu J. Patel, MD; Erin L. Werhun, DO, MS; Kyle Degeyter, MD; Mandy C. Weidenhaft, MD; Scott L. Beech, MD; et al *(jnguye2@tulane.edu)*

LEARNING OBJECTIVES: 1. Discuss the physical principles and mathematics of steady-state imaging sequence. 2. Describe balanced steady-state sequence, including technical aspects and pitfalls. 3. Describe and illustrate the clinical utility of balanced steady-state sequences in various diseases involving the liver, pancreas, spleen, gastrointestinal tract, and soft tissue.

CONTENT DESCRIPTION: Steady-state sequences are rapid magnetic resonance (MR) imaging techniques based on gradient-echo acquisitions in which both longitudinal magnetization (LM) and transverse magnetization (TM) are maintained. The magnetizations attain nonzero steady state through the use of TR that is shorter than the T2 relaxation time of tissue. Balanced steady-state sequences utilize both free induction decay (FID) and spin-echo components for image formation. The image contrast is the ratio T2/T1. The sequence offers high signal-to-noise ratio (SNR) and short acquisition time. Balanced steady-state sequence is now widely used in body imaging, for which the images can be used for quick survey. However, the sequence can be extremely useful, as it can augment the standard T1 and T2 sequences to provide additional information. Understanding the usefulness, technical limits, and pitfalls of the sequence is important for optimal interpretation. MR images of balanced steady-state sequence in correlation with T1W and T2W sequences, as well as computed tomography and ultrasound, will be presented in various diseases in the chest and abdomen/pelvis to demonstrate the utility of balanced steady-state imaging sequence.

(E-04) Thursday • 7:00 AM
CT-guided Random and Target Lesion Core Biopsy: Review of Technique, with Correlation between Sample Size and Pathologic Specimen Adequacy

Joseph R. Grajo, MD, *University of South Florida, Tampa, FL*; Thora S. Steffensen, MD; Leena Kamat, BS, MD; Kimberly Funaro, MD; Todd R. Kumm, MD *(jgrajo@health.usf.edu)*

LEARNING OBJECTIVES: 1. Describe CT-guided core biopsy technique. 2. Explain the various approaches to percutaneous CT-guided "random" biopsy of livers and kidneys, as well as targeted biopsy of lesions within the abdominopelvic viscera. 3. Describe a retrospective analysis examining correlation between length/size of core biopsy samples and adequacy of pathologic specimens.

CONTENT DESCRIPTION: Image-guided core biopsies are an important tool in medicine, yielding vital diagnostic and staging information for clinicians and patients. Proper technique is essential in obtaining an adequate sample. Various approaches and equipment are available to the radiologist in procuring a percutaneous "random" sample from a liver or kidney, as well as a targeted biopsy of a lesion within a solid organ. An overview of CT-guided biopsy technique will be provided, including *(a)* available options for obtaining a viable window for access; *(b)* review of biopsy devices, including different needle gauges and throw lengths; *(c)* techniques for targeting lesions in difficult locations; and *(d)* presentation of a retrospective analysis of correlation between sample size and tissue sample quality through examination of specimens deemed suboptimal or limited at our institution over a several-year period.

Cardiopulmonary Radiology

(E-05) Wednesday • 7:00 AM
Imaging Features of Esophageal Perforation

Michael A. Wolf, MD, MBA, *Albany Medical College, Albany, NY*; Adam Cole; Yibo Chen; John P. Fantauzzi, MD

LEARNING OBJECTIVES: 1. Describe the radiographic evaluation for esophageal perforation. 2. Identify the imaging findings of esophageal perforation on contrast esophagram and CT.

CONTENT DESCRIPTION: Esophageal perforation is a rare condition associated with significant morbidity and mortality. The most common cause of esophageal perforation is instrumentation of the esophagus. However, trauma, ingested foreign bodies, and neoplasms are also known to cause esophageal perforation. The management of esophageal perforation requires prompt diagnosis, which is usually confirmed with imaging. If there is clinical concern for esophageal perforation, an esophagram with nonionic water-soluble contrast media should be considered, evaluating for extravasation of contrast. Extravasated contrast can be self-contained or extend along fascial planes into the mediastinum. If no leak is identified, the study can be repeated with barium, which may detect small leaks that were not seen initially. CT is an alternative to contrast esophagram in the evaluation for esophageal perforation. Imaging findings on CT include extraluminal air, extraluminal oral contrast, mediastinal fluid collections, pleural and/or pericardial fluid collections, and infiltration of the mediastinal fat. We present three cases of esophageal perforation that recently presented to our institution, each with a different etiology, and review the imaging findings in each.

(E-06) Thursday • 7:00 AM
Cystic Lung Disease: Imaging Characteristics and Differential Diagnosis

Asha Bhatt, BA, MD, *Rochester General Hospital, Rochester, NY*; Timothy M. O'Herron, MD

LEARNING OBJECTIVES: 1. Discuss the definition of a pulmonary cyst and key factors that should be included in the description of a cyst. 2. Describe the differential diagnosis of cystic lung disease, with an emphasis on key differentiating features. 3. Identify the various stages of LCH. 4. Discuss key extrapulmonary findings of certain cystic lung diseases, which can help pinpoint the diagnosis.

CONTENT DESCRIPTION: Pulmonary cysts are abnormalities commonly encountered in chest radiology. The spectrum of pulmonary cysts ranges from emphysematous changes to multicystic lung disease. The purpose of this presentation is to review the various multicystic lung diseases in a case-based approach. This will include reviewing the definition of a pulmonary cyst, as well as the factors that should be analyzed when looking at a cyst, such as wall thickness, morphology, location within the lung, and internal contents. The radiographic findings of emphysema will be compared and contrasted with those seen in various cystic lung diseases, such as lymphangioleiomyomatosis (LAM) and Langerhans cell histiocytosis (LCH), and benign metastasizing leiomyoma (BML).

Education

(E-17) Wednesday • 7:00 AM
Putting the Medical Student in the Radiologist's Chair: An Autotutorial for Medical Students during Their Radiology Rotation

Sheilah Curran-Melendez, MD, *Allegheny General Hospital, Pittsburgh, PA*; Matthew S. Hartman, MD; Paul Klepchick, MD

LEARNING OBJECTIVES: 1. Explain how to develop a search pattern to approach unknown cases and make a diagnosis. 2. Describe radiographic signs associated with specific pathology. 3. Discuss the ACR Appropriateness Criteria® for evaluating common indications. 4. Describe common complications of pathology and their radiologic appearance. 5. Demonstrate knowledge of the material through a series of questions after each case.

CONTENT DESCRIPTION: At first, the role of the medical student on a radiology rotation is usually that of a passive observer. To make these rotations more interactive, we created a series of training modules that focus on pathology often encountered in thoracic, abdominal, and neurologic imaging. The cases included in these modules serve as an autotutorial to allow the student to review a CT study using the PACS system in the same way that a radiology resident or attending physician would. Access to prior studies and relevant medical history is included in the simulation. After students have drawn their own conclusions for a case, they can then return to the module to check their work. Each case is clearly outlined with annotated images, descriptors, and other pertinent information. The important points of each study are then reviewed through a series of questions that cover radiologic findings, ACR Appropriateness Criteria®, and treatment options. The modules are designed to be completed by the student at his or her own workstation in the same reading room as the supervising resident or attending radiologist. This provides the student with the ability to approach the cases at his or her own pace while also having someone nearby to answer questions. We expect that the use of these training modules will help to prepare students for future interactions with radiologists by imparting a better understanding of the field.

(E-20) Thursday • 7:00 AM
Radiology Morning Report: A Competency-based Conference That Enhances Resident Education

Elina Zaretsky, MD, *Beth Israel Medical Center, New York, NY*; Rydhwana Hossain, MD; James E. Silberzweig, MD *(ezaretsky@chpnet.org)*

LEARNING OBJECTIVES: At our institution, many educational cases are read overnight by the resident during each night float rotation. The residents want to show these cases to their colleagues but have no formal setting in which to do so. Many residencies in other fields, such as internal medicine and surgery, have a weekly morning report (ie, interesting case) conference. The morning report allows residents to discuss interesting cases as a group, debate management, discuss misses, discuss communication of findings to clinicians, etc. With this conference format, residents are allowed to learn cohesively from each other instead of on their own. At Beth Israel Medical Center (NYC), we recently implemented a weekly morning report, which allows us to address several competencies that enhance resident education.

CONTENT DESCRIPTION: The educational exhibit will provide details as to how the weekly morning report is structured at Beth Israel Medical Center. Each week, the night float resident (R2) compiles a list of interesting cases from the call shift. This list includes any and all modalities, with attention to difficult cases, rare pathology, and misses. The R2 resident provides the clinical history, images, any follow-up, including pathology if available, and key teaching points. All residents attend the weekly conference, with an R4 resident assigned to act as the moderator. Competencies addressed with this conference format are (1) discussion and presentation of "active" cases seen on call shifts; (2) residents encouraged to seek clinical and/or imaging follow-up for their case presentations; (3) opportunity for junior residents to see more cases and ask questions in an informal setting; (4) ability of R2s to present cases in conference and communicate findings to a large group (interpersonal skills); (5) address how best to communicate findings to the referring physicians, as well as which findings should/should not be communicated over the phone (interpersonal skills, system-based practice); and (6) ability of R4s to act as teachers/leaders during the moderation of each conference. With the new structure and timing of the boards, the R4s can take a more active role in educating junior residents.

(E-21) Wednesday • 7:00 AM
Beyond PowerPoint and Keynote: Prezi—Using a Virtual Canvas to Present Radiologic Cases and Images

Nicole Lamparello, MD, BS, *Beth Israel Medical Center, New York, NY*; James E. Silberzweig, MD *(nlamparello@chpnet.org)*

LEARNING OBJECTIVES: 1. Identify the pitfalls and weaknesses of PowerPoint and Keynote, specifically as they relate to education in radiology. 2. Explain what Prezi is, and explain the unique features and functions of Prezi compared to other common presentation softwares. 3. Describe Prezi in action, as well as a mock-Prezi displaying a radiologic teaching case. 4. Discuss how our department trains faculty and residents to use Prezi, as well as surveys opinions regarding Prezi use. 5. Discuss the analysis of data from our medical center, in which we educate residents/attendings on a radiologic topic with Prezi and with PowerPoint and study which presentation software yields better scores using pre- and posttest comparisons.

CONTENT DESCRIPTION: For as long as there have been online PowerPoint (Microsoft, Redmond, WA) and Keynote (Apple, Cupertino, CA) presentations, users have struggled with issues related to expressing information and details without overcrowding slides and having unreadable text. With a small workable area and in an effort to avoid using too small of a font and images, users are forced to fragment ideas, charts, and data by breaking them up over several slides, such that the connection between them is lost. Particular to the field of radiology, presenting a case composed of multiple images or illustrating radiographic findings without a zooming interface makes presentations incohesive and uninteresting. Prezi (Prezi, Budapest, Hungary) is a visual presentation tool that allows users to express ideas on a virtual canvas, creating dynamic presentations with 3D backgrounds, embedded images and videos, and zooming capabilities. Prezi allows you to transform static slide presentations into a dynamic engaging interface. Drop text, images, videos, and even prior PowerPoint slides onto your Prezi canvas. Explore charts, diagrams, and images by zooming in for a closer look. Prezi creates a visual metaphor, empowering you to show the big picture and then zoom in on the details. Study from Beth Israel Medical Center will be conducted, and data will be presented.

(E-22) Thursday • 7:00 AM
CT and MR Imaging Ordering Algorithm for Nonradiology Residents

Dara Fedele, MD, *Yale New Haven Health System/Bridgeport Hospital, Bridgeport, CT*; Josephina A. Vossen, MD, PhD; Michael Meszaros

LEARNING OBJECTIVES: Explain to nonradiology residents about the appropriate imaging modalities for various clinical scenarios based on preapproved institution protocols and the ACR Appropriateness Criteria®.

CONTENT DESCRIPTION: Nonradiology residents often have a limited understanding of the appropriate type of imaging to obtain in order to answer a particular clinical question(s). Incorrectly ordered exams often delay patient care and may require repeat examinations, resulting in an increase in radiation for our patients. Our goal was to devise an easy-to-navigate ordering algorithm that would help residents choose the appropriate imaging modality for a specific clinical scenario. Our institution's approved imaging protocols were the basis for the algorithm, as well as the ACR Appropriateness Criteria® of various clinical conditions. Our algorithm was made readily available to residents on the hospital intranet.

