Wednesday, April 5, 2006
2:30–3:30 PM

■ SS01: AUR Scientific Session 1
Chest (Papers 1–6)
Location: Room 408
Moderators: Lynn S. Broderick, MD
Paul P. Cronin, MBBCh

(SS01-01) 2:30 PM
Development and Implementation of a Resident-led Integrated Case Conference Series on Emergency Radiology Topics for Residents Preparing to Assume Overnight On-Call Responsibilities

Kevin Daly, MD, University of Virginia, Charlottesville, VA; Juan M. Olazagasti, MD; Spencer B. Gay, MD*

PURPOSE: Our program recognized limitations in the preparation of junior radiology residents prior to assuming overnight on-call responsibilities. Residents perceived lack of sufficient experience with emergent cases during daytime rotations. The radiology department has been under greater pressure to provide timely and accurate interpretations 24 hours a day and to minimize the number of patients who must be contacted or called back for missed findings. The development and implementation of a resident-led case conference series on emergency radiology topics is described, with a primary goal of enhancing resident preparation prior to assuming in-house overnight radiology call.

METHOD AND MATERIALS: A consensus list of emergent topics where prompt radiological diagnosis affects clinical management was developed by chief residents and faculty. Topics were grouped by on-call resident responsibility and modality for a tiered call structure with two radiology residents in house overnight. Each 2nd-year resident prepared a 45-minute case conference given to the 1st-year class, who would soon be assuming on-call responsibility and modality for a tiered call structure with two radiology residents in house overnight. Each 2nd-year resident prepared a 45-minute case conference given to the 1st-year class, who would soon be assuming overnight on-call responsibilities. In a similar fashion, each 3rd-year resident prepared and delivered a case conference for an audience of 2nd-year residents, who would soon be assuming upper-level call.

RESULTS: A total of 18 conferences were conducted over 9 weeks, concluding 1 month before call changeover. These were supplementary to daily faculty-led resident conferences. Most residents rated the conference series as “very effective” in providing supplementary background prior to assuming on-call responsibilities in postconference surveys. Case material prepared was archived electronically on a shared network drive as a reference and can be revised for reuse in future years.

CONCLUSIONS: We feel a resident-led precall case conference series is an innovative and effective means of supplementing resident preparation prior to assuming on-call responsibilities. The experience fostered camaraderie and mentorship between residents and enhanced resident presentation skills and, we believe, will ultimately improve patient care. We plan to continue this conference series in future years.

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(AUR 2006 Scientific Paper Abstracts
AUR scientific presentations are 8 minutes in length, followed by a 2-minute discussion period. RAHSR scientific presentations (Scientific Session 7) are 12 minutes in length, followed by a 3-minute discussion period.

Presenting author is identified by institution, city, state, and country, if not United States or Canada. Presentations by trainees (residents, medical students, first-year fellows) are noted in red.

(SS01-02) 2:40 PM
Volume Measurement of Noncalcified Coronary Plaque Using MDCTA 16

Adeel Sabir, MBBS, Beth Israel Deaconess Medical Center, Boston, MA; Melvin E. Clouse, MD; Norihiko Yoshimura, MD; Shezhang Lin, MD; Richard Munro, RT(R)(CT); Carol J. Wilcox (asabir@bidmc.harvard.edu)

PURPOSE: To develop CT 3D processing methods to automate and quantify noncalcified coronary plaque volume using voxel histograms.

METHOD AND MATERIALS: From 11 coronary CTAs, cross-sectional images of 41 normal and seven with noncalcified plaque were identified in six proximal arterial segments (RCA, two segments; LM, one; LAD, two; LCX, one) and analyzed on a 3D workstation. Eight equally spaced lines from outside to lumen center were drawn around the normal vessels, and 1–8 lines were drawn through each plaque. According to the histogram of each line, densities (HU) of six consecutive isotropic voxels (0.4 mm) were recorded (the voxel with density nearest to zero was defined as the second in each series). Our data analysis determined that normal wall thickness was 2 voxels (0.8 mm), and the densities at the interface of epicardial fat/wall and wall/lumen were 30HU and 175HU, respectively. These parameters were used for the 3D processing of normal coronary segments and those with noncalcified plaque and to abstract the arterial segments and subtract the wall, lumen, and noncalcified plaque, to measure and subtract the arterial wall (30–175HU) from the lumen and calcified plaque. The remaining voxels were used to calculate the volume of noncalcified plaque.

RESULTS: Densities (mean ± SD HU) of six voxels across normal wall were –42 ± 19 (epicardiac fat), –2 ± 19 (partial fat/wall), 67 ± 38 (wall), 144 ± 57 (wall), 211 ± 65 (lumen), and 255 ± 63 (lumen; P < .01, ANOVA). The correlated voxel densities across wall/plaque were –34 ± 16 (fat), 1 ± 12 (fat/wall), 46 ± 27 (wall), 92 ± 53 (wall), 133 ± 77 (plaque), and 162 ± 88 (plaque), indicating increased thickness related to plaque. The wall thicknesses in eight equally separated directions around normal vessels were not significantly different (P > .05, ANOVA). Sensitivity in quantifying noncalcified plaque volume (39 ± 12 mm3) was 100% (22/22), and specificity was 87.5% (14/16).

CONCLUSIONS: Voxel analysis is a promising technique to identify thickness and density of coronary walls. Based on voxel analysis, 3D analysis of plaque vessels may provide a sensitive, reproducible, and specific method to quantify noncalcified plaque volume.

(SS01-03) 2:50 PM
Comparison of 16-Slice Multidetector CT to Intravascular US in the Characterization of Coronary Plaque Morphology: Initial Results

Kiran R. Nandalur, MD, University of Virginia Health System, Charlottesville, VA; C. J. Choi, MD, PhD; Rajan Patel; Jennifer Hunter; Spencer B. Gay, MD*, Christopher M. Kramer, MD* (nandalur@virginia.edu)

PURPOSE: A noninvasive method of characterizing plaque morphology would be valuable in the risk stratification of coronary artery disease. The purpose of our study was to evaluate the ability of multidetector CT (MDCT) to assess coronary plaque morphology relative to intravascular ultrasound (IVUS).

* Faculty financial disclosures are located in the Faculty Index.

54th Annual Meeting 55
METHOD AND MATERIALS: We prospectively recruited 14 patients (six female; age: 56.0 ± 11.9 years), who underwent x-ray coronary angiography and were found to have mild-moderate stenosis (25%–70%), to be selected for IVUS of the particular diseased vessel. Patients underwent contrast-enhanced 16-slice MDCT angiography (1.25-mm collimation, 500-ms rotation) within 10 days (±3.1 days). Plaques were classified as lipid-rich/soft, fibrous/intermediate, or calcified by IVUS, based on previously published criteria, by a blinded observer, and by MDCT qualitatively and quantitatively, based on density measurements (10 distinct 1-mm² regions of interest) as soft (<50 HU), intermediate (51–120 HU), or calcified (>120 HU), by an independent blinded observer.

RESULTS: To date, eight coronary plaques (six left anterior descending, two right coronary; stenosis, 41.3% ± 6.4%; plaque length, 11.2 ± 3.7 mm) of seven patients have been analyzed, with IVUS categorizing five intermediate, two soft, and one calcified plaque. By MDCT attenuation measurements, there was concordant classification for two soft (30.5 ± 16 HU), one intermediate (99 HU), and one calcified plaque (510 HU), but four intermediate plaques were misclassified as calcified (531 ± 152 HU), leading to moderate agreement between the modalities (κ = 0.48 ± 0.19). Similar moderate agreement (κ = 0.57 ± 0.21) was seen with qualitative MDCT analysis, with three intermediate plaques misclassified as calcified.

CONCLUSIONS: Based on our initial results, MDCT demonstrates only moderate agreement qualitatively and quantitatively with intravascular ultrasound in the characterization of plaques causing mild-moderate stenosis. Volume averaging and blooming artifact from calcium on MDCT may decrease the ability to assess adjacent noncalcified components of heterogeneous plaques. Further data are needed to evaluate if MDCT is a viable noninvasive option to evaluate plaque morphology.

(S01-04) 3:00 PM
Resident On-Call Interpretation of 16-Row Multi-detector CT Pulmonary Angiography (CTPA) with Indirect CT Venography (CTV)
Stephanie Rufener, MD, University of Michigan, Ann Arbor, MI; Smita Patel, MBBS; Ella A. Kazerooni, MD; Aine M. Kelly, MD, MS* (rufener@med.umich.edu)

PURPOSE: On-call radiology residents at academic institutions frequently interpret CTPA and CTV studies during the evenings and weekends. The purpose of this study was to compare resident and faculty interpretations to determine the rate of discrepancies.

METHOD AND MATERIALS: All 125 CTPA examinations performed over a 3-month period formed the study group; CTV examinations were performed in 124 patients. The radiology resident’s written preliminary report was compared to the official dictated faculty interpretation. Discrepant cases were independently reviewed by three thoracic radiologists who were not aware of the initial resident and faculty interpretations. In cases of discrepancy among the three thoracic radiologists, a consensus was obtained to use as the reference standard by which to evaluate resident performance.

RESULTS: Resident and faculty CTPA and CTV interpretations agreed in 118 patients (94%). There was disagreement on CTPA interpretation in seven patients (6%). There was disagreement on CTV in three patients (2%); all of these cases also had disagreement on the CTPA study. For CTPA, there were three false-negative, one false-positive, and three false-indeterminate readings by the resident. For CTV, there were one false-positive and two false-indeterminate readings. When comparing resident interpretation to the consensus reference panel for CTPA, there were one true-negative, one true-indeterminate, two false-negative, one false-positive, and two false-indeterminate readings, yielding a corrected resident error rate for CTPA of 4%. When comparing resident interpretation to the consensus reference panel for CTV, there were one false-negative and two false-indeterminate readings, yielding a corrected resident error rate for CTV of 2%.

CONCLUSIONS: On-call radiology resident interpretation of CTPA and CTV studies demonstrates a high level of agreement with radiology faculty interpretation.