(E-24) Thursday • 7:00 AM
Accessing the "Graffle": Creating a Shareable Framework for Retention of Material during Residency and Beyond

Anjuli R. Cherukuri, MD, *Fletcher Allen Health Care, South Burlington, VT*; Robert D'Agostino, MD *(anjuli.cherukuri@vtmednet.org)*

LEARNING OBJECTIVES: Organizing the vast subject matter of radiology can be overwhelming when first starting out in residency. It can be difficult to know the extent of the material or how it all relates together. This poster demonstrates how to create a shareable framework of material that utilizes visuospatial memory and allows more advanced topics to be integrated at an earlier stage in residency. This framework can be constantly built upon and serve as a familiar reference to help retain information learned in prior years.

CONTENT DESCRIPTION: By using the program OmniGraffle (Omni Group, Seattle, WA), a large diagram, or "graffle," of condensed information can be created for each of the main subsections of radiology. This program allows information to be typed into boxes and moved freely around a canvas without the formatting limitations of word processing or spreadsheet programs. Images can be easily incorporated. These files can be very large and retain their quality and detail, since one can quickly zoom in on any area. Having the material organized in this way allows one to make associations visually between various topics and keep the big picture in mind while studying specific diseases. Once these basic framework graffles are made covering the basics of most disease processes and anatomical considerations, they can be quickly referenced at any time on a computer, iPad, or other device. During more-advanced lectures or while reading additional books, these graffles can be easily expanded. In this way, they are a growing source of knowledge for a potentially large group of residents. These diagrams may be stored in a shareable folder that multiple people can access and edit with new information, which automatically updates on all devices. The files can be exported as a PDF at any time and transferred to any device. This method of diagramming the vast amount of material a radiology resident must learn provides an easily shareable, concise visual base upon which to build and retain a full knowledge of radiology.

(E-25) Wednesday • 7:00 AM
Interpersonal Skill Training in Virtual Reality: Consideration for Platform Choice

Elvira V. Lang, MD*, *Hypnalgesies, LLC, Brookline, MA*; Paul Senn, MEd, BA*; James Stone* *(elang@hypnalgesics.com)*

LEARNING OBJECTIVES: 1. Explain the potential of virtual reality (VR) interactions for interpersonal and communication skills training. 2. Discuss advantages and limitations of VR platforms.

CONTENT DESCRIPTION: Web-based assessment of interpretative skills is a natural extension of the usual interactions radiology residents and medical students experience during readout on electronic media. Interpersonal skills training and testing, however, require an experienced observer to comment on the interaction of the trainee with a real or standardized patient. Traditionally, this entails coordination and physical presence of at least three individuals. An alternative could be a VR environment, where the trainee's avatar enters a radiology department and interacts with a patient avatar while the session is recorded. To test feasibility, samples of patient-provider interactions were based on behavioral strategies in response to patients' verbal and nonverbal cues, which had been field-tested in extensive clinical trials for efficacy in terms of medical outcomes and patient satisfaction. Feasibility was demonstrated in Second Life (Linden Labs, San Francisco, CA) in an MRI environment allowing assessments by objective structured clinical examination: A patient avatar interacted live online with the trainee avatar while the sequence, including audio, was recorded for viewing by the

---

* Faculty financial disclosures are located in the Faculty Index.

evaluator at a later time. Data mining capability at this step can prepare the move to automated scripted online agents programmed to display certain behaviors to which the trainee would need to respond quickly and appropriately. Beyond feasibility, additional issues have to be considered when committing to a platform. Advantages and shortcomings of an additional 14 commercial and open platforms were evaluated and mapped into a 21-item decision matrix encompassing elements of user experience, intellectual property, preservation of usage, deployment in terms of recording and hosting, development issues, and vendor stability. It is unlikely that one platform will be a clear winner on all criteria, either in general or for a given institution. The decision matrix will therefore enable a more informed decision. (Supported by NIH/NCCAM R43 AT006296.)

(E-27) Wednesday • 7:00 AM
Novel Artificial Intelligence Software for Learning Radiologic Differential Diagnosis

Evan J. Zucker, MD, *Lucile Packard Children's Hospital, Stanford University, Stanford, CA (zucker@post.harvard.edu)*

LEARNING OBJECTIVES: 1. Identify the benefits of a novel software tool for learning radiologic differential diagnosis. 2. Describe the software algorithm and specific applications.

CONTENT DESCRIPTION: Learning differential diagnosis is a crucial yet daunting task for the radiologist in training. Novel artificial intelligence software is introduced that allows an active approach to learning, based on the classic "animal game" algorithm. The software prompts the user with a series of questions on specific radiologic topics, such as bone tumors, attempting to guess the best diagnosis. If it fails, the user supplies a new question that allows the software to improve its future performance. In this way, the user can develop a personalized radiology knowledge database and learn a stepwise approach to radiologic differential diagnosis.

(E-30) Thursday • 7:00 AM
Making Your Lectures "Click": Use of Audience Response Technology in a "Flipped Classroom" Approach to Radiology Education during 3rd-Year Clinical Clerkships

Andres R. Ayoob, MD, *University of Kentucky, Lexington, KY*; M. Elizabeth Oates, MD *(andres.ayoob@uky.edu)*

LEARNING OBJECTIVES: 1. Discuss three specific benefits of audience response system (ARS) use in the setting of a "flipped classroom." 2. Create questions for an ARS that facilitate identification of knowledge deficiencies and foster full-class discussion. 3. Design a review lecture that incorporates an ARS through the application of a six-step model.

CONTENT DESCRIPTION: In an attempt to integrate formal radiology education into a saturated 3rd-year medical school curriculum, we have adopted a "flipped classroom" approach. This consists of two components: (1) radiologist-developed clerkship-specific lectures that are recorded and viewed by students on their own time, and (2) a live 1-hour case-based review lecture designed to allow time to answer questions and explain difficult concepts covered in the recorded lecture series. While this model is designed to optimize the use of "face time," it does place unique demands on the educator. Given the time constraints of the review session, the instructor must determine which topics—of the various subjects covered in the recorded lectures—merit attention during the review session. Writing questions for an ARS facilitates this decision making by encouraging the teacher to reflect on which topics are most imperative for the students to understand. ARS technology provides "real-time" feedback to the lecturer, permitting identification of knowledge deficiencies that can then be addressed in more detail. In this way, an ARS allows the instructor to tailor the lecture adaptively to the specific audience. Finally, ARS use engages full-class participation, which provides the instructor with a more accurate assessment of the knowledge base of the entire audience, not just that of the students who are more likely to voice their answers. This presentation will explore the benefits of an ARS in such a "flipped classroom" setting and will outline an easy six-step model of integration to maximize its educational value.

(E-33) Wednesday • 7:00 AM
Imaging during Pregnancy and Lactation: An Online Educational Resource

Erin McCrum, MD, *University of Virginia, Charlottesville, VA*; Carrie M. Rochman, MD; Allen Goode, MS; Brandi T. Nicholson, MD* *(bte6v@virginia.edu)*

LEARNING OBJECTIVES: Residents should be able to use the online tool to (1) select the most appropriate test for a pregnant or lactating patient based on the presenting symptoms, and determine when a blood or urine pregnancy test is recommended prior to imaging by using online algorithms; (2) use quick reference data to have concrete discussions about radiation risk with pregnant and lactating patients; and (3) test their knowledge through a series of online cases about imaging strategies and radiation dose reduction in pregnant and lactating patients.

CONTENT DESCRIPTION: The use of ionizing radiation and contrast material in the pregnant or lactating patient poses diagnostic and management dilemmas. Feedback from our residents, with representation from all levels, related to imaging in the pregnant or lactating patient shows they desire an online tool (96%) and would use it (100%), have reservations about selecting appropriate tests (40%), do not know our institutional recommendations for imaging (56%), and lack confidence talking to women about the risks of imaging (52%) when pregnant or lactating. We have therefore developed an online educational resource for health care providers that provides quick comparative reference data on fetal radiation exposure of common radiologic exams and the effect of ionizing radiation based on gestational age. Additionally, health care providers can access suggested imaging algorithms for a variety of common complaints and pregnancy screening methods based on tables of risk stratification. Finally, residents are able to test their radiologic management savvy in a series of online interactive Web-based cases.

(E-35) Wednesday • 7:00 AM
Getting Promoted with Teaching as Your Area of Focus

Elizabeth Sadowski, MD, *University of Wisconsin, Madison, WI*; Sarina Schrager, MD, MS; Jessica B. Robbins, MD

LEARNING OBJECTIVES: 1. Explain the general criteria for being promoted on teaching at most universities, highlighting a scholarly approach to teaching and daily work. 2. Describe how to document a scholarly approach to teaching, including incorporating CME talks, posters, papers, and electronic publishing into academic work. 3. Discuss how the academic portfolio can be used as a tool to document productivity in the area of teaching and highlight educational excellence as a clinician educator.

CONTENT DESCRIPTION: Many clinician educators use teaching as an area of excellence when they prepare for promotion. The purpose of this presentation is to describe the criteria and an approach to being promoted successfully with teaching as your area of focus. This will include a general review of promotion criteria, examples of a scholarly approach to teaching, and tips on documenting and organizing educational work. When promotion committees review clinician educators for promotion, they will be assessing the candidates' abilities as educators based on their scholarly accomplishments. Evidence of excellence in teaching may include invitations to talk at conferences or CME events; publications or reviews of clinical topics; and strong teaching evaluations, novel curricula, or innovative lectures. Clinician educators can develop a scholarly approach to their work by documenting their teaching endeavors and demonstrating the impact of their work. This can be done through a variety of approaches, including developing a new curriculum; keeping track of particularly excellent evaluations received from learners; highlighting new lectures, courses, and teaching methods; and presenting teaching material in journal publications, online publications, CDs, pamphlets, books, and presentations at meetings. Lastly, keeping track of educational material that may be used to highlight scholarly work throughout a career is essential. An academic portfolio is a particularly useful tool to help keep materials organized and ready for promotion. Understanding the criteria for being promoted on teaching and documenting a scholarly approach to teaching are the keys to being successfully promoted.

(E-36) Thursday • 7:00 AM
"Clear as Day": Understanding Positioning Utilized during Routine Gastrointestinal and Genitourinary Fluoroscopic Examinations Using Simple Balloon Models—A Resident Teaching Tool

Perry S. Gerard, MD, *Westchester Medical Center, Valhalla, NY*; Jay Acharya, MD; Christopher M. Harnain, MD, MBA; Anthony G. Gilet, MD; Zvi Lefkovitz, MD *(docnucs@yahoo.com)*

LEARNING OBJECTIVES: With the development of various cross-sectional imaging modalities, there has been a decrease in the number of fluoroscopic contrast examinations, limiting resident exposure in the performance and interpretation of these studies. Contrast examinations of the upper and lower gastrointestinal tract by single-contrast or double-contrast technique are used to establish the presence or absence and extent of disease. It is important that residents understand the anatomy of the GI tract and concepts of fluoroscopy to be able to adequately perform these examinations. Better understanding leads to reduction in fluoroscopic time and radiation dose, with enhanced diagnostic quality of examinations. We discuss the various steps in performing these fluoroscopic examinations, discuss the appropriate patient positioning, and correlate these positions with simple balloon models. The balloon models help illustrate to the resident why the various positions are utilized. We discuss both normal anatomy and the appearances in various diseases.

CONTENT DESCRIPTION: We discuss how an enhanced resident understanding of the concepts of positioning during fluoroscopic examinations can lead to reduction in fluoroscopy times, reduced radiation dose, and limited amount of repeat examinations. We utilize simple balloon models to simulate the anatomy of the GI and GU tract. We simulate the various positions of the patient during fluoroscopic examinations, show how the various organ systems appear with different positioning, and show how contrast material would appear during the examination using simple balloon models. In a pictorial review, we correlate the balloon models with actual fluoroscopic studies and also show how these simulate various patient positions on the table during the study.

Health Services for Radiology

(E-37) Wednesday • 7:00 AM
i-STAT Point-of-Care Estimation of Whole-Blood Creatinine Level's Impact on Patient Safety and Economics: A Review

FDA

Francesco Priamo, MD, *Beth Israel Medical Center, New York, NY*; Yuriy Babeyev, MD; James E. Silberzweig, MD

LEARNING OBJECTIVES: 1. Identify what the benefits and disadvantages are of using the i-STAT whole-blood creatinine estimation system in terms of economics and patient safety versus conventional methods. 2. Discuss the application of this knowledge in shaping a protocol that best suits the needs of the patients and practice.

CONTENT DESCRIPTION: Creatinine level estimation by means of the i-STAT point-of-care whole-blood analysis system (Abbott Point of Care, Princeton, NJ) is a readily available and rapid means of detecting patients who may be susceptible to adverse outcomes related to contrast-enhanced radiologic studies while also increasing throughput in the outpatient setting. However, this system, when compared to conventional means of estimating whole-blood creatinine in the outpatient setting, may be more costly to certain patient groups without significantly changing patient management. In this educational exhibit, we will address the economic impact of the i-STAT whole-blood creatinine level system and its alternative on patients and radiology practices. We will also review what effects, if any, point-of-care whole-blood estimators of creatinine level, such as the i-STAT system, have had on reducing contrast-related adverse effects in the outpatient setting and increasing practice-based efficiencies.