(S01-05) 3:10 PM
Differentiating Diaphragmatic Paralysis and Eventration with Conventional Chest Radiography
Peter Verhey, MD, MS, Oregon Health and Science University, Portland, OR; Marc V. Gosselin, MD; Steven Primack, MD (verheyp@ohsu.edu)

PURPOSE: Although elevation of the diaphragm can be appreciated on conventional PA and lateral chest radiography, the modality is commonly viewed as inadequate to differentiate diaphragmatic paralysis from eventration. Based on our experience, we believe evaluation of the shape of the elevated diaphragm on PA and lateral chest radiographs can enable the differentiation of diaphragmatic paralysis and eventration. Our objective was to qualitatively and quantitatively measure the utility of chest radiography in determining the presence or absence of diaphragmatic paralysis in patients with an elevated diaphragm.

METHOD AND MATERIALS: A retrospective analysis of chest radiographs in 35 patients who underwent fluoroscopic sniff tests for elevated diaphragm was performed. Diaphragm position and shape for each patient were determined using measurements relating to skeletal structures and radius of curvature, respectively. These results were correlated with the results of the fluoroscopic sniff tests.

RESULTS: Of 35 patients with elevated diaphragm on chest radiograph, 14 had diaphragmatic paralysis confirmed with fluoroscopic sniff tests. Our results indicate that the radius of curvature or shape of the diaphragm is the most important factor in the presence or absence of diaphragmatic paralysis.

CONCLUSIONS: Conventional chest radiography is a useful modality for assessment of the functional status of an elevated diaphragm. Based on our results, evaluation of the shape of an elevated diaphragm may preclude the need for fluoroscopic sniff test to determine diaphragmatic paralysis.

(S01-06) 3:20 PM
Junior Academic Faculty Home and Office Survey
Aine M. Kelly, MD, MS*, University of Michigan, Ann Arbor, MI; Paul P. Cronin, MBBS; Ruth C. Carlos, MD (ainekell@med.umich.edu)

PURPOSE: The purpose of this survey is to assess junior faculty satisfaction in a large academic radiology department.

METHOD AND MATERIALS: We conducted an anonymous survey of junior faculty at the Radiology Department of the University of Michigan. Questions included attitudes regarding work, home, and family issues. Twenty-seven junior faculty (73%) responded to the survey. Questions included “yes/no” options, as well as four-point rating scales with the options “strongly agree, agree, disagree, strongly disagree” and “always, often, sometimes, never.”

RESULTS: Junior faculty are happy at work and feel valued by radiological and clinical colleagues alike. Junior faculty feel that their work has meaning and purpose. The average junior faculty member works 80% clinical time (range, 20%–100%) and gets 0.75 day/week of professional development (PD) time. 27% are funded at an average of 1.4 days/week. 11% are on tenure track, and of the remainder, 44% desire to be. 66% of junior faculty have mentors, and 53% receive adequate mentoring. 66% of faculty report not getting enough academic time. 66% surveyed feel under pressure to publish, and 72% feel it is harder to publish nowadays. The main reasons cited are increasing clinical workload (60%), lack of PD time (39%), higher standards required (50%), and IRB issues (22%). 66% of faculty work on research projects during weekends, 61% during PD time, and 45%

* Faculty financial disclosures are located in the Faculty Index.
on weekday evenings. However, 66% said they had too little time to spend at home, with family or at hobbies. The main reasons cited were research (50%), work (39%), and preparing conferences (28%). 56% said that their work regularly causes conflicts at home. The main reasons to stay in academics were teaching (61%), research (55%), and interesting cases (50%). Disincentives to stay in academics included insufficient financial remuneration (83%) and the promotion structure (50%).

CONCLUSIONS: Junior faculty are happy with their work. They are in academics for teaching and research. Disincentives to stay are insufficient PD time, finding time to do research, difficulty balancing home and office, and insufficient financial remuneration.

SS02: AUR Scientific Session 2
Bone (Papers 7-12)
Location: Room 410
Moderator: Felix S. K. Chew, MD, MBA

(SS02-07) 2:30 PM
Efficacy of MR Imaging in Classifying Proximal Focal Femoral Deficiency
Catherine Malldjian, MD; Trisha Y. Patel, MD, New York Medical College, Valhalla, NY; Robert M. Klein, MD (patel@wcmc.com)
PURPOSE: (1) To evaluate the efficacy of MRI in classifying PFFD. (2) Compare MRI to plain film classification of PFFD.

METHOD AND MATERIALS: Retrospective evaluation of radiographs and MRI exams in nine hips of eight patients with proximal focal femoral deficiency was performed by two radiologists. Plain film and MRI classification of the cases was performed utilizing the Amstutz classification system.

RESULTS: The cases were classified by plain films as Amstutz 1: n = 3; Amstutz 3: n = 3; Amstutz 4: n = 1; and Amstutz 5: n = 2. The classifications based on MRI were Amstutz 1: n = 6; Amstutz 2: n = 1; Amstutz 3: n = 0; Amstutz 4: n = 2; and Amstutz 5: n = 0. Three cases demonstrated complete agreement. There were six discordant hips. In two of the discordant cases, follow-up radiographs of 6 months or greater interval were available and helped to confirm MRI findings. Errors in radiographic evaluation consisted of overestimating the degree of deficiency.

CONCLUSIONS: MRI is more accurate than plain film evaluation for the classification of PFFD, particularly early on, prior to the ossification of cartilaginous components in the femurs. Since radiographic evaluation tends to overestimate the degree of deficiency, in equivocal cases classification correlating with the lesser degree of deficiency should be favored.

(SS02-08) 2:40 PM
Usefulness of PET-directed Skeletal Biopsy for Metastatic Neoplasm
Parham Pezeshk, MD, Brigham and Women’s Hospital, Harvard Medical School, Boston, MA; John A. Carrino, MD; Philipp Lang, MD, MBA; Carl Winalski, MD; Cheryl A. Sadow, MD (ppezeshk@partners.org)
PURPOSE: Tc-99m MDP bone scintigraphy (bone scan) and positron emission tomography (PET) are considered useful imaging modalities to detect metastases in patients with cancer. There are several other conditions, such as infection, fractures, and arthritis, that can lead to false-positive results with either modality; however, PET is felt to be more specific than bone scan for malignancy. The aim of the study was to investigate the value of PET scan for directing biopsies of suspicious bone lesions in patients with known malignancy and to compare it to bone scan–directed biopsies.

METHOD AND MATERIALS: Retrospective case series of subjects undergoing skeletal biopsy with history of a known malignancy: One group had PET-positive lesions, and the other group had bone scan–positive lesions. Reference standards were pathology and follow-up for 6 months. The diagnostic test performance measures of true positive (TP), false positive (FP), and positive predictive value (PPV) were calculated for each group. The PPV was compared using the Fisher exact test.

RESULTS: There were 87 subjects included. PET-directed biopsies (n = 40) showed 40 TP, five FP, and an 87.5% PPV (95% CI: 73.1–95.8). Bone scan–directed biopsies (n = 47) had 37 TP, 10 FP, and 78.7% PPV (95% CI: 34.3–89.3). The PPV was not significantly different between the groups.

CONCLUSIONS: This study supports that PET can be used to effectively direct bone biopsies to confirm metastatic neoplasm in patients with a primary malignancy and suggests that PET may provide an incremental improvement to the diagnostic yield. The role of PET, compared to bone scans, for directing skeletal biopsies warrants further verification.

(SS02-09) 2:50 PM
The Use of 3D Reconstruction of High-Resolution Shoulder CTs in Order to Develop a New Clinically Useful Classification of Scapular Fractures
Alfred Llave, MD, University of Florida, Jacksonville, FL; Adam Gray; Stephen Augustine, DO; Harry J. Griffiths, MD
PURPOSE: The present classification systems for scapular fractures are inadequate to manage specific problems in patients with complex scapular fractures. It was decided to attempt to develop a new classification based on three-dimensional (3D) CT imaging using a high-resolution 16-slice CT scanner.

METHOD AND MATERIALS: Thirty-five patients with plain film evidence of scapular fractures received high-resolution CT scans of their affected shoulders, and 3D reconstructions were made. These were analyzed with respect to the appearance of the fracture, the separation, disposition, and configuration of the bony fragments, and the suspected lines of stress.

RESULTS: We were able to develop a new classification of complex scapular fractures based on a grading system with five categories ranging from simple linear fractures of the scapula blade to complex fractures involving both the glenoid fossa and the blade of the scapula, as well as the coracoid and acromial processes. This classification has now been successfully implemented in the management of the most recent patients admitted to our emergency room with scapular fractures.

CONCLUSIONS: A new clinically relevant and simplified classification of scapular fractures has been successfully developed based on 3D reconstructions using a high-resolution CT scanner.

(SS02-10) 3:00 PM
Analysis of Resident Interpretation Errors of Thoracic and Lumbar Spine Radiology Examinations
Dawn Hastreiter, MD, PhD, University of Washington/Harborview Medical Center, Seattle, WA; Dae Hee Bang, MD; Lee B. Talner, MD (dhastrei@u.washington.edu)
PURPOSE: Education of radiology residents with respect to thoracic and lumbar spine exams could be improved by analyzing their errors in interpretation.

METHOD AND MATERIALS: The after-hours senior radiology resident error database at Harborview Medical Center was searched for thoracic and lumbar spine exams from 11/01 to 12/04. Interpretation errors were analyzed for type of error, whether the finding was reported correctly on another exam, whether there were other distracting injuries on the exam, and outcome of the error correction. Time to...
error correction was estimated. Errors were categorized as to clinical significance, involvement of bone vs soft tissue, and type (ie, overcall, failure to observe, management issue, etc).

RESULTS: The resident error database included 190 thoracic and lumbar spine exams: 122 plain film and 68 CT. The reports contained 214 interpretation errors. 175 of the exams occurred when the attending radiologist was not in-house. During the same time period, 11,116 thoracic and lumbar spine exams were interpreted by the after-hours residents, resulting in an error rate of 1.6%. Prevalent errors included failure to mention a finding (158; 74%), misclassification/incomplete description of a fracture (27; 13%), and resident overall (16; 7%). Failure to mention a pars defect was common (23; 11%). Clinically significant errors occurred in 132 cases, including 11 major fractures. Time to correction averaged 6.5 hours, taking into account 45 missed findings reported correctly on a prior or subsequent study before attending review. Forty-five (24%) error exams had other acute distracting injuries on the images. The Denis classification fracture type included wedge compression (31), burst (0), and flexion distraction (10). Review of subsequent imaging showed that 12 (6%) of the attending corrections were overcalls. Correction of most interpretation errors required no additional clinical treatment.