(E-38) Thursday • 7:00 AM
Lessons Learned for Implementing Radiology Services in Resource-constrained Areas: Review of the Literature with a Focus on Safety, Quality, and Reliability

Vivek Kalia, MD, MPH, MS, *Fletcher Allen Healthcare, South Burlington, VT*; Kristen K. DeStigter, MD⋆ *(vivek.kalia@vtmednet.org)*

LEARNING OBJECTIVES: 1. Identify key common themes in radiology outreach projects that have struggled or failed for a variety of reasons, and explore ways to prevent or minimize such challenges. 2. Describe key quality indicators for and characteristics of effective and sustainable radiology outreach projects.

CONTENT DESCRIPTION: As the surge to bridge the imaging technology gap between resource-constrained and more economically developed countries continues unabated, there is a resounding need to standardize the way we plan, implement, and evaluate these programs. Based on a review of the literature, we showcase several examples of projects that struggled or failed due to problems with miscalibration of equipment, inadequate training for equipment maintenance, poor management of donated items, poor coordination of efforts after initial project launch, and other unanticipated obstacles. We propose that there are essential attributes of a reliable and sustainable system that imaging outreach programs should achieve in order to ensure safety and quality, including, but not limited to, radiation dose monitoring and protection measures; accurate and timely reporting and monitoring of image quality; infrastructure for data transfer, storage, and retrieval; decision support for appropriate utilization; standards for training and credentialing professionals; backup systems for equipment maintenance and repair; and quality assurance monitoring.

⋆ Faculty financial disclosures are located in the Faculty Index.

(E-40) Thursday • 7:00 AM

Radiology Morbidity and Mortality Conference: A Multidisciplinary Approach Using an Audience Response System

Peter D. Poullos, MD, *Stanford University, Stanford, CA*; David B. Larson, MD, MBA *(PPoullos@stanford.edu)*

LEARNING OBJECTIVES: 1. Explain how to design and implement a nonconfrontational learner-centric radiology-specific morbidity and mortality (M&M) conference. 2. Describe how to incorporate meaningful and engaging audience response, with questions mindfully inserted at management branch points. 3. Explain how to incorporate multidisciplinary discussion, reinforcing our critical clinical role.

CONTENT DESCRIPTION: Morbidity and mortality conferences are a long-standing tradition in medical and surgical subspecialties. However, there is little guidance in the literature on how to design and implement one tailored toward training and practicing radiologists. We have built an easily replicable and modifiable model. The basic building blocks of such a conference are collecting cases, analyzing their importance and teaching value, presenting them in a nonblaming and mentally engaging format using audience response, and reinforcing the teaching points. ***Collecting Cases:*** We collect cases from multiple sources: a unique folder on the PACS where one can anonymously contribute cases, cases submitted to the QA committee, referring clinicians, and e-mails to the M&M conference director. ***Analyzing Importance:*** We prefer cases with real clinical implications, especially management consequences, rather than "eye tests." ***Case Presentation:*** Two cases are presented at each conference, each by a resident. The format can be modified based on the details of each case but usually follows an abbreviated history and physical–type format focused on the history of the present illness, past medical history, and relevant physical exam and laboratory findings. The bulk of the presentation focuses on the imaging. The images are anonymized by embedding them within a PowerPoint presentation, using a novel macro that enables scrolling. Audience response questions force attendees to identify findings, make a diagnosis, and choose among management options. At each step, commentary is provided by expert radiologists and clinicians. A summary of the teaching points is made at the end, and the presentation is posted on the resident wiki.

(E-41) Wednesday • 7:00 AM

Preventing and Minimizing Adverse Intravenous Contrast Reactions: What We Need to Know about Our Patients before Administering Intravenous Contrast Media

Staci Gagne, *University of Massachusetts Memorial Medical Center, Worcester, MA*; Arash Bedayat, MD; Max P. Rosen, MD, MPH* *(staci.gagne@umassmemorial.org)*

LEARNING OBJECTIVES: 1. Identify the various complications that arise from administering intravenous (IV) contrast media. 2. Describe the risk factors associated with adverse reactions to IV contrast. 3. Explain the accuracy of various screening tests for impaired renal function. 4. Discuss options for minimizing adverse contrast reactions in patients with various risk factors. 5. Describe a checklist for preprocedure evaluation prior to intravenous contrast administration.

CONTENT DESCRIPTION: There are a variety of indicators used to identify patients at high risk for an adverse reaction to IV contrast. These indicators include, but are not limited to, assessment of (1) renal function, (2) potential drug interactions, (3) allergy history, (4) surgical history, (5) medical comorbidities, (6) renal transplant, and (7) recent use of IV contrast. Some of these risk factors are clearly identified, while others are multifactorial and often ambiguous. For example, renal function may be determined by creatinine or glomerular filtration rate (GFR), and the risk factor "diabetes" may be present with a wide range of severity. The goal of this exhibit is to review the literature regarding the predictive value of each of these indicators for development of an adverse reaction to IV contrast. In addition, an outline of a comprehensive precontrast administration checklist will be proposed. The impact of the use of this checklist in reducing adverse reactions to IV contrast will be reported at a future date.

(E-46) Thursday • 7:00 AM

"Know the Ropes": A Creative Medical School Curriculum for Radiology—Important Concepts in Preparation for Successful Practice

Perry S. Gerard, MD, *Westchester Medical Center, Valhalla, NY*; Jay Acharya, MD; Christopher M. Harnain, MD, MBA; Anthony G. Gilet, MD; Zvi Lefkovitz, MD *(docnucs@yahoo.com)*

LEARNING OBJECTIVES: We discuss the conventional medical school curriculum and how it applies to teaching the concepts of radiology. We discuss that there are many concepts that need to be addressed in preparation for a successful career in radiology. We discuss a new approach in the preparation of medical students for the field of radiology. Besides teaching medical students about the indications, performance, and interpretation of radiology studies, additional important daily concepts are discussed in detail, which include *(a)* mutual respect of health care staff; *(b)* importance and methods of communication, and critical results; *(c)* how to deal with patient language barriers and literacy issues; *(d)* concepts and methods of utilizing service recovery when things do not go as planned; *(e)* how to deal with the upset and violent individual in the department; *(f)* concepts of identification and prevention of errors; *(g)* informatics in the field of radiology, including PACS, RIS, and voice technology; *(h)* the importance of emotional intelligence in the radiology workplace; and *(i)* methods of dealing with stress in the radiology workplace.

CONTENT DESCRIPTION: The integration of radiology teaching into the medical education curriculum is known to have a positive effect on medical students' attitudes toward the practice of radiology. It is important to allow medical students to choose a career in radiology with the understanding of several important concepts to survive in the radiology workplace. We discuss the importance of implementing educational programs in the radiology medical school curriculum to address the educational and administrative needs of students and prepare them for important issues commonly encountered by the radiologist in everyday practice. These basic concepts are important to learn early in the medical career, to attain a successful career in radiology and in health care in general.

---

* Faculty financial disclosures are located in the Faculty Index.

Informatics

(E-09) Wednesday • 7:00 AM
Machine Learning for the Nonprogrammer

Rajiv C. Raju, BA, *University of Illinois at Chicago College of Medicine, Chicago, IL*; Barbara Di Eugenio, PhD *(rraju4@uic.edu)*

LEARNING OBJECTIVES: 1. Explain the basics of what machine learning is and what sorts of problems can be approached with machine learning methods. 2. Describe how to experiment with and explore machine learning using WEKA software, and explain how to evaluate the effectiveness of a machine learning system.

CONTENT DESCRIPTION: The purpose was to introduce machine learning principles to those with no programming experience. Machine learning and data mining techniques have proven to be extremely powerful tools in many fields, including medical imaging. Freely available software packages such as WEKA now make advanced machine learning techniques accessible to the nonprogrammer clinician. If clinicians learn the basic principles of machine learning, they may be able to identify problems that can be solved with machine learning techniques. This can lead to more fruitful collaboration between the clinician and the machine learning experts. ***Content Organization:*** The fundamental task of machine learning will be defined and explained. General features of problems that are best suited to machine learning methods will be discussed. Using a concrete example of a computer-aided diagnosis system and a real-word data set for breast cancer diagnosis, an example of machine learning will be illustrated using the freely available noncommercial multiplatform WEKA software package. Methods to evaluate the performance of machine learning algorithms, such as sensitivity, specificity, and the area under the ROC curve, will be explained and illustrated. The stratified 10-fold cross-validation method will be illustrated. Internet links to the WEKA software and related resources will be provided.

(E-12) Thursday • 7:00 AM
Business of Radiology 101: Language of Numbers

Nathan M. Cross, MD, MS*, *University of Washington, Seattle, WA*; Vicky T. Nguyen, MD; Joseph C. Fuller III, MD; Diana L. Lam, MD; Somnath Prabhu, MD; Jonathan R. Medverd, MD *(nmcross@uw.edu)*

LEARNING OBJECTIVES: 1. Explain and apply fundamental terminology and concepts of business finance. 2. Describe the interdependence of financial statements through the use of radiology business practice scenarios and live interactive spreadsheets. 3. Discuss the concept of time value of money through an introduction to business forecasting.

CONTENT DESCRIPTION: The ACGME's Next Accreditation System reiterates the requirement for education in business practices. Participants will refer to interactive instructional Web pages and radiology business practice scenarios supported with live spreadsheets. This experiential educational tool leverages technology to allow exploration of and experimentation with content, in order to facilitate understanding of financial principles and statements.

Interventional Radiology

(E-13) Wednesday • 7:00 AM
Hepatocellular Carcinoma after Interventional Therapy: How to Evaluate and Manage Expected and Unexpected Imaging Findings

Maryam Gul, MD, BS; Ammar A. Chaudhry, MD, *Stony Brook University Medical Center, Stony Brook, NY*; George A. Mikhail, MD, BS; Luke Gerges, DO; John A. Ferretti, MD *(ammar.chaudhry@stonybrookmedicine.edu)*

LEARNING OBJECTIVES: 1. Describe pictorial review of hepatocellular carcinoma, various clinical presentations, and IR-guided treatments. 2. Discuss case-based review, highlighting common and uncommon imaging findings after interventional treatment. 3. Describe different interventional radiology–guided treatment options/techniques and the prognosis of the above entities.

CONTENT DESCRIPTION: ***Content Organization:*** We will present case-based review of clinical presentation, imaging findings, and interventional radiology–guided management of expected and unexpected complications of pre- and postinterventional treatment of hepatocellular carcinoma. We will also discuss differential diagnoses that may mimic the aforementioned expected and unexpected findings. ***Summary:*** Understanding of liver anatomy, hepatocellular carcinoma, and the various treatment-related complications is critical in improving patient morbidity and mortality. By the conclusion of this presentation, viewer should have a better understanding of these complications, what the radiologist needs to know, and what should be recommended to the clinician. Viewer should also be able to narrow the differential diagnosis, aid in the workup, and guide any potential biopsy, treatment, and imaging follow-up. A chart of salient features for quick reference will be presented.

(E-14) Thursday • 7:00 AM
Cryoablation versus Radiofrequency Ablation of Renal Lesions: A Single-Institution 5-Year Experience

Maryam Gul, MD, BS, *Winthrop-University Hospital, Mineola, NY*; Ammar A. Chaudhry, MD; George A. Mikhail, MD, BS; John A. Ferretti, MD *(ammar.chaudhry@stonybrookmedicine.edu)*

LEARNING OBJECTIVES: 1. Describe pictorial review of renal cell carcinoma, various clinical presentations, and IR-guided treatments. 2. Discuss case-based review highlighting common and uncommon imaging findings after interventional treatment.

CONTENT DESCRIPTION: ***Content Organization:*** We will present a case-based review of clinical presentation, imaging findings, and interventional radiology–guided management of expected and unexpected complications before and after interventional treatment of renal cell carcinoma. We will also discuss differential diagnoses that may mimic the aforementioned expected and unexpected findings. ***Summary:*** An understanding of renal anatomy, renal cell carcinoma, and the various treatment-related complications is critical in improving patient morbidity and mortality. By the conclusion of this presentation, the viewer should have a better understanding of these complications, what the radiologist needs to know, and what should be recommended to the clinician. The viewer should also be able to narrow the differential diagnosis, aid in the workup, and guide any potential biopsy, treatment, and imaging follow-up. A chart of salient features for quick reference will be presented.

---

* Faculty financial disclosures are located in the Faculty Index.