CONCLUSIONS: Residents at our institution perform well overall in interpretation of thoracic and lumbar spine exams. Education could be directed towards a systematic interpretation approach to prevent failure of observance, understanding pars defects, and appropriate classification of fractures.

(SS02-11) 3:10 PM
An ROC Analysis of Independent Quantifications of Cartilage Lesions in Osteoarthritis Based on MR Imaging of the Knee Joints
Kelly H. Zou, PhD, Brigham and Women’s Hospital, Boston, MA; Hiroshi Yoshioka, MD, Jui Bhagvat, MD; Gesa M. Neumann, MD; Dennis S. Meredith, BS; Philipp Lang, MD, MBA (zou@bwh.harvard.edu)

PURPOSE: To quantify cartilage lesions in osteoarthritis (OA) of the knee, where the depth and size scores of the lesions were assessed by multiple readers.

METHOD AND MATERIALS: MR images were acquired in 28 subjects with moderate knee OA at 1.5 T (sagittal fat-suppressed FSE, TR ms/TE ms, 4,000/13 and 39; sagittal fat-suppressed 3D SPGR 60°, 40°). A fellow (Rf) and a medical student (Rs) independently and twice scored 12 cartilage sites in anterior, central, and posterior medial and lateral femoral condyle (AMFC, CMFC, PMFC, ALFC, CLFC, PLFC) and tibial plateau (AMTP, CMTP, PMTP, ALT, CLTP, PLTP). A third experienced musculoskeletal radiologist provided the gold standard by independently evaluating the same sites using the same depth (0–7) and size (0–5) scores. Statistical methods were area under the ROC curve ($A_x$), specificity (Sp), sensitivity (Se), and one-sided paired t-test of Rf and Rs in sites with $A_x ≥ 0.70$ for both of these readers.

RESULTS: The depth of cartilage loss was accurately scored in the sites AMFC, CMFC, PMFC, AMTP, PMTP, CLTP, PLTP, and PLTP: $A_x$ range, 0.75–0.97 by Rf vs 0.72–0.92 by Rs; Rf was more specific, with Sp of 0.80–1.00 ($P = .01$); Rs was more sensitive, with Se of 0.57–1.00 ($P = .01$). The size of cartilage loss was accurately scored in the sites AMTP, CMTP, CLTP, and PLTP: $A_x$ range, 0.72–0.77 by Rf vs 0.74–0.98 by Rs; Rf was more specific, with Sp of 1.00 ($P = .02$); Rs was more sensitive, with Se only 0.33–0.67 ($P = .03$).

CONCLUSIONS: Quantifications and identification of cartilage lesions in osteoarthritis based on MR imaging varied among different sites of the cartilage lesions and due to readers’ experience.

(SS02-12) 3:20 PM
Metastatic Bone Survey in Evaluation of Focal Lesions in Multiple Myeloma: Is It Becoming Obsolete?—Comparison of Findings with MR Imaging and PET
Anna A. Ajam, MD, University of Arkansas for Medical Sciences, Little Rock, AR; Lavanya Kalla; Edgardo J. Angtuaco, MD; Nidhi Gupta, MBBS (dranooran@hotmail.com)

PURPOSE: To evaluate the sensitivity and accuracy of metastatic bone survey (MBS), magnetic resonance imaging (MRI), and whole-body positron emission tomography (PET) in detection of focal lesions in axial skeleton of patients with multiple myeloma (MM).

METHOD AND MATERIALS: We reviewed the medical records of 106 newly diagnosed stage 3 patients with MM under research protocol UARK. Protocol entry required performance of MBS, MRI of brain, cervical, thoracic, and lumbar spine, and pelvis, and whole-body FDG-PET performed at same time period prior to start of therapy. We reviewed the imaging findings and counted focal lesions detected by each imaging modality. The presence and number of lytic lesions by MBS, the findings of focal lesions on STIR-weighted studies by MRI, and the presence of focally metabolically active lesions on PET in the anatomic areas investigated were compared.

RESULTS: Twenty-eight and 225 focal lesions were seen in MBS and MRI. The maximum number of focal lesions was detected using MRI, so we used MRI as our gold standard. The sensitivity of MRI and MBS were 100% and 12% to detect focal lesions. In conclusion, there was an 87% increase in detection with MRI compared to MBS.

CONCLUSIONS: Part of the clinical staging in newly diagnosed patients with MM involves an assessment of severity of disease as judged by lytic lesions on radiographic studies. Our review of these data shows that MBS seriously undercalls focal lesions detected by both MRI and PET studies. In reviewing skull lesions, diagnostic errors were made with radiographic studies due to confusion with venous lakes and prominent skull foramina. Further analysis of our data showed that small lesions less than 1 cm in the spine and pelvis detected on MRI were not seen on MBS and were the primary source of poorer visualization with PET studies. In areas of the body not covered by MR (ribs, distal extremities, and extramedullary sites), PET was superior to MBS in the detection of focal disease. Overall, we find that MRI and PET are complementary studies that provide a more accurate assessment of focal bony lesions in the initial evaluation of patients with MM and that MBS is inaccurate and misleading in demonstrating focal sites of disease.

Wednesday, April 5, 2006
4:00–6:00 PM

SS03: AUR Scientific Session 3
Resident Education (Papers 13–24)
Location: Room 408
Moderator: Michael J. Shortsleeve, MD

(SS03-13) 4:00 PM
Radiology Residency Programs’ Organizational Structures: Results of a National Survey
Hansel J. Otero, MD, Brigham and Women’s Hospital, Boston, MA; Pablo R. Ros, MD, MPH; Mehmet S. Erturk; Silvia Ondateoui-Parra, MD (hotero@partners.org)

PURPOSE: To determine and describe how academic radiology departments in the U.S. structure their residency programs.
**METHOD AND MATERIALS:** In this cross-sectional study, a validated survey covering 40 variables was sent to directors of radiology residency programs. Descriptive statistics and correlations were calculated using χ² test.

**RESULTS:** A response rate of 54.5% (67/123) was achieved. 98.1% of the programs evaluate residents per rotation. Only 44.2% of the programs monitor volume of cases read; this is significantly (P<0.05) more likely to occur in small hospitals (<200 operational beds). 73.1% of the programs monitor the number of procedures performed per modality. Residents from all programs take the American College of Radiology in-service exam. Only 78% of the programs use the results to assess the residents. 13.7% set a pass rate for this exam, significantly (P<0.05) different among different regions of the U.S. Annual pass rates of 90% or higher for the American Board of Radiology, written, and oral examinations are attained in 83.7%, 84%, and 44% of the cases, respectively. Written examination pass rates are significantly (P<0.05) higher in larger hospitals (>500 beds). All programs provide at least three conferences per week. 86.3% of the time, attendance is mandatory. Residents are present in 82% of the cases. 61.5% of the programs have a research requirement, but only 42% allotted time for this purpose. Residents from large hospitals are significantly (P<0.05) more likely to present research work at national meetings than those from programs based in smaller hospitals. There are forums to address academic and nonacademic residents’ issues in 98% and 92% of the programs, respectively. Faculty-resident mentorship agenda is available in 36.5% of the programs, while resident-resident mentorship is available in 11.8% of the cases.

**CONCLUSIONS:** The structure of residency programs across the country is highly variable. Standard evaluation tools as a determinant for outcome are not uniform. Hospital size plays an important role in the structure of the residency program.

**SS03-14 4:10 PM Nuclear Medicine Training for Radiology Residents: Needs Assessment Survey Preliminary Results**

Richard O. Lucas, Jr, MD, Saint Vincent Hospital-Worcester Medical Center, Worcester, MA; Heather Jacene, MD; Jay A. Harold, MD; Lynn Barnes; Alan H. Maurer, MD (richard.lucas@stvincenthospital.com)

**PURPOSE:** To perform a needs assessment and evaluation of radiology residents’ perceptions regarding the adequacy of and possible deficiencies in their nuclear medicine training and to identify new venues for distributing educational materials to radiology residents.

**METHOD AND MATERIALS:** A Web-based survey was developed and distributed to 305 chief radiology residents by the Society of Nuclear Medicine Young Professionals Committee and the Nuclear Medicine Residents' Association (SS03-14) 4:30 PM

**Evaluation of Radiology Residents in Contrast Reaction Management**

Martha B. Mainiero, MD, Rhode Island Hospital, Providence, RI; Marc Shapiro; Brian Murphy (mmainiero@lifespan.org)

**PURPOSE:** To assess resident compliance with contrast reaction protocols and assess resident perceptions of medical simulation.

**METHOD AND MATERIALS:** Six 1st-year radiology residents received didactic instruction on contrast reaction management consisting of a 1-hour lecture including treatment protocols and demonstration of the departmental contrast reaction kit. The following day, the residents participated in high-fidelity medical simulation (HFMS) of a contrast reaction. HFMS was performed in a medical simulation center with a high-fidelity verbally interactive mannequin in a fully equipped mock-up of a recovery room. The mannequin provides vital signs and oxygen saturation levels and simulates physical findings, including airway edema and wheezing. Each resident was evaluated independently for the scenario of a progressive life-threatening contrast reaction. Each resident was provided a “CT technologist” and necessary equipment, including the contrast reaction kit. Residents were evaluated by whether or not they performed 16 critical actions, including assessing vital signs, administering fluid and medications, and calling for assistance. Immediate of critical actions, appropriately targeted history and physical, recognition of disease process, communication skills, and degree of leadership were assessed on a global competency scale from 1 (very poor) to 7 (superior). Following the simulation, each resident was debriefed about his or her performance. An anonymous survey was administered regarding whether the experience was an educational one. Agreement with statements was rated on a scale of 1 (strongly disagree) to 5 (strongly agree).

**RESULTS:** The residents performed a mean of seven (range, 4–10) of the 16 critical actions. The average competency score was 4.7 (range, 3–6) on a scale of 1–7. Five of the six residents agreed strongly that the simulation training was a valuable educational experience, and one moderately agreed. Three residents strongly agreed that the training improved their skills in managing a contrast reaction, and two moderately agreed.

**CONCLUSIONS:** Medical simulation is valuable in the education of radiology residents in contrast reaction management.

**SS03-16 4:30 PM Cardiac Imaging Training in Radiology Residency Programs: A Survey of Radiology Chief Residents**

Paul Nikolaidis, MD, Northwestern University, Feinberg School of Medicine, Chicago, IL; Jeet Minocha; Ayis T. Pyrros; Vahid Yaghmai, MD; Stephen B. Zivin, MD; James Carr; et al (p-nikolaidis@northwestern.edu)

**PURPOSE:** Cardiac imaging (CI) is currently a hot topic for both radiologists and cardiologists. Additionally, proficiency in CI is now required for certification by the American Board of Radiology. In order to ensure that future radiologists are well trained in CI, it is imperative to assess the current status of CI training in radiology residency programs. The purpose of this study is to assess the status of CI training in radiology residency programs by surveying current radiology chief residents.

**CONCLUSIONS:** Survey results suggest that training in nuclear medicine therapy and training in nuclear medicine physics/instrumentation are perceived to be common deficiencies and that radiology residents feel least prepared to interpret nuclear cardiology studies. The most desired method to distribute review materials is in Web-based or CD-ROM format and by holding review courses in conjunction with major radiology meetings.
**METHOD AND MATERIALS:** Chief residents at accredited radiology residency programs were sent an e-mail with a link (www.radiology.northwestern.edu/residentsurvey) to a 17-question Web-based survey. The survey assessed the organization of CI training in each residency program, role of residents on CI rotations, imaging modalities incorporated into CI training, and attitudes of residents about their CI training and the future of CI.

**RESULTS:** Overall, 50 (44%) chief residents, PGY-3 to PGY-5, responded. More than half (62%) reported having at least one dedicated CI rotation during their residency. The average length of a CI rotation was 3.58 weeks. 52% and 62% of respondents had less than 5 hours of CI-related case conferences and didactic lectures per year, respectively. A large majority of responders, 86%, preferred learning about CI through a combination of both case conferences and lectures. Only 12% of responders did not have either cardiac CT or MR incorporated into their CI training. Although 92% felt that it was important for them to be trained in CI, only 18% felt that they received adequate training in CI. Furthermore, approximately 38% would consider a fellowship in CI.

**CONCLUSIONS:** Extensive training in cardiac imaging is important for radiology residents, and the implementation of an appropriate, well-rounded teaching curriculum is essential for all radiology residency programs. At present, the majority of chief residents believe that they do not receive adequate training in CI.

**(SS03-17) 4:40 PM Resident, Fellow, and Attending Attitudes toward the Incorporation of a Focus Year into Radiology Residency**

Warren Swee, MD, MPH, University of Virginia Health System, Charlottesville, VA; John F. Angle, MD, Alan H. Matsumoto, MD, Klaus D. Hagspiel, MD; Ulku C. Turba, MD; Spencer B. Gay, MD,* (www9c@virginia.edu)

**PURPOSE:** The purpose is to evaluate the utility of incorporating a “focus year” into the traditional radiology curriculum. The focus year would exchange 12 months of general diagnostic radiology training for 12 months of specialty training during the PGY-4 and PGY-5 years.

**METHOD AND MATERIALS:** An online survey was distributed to all residents, fellows, and attendings at a large university-based radiology program. A description of the focus year and a sample curriculum were provided. The survey included eight questions assessing attitudes toward the need for further specialization, the value of a focus year, potential negative effects of a focus year, and the willingness to implement a focus year. Responses were scored on a five-point ordinal scale: 1 = strongly agree, 3 = neutral, and 5 = strongly disagree. Subgroup analysis was performed using one-way analysis of variance.

**RESULTS:** The overall response rate was 81% (76/94). Subgroup response rates were residents, 97% (33/34); fellows, 71% (17/24); and attendings, 72% (27/36). The following questions received favorable scores (mean [95% CI]): Is there a need for further subspecialization? (1.72 [1.55–1.92]); would a focus year improve competency in a chosen specialty? (1.85 [1.68–2.02]); would a focus year help radiologists compete with nonradiologists who interpret images? (2.27 [2.03–2.51]); would a focus year dissuade residents from pursuing a formal fellowship? (2.51 [2.27–2.74]); would a focus-year curriculum provide adequate training in general radiology? (2.54 [2.31–2.85]); should a focus year be incorporated into radiology residency? (2.53 [2.26–2.81]); and could a focus year be implemented at your institution? (2.45 [2.21–2.69]). One question received a neutral score: Would a focus year negatively impact board pass rates? (3.18 [2.96–3.41]).

Subgroup analysis showed statistically significant (95% CI) differences in mean scores of four questions between residents and attendings, which suggested greater interest to incorporate a focus year by residents compared to attendings.

**CONCLUSIONS:** Participants believe that further specialization will be needed in the future and view the focus year as a potential solution.

**(SS03-18) 4:50 PM Effect of Eliminating Night-Float Morning Check-out on Resident Work Hours and Education**

Mark W. Kringle, MD, University of Virginia Health System, Charlottesville, VA; Kiran R. Nandalur, MD; Jeffrey R. Ramakaransingh, MD; Christopher D. Cook, MD; Spencer B. Gay, MD,*(mwk7q@virginia.edu)

**PURPOSE:** With implementation of ACGME work-hour guidelines, our institution has recently changed our junior-level resident call responsibilities. Overnight plain films are no longer checked out by the night-float resident with an attending in the morning. In the new system, preliminary overnight reads by the night-float resident are overseen by staff with daytime residents. Our goal was to evaluate how this change has affected the educational and clinical experience of the residents and attendings.

**METHOD AND MATERIALS:** Eight residents in the 2nd-year class have currently completed night-float rotations under both systems. Residents were surveyed regarding work hours, confidence reading studies at the end of their rotations, significant “miss” frequency, educational value of the rotation, and overall satisfaction with the rotation. Separate surveys for before and after the change were administered simultaneously. Additionally, 10 of the attendings responsible for morning checkout were also surveyed with similar questions. All responses were based on a five-point Likert scale, with 1 being worst and 5 being best.

**RESULTS:** Both the residents and faculty felt work hours were improved and that residents were consistently within ACGME guidelines after the change (residents’ mean/StdDev before: 3.9/1.0, after: 5.0/0.9; faculty before: 2.1/1.0, after: 4.5/0.5). The overall satisfaction of residents was improved after the change (before: 1.9/0.8; after: 3.3/1.2). However, faculty reported a higher resident significant miss frequency after the change (before: 2.4/0.5; after: 3.0/0.9) and decreased educational value (before: 3.9/0.8; after: 2.3/1.3). For the remaining factors, residents and attendings saw negligible differences before and after.

**CONCLUSIONS:** Preliminary data suggest that the cessation of morning plain-film checkout resulted in diminished hours in house and allowed the residents to stay within the ACGME guidelines for work hours. This improved the overall satisfaction of the residents. However, some faculty felt the loss of morning plain-film checkout diminished the educational value of the night-float rotation and resulted in a slightly elevated number of errors by the residents.

**(SS03-19) 5:00 PM Resident Perspective on Research in Radiology**

Farid A. Aladham, MBBS, University of Michigan Hospitals, Ann Arbor, MI; Richard H. Cohan, MD; Isaac R. Francis, MD; Janet E. Bailey, MD; N. Reed Dunnick, MD, (faladham@umich.edu)

**PURPOSE:** To assess the views and challenges faced by residents when conducting research during residency.

**METHOD AND MATERIALS:** Thirty-eight of 44 residents at our institution completed a survey assessing resident opinions on radiology research (containing five-point graded answers and open-ended questions). Demographic information about resident background, debt, and future goals was also obtained.

**RESULTS:** All responding residents agreed that research is important for the future of radiology as a discipline, with half (50%) also believing that research participation during residency results in better-trained radiologists. However, many responding residents (68%) found it difficult to find adequate time to do research, with over half (58%) stating that research was often performed instead of study-
ing clinical radiology. Other obstacles were difficulty finding a good research project (37%) and a good research mentor (25%). While 37% of residents felt that performing research in residency increased the likelihood of their pursuing an academic career, almost as many as disagreed (45%), with 18% remaining neutral. This may be based on the large debts incurred during preresidency training (in excess of $100,000 in 55% and in excess of $150,000 in 31% of respondents).

CONCLUSIONS: Residents appreciate the importance of research to the radiology profession; however, many feel that the time required to perform research and problems finding a good mentor or research projects were important obstacles. Research experience during the residency is not perceived by most residents as increasing the likelihood that they will pursue a career in academics, and this is possibly related to an increasingly larger resident debt.

(SS03-20) 5:10 PM
The Six ACGME General Competencies: Perceptions by Applicants to a University-based Radiology Residency Program

M. Elizabeth Oates, MD*, Boston University Medical Center, Boston, MA (elizabeth.oates@busm.bu.edu)

PURPOSE: The purpose of this brief interview survey was to gauge the opinions of senior medical student applicants to this university-based radiology program regarding the importance and relevance of the six ACGME general competencies to their chosen specialty of radiology.

METHOD AND MATERIALS: During 2004–2005, each of 70 interviewed candidates was shown a list of the six ACGME general competencies during their 20-minute interview with the program director. First they were asked, “Are you familiar with these ACGME general competencies?” The next question was “Which one do you think will be the most important and/or most relevant to you during your residency and later in your radiology career?” The applicant was then asked to expound on why he/she selected that competency. The program director recorded the responses as part of general note taking during the interview.

RESULTS: All of the applicants expressed familiarity with the six ACGME general competencies. Of 70 responses, 63 (90%) chose a single competency; seven (10%) responded with two choices. Of 63 with a single answer, 36 (57%) chose interpersonal and communication skills as most important, 13 (21%) patient care, seven (11%) practice-based learning and improvement, three (5%) professionalism, and two (3%) each medical knowledge and systems-based practice. Of seven with two answers, interpersonal and communication skills were most prevalent (50%), then patient care (36%), practice-based learning and improvement (7%), and systems-based practice (7%). Their comments revealed a diversity of perspectives as to the meaning and relevance of the competencies.

CONCLUSIONS: The vast majority of applicants to this radiology residency program considered interpersonal and communication skills and patient care as the most important and most relevant of the six ACGME general competencies for their training and future careers. Their responses underscored their perceptions of a radiologist’s role, as well as the skills required to be successful. These competencies are more intuitive and clearly defined than the others. Perhaps radiology residency programs should direct more attention to teaching and evaluation of the other less well-defined and more challenging competencies.