(E-16) Thursday • 7:00 AM
Small Bowel, Large Bleed: Case Series and Literature Review of Angiographically Managed Small Bowel Bleeds

Monzer Chehab, MD, *William Beaumont Hospital, Royal Oak, MI*; Alexander Z. Copelan, MD; Abizer Sakarwala; Matthias J. Kirsch, MD; Jeremy Handel, MD; Purushottam K. Dixit, MD *(moe.chehab@beaumont.edu)*

LEARNING OBJECTIVES: Discuss the role of interventional radiology in the management of small bowel bleeds through a series of angiographically managed cases, supplemented with a brief literature review.

CONTENT DESCRIPTION: Our case series includes clinical data, invasive and noninvasive imaging, pathological specimens, and a literature review of gastrointestinal bleeds originating from the small bowel for which angiography played a significant role in diagnosis and/or treatment. The case series includes etiologies from ulcerative disease, vascular lesions, benign and malignant neoplasms, and inflammatory processes.

Musculoskeletal Radiology

(E-47) Wednesday • 7:00 AM
Imaging Characteristics of Parsonage-Turner Syndrome

Benjamin Nasman, DO, *Aultman/Mercy/NEOMED, Canton, OH*; Samuel T. Braden, MS, MD; Michael W. Freels, MD

LEARNING OBJECTIVES: 1. Describe the clinical presentation of Parsonage-Turner syndrome. 2. Describe the classic imaging characteristics of Parsonage-Turner syndrome.

CONTENT DESCRIPTION: Parsonage-Turner syndrome (PTS) is a rotator cuff denervation syndrome that presents with shoulder pain and weakness. The cause of PTS is unknown, although it is thought that viral infection or an autoimmune process may be involved. PTS more commonly affects males over females between the ages of 10. Imaging characteristics of PTS are important to recognize, as this may be the initial suggestion of PTS. MRI findings include diffusely abnormal T2 signal within one or more muscles of the shoulder girdle, as well as a decrease in muscle bulk, which may contain fatty infiltration depending on the chronicity. Sonographic findings can demonstrate increased echogenicity of the affected muscles, aiding in the diagnosis, although these findings are less specific compared to MRI.

(E-48) Thursday • 7:00 AM
A Chip on the Shoulder: US-guided Lavage and Aspiration as a Treatment Technique for Calcific Tendonitis

Vivek Joshi, BSE, *Mount Sinai School of Medicine, New York, NY*; Alex Maderazo, MD; Darren Fitzpatrick, MD

LEARNING OBJECTIVES: 1. Describe the clinical significance and manifestations of calcific tendonitis. 2. List the imaging characteristics of calcific tendonitis of the shoulder. 3. Identify the normal anatomy of the shoulder as seen on ultrasound. 4. Explain the steps involved in ultrasound-guided lavage and aspiration for treatment of calcific tendonitis.

CONTENT DESCRIPTION: I. Calcific tendonitis: pathophysiology, clinical manifestations, and treatment. II. Imaging findings: examples of calcific tendonitis on plain film, CT, US, and MRI. III. Ultrasound shoulder anatomy: US images of the normal anatomy of the rotator cuff tendons. IV. Ultrasound-guided aspiration and lavage: step-by-step description of the procedure, with corresponding US images.

(E-49) Wednesday • 7:00 AM
MR Imaging of Sports-related Peripheral Nerve Injuries

Charles H. Mitchell, MD, *Johns Hopkins Hospital, Baltimore, MD*; Shivani Ahlawat, MD; Allan Belzberg; John A. Carrino, MD, MPH*; Laura M. Fayad, MD* *(cmitch52@jhmi.edu)*

LEARNING OBJECTIVES: 1. Describe common sports-related peripheral nerve injuries in athletes. 2. Identify the MR imaging findings associated with common peripheral nerve injuries in athletes. 3. Discuss the clinical diagnosis of peripheral nerve injuries and how to identify, with MR imaging, which patient's nerve injury will likely require surgery.

CONTENT DESCRIPTION: Sports-related peripheral nerve injuries are common among athletes and are often underrecognized. The diagnosis of neuropathy is commonly delayed in athletes due to symptom overlap with more common sports-related bone, soft-tissue, and joint injuries. MR imaging is playing an increasingly important role in the workup of peripheral nerve injuries and may show severe nerve abnormalities before they are diagnosed by electrodiagnositic testing or the clinical exam. The methods of classifying peripheral nerve injuries will be discussed. The mechanisms of sports-related nerve injuries will also be discussed, as well as how athletes with nerve injuries are evaluated clinically. The role of MR imaging in the workup of an athlete with peripheral nerve injury and the importance of identifying cases of nerve transection will be discussed. The MR imaging features of sports-related peripheral nerve injury will be reviewed. A review of common sports nerve injuries will be provided. The sports that will be discussed include baseball, cycling, running, football, skiing, and weight lifting. Nerve injuries involving the upper and lower extremities and their MR imaging features will be reviewed.

AUR Trainee Prize: 3rd Place

(E-50) Thursday • 7:00 AM
Proton MR Spectroscopy: A Systematic Review of Musculoskeletal Oncology Applications

Swati Deshmukh, MD, *Johns Hopkins Hospital, Baltimore, MD*; Laura M. Fayad, MD* *(lfayad1@jhmi.edu)*

LEARNING OBJECTIVES: 1. Describe technical aspects specific to performing MR spectroscopy in the musculoskeletal system. 2. Discuss metabolic markers of malignancy available by proton MR spectroscopy. 3. Identify potential clinical applications of MR spectroscopy in musculoskeletal tumor imaging.

CONTENT DESCRIPTION: MR spectroscopy is a technique that provides metabolic content within an area of interest. Through the detection and quantification of signals from metabolites, MR spectroscopy allows the noninvasive molecular characterization of a musculoskeletal lesion. Although routinely used in neuroradiology, MR spectroscopy is less developed for use in the musculoskeletal system. The most salient clinical applications in musculoskeletal tumor imaging include the evaluation of potential malignancy in newly discovered tumors and the assessment of neoadjuvant therapeutic response. We present a systematic review of the literature with examples to elucidate the potential roles of MR spectroscopy in musculoskeletal tumor imaging.

---

* Faculty financial disclosures are located in the Faculty Index.

(E-51) Wednesday • 7:00 AM
The Talus: Reviewing the Spectrum of Pathologies—Traumatic and Atraumatic

Robert K. Hang, MD, *St Luke's-Roosevelt Hospital Center, New York, NY*; Sagar M. Patel, DO; Leonid Lempert, MD *(rhang@chpnet.org)*

LEARNING OBJECTIVES: 1. Describe the anatomic talar features that predispose to various pathologic processes. 2. Discuss the mechanisms, classifications, and treatments of talar fractures. 3. Identify the evolutionary imaging findings of talar avascular necrosis. 4. Describe osteochondral lesions, and explain the underlying pathophysiology. 5. Discuss unique talar processes that may result in secondary arthrosis.

CONTENT DESCRIPTION: The location and severity of talar injuries determine the risk for avascular necrosis and the need for surgical intervention. A review of the talar head, neck, and body, including talar body subdivisions of the dome and lateral and medial processes, and fracture biomechanics with classification schemes will aid in proper diagnoses and management. Osteochondral lesions may be challenging to diagnose on plain films. It is important to recognize further characterization on other imaging modalities, as delays in diagnosis may alter the treatment course. The reviewer will understand specific imaging characteristics that may determine the stability of this disease. The radiographic findings of avascular necrosis depend on the evolutionary stage. As this potentially joint-replacing process can also be seen at several anatomic locations, it is important not only to identify the entity but also to recognize when further imaging is warranted. While the most common degenerative changes are due to primary osteoarthritis, inflammatory etiologies, or diabetic neuropathy, investigation with additional imaging modalities may reveal rare secondary causes (ie, juxtacortical osteoid osteoma). A thorough case-based review will enable the radiologist to distinguish these entities.

(E-52) Thursday • 7:00 AM
Why Not Fibrous Dysplasia? A Comprehensive Review—What We Know and What We Have Learned

Elaine S. Gould, MD; Cheryl H. Lin, MD; Hiten B. Patel, MD, *Stony Brook University Hospital, Stony Brook, NY*; Mingqian Huang, MD; Douglas S. Katz, MD; Kevin S. Baker, MD *(elaine.gould@stonybrookmedicine.edu)*

LEARNING OBJECTIVES: 1. Describe clinical and imaging findings of fibrous dysplasia (FD). 2. Discuss various appearances of FD on plain film, CT, and MRI. 3. Discuss differential diagnoses. 4. Describe syndromes and associated findings. 5. Describe histologic features.

CONTENT DESCRIPTION: This exhibit will present a pictorial guide of various clinical and imaging features of fibrous dysplasia (FD) in a variety of locations throughout the body and their associated frequencies. FD has a variety of imaging appearances, from focal to diffuse, ground-glass, lytic, sclerotic, or mixed; and some cases may present a diagnostic dilemma. The broad differential diagnosis and imaging mimics will be discussed. Imaging mimics include Paget disease, adamantinoma, nonossifying fibroma, giant cell tumor, simple bone cyst, and chondroid- or osteoid-containing lesions. Syndromes and conditions associated with fibrous dysplasia, such as McCune-Albright syndrome and Mazabraud syndrome, will be discussed. McCune-Albright syndrome comprises a clinical spectrum of polyostotic fibrous dysplasia and precocious puberty with café au lait spots. Mazabraud syndrome comprises a spectrum of polyostotic fibrous dysplasia and intramuscular myxomas. Complications related to fibrous dysplasia, including pathologic fracture and sarcomatous degeneration, will also be discussed. If a systemic approach is used, the correct diagnosis of FD can often be made.

(E-53) Wednesday • 7:00 AM
The Finger: The Good, the Bad, and the Ugly

Elaine S. Gould, MD; Mingqian Huang, MD; Cheryl H. Lin, MD; Hiten B. Patel, MD, *Stony Brook University Hospital, Stony Brook, NY*; Kevin S. Baker, MD *(elaine.gould@stonybrookmedicine.edu)*

LEARNING OBJECTIVES: 1. Describe the myriad of osseous and periosseous lesions that affect the finger, with differential diagnoses. 2. Discuss clinical issues and appropriate actions, including further testing and treatment.

CONTENT DESCRIPTION: I. Pictorial imaging review as unknown and known cases, followed by discussion of entities, their differential diagnoses, and management. II. Selected imaging examples (subject to change based on space available on poster, but the following cases are prepared): hyperparathyroidism, parosteal chondroma, amniotic band syndrome, scleroderma, enchondroma, glomus tumor, thyroid acropachy, giant cell tumor, metastatic disease, multiple hereditary exostoses, hypophosphatasia, infection, acro-osteolysis, inflammatory arthritides, depositional processes, giant cell tumor of the tendon sheath, sarcoid, and leprosy. A myriad of lesions and processes affect the fingers. These processes run the gamut of tumor (primary/metastatic), infection, collagen vascular, arthopathy, depositional, metabolic/endocrine, trauma, occupational, and congenital/developmental processes. A thorough evaluation of the finger is critical in the diagnosis not only of subtle lesions but also of processes that may be part of more generalized or systemic disease states.

(E-54) Thursday • 7:00 AM
Diffusion-weighted Imaging of Benign and Malignant Bone Tumors

Maryam Gul, MD, BS, *Winthrop-University Hospital, Mineola, NY*; Ammar A. Chaudhry, MD; Yudell Edelstein, MD *(maryamgul@gmail.com)*

LEARNING OBJECTIVES: Radiologists frequently encounter tumor and tumorlike lesions as incidental findings. These can result from a number of processes that can be benign or malignant. Differentiating between the two can be challenging and is critical for patient care, as a miss of a malignant lesion can prove to be fatal. This educational exhibit will be a case-based presentation of common and uncommon causes of benign and malignant processes that result in lytic lesions in the skeletal system. In particular, we will focus on the utility of diffusion-weighted imaging, in addition to conventional imaging techniques, in differentiating benign from malignant lesions.

CONTENT DESCRIPTION: ***Educational Goals/Teaching Points:*** 1. Case-based presentation will include clinical features, key imaging findings, radiology-pathology correlation, treatment, and prognosis of common and uncommon causes of benign and malignant osseous neoplasms. 2. Case examples include fibrous dysplasia, enchondroma, chondrosarcoma, sarcoma, lymphoma, and metastasis (carcinoid, prostate, lung, melanoma, etc). 3. Review physics of diffusion-weighted imaging (*b* values: 50, 400, and 800 s/mm^2) with ADC mapping. 4. Review imaging findings of various musculoskeletal and soft-tissue tumors. 5. Discuss limitations and pitfalls of diffusion-weighted imaging in the musculoskeletal system. ***Conclusion:*** Osseous tumors are frequently encountered incidentally on radiologic imaging, and nonspecific imaging findings cause a diagnostic dilemma. Being familiar with discriminating imaging findings, including DWI, can help characterize a tumor as benign or malignant, thus assisting radiologists in guiding clinical management of the lesion.