(SS03-21) 5:20 PM
Electronic versus Paper-based Resident Evaluation Systems: Survey of APDR Members

Phillip Boiselle, MD; Martha B. Mainiero, MD, Rhode Island Hospital, Providence, RI (MMainiero@Lifespan.org)

PURPOSE: To assess the current practices of APDR members regarding the use of electronic versus paper-based systems for resident evaluations.

METHOD AND MATERIALS: Surveys were mailed electronically to the APDR membership list, which is comprised of directors from approximately 158 residency programs. Respondents were instructed to send one response from each program. Information gathered included the use of electronic versus paper-based evaluation systems and the overall level of satisfaction with such systems (5-point scale, with 1 = dissatisfied and 5 = satisfied). For those respondents using electronic systems, additional questions were asked regarding their impact upon response rate, timeliness of responses, and quality of responses in comparison to paper-based systems.

RESULTS: Seventy-two responses were received, for an estimated response rate of 46% on a per-program basis. Of the 72 respondents, 42 (58%) use electronic and 30 (42%) use paper-based systems. Median level of satisfaction was equivalent (4 = somewhat satisfied) for both groups. Of the 42 respondents using electronic systems, 24 (57%) reported an increased response rate, 16 (38%) reported no change, and two (5%) reported a decreased response rate compared to paper-based systems. Regarding timeliness of responses, 29 (69%) reported a faster response rate, 10 (24%) reported no change, and three (7%) reported a slower rate compared to paper-based systems. Regarding quality of responses, 24 (57%) reported no change, 11 (26%) reported improved quality, and seven (17%) reported worse quality compared to paper-based systems.

CONCLUSIONS: Electronic evaluation systems are commonly employed and are generally associated with an improved response rate and enhanced timeliness of responses compared to paper-based systems.

(SS03-22) 5:30 PM
Documenting Performance: Do Evaluations Help or Hurt?

Stephen Bagg, Medical University of South Carolina, Charleston, SC; Leonie Gordon, MBChB; James G. Ravenel, MD (gordonl@musc.edu)

PURPOSE: To assess the usefulness of completed evaluations in identifying performance problems in residents and faculty.

METHOD AND MATERIALS: Regular evaluations and feedback are used to evaluate performance in academic radiology. Documentation is required when disciplining residents or faculty, since remediation and termination can carry legal risks. We examined completed evaluations to see whether the content was helpful in guiding the program director or chairman to identify problems with faculty or resident performance. Evaluations are obtained every 4 weeks after completion of a rotation. These are completed by residents, faculty, technologists, and/or nursing supervisors. For this study, the overall performance (0–5) was used, as well as any comments made.

RESULTS: Five hundred completed evaluations were assessed. Average overall performance when faculty evaluated residents was 3, which is satisfactory. There was no difference in postgraduate resident year level. Comments, when made, were positive and often did not reflect accurately the overall numeric performance value given to resident(s). Negative comments were not made, even when faculty knew resident(s) had problems and remediation was being considered. Residents uniformly evaluated faculty above average and only gave positive comments.

CONCLUSIONS: Although evaluations are an integral component for assessing overall performance of residents or faculty, they often are not useful, since they do not accurately reflect performance. Alternate methods need to be developed so that problems can be documented early and effective remediation applied.
(SS03-23) 5:40 PM
Continuing Professional Improvement: A New Monthly Self-Assessment Conference Series for Radiology Staff and Residents
Elizabeth A. McGuigan, MD; William R. Carter, MD, Rockville, MD (eamcguigan@bethesda.med.navy.mil)
PURPOSE: To provide formative assessment of diagnostic skills and to provide both a formative and summative self-assessment tool for the residency program, faculty, and residents.

METHOD AND MATERIALS: The Continuous Professional Improvement program consists of 20 cases (two per ABR category) presented as unknown in a timed PowerPoint™ quiz. The quiz is presented in the last week of each 4-week rotation. During the first half of the conference, each case is presented sequentially as one or more images (20 seconds per image), and then the series is repeated a second time with shorter intervals. The participants anonymously record their diagnoses on a standard form, noting only their level of training.

During the second half of the conference, the cases are reviewed and diagnoses discussed, at which point the participants have an opportunity to assess their relative strengths and weaknesses and delineate a plan for improvement. The answers are subsequently graded by attending radiologists.

RESULTS: Since February 2005, eight episodes of monthly CPI have been completed, with 128 answer sheets graded (PGY2 = 55; PGY3 = 34; PGY4 = 22; PGY5 = 17). With 30 residents available per month, the participation rate was 53%. The accuracy of diagnoses by residents is as follows: PGY2: total, 35% (chest, 35%; GI, 30%; GU, 31%; mammo, 24%; MSK, 42%; neuro, 30%; nuclear medicine, 36%; pediatrics, 43%; vasc/IR, 34%; cardiac, 21%; US, 40%); PGY3: total, 41% (chest, 44%; GI, 33%; GU, 35%; mammo, 22%; MSK, 39%; neuro, 50%; nuclear medicine, 47%; pediatrics, 56%; vasc/IR, 50%; cardiac, 7%; US, 65%); PGY4: total, 61% (chest, 45%; GI, 42%; GU, 43%; mammo, 75%; MSK, 49%; neuro, 76%; nuclear medicine, 67%; pediatrics, 74%; vasc/IR, 100%; cardiac, 33%; US, 74%); PGY5: total, 72% (chest, 60%; GI, 68%; GU, 53%; mammo, 76%; MSK, 70%; neuro, 72%; nuclear medicine, 71%; pediatrics, 84%; vasc/IR, 93%; cardiac, N/A; US, 80%).

CONCLUSIONS: The CPI program has successfully demonstrated progressive improvement in diagnostic ability of radiology residents with increasing levels of experience and has aided curriculum development. The self-assessment aspect of the program has given trainees the opportunity to identify areas of weakness in order to focus further study and review.

(SS03-24) 5:50 PM
Qualitative Assessment of Web-based Radiology Teaching Files
Jared Christensen, MD, University of Rochester, Rochester, NY; Vikram S. Dogra, MD (Jared.Christensen@urmc.rochester.edu)
PURPOSE: Application of objective qualitative criteria for assessing the content and presentation of radiology teaching files available on the World Wide Web (WWW).

METHOD AND MATERIALS: A total of 32 Web sites with radiology teaching files were assessed. These were found through Internet search engines Google, Yahoo, and MSN, utilizing keywords “radiology,” “education,” “teaching,” “file,” and “case,” as well as via radiology Web portals such as the APDR and RSNA. Non-English sites, pages requiring registration, and collections with less than 50 teaching files were excluded. Ten randomly selected cases were assessed from each Web site. Teaching file quality was scored by objective criteria, including authorship, review process, image presentation, interactivity, content accuracy, breadth of discussion, and references. A maximum of 42 points was attainable per case, with the average forming the “case” score. Additional criteria, including collection size, search functionality, viewing options, and popularity, assessed the teaching file collection as a whole and formed the “collection” score (max. of 28 points). The sum of case and collection points formed the “site” score.

RESULTS: Of the 32 teaching file collections reviewed, 15 were university affiliated, and 17 were private or commercial. The mean case and collection scores were 20.1 and 10.6 for university sites versus 24.7 and 12.6 for private sites. Overall site scores for university and private Web sites were 31.8 and 42.2, respectively. Peer-reviewed and interactive teaching file collections obtained the highest scores. Private sites scored, on average, higher than university sites. The case score did not necessarily correlate with the total site score due to variables affecting Web site functionality.

CONCLUSIONS: The content, presentation, and functionality of radiology teaching files on the WWW vary widely. Objective qualitative criteria may be used to develop new Web-based radiology teaching files and further enhance existing collections. Residents may utilize such criteria for more meaningful and efficient directed learning.

Thursday, April 6, 2006
10:30 AM–12:00 PM

■ SS04: AUR Scientific Session 4
Abdomen (Papers 25–33)
Location: Room 408
Moderators: Saroja Adusumilli, MD* Deborah A. Baumgarten, MD, MPH

■ SS04-25 10:30 AM
US-guided Fine-Needle and Core Biopsy of the Liver: Low Complication Rates with Sonographer Assistance
James M. Papesch, MD, University of Wisconsin-Madison, Madison, WI; Paul F. Laeseke, BS; Thomas C. Winter, MD; Mark A. Klieвер, MD; Michael E. Ledwidge, BS; Fred T. Lee, MD
PURPOSE: To determine the safety and efficacy of ultrasound-guided liver biopsies performed with sonographer assistance.

METHOD AND MATERIALS: Records and images of 361 patients who underwent sonographer-assisted liver biopsy between January 2000 and July 2005 were reviewed. All patients had baseline INR < 1.5 and platelets > 50,000 or underwent transfusion to correct a coagulopathy. Ascites was present in 21 patients. Patients were divided into three groups: (1) 18-gauge core nontargeted biopsy for medical liver disease (n = 178); (2) 18-gauge targeted biopsy for focal mass (n = 91); and (3) fine-needle aspiration (FNA) biopsy (20–25 gauge) for focal mass (n = 92). Complications were defined as major (pain requiring admission, infection, hemorrhage requiring transfusion, pneumothorax, mortality) or minor (local discomfort, pain requiring analgesia, mild transient hypotension, small hematoma detected with ultrasound).

RESULTS: Biopsy samples were adequate in all core biopsies (100%) and 89/92 FNAs (89%). Overall major and minor complication rates were 5/361 (1.4%) and 40/361 (11.1%), respectively. There were no deaths. Complications in each group were as follows: Group 1 had zero (0%) major and 18 (10.1%) minor complications; group 2 had four (4.4%) major and 12 (13.1%) minor complications; group 3 had one (1.1%) major and 10 (10.8%) minor complications. Six (28.6%) patients with ascites had minor complications (minor pain or bleeding) and no major complications. The difference in major complications between targeted and nontargeted core biopsies was statistically significant (Pearson-Clopper test: P = .013). No significant differences were seen in major or minor complication rates between core and FNA biopsy (Fisher’s exact test: P = 1.0).

* Faculty financial disclosures are located in the Faculty Index.
CONCLUSIONS: Core biopsy results in slightly higher efficacy than FNA. Sonographer assistance appears to result in very low major complication rates (1.4%) when compared to rates reported in the medical literature (3%-32%). Nontargeted and FNA biopsies appear to have the lowest rates of major complications, likely due to decreased tissue trauma associated with these techniques. Asceitis did not appear to be an independent predictor of major complications in this series.

(SS04-26) 10:40 AM
Nonalcoholic Steatohepatitis Is Significantly Associated with Atherosclerosis in Nonhuman Primates
Marta E. Heilbrun, MD, Wake Forest University Health Sciences, Winston-Salem, NC; John J. Carr, MD, MSCE; Thomas Register, PhD; Carol A. Shively, PhD (mheilbru@wfubmc.edu)

PURPOSE: The relationship between CT measures of nonalcoholic hepatic steatosis and histologic measures of atherosclerosis has not been evaluated previously. Using cynomolgus monkeys (Macaca fascicularis), a well-established animal model of cardiovascular disease, we demonstrate the relationship of hepatic steatosis to atherosclerosis and cardiovascular disease risk.

METHOD AND MATERIALS: CT scans were completed on 24 female cynomolgus monkeys under an approved protocol. Liver attenuation was measured and compared to body weight, body mass index (BMI), CT-determined measure of visceral fat, and histologically determined atherosclerosis (intimal area, internal elastic lamina area, and the ratio between the two) in the common iliac arteries, a predictor of coronary atherosclerosis. Correlation and linear regression analytic methods were used.

RESULTS: Liver attenuation did not correlate with body weight, BMI, or visceral fat (all P values > .1) and significantly correlated with intimal area, internal elastic lamina area, and the ratio between the two (P = .02, P = .01, and P = .03, respectively) in the right common iliac artery, which is used in cynomolgus monkeys to estimate coronary artery atherosclerotic disease.

CONCLUSIONS: This is the first study to directly correlate CT measures of hepatic steatosis with histologic measures of atherosclerosis in cynomolgus monkeys, an important animal model of the metabolic syndrome and cardiovascular disease.

(SS04-27) 10:50 AM
Imaging of Liver Metastases Treated with Yttrium-90 Microspheres (TheraSphere®)
Ana Keppke, MD, Northwestern University, Chicago, IL; Frank H. Miller, MD; Denise Reddy, MD; Jie Huang, PhD; Jianhua Jin; Mary Mulcahy; et al

PURPOSE: (1) To evaluate the response of unresectable liver metastases to yttrium-90 microsphere (TheraSphere®) treatment on anatomic imaging studies according to different criteria; (2) to correlate imaging response on CT and MRI with response on PET; and (3) to assess complications of therapy.

METHOD AND MATERIALS: We reviewed the imaging studies of 42 patients with liver metastases treated with yttrium-90 microspheres. One hundred twelve lesions in 61 treated lobes were evaluated. Response to treatment on CT and MRI was determined using the traditional size (RECIST) criteria and two new criteria consisting of necrosis only and a combination of size (RECIST) and necrosis criteria. We correlated the response on CT and MRI with response on PET. Complications of treatment on cross-section imaging studies were also assessed.

RESULTS: The response rate was 23% (10/42) by size (RECIST) criteria, 50% (21/42) by necrosis criteria, and 52% (22/42) by the combined criteria of size (RECIST) and necrosis. Seven patients who responded to treatment based on our combined criteria had an increase in the size of the lesions on the first follow-up exam. PET showed response in 14 (66%) of 21 patients, while CT showed response in 10 (47%) of these patients based on the combined criteria and in five (23%) patients based on the size (RECIST) criteria. Ten patients had radiation cholecystitis; one patient required cholecystectomy. Low-attenuation changes in the hepatic parenchyma, likely representing edema related to yttrium-90 treatment, were seen in 24 lobes in 18 patients.

CONCLUSIONS: Yttrium-90 microspheres are effective in the treatment of unresectable liver metastases. The necrosis criteria and the combined criteria on CT and MRI detected more responses to treatment than the size (RECIST) criteria and correlated better with response shown on PET. Correlation of CT or MRI findings with lesion uptake on PET may improve the accuracy of response evaluation in patients with liver metastases. Liver edema and radiation cholecystitis are common potential complications of yttrium-90 treatment, which have minor clinical significance.

(SS04-28) 11:00 AM
Mapping of Metastatic Lymph Nodes in Patients with Locally Advanced Prostate Cancer for Radiotherapy Planning
Mukesh G. Harisinghani, MD; Helen Shih; Mansi Saksena, Center for Molecular Imaging and Research, Boston, MA; Anthony Zietman; Ralph Weissleder, MD, PhD

PURPOSE: The purpose of this study was to better define sites of nodal involvement in prostate cancer by developing a unique anatomic map of regions of prostate nodal drainage at high risk for harboring metastatic disease.

METHOD AND MATERIALS: Twenty-one prostate cancer patients with pathologically confirmed node-positive disease had a total of 66 nodes identifiable by MRI with ferumoxtran-10 (Combidx®, Advanced Magnetics, Cambridge, MA; Sinerem®, Guerbet, Paris, France). The position of each of these malignant nodes was mapped to a common template based upon its relation to either fixed skeletal landmarks or vascular anatomy.

RESULTS: When the nodes were plotted relative to skeletal anatomy, they covered a diffuse volume from the top of the lumbar spine to the superior ramus of the pubis and were found along most of the sacrum, extending inferiorly along the lateral pelvic walls. Twenty para-aortic nodes were found along the lumbar spine. All were within 2.5 cm of the anterior surface of the lumbar vertebral bodies. 95% of nodes within the pelvis were within 3.5 cm of a bony surface. No positive nodes were identified inferior to the superior pubic rami. When mapped in relation to the vessels, they were in three regions: right and left external iliac and para-aortic vessels. The latter were seen along the inferior 12 cm of the aorta and extending an additional 2 cm below the level of the aortic bifurcation. All were within 1.2 cm of the aorta. All nodal metastases along the external iliac vessels were seen along a length extending from a point 2 cm superior to the common iliac bifurcation to 11 cm inferior. Fewer nodes were found along the proximal internal iliac vessels. 89% of all nodes were within 2.5 cm of a major vessel. The relationship of the nodes was much closer to vascular than bony anatomy.

CONCLUSIONS: Nodal metastases from prostate cancer are largely localized along the abdominal aorta, the external iliac vessels, and the proximal internal iliacs. The anatomic map opens new options for defining radiation treatment portals for high-risk prostate cancer patients based on vascular rather than bony anatomy.
**METHOD AND MATERIALS**: We utilized a porcine model for percutaneous liver biopsy. Pig 1: Following selective catheterization of the hepatic artery, 40 mCi of Tc-99m MAA was injected. Under ultrasound guidance, six fine-needle aspirates (FNAs) were obtained from the liver in different locations, alternating between a coaxial and noncoaxial technique; 1.8-cm-diameter tissue plugs of the subcutaneous tissues surrounding each of the needle tracts were removed immediately after each FNA. Pig 2: One hour after the IV injection of 50 mCi of Tc-99m sulfur colloid, four FNAs were obtained, again using alternating techniques. Tissue plugs of each needle tract were removed immediately after each FNA. Analysis: Decay-corrected counts/minute/gram (cpm/g) for each tissue plug were determined using a scintillation counter.

**RESULTS**: For each pair of coaxial and noncoaxial biopsy tracts, the amount of activity in the subcutaneous tissue was less for the coaxial technique, with the percent difference ranging from 4% to 44% (mean, 14%) ($P = 0.014$), suggesting that more material was deposited in the biopsy tracts using the noncoaxial approach. The amount of activity in the tissue plugs containing a biopsy tract (mean, 11,969 cpm/g; SD, 1,211 cpm/g) was approximately twice that of the tissue plug that did not contain a biopsy tract (5,688 cpm/g), suggesting that there is significant deposition of material in the needle tract with both techniques.

**CONCLUSIONS**: A porcine model for evaluating the deposition of material in the needle tract following percutaneous biopsy of the liver was developed. The coaxial technique appears to reduce the amount of material deposited in the biopsy tract, but both the coaxial and noncoaxial techniques appear to deposit material in the biopsy tracts. This model may facilitate the development of interventions to reduce the likelihood of tumor seeding within biopsy tracts.

**METHOD AND MATERIALS**: This study was approved by our institutional review board. Abdominopelvic CTs of 53 patients (27 with appendicitis and 26 without appendicitis) were reviewed. All scans had been obtained using a multidetector CT. The radiologists were not aware of the diagnosis. They interpreted the cases displayed in axial or coronal planes on separate days, and the cases were randomized to eliminate bias. Cases were reviewed for the visualization of the appendix and presence of appendicitis. All cases were reviewed on PACS.

**RESULTS**: There were no false positives for either the axial or coronal images. There were two cases where appendicitis was missed on both axial and coronal images. The sensitivity for diagnosing appendicitis based on the coronal images alone was therefore 93%, and the specificity was 100%. Both cases where appendicitis was initially not recognized on the coronal display format were reevaluated, and in both cases, the diagnosis was apparent upon reevaluation. Therefore, this “misdiagnosis” was probably due to limited experience with coronal image interpretation, rather than a true limitation of the image display itself. Coronal reformations decreased the number of images by approximately 20%.

**CONCLUSIONS**: CT diagnosis of appendicitis based on coronal images is extremely accurate and may be substituted for the conventional axial images as the primary mode of image display. This can potentially reduce image interpretation time and may affect interpretation methodology.
laboratory values, and recommendation by a radiologist were recorded. Studies were considered indicated when there was allergy to iodine, renal insufficiency, or prior nephrectomy, or if prior imaging studies were equivocal and therefore MR was recommended. Studies deemed not indicated included those in which other studies, such as CT and ultrasound, were either diagnostic or not performed. When the requesting physician listed indications such as generalized pain, weight loss, or cancer staging, CT scanning was deemed more appropriate, and therefore MR was considered not indicated.

RESULTS: Of the 516 studies, 388 were ordered by specialists and 129 by general practitioners; 122 (31.4%) of the MRIs ordered by specialists were recommended by a radiologist versus 61 (47.3%) for general practitioners. Overall, 22.2% of the MRIs were deemed not indicated. Of the 266 studies ordered by specialists that were not recommended by a radiologist, 32% were not indicated. Of the 68 studies ordered by general practitioners without recommendation, 44.1% were not indicated.