(E-55) Wednesday • 7:00 AM
Rhabdomyolysis: No Longer a Clinical Diagnosis

Jeremy B. Nguyen, MD, MS, *Tulane University, New Orleans, LA*; Jason B. Rodulfa, BS; Sarah Castillo, MD; Mandy C. Weidenhaft, MD; Enrique Palacios, MD; Harold R. Neitzschman, Jr, MD *(jnguye2@tulane.edu)*

LEARNING OBJECTIVES: 1. Discuss magnetic resonance imaging (MRI) in musculoskeletal radiology with an emphasis on selection of proper imaging sequences, with associated pitfalls. 2. Describe the pathophysiology of rhabdomyolysis and its clinical presentations. 3. Describe the imaging findings of rhabdomyolysis through different imaging modalities, including MRI, computed tomography (CT), and radiography, as well as the characteristic imaging appearance of the different stages of rhabdomyolysis. 4. Explain the utility of cross-sectional imaging to assess patients with an unclear medical history and a clinical suspicion for soft-tissue/muscular pathology.

CONTENT DESCRIPTION: Rhabdomyolysis is a potentially life-threatening condition for which there are a considerable number of variable clinical presentations. There is also a concomitant rise of its once less-common causative factors, such as alcohol toxicity, myotoxic effects of prescribed drugs, and diabetes mellitus. Importantly, the sensitivity of a clinical diagnosis has declined. MRI has emerged as an excellent modality for visualizing soft-tissue pathology. It has been found that MRI sensitivity for detecting rhabdomyolysis is unmatched. CT also has been shown to aid in diagnosis, with good sensitivity and rapid results. With such nonspecific signs and symptoms of rhabdomyolysis, advanced imaging can aid in forming a useful list of differential diagnoses and thus can decrease the time to implementation of definitive and more-specific therapeutic measurements. Inclusion of imaging in the workup can improve clinical outcomes while diminishing known complications, such as disseminated intravascular coagulation, cardiac dysrhythmias, renal failure, and mortality. Multiple cases of proven rhabdomyolysis with appropriate clinical history will be presented. The imaging characteristics of the multiple phases of rhabdomyolysis will be displayed, along with pertinent discussions.

(E-56) Thursday • 7:00 AM
Radiologic Approach to Musculoskeletal Soft-Tissue Sarcomas, with Emphasis on MR Imaging

Nicholas Bhojwani, MD; Nathan P. Fergus, MD, *University Hospitals Case Medical Center, Cleveland, OH;* Mark R. Robbin, MD

LEARNING OBJECTIVES: 1. Explain the roles of the multiple imaging modalities for evaluation, with emphasis on MRI. 2. Describe imaging features of various musculoskeletal soft-tissue sarcomas. 3. Identify a differential diagnosis based on imaging characteristics, anatomic location, gender, and age. 4. Describe a plan for biopsy based on tumor location and size. 5. Discuss management and treatment, including monitoring treatment response and evaluating for recurrence.

CONTENT DESCRIPTION: Musculoskeletal soft-tissue sarcomas are best imaged with MRI. Metastatic disease can be further evaluated with CT, in addition to chest wall lesions. Ultrasound plays a more limited role. There are many types of soft-tissue sarcomas. The most common are undifferentiated pleomorphic sarcoma and liposarcoma. They are of mesenchymal origin and originate from the connective tissues. Determining the exact diagnosis from imaging is difficult except for some benign soft-tissue tumors. Biopsy is the gold standard. Biopsy planning requires consultation with the orthopedic oncologic surgeon in conjunction with diagnostic imaging for a planned route of entry and region of interest to biopsy. Post-treatment evaluation is best done with MRI; however, metastatic workup can be done with body CT including PET.

(E-57) Wednesday • 7:00 AM
Radiologic Approach to Chondroid Lesions of Bone, with Emphasis on Radiographic and MR Imaging Appearance

Nicholas Bhojwani, MD; Nathan P. Fergus, MD, *University Hospitals Case Medical Center, Cleveland, OH;* Mark R. Robbin, MD

LEARNING OBJECTIVES: 1. Explain the role of the multiple imaging modalities for evaluation. 2. Describe imaging features of various chondroid lesions of bone. 3. Identify a differential diagnosis based on imaging characteristics, anatomic location, sex, and age. 4. Describe a plan for biopsy based on tumor location and size. 5. Discuss management and treatment, including monitoring treatment response and evaluating for recurrence.

CONTENT DESCRIPTION: Imaging characteristics include tumor size, mineralization, periosteal reaction, extension, signal characteristics, edema, and surrounding margins. Age, sex, and anatomic location can be an aid to imaging for narrowing a differential diagnosis; however, histologic diagnosis can be necessary. Benign and malignant chondroid bone lesions will be presented, in addition to those involving syndromes. Examples of chondroid bone lesions include enchondroma, osteochondroma, chondroblastoma, periosteal chondroma, chondrosarcoma, and chondromyxoid fibroma. Radiologic-pathologic correlation will also be provided.

(E-58) Thursday • 7:00 AM
Fracture Classification: Finding a Common Language for Radiology and Orthopedic Residents

Philip J. Benfield, MD, *Wake Forest Baptist Medical Center, Winston-Salem, NC*; Bahram Kiani, MD, MHA; Leon Lenchik, MD; Scott D. Wuertzer, MD

LEARNING OBJECTIVES: 1. Explain the importance of fracture classification systems. 2. Describe a universal classification system useful for radiology and orthopedic residents.

CONTENT DESCRIPTION: Fracture classification systems of the 19th century were based on clinical appearance of the traumatized limb. In the early 20th century, these were replaced with systems based on radiographs. In the late 20th century, CT-based systems gained wider acceptance. We show examples of common classification systems, including Neer (proximal humerus), Garden (femoral neck), Schatzker (tibial plateau), and Lauge-Hansen (ankle). These systems helped standardize the approach to fracture treatment and helped manage patient expectations. The problems with these classifications stem from inconsistent radiographic projections and difficulty in positioning of severely traumatized patients. This results in high interobserver and intraobserver variation. The Orthopaedic Trauma Association (OTA) fracture classification attempts to correct that with a standard set of questions applicable to any bone: Which bone? Where in bone (proximal, distal, diaphyseal)? Which type (extraarticular, intraarticular, etc)? Which group (spiral, wedge, etc)? Which subgroup (differs by bone)? We show examples of OTA classification applied to various parts of the skeleton. We argue that the OTA fracture classification is especially useful for radiology residents because it allows them to speak a common language with orthopedic residents.

(E-59) Wednesday • 7:00 AM
Demystifying Musculoskeletal MR Imaging for 1st-Year Radiology Residents

Philip J. Benfield, MD, *Wake Forest Baptist Medical Center, Winston-Salem, NC*; David A. Pacholke, MD; Leon Lenchik, MD; Scott D. Wuertzer, MD

LEARNING OBJECTIVES: 1. Explain an approach to musculoskeletal MR that does not intimidate 1st-year residents prior to their initial MR rotation. 2. Identify key anatomic structures in the most frequently imaged joints, including shoulder, knee, and ankle. 3. Describe typical findings of tendon, ligament, bone, and cartilage pathology on MR. 4. Discuss this pathology and anatomy through case examples.

CONTENT DESCRIPTION: This educational exhibit presents a simple approach to musculoskeletal MR for 1st-year residents. Because most 1st-year residents learn the osseous anatomy through initial plain film exposure, this exhibit will focus on the key ligaments and tendons of the shoulder, knee, and ankle that are better visualized on MR. An emphasis will be placed on the specific imaging plane and the anatomic structures that should be reviewed on each series. Because MR characteristics of tendon, ligament, bone, and cartilage pathology generally remain the same regardless of location, an overview of these MR characteristics is essential. The approach will be illustrated through numerous case examples so that the 1st-year radiology residents feel less intimidated by musculoskeletal MR.

(E-60) Thursday • 7:00 AM
Basic Principles and Common Pitfalls of Arthrography

Jacob Benfield, *Wake Forest University School of Medicine, Winston-Salem, NC*; Leon Lenchik, MD; Bahram Kiani, MD, MHA; Scott D. Wuertzer, MD *(swuertze@wakehealth.edu)*

LEARNING OBJECTIVES: 1. Describe the role of arthrography in musculoskeletal imaging. 2. Explain basic techniques for common joint injections. 3. Discuss joint-specific techniques, including key access targets and joint capacities. 4. Identify pitfalls and complications of arthrography, with strategies to avoid them.

CONTENT DESCRIPTION: This educational exhibit focuses on an organized approach to musculoskeletal arthrography for common joints. Precise patient positioning and needle placement are emphasized. The appearances at injection, including early and late appearance of intraarticular contrast, are correlated with anatomical structures. Additionally, the methods and materials for specific joints will be presented, including common joint volumes, contrast dilutions, and needle selection for the shoulder, hip, elbow, knee, and wrist. The goal is to provide a guide for beginning arthrographers. The pitfalls of poor patient positioning and common complications of arthrography will be discussed. Strategies to avoid these complications, including alternate needle routes, will be presented.

(E-61) Wednesday • 7:00 AM
Dual X-ray Absorptiometry Interpretation Primer: Avoiding Reporting Pitfalls

Jacob Benfield, *Wake Forest University School of Medicine, Winston-Salem, NC*; Bahram Kiani, MD, MHA; Scott D. Wuertzer, MD; Leon Lenchik, MD

LEARNING OBJECTIVES: 1. Describe our approach to DXA interpretation and reporting. 2. Discuss common pitfalls of DXA interpretation and reporting.

CONTENT DESCRIPTION: We discuss our approach to DXA interpretation and present our template for DXA reporting. We show examples of major reporting pitfalls: (1) use of more than one WHO diagnostic category per patient, (2) not including a statement on fracture risk, and (3) not including the significance of BMD change on follow-up exams. We show examples of minor reporting pitfalls: (1) incorrect patient demographics, (2) no mention of scanner make/model, (3) no mention of technical limitations of the study, (4) no mention of what spine and hip regions of interest were used, (5) no explanation for vertebra excluded from region of interest, (6) no mention of artifacts that can influence BMD, (7) reporting of Ward's region, (8) incorrect use of WHO diagnostic categories, (9) use of T-scores instead of Z-scores in inappropriate patients, (10) using FRAX in inappropriate patients, (11) no mention of the date of previous DXA, (12) no mention of time interval for follow-up DXA, and (13) no mention of what patients meet criteria for pharmacologic therapy. By presenting common reporting pitfalls, this exhibit is intended to improve DXA interpretation.

Neuroradiology

(E-68) Thursday • 7:00 AM
Spontaneous Spinal Cerebrospinal Fluid Leak: Imaging Characteristics and Treatment Options

Benjamin Nasman, DO, *Aultman Hospital, Canton, OH*; Kelly A. Covey, MD, BS; Samuel T. Braden, MS, MD; Joseph A. Mendiola, MD

LEARNING OBJECTIVES: 1. Describe the clinical presentation and imaging characteristics of intracranial hypotension and spontaneous spinal cerebrospinal fluid leak. 2. Describe treatment options to correct spontaneous spinal cerebrospinal fluid leak.

CONTENT DESCRIPTION: Spontaneous spinal cerebrospinal fluid leaks (SCSFLs) are being diagnosed with increasing frequency as a cause of headache. Patients with SCSFL classically present with postural headaches, typically after some sort of strenuous activity. Additional clinical features can include visual changes, neck pain, nausea, and vomiting, making it difficult to distinguish from the more common causes of headaches. Imaging characteristics of intracranial hypotension on MRI of the brain are important to recognize in order to suggest the possibility of SCSFL. These include dural thickening and enhancement, a "sagging" appearance of the brain, and subdural hygromas/hematomas. Evaluation of the spine with myelography can confirm the presence of a CSF leak with the presence of extradural contrast. Treatment for SCSFL may be difficult, as often the location of the leak is not readily identified by imaging. Initial treatment is focused on improving CSF volume. An epidural blood patch can also be attempted to prevent further leaking if the location of the leak is identified.

(E-69) Wednesday • 7:00 AM
Systematic Approach to Hyperdense Intracranial Masses

Ammar A. Chaudhry, MD, *Stony Brook University Medical Center, Stony Brook, NY*; Maryam Gul, MD, BS; Abbas A. Chaudhry; Robert G. Peyster, MD *(ammar.chaudhry@stonybrookmedicine.edu)*

LEARNING OBJECTIVES: 1. Describe the clinical presentation and imaging findings of hyperdense intracranial masses on noncontrast CT. 2. Discuss differential diagnoses (physiologic process, infection, inflammation, injury, and/or malignancy) that may result in hyperdense intracranial masses. 3. Identify key points that help to narrow the differential diagnosis.