CONCLUSIONS: Many MRI studies of the abdomen and pelvis may not be indicated, and therefore due to the high demand for neurologic and musculoskeletal MR imaging, we would recommend that abdominal and pelvic MRIs be ordered in consultation with a radiologist.

(SS04-33) 11:50 AM Noninvasive Nodal Staging of Patients with Penile Cancer Using Ferumoxtran-10
Mukesh G. Harisinghani, MD; Marion Jantsch, MD; Mansi Saksena, Center for Molecular Imaging and Research, Boston, MA; Ralph Weissleder, MD, PhD
PURPOSE: The purpose of this study was to evaluate the utility of ferumoxtran-10–induced signal intensity changes in lymph nodes for staging patients with penile cancer.

METHOD AND MATERIALS: Five patients with pathologically proven penile cancer who were scheduled for bilateral inguinal lymphadenectomy were enrolled in the study. In these patients, 96 lymph nodes were evaluated on T1-weighted spin-echo (SE), T2-weighted fast spin-echo (FSE), and T2*-weighted gradient-echo (GRE) MR imaging at 1.5 T before and 24–36 hours following IV administration of ferumoxtran-10 (2.6 mg Fe/kg). Two blinded readers performed qualitative image evaluation separately, with differences settled by consensus. Nodes with homogeneous enhancement and darkening with ferumoxtran-10 were classified as benign, whereas those with lack of uptake and hyperintense were classified as malignant. Primary outcome parameters, including sensitivity and specificity, were calculated. Additionally, for each lymph node, quantitative signal intensity measurements were made in ROIs that were placed in the most suspicious area. Then a second ROI was placed in the adjacent muscle. For each lymph node, a ratio of the SI of the node to that of the muscle was calculated both pre and post contrast. A t test was performed on the SI ratio values of the malignant and benign nodes on the pre- and postcontrast scans.

RESULTS: Of the evaluated 93 lymph node groups, 87 were benign and nine malignant by histopathologic analysis. The specificity, sensitivity, and positive and negative predictive values of MR lymphangiography were 100%, 96.6%, 75%, and 100%, respectively. The mean signal intensity ratio on T2*-weighted GRE images for benign lymph nodes changed from 2.229 (precontrast) to 0.46 (postcontrast). Signal intensity for malignant lymph nodes was relatively unchanged: 2.636 (precontrast) and 1.706 (postcontrast). The P value was not significant on the precontrast scans (P = .4121) but was significant for the postcontrast scans (P < .0001).

CONCLUSIONS: Ferumoxtran-10 is a useful MR contrast agent for noninvasive characterization of lymph nodes in patients with penile cancer. Improved accuracy for lymph node characterization will help in better patient management.

Thursday, April 6, 2006 12:00–2:00 PM

AUR Joseph E. and Nancy O. Whitley Award and AUR Memorial Award Presentations
Location: Salon F-G

AUR Joseph E. and Nancy O. Whitley Award Preparing and Assessing 1st-Year Radiology Resident On-Call Readiness
Suvranu Ganguli, MD, Beth Israel Deaconess Medical Center/Harvard Medical School, Boston, MA; Ivan Pedrosa, MD; Chun-Shan Yam, PhD; Herbert Y. Kressel, MD
PURPOSE: To evaluate the effectiveness of an emergency radiology (ER) core curriculum training module and a DICOM-based interactive examination system to prepare and assess 1st-year radiology resident (PGY-2) readiness prior to taking overnight radiology call.

METHOD AND MATERIALS: A dedicated month-long emergency radiology core curriculum was designed to prepare new radiology residents for overnight radiology call, which includes interpretation of off-hour urgent and emergent studies. The lectures of the curriculum, provided by department staff, were based on the American Society of Emergency Radiology core curriculum. The lecture series was implemented after the PGY-2 residents had completed formal introductory rotations during their first 6 months of training. A DICOM-based testing module was developed and administered at the end of the lecture series. The interactive module consisted of 19 actual emergency room cases with entire series of images, simulating an on-call setting. The tests were scored by two staff members blinded to resident-identifying information. Statistical analysis of the results was performed using a t test.

RESULTS: All residents in the program present during the month (nine PGY-2; six PGY-3; seven PGY-4; seven PGY-5) attended the lecture series and subsequently finished the testing module. Of the 19 actual emergency cases on the testing module, five were neuroradiology, three were thoracic imaging, eight were body imaging, and three were musculoskeletal. The PGY-2 residents scored an average of 73.0% (range, 63.2%–81.6%) of the total points possible. The PGY-3 residents scored an average of 76.8% (range, 68.4%–86.8%), the PGY-4 residents scored an average of 77.4% (range, 65.8%–100%), and the PGY-5 residents scored an average of 81.2% (range, 68.4%–94.7%). There was no statistically significant difference (P > .05) in the scores according to level of training.

CONCLUSIONS: First-year radiology residents who underwent 6 months of formal radiology training followed by an intensive emergency radiology lecture series prior to taking overnight call scored comparable to upper-level colleagues on an interactive computer-based emergency radiology simulation module.

AUR Memorial Award Mathematical Modeling Improves CT Diagnosis of Traumatic Aortic Injury
David T. Fetzer, BS, University of Texas, Houston, TX; Charles Green, PhD; O. C. West, MD
PURPOSE: Acute traumatic aorta injuries (ATAI) and other intrathoracic great vessel injuries (GVI) following blunt thoracic trauma are surgically important arterial injuries. Rapid and accurate diagnosis is essential for institution of lifesaving treatment. Computed tomography (CT) has become the diagnostic modality of choice in many trauma centers. Developing a standardized, weighted scoring system may improve diagnostic performance of CT for ATAI/GVI detection.
METHOD AND MATERIALS: Over a 44-month period, thoracic CT on 69 blunt trauma victims was collected in electronic form. A scoring method was developed using specific CT diagnostic criteria. Eleven areas of potential hematoma formation were defined within the thorax. Maximum short- and long-axis cross-sectional diameter of the aortic isthmus was measured. Qualitative morphologic information (contour change, intimal flap, caliber change, extravasation) was recorded. Finally, smoothness of the aorta wall was assessed. After scoring of all cases, injury characteristics were used to develop an injury assessment model. Variables were analyzed for statistical significance. Model prediction was compared to original radiologist reading and final diagnosis.

RESULTS: Average weighted κ of 0.74 revealed good agreement among observers and reproducibility of the scoring model. A preliminary weighted model improved the ability to classify equivocal cases as either positive or negative when compared to the original radiologist interpretation (ORI). The ROC curve calculated from the ORI contained 86.1% area under the curve (AUC). Addition of the mathematical model to the ORI increased the AUC to 97.5%. The likelihood ratio increased from 30.06 to 48.67. The degree to which the new measure improved prediction over the original radiologist reading was tested using a nested model and yielded a reliable increment in model fit (Δχ² [df 3] = 20.929, P ≤ .0001). A quantitative best-fit diagnostic model based on injury variable beta weights was constructed.

CONCLUSIONS: We have developed a diagnostic tool that may help radiologists better identify ATAI by improving CT diagnostic performance.

Thursday, April 6, 2006
4:00–5:30 PM

(SS05-34) 4:00 PM
Screening Sinus CT: Prevalence of Acute Sinusitis and Association with Patient’s Immune Status and Clinical Symptoms
Yoshihisa Anzai, MD, MPH*, University of Washington, Seattle, WA; William Hollingsworth, PhD; C. Craig Blackmore, MD, MPH; Jeffrey G. Jarvik, MD, MPH* (anzai@u.washington.edu)
PURPOSE: Prevalence of abnormal screening sinus CT findings and relationship with patients’ sinusitis symptoms have not been well addressed. The purposes of this study are to examine indications for and findings of screening sinus CT and to assess the association of CT findings with patients’ immune status and presenting sinusitis symptoms.

METHOD AND MATERIALS: A descriptive study was performed examining indications for and findings of screening sinus CT. A query of the radiology information system identified 304 limited sinus CT studies that were performed from June 2000 to May 2001 in a tertiary care setting. We reviewed the radiology reports of these 304 cases in terms of clinical indications, prevalence of CT abnormality, patient’s immune status, and presenting clinical symptoms. Severe opacification and/or fluid level and moderate mucosal thickening were considered positive CT findings for acute sinusitis.

RESULTS: Among 304 patients, 99 patients (33%) were immunocompromised (IC), having undergone organ transplant or chemotherapy. One hundred ten patients (37%) presented with sinusitis symptoms without significant medical history. Sixty-six patients had a history of chronic sinusitis with recurrent symptoms, and the remainder of 29 patients had follow-up sinus CT scan for previously known sinusitis or cancer. 13% (15/110) of otherwise healthy patients and 40% (40/99) of IC patients had abnormal CT findings suggestive of acute sinusitis. Odds ratio of abnormal sinus CT findings between IC and otherwise healthy patients was 3.7 (95% CI: 1.88–7.13). Among IC patients, presenting nonspecific symptoms of fever or headache had significantly lower rate of positive CT scan compared with presenting sinus symptoms such as nasal drainage, congestion, or upper respiratory tract infection (odds ratio of 0.26; 95% CI: 0.10–0.64).

CONCLUSIONS: Acute sinusitis is uncommon among healthy patients, using sinus CT as a proxy for diagnosis of acute sinusitis. Although acute sinusitis is more common among IC patients, if presenting symptoms were only fever and/or headache, the prevalence of CT-positive acute sinusitis is significantly lower than in those with sinus drainage or tenderness.

For more information please visit the Association of University Radiologists website.
RESULTS: For the FLAIR images, readers ranked BLADE as better than or equal to the conventional FLAIR images ($P < .01; \kappa = 1$). BLADE with motion correction was not superior to BLADE without. BLADE scans had reduced image ghosting, “stars” ringing, and pulsation artifacts ($P < .001$). Both BLADE scans were degraded by a “star” artifact (CSF pulsation) at the top of the fourth ventricle ($P < .001$). BLADE with motion correction was degraded by an artifact at the interface between CSF and the cerebral sulci ($P < .001$). For the T1-weighted sagittal scans, readers were in fair agreement that BLADE was better than or equal to the conventional T1-weighted sagittal acquisition. Results of one reader were significant ($P < .001$), while the other’s were not ($P < .001$). In comparing BLADE with and without motion correction, there was moderate interreader agreement that BLADE with correction was not better than or equal to BLADE without correction.