CONTENT DESCRIPTION: ***Content Organization:*** I. Case-based demonstration of common and uncommon causes of hyperdense intracranial masses. II. Case examples, including malignant fibrous histiocytoma, hemangiopericytoma, hematoma, lymphoma, metastasis, abscess, meningioma, gliomas, desmoids, esthesioneuroblastoma, etc, and discussion of their different clinical findings, imaging features, histopathophysiology, treatment, and prognosis. III. Chart of salient features for quick reference. ***Summary:*** Hyperdense intracranial lesions are a common finding on noncontrast CT, and their presence should be explained, as these may be from a benign or malignant process. Differential can be narrowed utilizing age, clinical features, and imaging characteristics of the hyperdense lesion (eg, MRI findings, enhancement pattern, necrosis, cystic degeneration, etc). At the end of the presentation, the viewer should be able to aid in the workup, guide any potential biopsy, and recommend appropriate imaging follow-up.

(E-70) Thursday • 7:00 AM
Diffusion-Tensor Imaging and Tractography Made Easy

Jeremy B. Nguyen, MD, MS, *Tulane University, New Orleans, LA*; Christian Fauria, MD; Bruce Bordlee, MD; Mandy C. Weidenhaft, MD; Enrique Palacios, MD; Harold R. Neitzschman, Jr, MD *(jnguye2@tulane.edu)*

LEARNING OBJECTIVES: 1. Explain the physical principles and mathematics of diffusion-tensor imaging (DTI). 2. Describe the utilization of the DTI data. 3. Explain the principles of tractography.

4. Describe normal anatomy of the fiber tracts of the brain in correlation with tractography of the white matter. 5. Discuss the clinical applications of DTI to characterize disease processes in the brain, including stroke, neoplasm, neurodegenerative disorders, congenital anomalies, traumatic brain injury, and demyelinating disease.

CONTENT DESCRIPTION: Diffusion-tensor imaging (DTI) is an advanced form of diffusion imaging in magnetic resonance imaging (MRI) that has shown useful applications in clinical imaging. However, understanding DTI is no easy task, since it involves highly complex mathematics and physics of tensor analysis. Diffusion imaging is based on the inherently random motion of the molecules known as brownian motion. DTI exploits this characteristic motion of water molecules in tissues, allowing full characterization of molecular diffusion in the three dimensions of space. Diffusion anisotropy effects can be fully extracted, characterized, and utilized, thus providing even more exquisite details on tissue microstructure. The two most common scalar metrics are fractional anisotropy (FA) and mean diffusivity (MD), which are used to generate images of the diffusion data. Tractography can also be performed using data from DTI to allow the mapping of the white matter tracts in the brain. Illustrations will be provided to ease the understanding of tensor theory as applicable to diffusion imaging. MR images of the brain based on diffusion data and fiber tracts will be displayed.

AMSER Henry Goldberg Medical Student Award

(E-71) Wednesday • 7:00 AM
Creating an Inexpensive Educational Lumbar Spine Model for Teaching Fluoroscopy-guided Intervention

Thomas McLaren, BS, *Quillen College of Medicine, Johnson City, TN*; Austin C. Bourgeois, MD; Austin R. Faulkner, MD; Kathleen T. Hudson, MD; Alexander S. Pasciak, PhD* *(Austincb@gmail.com)*

LEARNING OBJECTIVES: Fluoroscopically guided needle placement is an essential skill taught to nearly every lower-level radiology trainee. Procedures in the lumbar spine such as the lumbar puncture (LP) and facet injection are among the most commonly performed examples of this technique. In spite of their commonality, these procedures are often performed without expert knowledge of bony landmarks, experience with image guidance equipment, or other formal training. These factors are at least partially a result of the prohibitively expensive nature of the few commercially available and fluoroscopically compatible training models. Some of these models exceed $3500 in cost. We describe the creation of an easily reproducible, inexpensive, and reusable phantom for use in conjunction with a formal education curriculum for teaching fluoroscopically guided spine intervention.

CONTENT DESCRIPTION: This education exhibit explores the synthesis of several months of trial and error in the creation of a lumbar spine phantom that fulfills the following requirements: (1) easily reproducible, (2) possessing accurate anatomic detail under fluoroscopy, (3) durable, (4) reusable, and (5) inexpensive. This model is utilized as part of a formal educational curriculum in our department aimed at reducing fluoroscopy time and improving resident confidence with the lumbar puncture. We provide pictorial directions of the lumbar spine phantom creation process, a QR code link to downloadable instructions, and suggestions of other ways to utilize this technology for resident education.

(E-72) Thursday • 7:00 AM
Restricted Diffusion in the Brain: Do Not Be Restricted to Stroke

Mrudula Penta, MD, *University of Texas Southwestern Medical Center, Dallas, TX*; Jed Hummel, MD; Dianne B. Mendelsohn, MD; Chien I. Yang, MD; Evelyn Babcock, PhD; Marco Pinho, MD *(marco.pinho@utsouthwestern.edu)*

LEARNING OBJECTIVES: 1. Identify the principles of biological mechanisms, the basics of MR image acquisition, and pearls of clinical interpretation for brain diffusion-weighted imaging (DWI). 2. Describe typical and atypical DWI patterns of stroke, with a focus on pathophysiology and etiology. 3. Discuss a comprehensive pictorial review of brain lesions other than stroke that restrict diffusion, highlighting key imaging and clinical features for differential diagnoses.

CONTENT DESCRIPTION: Stroke is the most common cause for restricted diffusion and, not surprisingly, what first comes to mind for radiologists interpreting MRI scans. However, looking beyond stroke into other differential diagnoses is essential to provide accurate interpretations and add valuable diagnostic information to patient care. We aim to present a pictorial review, discussing the differential diagnosis of brain lesions that present with restricted diffusion on MRI, thereby mimicking acute infarcts. These will include infections such as herpes encephalitis and Creutzfeldt-Jakob disease; vascular processes such as PRES and transient global amnesia; neoplasms such as lymphoma, metastases, and glioma; metabolic processes such as central pontine myelinolysis and hyperammonemic encephalopathy; genetic diseases such as MELAS and Leigh's; and excitotoxic brain injury such as sustained seizure activity and acute wallerian degeneration. We will highlight clinical and imaging characteristics that should prompt radiologists to consider possibilities other than stroke when faced with such lesions.

(E-73) Wednesday • 7:00 AM
Things You May Wonder about in Neuroradiology: "Don't Touch Lesions" in the Spine

Lee W. Chen, MD, *University of Texas Southwestern Medical Center, Dallas, TX*; Yi Ju Chuang, MD; Marco Pinho, MD; Carlos L. Perez, MD, BS; Korgun Koral, MD; Richard Suss, MD *(marco.pinho@utsouthwestern.edu)*

LEARNING OBJECTIVES: Common and uncommon spinal "don't touch lesions" (DTLs) identified on conventional radiographic CT and MR spine studies of adult and pediatric patients will be presented and organized by the following categories: paraspinal, vertebral, and intraspinal. Typical and atypical imaging characteristics will be highlighted with representative images and descriptions. Pathological differential diagnoses will be presented for DTLs.

CONTENT DESCRIPTION: Spinal imaging frequently reveals incidental anatomic and developmental variants, as well as benign lesions, both congenital and acquired. These "don't touch lesions" (DTLs) may mimic clinically significant pathology, but imaging findings are often typical enough to permit an accurate imaging diagnosis. To avoid unnecessary additional imaging or procedures, it is important for the interpreting radiologist to have a functioning knowledge of the common appearance of spinal DTLs.

(E-74) Thursday • 7:00 AM
Lucent Lesions of the Mandible

Frank M. Landino, DO, MPH, MS, *Yale-New Haven Hospital/Yale University, New Haven, CT*; James J. Abrahams, MD; Jodi L. Schielke, DO

LEARNING OBJECTIVES: 1. Identify and describe imaging appearances of lucent lesions in the mandible that are of odontogenic and nonodontogenic etiologies. 2. Explain key imaging features of odontogenic versus nonodontogenic lucent mandibular lesions that allow more accurate diagnosis. 3. Describe the differential diagnosis for lucent mandibular lesions, including odontogenic and nonodontogenic etiologies.

CONTENT DESCRIPTION: I. Origin (brief review of embryology and pathology) of major lucent odontogenic lesions in the mandible. II. Origin (brief review of embryology and pathology) of major lucent nonodontogenic lesions in the mandible. III. Key imaging features and important radiologic descriptors related to lesions of odontogenic versus nonodontogenic etiology. IV. Differential diagnosis with imaging (radiographic, CT, and MRI as appropriate) examples of lucent mandibular lesions of odontogenic and nonodontogenic etiology.

---

* Faculty financial disclosures are located in the Faculty Index.

Nuclear Medicine

(E-62) Thursday • 7:00 AM

Hot Deliveries: What the Radiologist Needs to Know about the Receipt of Radioactive Materials

Emily A. Dunn, MD, *SUNY Downstate Medical Center/Kings County Hospital Center, Brooklyn, NY*; Brian J. Magee, DO; Anju Dubey, MD; Sherlin Lavianlivi, MD *(emilyadunn@gmail.com)*

LEARNING OBJECTIVES: 1. Describe Department of Transportation (DOT) transport group classification, packaging requirements, and labeling requirements. 2. Explain how to perform a contamination survey when receiving radioactive materials in the nuclear medicine department, and describe threshold limits of contamination. 3. Describe Nuclear Regulatory Commission (NRC) requirements for record keeping.

CONTENT DESCRIPTION: The NRC has strict policies for the monitoring and record keeping associated with transportation of medical radioisotopes. These policies are designed to prevent and detect radioactive contamination. As authorized users of medical radioisotopes, radiologists are responsible for supervising the receipt of nuclear material. We will review the requirements of the NRC and DOT relating to the receipt of radioisotopes in the nuclear medicine department. Pictorial information presented will enable identification of packaging containing radioactive material, which must be surveyed. The technique for surveying a package to determine surface dose rate will be demonstrated. Additionally, we will review threshold limits for surface contamination and what must be done when a package is contaminated. Procedures for returning waste materials to suppliers will be reviewed. NRC record-keeping requirements will be outlined. With the information provided in this educational poster, a radiologist will learn the fundamental information necessary to safely supervise the receipt of packages in the nuclear medicine department.

(E-63) Wednesday • 7:00 AM

Nuclear Regulatory Commission Authorized User Eligibility Training and Experience Requirements: Creating a Dedicated Multifaceted Curriculum

Martha Ksepka, MD, *Rutgers-Robert Wood Johnson Medical School, New Brunswick, NJ*; Jeffrey Kempf, MD; Sandip Basak, MD *(JKempf@univrad.com)*

LEARNING OBJECTIVES: 1. Describe and explain current NRC, ABR, and ACGME Authorized User (AU) training requirements. 2. Explain the ABR Radioisotope Safety Exam (RISE) curriculum and testing on the new ABR Core and Certifying Exams. 3. Describe our multifaceted approach to AU training and experience that we have developed at our institution.

CONTENT DESCRIPTION: Nuclear medicine AU eligibility training in a diagnostic radiology (DR) residency entails numerous requirements, as defined by the NRC, ABR, and ACGME. Understanding, fulfilling, and documenting the varied requirements has become challenging for residents and faculty over the years, including recent additions of the new ABR Core and Certifying Exams. We have developed a multifaceted approach to AU eligibility at our institution, beginning the process from day 1 for our new radiology trainees with a didactic introduction to AU training requirements, including a detailed description of AU status and the ABR steps to attain it. Each resident is mentored by a nuclear medicine radiologist, a core faculty member, who closely monitors and documents their work experience, including their iodine-131 case training/logs. Residents are taught in the classroom, as well as the laboratory, by a medical physicist and hospital radiation safety officer, as well as NM radiology faculty. Residents are given didactic and hands-on lab training on topics ranging from radiation physics to containing radioactive spills, with coverage of the RISE curriculum. All residents are required to complete the RSNA/AAPM online physics modules at least twice prior to taking the ABR Core Exam. Our 3rd-year residents receive additional instruction at an outside radiopharmacy, including generator elution training, and our 4th-year residents train at a nearby cyclotron facility. We have created an "AU-passport" that is given day 1 to each 1st-year resident, to allow documentation of each step of their AU training along the way. Our poster will help clarify the road to AU eligibility and the approach we have developed to optimize AU training for our radiology residents.

(E-64) Thursday • 7:00 AM

^{18}F-FDG PET/CT Imaging of Pancreatic Carcinoma: A Pictorial Review

Devaki Shilpa Surasi, MBBS, *University of Alabama at Birmingham, Birmingham, AL*; Michelle M. McNamara, MD; Mark Langston, MD; Pradeep Bhambhvani, MD; Janis P. O'Malley, MD

LEARNING OBJECTIVES: This presentation will allow readers to better understand the utility of PET/CT in pancreatic cancer. This includes (1) review of CT and PET/CT protocols, (2) case review of initial staging and restaging of pancreatic malignancies, (3) correlation with other imaging modalities like enhanced CT and MRI, and (4) potential pitfalls and limitations of PET/CT imaging.

CONTENT DESCRIPTION: Pancreatic cancer is the fourth most common cause of cancer-related deaths in the United States. At presentation, 7% of tumors are confined to the pancreas, 40% are locally advanced, and 53% have distant metastases. Surgery is the only option for cure, although only 15%–20% of the cases are resectable. Advances in neoadjuvant chemotherapy can convert unresectable cases to surgical candidates. Therefore, methods to better stage, restage, and monitor therapy are needed. FDG PET offers significant information and ability to impact therapy. CT, MRI, and endoscopic ultrasound (EUS) remain the primary methods for diagnosis and staging. This poster will highlight the utility of PET for detection of occult metastasis and local and distant recurrence and for monitoring treatment response.

(E-65) Wednesday • 7:00 AM

FDG PET Brain Studies: What to Look for on Correlative CT/MR Imaging

Asha Kandathil, MBBS, MD, *University of Michigan, Ann Arbor, MI*; Andrew T. Trout, MD; Hemant A. Parmar, MD*; Kirk Frey*; Richard K. Brown, MD*

LEARNING OBJECTIVES: To provide the nuclear medicine physician with a working knowledge of the metabolic and correlative imaging features of intracranial lesions incidentally detected on FDG PET/CT studies by (1) reviewing typical metabolic signatures, (2) emphasizing review of correlative anatomic images to narrow the differential diagnosis, and (3) identifying characteristic CT/MRI findings to allow the nuclear physician to make common diagnoses.

CONTENT DESCRIPTION: Incidental intracranial lesions are seen in 1/20 patients imaged by FDG PET/CT. Lesion detection and interpretation require recognition of characteristic metabolic and anatomic appearances. We present examples of benign and malignant intracranial lesions seen by FDG PET/CT, including, but not limited to, brain metastases, primary and recurrent intraaxial tumor, radiation necrosis, meningioma, encephalomalacia, and developmental and vascular malformations. We will review the metabolic and anatomic characteristics of these lesions on PET/CT and emphasize findings on CT and MRI that can be used to refine a diagnosis.

---

* Faculty financial disclosures are located in the Faculty Index.

(E-66) Thursday • 7:00 AM
Nonosseous Findings on ^{99m}Tc-MDP Bone Scans: When Do You Need SPECT/CT and Correlative Imaging to Reach the Diagnosis?

Hatice Savas, MD, *University of Michigan, Ann Arbor, MI*; Asha Kandathil, MBBS, MD; Ka Kit O. Wong, MBBS, MD; Daniel O. Wale, DO; Ehab H. Youssef, MBBCh, MD, PhD; Richard K. Brown, MD* *(rkjbrown@med.umich.edu)*

LEARNING OBJECTIVES: 1. Describe examples of common and uncommon nonosseous findings on ^{99m}Tc-MDP bone scan that readers may encounter in routine clinical practice. 2. Explain the importance of detecting nonosseous findings. 3. Discuss the mechanism(s) underlying radiotracer uptake in extraosseous structures.

CONTENT DESCRIPTION: Nonosseous findings on bone scan are often encountered in routine practice. Proper interpretation of these cases requires recognition of nonosseous findings, understanding the underlying mechanism(s), and knowledge of the various etiologies that cause these findings. We present examples of soft-tissue tumors, renal masses, organ uptake (ie, hepatic, cardiac, and uterine), pleural effusions and ascites, and factors that can alter the normal biodistribution, including alumina breakthrough and dehydration. ^{99m}Tc-MDP bone scan is an important diagnostic tool for identifying osseous metastatic disease and for investigation of benign bone disorders. Nonosseous uptake should be recognized and further evaluated when needed. Understanding the underlying mechanism(s) and having familiarity with the common and uncommon etiologies causing these findings will result in improved scan interpretation and better patient care.

(E-67) Wednesday • 7:00 AM
Metabolic Bone Disease: Nuclear Imaging Spectrum of Rare and Frequent Findings—Correlation with Other Imaging Modalities and Pathologic Changes

Nael Khayyat, MD, *William Beaumont Hospital, Dearborn, MI*; Richard Joyrich, MD; Luis Goncalves, MD*

LEARNING OBJECTIVES: ***Background Information:*** Metabolic bone diseases may have an unusual appearance and can be confused with osseous metastasis or other diseases. The expansion of the utilization of different old and new imaging modalities is improving the accuracy of disease evaluation; however, the radiologist must be familiar with the radiologic spectrum in different imaging modalities. ***Education Goals/Teaching Points:*** 1. Demonstrate the nuclear imaging spectrum of metabolic bone diseases, and correlate with other imaging modalities. 2. Demonstrate the pathologic changes. 3. Correctly identify the differential diagnosis. 4. Identify disease progression and complications. 5. Demonstrate the role of the radiologist in treatment planning.

CONTENT DESCRIPTION: I. Pathologic changes in all stages of metabolic bone diseases. II. Correlation of pathologic changes with different imaging modalities. III. Appearance of each disease in different imaging modalities. A. MDP bone scan, ^{111}In-octreotide, and other different radionuclides. B. Multiple PET/CT radiotracers, including ^{18}F-FDG, ^{11}C-choline, and others. IV. Differential diagnosis and correlation with other imaging modalities. V. Role of the radiologist in treatment planning.

Pediatric Radiology

(E-75) Wednesday • 7:00 AM
Critical Imaging Features in the Recognition of Gastric Volvulus in Children

Anjum Bandarkar, MD, *Children's National Medical Center, Washington, DC*; Adebunmi Adeyiga, MD; Abhimanyu Aggarwal, MBBS; Anna Blask, MD *(anjumnb@gmail.com)*

LEARNING OBJECTIVES: 1. Describe the clinical presentation, radiological findings, and complications of gastric volvulus in children. 2. Identify the critical imaging features that aid in its prompt recognition and expedite management.

CONTENT DESCRIPTION: Gastric volvulus is a rare, potentially life-threatening clinical entity where the stomach twists on itself by more than 180°, thereby creating a variable obstruction of its contents that may result in strangulation. This condition may not be readily recognized clinically or radiographically. Prompt diagnosis and emergent surgical intervention are necessary in the acute setting, while surgery may be planned for the chronic form of volvulus. Predisposing factors are presence of Bochdalek hernia/other diaphragmatic defects, neurological impairment, and prior upper abdominal surgery. Complications include gastric ischemia, necrosis, perforation, and peritonitis. Two forms of gastric volvulus are described: *(a)* organoaxial type, where the stomach rotates along its longitudinal axis that connects the cardia and pylorus, giving rise to an upside-down or horizontal configuration of the stomach; and *(b)* mesenteroaxial type, where the stomach rotates along an axis perpendicular to its long axis such that the stomach lies in a vertical plane with the antrum and pylorus projected anteriorly and superiorly to the gastroesophageal junction. Critical imaging features include (1) marked gastric distention; (2) paucity of distal gas; (3) unusual course of nasogastric tube; (4) differential air-fluid levels in left upper quadrant; (5) diaphragmatic elevation; (6) inversion of greater curvature to the right, typically seen in organoaxial type; (7) gastroesophageal junction located at a lower level compared to the pylorus, which may project higher beneath the left hemidiaphragm, typically seen in the mesenteroaxial type; and (8) delayed gastric emptying with either partial or complete outlet obstruction.

---

* Faculty financial disclosures are located in the Faculty Index.

Women's Imaging

(E-76) Thursday • 7:00 AM
Review of Hysterosalpingography and Common Causes of Misdiagnosis

Corey Ho, MD, BA, *Beth Israel Medical Center, New York, NY*; James E. Silberzweig, MD; Vetana Seit-Khalil, MD *(cho@chpnet.org)*

LEARNING OBJECTIVES: 1. Explain the importance of hysterosalpingography (HSG). 2. Describe common techniques of HSG. 3. Discuss common pitfalls of HSG that lead to cases of misdiagnosis.

CONTENT DESCRIPTION: I. Introduction. II. Common techniques used for HSG. III. Causes for misdiagnosis. IV. Summary: Hysterosalpingography is a powerful tool in the evaluation of infertility. Although its validity has been questioned, positive predictive values have been seen as high as 84.5%. Optimizing the procedure and understanding the basic causes of misdiagnosis are paramount in maximizing the yield of this diagnostic test.

(E-77) Wednesday • 7:00 AM
Reviewing the Role of Pre- and Postoperative Pelvic MR Imaging in Patients Undergoing Uterine Artery Embolization

Jenanan Vairavamurthy, MD, *Beth Israel Medical Center, New York, NY*; Rydhwana Hossain, MD; Alexander C. Kagen, MD*; James E. Silberzweig, MD

LEARNING OBJECTIVES: 1. Explain the classification of uterine leiomyomas. 2. Describe the clinical presentation and treatment of uterine leiomyomas. 3. Describe the normal and variant preoperative MR appearance of uterine leiomyomas. 4. Identify pertinent findings on preoperative MRI related to uterine artery embolication. 5. Identify pertinent findings on postembolization MRI.

CONTENT DESCRIPTION: I. Classification and imaging appearance of uterine leiomyomas. A. Submucosal. B. Intramural. C. Subserosal. D. Peduculated. E. Intracavitary. F. Lipoleiomyoma. G. Extrauterine leiomyomas. H. Degenerated and nondegenerated leiomyomas. II. Clinical symptoms. A. Bleeding. B. Infertility. C. Mass effect within the pelvis. III. Preoperative MRI. A. Location. B. Appearance. C. Vascularity. D. Contraindications. IV. Postoperative MRI. A. Expected findings. B. Complications.

(E-78) Thursday • 7:00 AM
Cornual, Interstitial, and Angular Pregnancies: Clarifying the Terms and a Review of the Literature

Elizabeth K. Arleo, MD, *New York-Presbyterian/Weill Cornell Medical Center, New York, NY*; Ersilia M. DeFilippis, BA *(ela9033@med.cornell.edu)*

LEARNING OBJECTIVES: 1. Define cornual, interstitial, and angular pregnancy. 2. Identify these entities more comfortably on multiple modalities. 3. Describe the differences in prognosis and management between interstitial and angular pregnancy.

CONTENT DESCRIPTION: The poster's major sections include the following: I. Anatomy and nomenclature. II. The confusion: three issues. III. Diagnostic modalities and findings: laparoscopy and hysteroscopy, US (2D and 3D), and MRI. IV. Prognosis and management.

(E-79) Wednesday • 7:00 AM
Radiologic Manifestations of Intrauterine Device Mishaps

Tiffany M. Newman, MD, *New York-Presbyterian/Weill Cornell Medical Center, New York, NY*; Kemi T. Babagbemi, MD*; Lily M. Belfi, MD

LEARNING OBJECTIVES: 1. Identify abnormal IUD position on various imaging modalities. 2. Explain when to recommend appropriate follow-up exam if IUD is not identified on initial exam. 3. Describe complications associated with IUD placement and their radiologic manifestations. 4. Identify urgent findings, and describe appropriate follow-up recommendations when an IUD has migrated or is abnormal in position. 5. Discuss radiologic and pathologic correlation of IUD abnormalities with clinical follow-up.

CONTENT DESCRIPTION: Intrauterine device (IUD) placement is one of the most common methods of temporary contraception, with an efficacy of about 97%. IUDs are a safe method for long-term use and are placed transvaginally within the uterine cavity. However, utilization of IUDs is associated with risks of pelvic infection, pelvic pain, and abnormal bleeding, as well as more serious complications such as migration and uterine perforation. Transvaginal sonographic examination of the pelvis is essential in the evaluation of patients prior to and after IUD placement. It is the test of choice in patients with an "absent IUD string" on physical exam. Sonographic features of an appropriately placed IUD include a distinct hyperechoic structure with a central location in the endometrial cavity, placement of the side arms of a T-shaped device within the uterine fundus, and location of the stem at or above internal os. We pictorially review normal radiologic IUD position and several cases of IUD mishaps in patients who presented for routine or emergent evaluation. We will review the clinical history and follow-up associated with the abnormal IUDs, as well as the pathologic correlation. For example, we review the imaging of two patients with live intrauterine pregnancies with an IUD in place and their associated sonographic and pathologic findings. We review a patient with uterine perforation from a migrated IUD and her surgical outcomes. Additional cases of abnormally positioned IUDs are reviewed pictorially. We then discuss the radiologist's role in identifying IUD mishaps and the appropriate recommendations for imaging and/or clinical follow-up.

(E-80) Thursday • 7:00 AM
Complications of Intrauterine Device Placement

Joe L. Farnam, MD*, *Brown University/Rhode Island Hospital, Providence, RI*; Ana P. Lourenco, MD *(jfarnam@lifespan.org)*

LEARNING OBJECTIVES: 1. Identify normal IUD positioning, based on an understanding of the material used in IUD manufacture and its corresponding radiographic, computed tomographic, and sonographic properties. 2. Describe the variety of complications associated with IUD placement and the associated findings; this will outline an appropriate algorithm for imaging IUD patients, given the diverse clinical histories and imaging findings. 3. Explain the implications related to these complications and the importance of communicating these results.

CONTENT DESCRIPTION: IUDs have been commonly used worldwide for contraception and have been increasingly utilized within the United States since the introduction of a device (Mirena; Bayer Healthcare, Wayne, NJ) into the U.S. market in 2001. Given the increased use of these devices, complications may be more frequently encountered at imaging, and radiologists should be familiar with the imaging findings. Specifically, knowledge of both normal and abnormal findings is paramount. In addition, communication of abnormal findings to both the patient and referring provider is critical to prevent unintended pregnancies, as inappropriately located IUDs may not provide effective contraception. The first section will demonstrate the appearance of a variety of normally positioned

---

* Faculty financial disclosures are located in the Faculty Index.

IUDs, emphasizing the appearance using 3D ultrasound. The second section will focus on several complications associated with IUD placement, including inappropriately low position within the uterus or cervix, T-arms inappropriately rotated away from the fundus, IUD embedded within the myometrium, IUD embedded within a fibroid, IUD perforated through myometrium or fallopian tube, and an intrauterine pregnancy with an IUD in place. Examples of these will be demonstrated on a variety of imaging modalities, including US, 3D US, radiography, CT, and MRI. The third section will outline the clinical ramifications expected with the above complications.

(E-81) Wednesday • 7:00 AM

How to Have Perfect Aim: The Radiology Resident's Guide to US-guided Breast Biopsy

Bo Li, MD, *St Luke's-Roosevelt Hospital Center, New York, NY*; Bradley Handler

LEARNING OBJECTIVES: 1. Explain the indications for an ultrasound-guided breast biopsy, including the importance of assimilating a patient's clinical history and previous past surgical history, BI-RADS category, and mammographic findings. 2. Describe the method of technique, mode of equipment, and physical maneuvers when attempting a needle biopsy while using a breast phantom simulator. In our tutorial, we are using the Blue Phantom Breast Ultrasound Training Model (CAE Healthcare, Sarasota, FL) for reference. 3. Discuss the results of an ultrasound-guided breast biopsy, noting concordance with the mammographic findings and carrying out the proper follow-up and/or treatment.

CONTENT DESCRIPTION: I. Introduction: assimilating a patient's history and mammographic findings. II. Equipment: ultrasound probe settings; needle types and sizes. III. Method and technique: how to use a breast phantom simulator. IV. Results: assessing concordance; follow-up versus treatment. V. What's next: residency curriculum.

(E-83) Wednesday • 7:00 AM

Pregnancy of Unknown Location: Solving the Diagnostic Dilemma

Sindhura Alapati, MD, MBBS, *University of Arkansas for Medical Sciences, Little Rock, AR*; Teresita L. Angtuaco, MD

LEARNING OBJECTIVES: 1. Describe how to design an approach for making the diagnosis of pregnancy of unknown location easier to navigate, especially for new incoming residents. 2. Identify and establish follow-up protocols as a standard of reference for new residents taking call.

CONTENT DESCRIPTION: The first trimester of pregnancy is fraught with many significant risks that increase morbidity and mortality. As radiologists, we are reminded of this reality when a patient presents for the first time in the emergency room with a positive pregnancy test in association with other symptoms. We play an essential role in determining the outcome for these patients. Since the management options vary tremendously according to the patient's symptoms and the results of diagnostic studies, it is imperative that we develop an efficient and cost-effective algorithm to reach an accurate diagnosis and guide physician management to achieve the best patient outcome. A review of patients seen in the emergency room in the past 2 years with positive pregnancy tests was performed. A flowchart was created, formulating the differential diagnosis in the most common as well as rare case scenarios. Follow-up protocols were established wherever required. Follow-up ultrasounds were reviewed to support the protocols. Proven cases are used to illustrate the efficacy of the algorithm created.

(E-84) Thursday • 7:00 AM

Radiogenomics in the Reading Room: A Review of the Relationships between Breast MR Imaging Findings in Stage 2 and 3 Cancer, Tumor Biomarker Subtypes, and Response to Neoadjuvant Chemotherapy

Elissa R. Price, MD, *University of California, San Francisco, San Francisco, CA*; Rita Mukhtar, MD; Christina Yau; Bonnie N. Joe, MD, PhD; Nola Hylton; Laura Esserman *(elissa.price@ucsf.edu)*

LEARNING OBJECTIVES: 1. Discuss the concept of radiogenomics in the context of breast imaging. 2. Describe the relationship between breast MRI phenotypes and tumor biomarker subtypes. 3. Describe the relationship between breast MRI phenotypes and *(a)* response to chemotherapy and *(b)* eligibility for breast conservation. 4. Describe the relationship between postneoadjuvant MRI findings, pathology, and tumor biomarker subtypes. 5. Discuss how understanding these relationships impacts the daily practice of breast imaging, ensuring the radiologist's relevance and added value to individualized patient management.

CONTENT DESCRIPTION: Radiogenomics (also known as imaging genomics) is the study of the correlation between cancer imaging features and gene expression. A literature base exists in the radiogenomics of breast cancer, particularly relating to breast MRI, but is published predominantly in the surgical and oncologic literature. This literature base demonstrates relationships between breast MRI phenotypes, tumor biomarkers, and response to neoadjuvant chemotherapy. For example, solid MRI phenotypes are more likely to represent ER-negative tumors. Response to neoadjuvant chemotherapy in locally advanced cancers, as measured on breast MRI, also varies by phenotype and by tumor biomarkers. For example, triple-negative and *HER2*-positive cancers demonstrate the highest reduction rates on posttreatment MRI. These biomarker subtypes (triple negative and *HER2* positive) also demonstrate the highest concordance between preoperative MRI tumor diameter and surgical pathology, allowing MRI in these cases to be highly reliable for surgical planning. However, hormone (estrogen and progesterone) receptor–positive and *HER2*-negative cancers have a higher rate of false negativity on posttreatment MRI, making surgical guidance more nebulous in these cases. In the era of personalized medicine, the radiologist needs to understand these relationships to remain a relevant and integral member of the clinical care team. The mantra of managing each individual breast cancer based on its specific biology needs to extend to the reading room.

(E-85) Wednesday • 7:00 AM

The Properly Positioned and the Malpositioned Intrauterine Device

Matthew L. Hoimes, MD, MS; Young H. Kim, MD, PhD; Byron Chen, MD; Larry Z. Zheng, MD; Kristina Nowitzki, MD, PhD, *University of Massachusetts Memorial Medical Center, Worcester, MA*; Nancy Resteghini, DO *(matthew.hoimes@umassmemorial.org)*

LEARNING OBJECTIVES: 1. Discuss the role of diagnostic imaging in the evaluation of the intrauterine device (IUD). 2. Describe critical imaging features of the properly positioned IUD and the malpositioned IUD for the radiologist.

CONTENT DESCRIPTION: The IUD is gaining popularity as a form of contraception, and the role of diagnostic imaging is crucial in evaluating for proper IUD position. This exhibit will review the imaging of the properly positioned and the malpositioned IUD and discuss current imaging recommendations and management considerations for the malpositioned IUD. Major topics will include (1) introduction to the types, use, and placement of IUDs; (2) demonstration of the normally positioned IUD on radiography, US, MDCT, and MRI; (3) demonstration of the spectrum of the malpositioned IUD through various case presentations: expulsion, displacement, embedment/perforation, and intraperitoneal IUD; and (4) discussion of the current imaging workup and management recommendations.

(E-87) Wednesday • 7:00 AM
Radiologic Findings and Pathologic Correlation of Lobular Carcinoma in Situ (LCIS) of the Breast: A Review and Implications for Screening and Diagnosis

Sha-har Admoni, *Weill Cornell Medical College, New York, NY*; Timothy D'Alfonso; Michele K. Drotman, MD *(sha2021@med.cornell.edu)*

LEARNING OBJECTIVES: 1. Describe cases of unusual imaging findings associated with a diagnosis of lobular carcinoma in situ (LCIS), a diagnosis that usually does not have correlated radiologic findings, focusing on mammography, ultrasound, and MR imaging. 2. Describe the pathologic features of LCIS. 3. Discuss the current standards of radiologic and clinical management for lesions with a pathologic diagnosis of LCIS obtained at either core and/or surgical biopsy.

CONTENT DESCRIPTION: Lobular carcinoma in situ (LCIS) of the breast is a pathology that is usually identified during biopsy as an incidental finding. However, LCIS is a significant finding, as women diagnosed with LCIS have a 30%–35% lifetime risk of breast cancer. LCIS has been described as clinically undetectable and with no associated radiographic findings. In this exhibit, we demonstrate several unusual imaging presentations that ultimately resulted in a pathologic diagnosis of LCIS. We discuss the cases of eight patients who presented with findings on mammogram, ultrasound, or MRI by illustrating and providing a discussion of these findings. We will then review the pathologic findings of LCIS, as well as other coexisting pathologies seen in these patients. Finally, we will discuss appropriate management of LCIS from a radiologic and a clinical perspective.

(E-89) Wednesday • 7:00 AM
Characterizing the Grades of Ductal Carcinoma in Situ on Imaging and Recognizing the Potential Mimics

Kathy M. Borovicka, MD, *William Beaumont Hospital, Royal Oak, MI*; Carol Mitri, MD *(Kathy.Borovicka@beaumont.edu)*

LEARNING OBJECTIVES: 1. Discuss the histopathologic classification of DCIS; and describe the spectrum of imaging characteristics, depending on the grade of DCIS, including with mammography, sonography, and magnetic resonance imaging (MRI). 2. Describe cases for each grade of DCIS, including the demographics and histories, diagnostic imaging, microscopic slides, and the histologic grades. 3. Discuss potential mimics for low, intermediate, and high grades of DCIS.

CONTENT DESCRIPTION: Breast calcifications are encountered on a daily basis in breast imaging. Characterizing the distribution and morphology is crucial in determining whether these are benign, probably benign, indeterminate, or suspicious. DCIS has been reported to account for at least a quarter of breast cancers detected at screening mammography. DCIS is a heterogeneous disease and has various appearances in breast imaging. The most frequent mammographic appearance is microcalcifications. Depending on the nuclear grade, the calcifications can vary in their morphology and distribution. A smaller percentage of cases of DCIS present as masses or asymmetries. MRI also plays a role in characterizing DCIS, including common presentations of nonmasslike enhancement and segmental distribution of disease. Histopathologic classification systems exist to further characterize this disease into low, intermediate, and high grades; and studies have reported that the frequency of local recurrence differs among these histologic grades. Analyzing the imaging characteristics can help predict the expected histologic grade. Additionally, potential mimics for each grade of DCIS exist, including etiologies such as fibrocystic changes, sclerosing adenosis, and early calcifications of fat necrosis and fibroadenomas. This exhibit reviews our experience with characterizing the grades of DCIS with imaging and reviews potential mimics for each grade of DCIS.

(E-90) Thursday • 7:00 AM
Detecting Breast Cancer: Case Review of Asymmetries and Architectural Distortions

Kathy M. Borovicka, MD, *William Beaumont Hospital, Royal Oak, MI*; Carol Mitri, MD; Gurpriya K. Gupta, MD

LEARNING OBJECTIVES: 1. Discuss breast cancers presenting as asymmetries and architectural distortions and the challenges in diagnosing these cancers. 2. Describe the diagnostic evaluation for asymmetries and architectural distortions, including imaging techniques on mammography to aid in the detection, and the use of ultrasound and magnetic resonance imaging in such cases. 3. Discuss multiple cases of asymmetries and architectural distortions, including the demographics and histories, diagnostic evaluations, and the pathologic diagnosis.

CONTENT DESCRIPTION: Breast cancers present in various ways on mammography, including as asymmetries and architectural distortions. Asymmetries may be further characterized as being global, focal, or developing. Once an asymmetry or architectural distortion is identified on a screening mammogram, a diagnostic evaluation is completed with additional mammographic views. Sonography is a secondary modality for further assessment of the mammographic abnormality. After a complete mammographic and sonographic workup, magnetic resonance imaging (MRI) may be recommended for further assessment in select cases. Overall, breast cancers presenting as asymmetries and architectural distortions may be challenging for the radiologist. It is important to be aware of these presentations, techniques to aid in the detection, and the imaging characteristics with the different modalities used in breast imaging. Overall, early detection of invasive cancers presenting as asymmetries and architectural distortions is important, as it impacts patient survival.