CONCLUSIONS: BLADE can improve image quality at 3 T even in a “nonmoving” patient. However, this may be the way that k-space is acquired, rather than “correction” of subtle patient motion. Further, motion correction led to an artifact at the interface between CSF and the cerebral sulci at 3 T, a finding seen much less at 1.5 T.

**Method and Materials**

We retrospectively reviewed all static images from brain death scans of 29 patients over the last 2 years at our institution. Views were taken from anterior and lateral positions following the administration of technetium 99m hexamethylpropyleneamine oxime (99mTc-HMPAO). Five consecutive patients with suspected brain death then underwent dynamic scintigraphy following administration of 25–30 mCi of 99mTc-HMPAO, with views during the flow phase from both lateral and anterior positions, as well as dynamic images.

**RESULTS:** Our retrospective analysis of patients with lack of cerebral flow showed flow through the external carotid artery branches produces a “hot nose” sign on anterior views. However, lateral views showed the area of increased uptake to be more posterior than the nose, corresponding to the brainstem and, to a lesser extent, the mucosa of the nasopharynx. The results from our prospective analysis confirmed that increased flow is seen more posterior to the nose on dynamic and static images.

**Conclusions:** Our study shows that the “hot nose” sign is most probably not due to increased flow to the nose. The flow that is diverted secondary to occlusion of the internal carotid artery through the external carotid artery branches appears to result in increased flow to the brainstem and, to a lesser extent, the nasopharynx.

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**SS05-39 4:50 PM**

**Achieving 24/7 Attending Radiologist Coverage in an Academic Setting through Synergy with the Growing Overnight Teleradiology Market: Initial Experience of the Brigham Radiology NightWatch Program**

Aaron Sodickson, Brigham and Women's Hospital, Boston, MA; Stephen Ledbetter, MD (asodickson@partners.org)

Academic radiology programs face ever-increasing pressure to expand to 24/7 attending coverage. For departments already contending with understaffing, extended coverage hours may heighten concerns over staff morale and retention, and pose financial challenges if new hires or staff incentives are required without additional growth in departmental revenues or funding. Smaller community radiology and private practice groups face similar pressures for rapid overnight availability of on-call radiologists for emergent study interpretation. For these groups, overnight coverage needs may diminish next-day performance and reduce quality of life, which complicates staff retention and hiring. This environment has led to rapid growth in after-hours teleradiology services that provide remote interpretations of after-hours examinations. The current landscape provides a unique opportunity for academic centers to collaborate with community and private radiology practices as a means for expanded radiology coverage hours at both. Teleradiology revenues can help defray the cost of radiologist hires, with the added benefit of improved patient care and resident teaching at the home institution. This case study will outline the initial 20-month experience of the Brigham and Women’s Hospital Radiology NightWatch program. We describe the risk-sharing/revenue-sharing model employed between the night radiologists and the radiology department, and the program structure adopted to promote long-term viability and growth. We discuss work-flow issues, including balancing outside teleradiology work and on-site coverage, and the complexities related to radiology resident training and perception of autonomy. We outline specific benefits to patient care afforded by our regional teleradiology model.

**SS05-40 5:00 PM**

**Effect of Clinical History on Interpretation of Noncontrast Head CT in Suspected Acute Ischemic Stroke**

Jason R. Shewchuk, MD, Harborview Medical Center, Seattle, WA; Luana Stanescu, MD; James R. Fink, MD; Fidel C. Rebeles, MD; Pyong Kim, MD; Yoshimi Anzai, MD, MPH

**PURPOSE:** To determine the effect of clinical history on the interpretation of noncontrast head CT in the setting of suspected acute ischemic stroke.

**METHOD AND MATERIALS:** Forty-four patients were included in this analysis. Twenty-six patients had one or more acute ischemic gray matter infarcts on MR and subtle findings on CT. Eighteen patients without acute ischemic infarct on MRI served as a control group. Three board-certified radiologists, blinded to the MRI results, interpreted each CT scan of the head, first without clinical history and then again in random order with localizing clinical history. Readers recorded whether there was evidence of acute ischemic gray matter infarct on the head CT and, if so, where (infarcts were localized to 12 locations: frontal, parietal, temporal, occipital, basal ganglia, and cerebellum, and either right or left). Interobserver agreement was calculated using the \( k \) statistic. Sensitivity and specificity for the detection of acute ischemic gray matter infarcts were calculated for each reader and for the group of three readers on a per-patient basis and per location.

**RESULTS:** Pooled sensitivity and specificity per patient for the three readers without history were 65% and 91%, respectively, and for interpretation with localizing history were 73% and 83%. Per-location pooled sensitivity and specificity were 58% and 97% without history and 69% and 98% with localizing history. Differences between these values without or with history did not reach statistical significance. Pooled sensitivity based on location of infarcts approached statistical significance \( (P = .064) \). The greatest differences were between sensitivity for infarcts without and with history for reader 1. For this reader, sensitivity by location was 61% without history and 88% with localizing history \( (P = .006) \), and specificity by patient was 77% without history and 89% with localizing history \( (P = .044) \). Interobserver agreement averaged \( k = 0.50 \) without history and 0.45 with history.

**CONCLUSIONS:** Interpretation of head CTs with clinical history increased sensitivity for gray matter infarcts compared to interpretation without history.

**SS05-41 5:10 PM**

**Effect of Sympathizing with Vocabulary of Negative Connotations on Patients’ Pain and Anxiety during Interventional Radiological Procedures**

Elvira V. Lang, MD, Beth Israel Deaconess Medical Center, Boston, MA; Olga Hatsiopoulou, MD; Kevin S. Berbaum, PhD; Ted Kaptchuk, PhD; Timo Koch, MD; Eva Kettenmann, BS (elang@bidmc.harvard.edu)

**PURPOSE:** Patients are often prepared for procedural discomforts with descriptions of pain or undesirable experiences. This practice is thought to be compassionate and helpful, but there are few data on the effect of such communicative behavior. This study assesses how such descriptions affect patients’ pain and anxiety during medical procedures.

**METHOD AND MATERIALS:** The interactions of patients with their health care providers during interventional radiological procedures were videotaped. On 159 videos, all statements that described painful or undesirable experiences as warning before potentially noxious stimuli or as expression of sympathy afterwards were recorded. Patients’ ratings of pain and anxiety on 0–10 numerical scales \( (0 = no\ pain, no\ anxiety\ at\ all; \ and\ 10 = worst\ pain\ possible,\ terrified) \) after the painful event and/or sympathizing statement were the basis for this study.

**RESULTS:** Warning the patient in terms of pain or undesirable experiences resulted in greater pain \( (P < .05) \) and greater anxiety \( (P < .001) \) than not doing so. Sympathizing with the patient in such terms after a painful event did not increase reported pain but resulted in greater anxiety \( (P < .05) \).

**CONCLUSIONS:** Contrary to common belief, warning or sympathizing using language that refers to negative experiences may not make patients feel better. This conclusion has implications for the training in medical communication skills and suggests the need for randomized trials testing different patient-practitioner interactions.

**SS05-42 5:20 PM**

**Use of Normal Saline Injection to Facilitate Needle Placement during Image-guided Soft-Tissue Biopsy**

Hugh H. Kerr, MD, Royal Oak, MI (hkerr@beaumont.edu)

**PURPOSE:** To provide a safe route for needle passage during image-guided soft-tissue biopsy.

**METHOD AND MATERIALS:** Sterile normal saline was injected to create a safe path for needle biopsy to otherwise difficult-to-reach locations. Sites biopsied included subcarinal node, adrenal gland, paraspinal chest lesion, lung nodule, thoracic esophagus, and retrosternal thyroid. The volume of saline required ranged from 5 mL to 20 mL determined by the CT appearance during infusion. Saline was injected under image guidance during needle passage to displace soft-tissue structures in the needle path.
RESULTS: No complications were encountered due to the use of saline to provide a route for needle placement. All biopsies were diagnostic. Core- and fine-needle specimens were obtained. The saline infusion was well tolerated in all cases.

CONCLUSIONS: Injection of normal saline may be used to provide a route for safe needle advancement during image-guided soft-tissue biopsy when the target is difficult to reach. The technique is simple to use and well tolerated.

**Thursday, April 6, 2006**

**4:00–5:30 PM**

- **SS06: AUR Scientific Session 6**
  - General (Papers 43–51)
  - Location: Room 410
  - Moderator: Deborah J. Rubens, MD

(SS06-43) 4:00 PM

**Impact of Teleradiology on University Hospitals**

Amna A. Ajam, MD, University of Arkansas for Medical Sciences, Little Rock, AR; Ernest J. Ferris, MD; Linda A. Deloney, EdD (dranoorani@hotmail.com)

PURPOSE: Teleradiology (TR), “the electronic transmission of radiological images from one location to another for the purpose of interpretation and consultation,” is being used to resolve radiology workforce challenges by improving access to services, increasing productivity, and enhancing revenue. There is literature on the technical aspects of TR, but virtually no studies have examined the impact of TR on radiology training programs.

METHOD AND MATERIALS: A 32-item survey to provide an overview of current TR practices in academic radiology departments was developed by the authors. Following IRB approval, the survey was electronically distributed by SCARD to three national academic radiology groups: radiology department chairs, APDR members, and chief residents.

RESULTS: A total of 91 surveys from 26 chairs, 47 program directors, and 18 chief residents were completed. Most programs had more than 30 faculty and 14–40 residents. Most residents in university-based residency programs frequently participated in interpretation of TR images. In general, neither faculty nor residents received additional compensation for TR interpretations. When asked about the impact of TR on quality of faculty life and faculty recruitment, respondents were neutral. Very few department chairmen and program directors felt that TR had a detrimental impact on resident education, but 23% of the chief residents reported that it had. Respondents identified the most important benefits of TR as (1) making consultations available in medical facilities without on-site radiologic support, (2) providing timely availability of radiologic images/image interpretation in emergent and nonemergent clinical care areas, (3) providing consultative and interpretative radiologic services, and (4) facilitating radiologic interpretations in on-call situations.

CONCLUSIONS: TR services are being provided by academic radiology departments across the country, and all modalities are read. It is possible that respondents were biased in favor of TR, but our study suggests that TR has benefits for an academic radiology practice. The growing use of TR does not seem to have a negative impact on resident education.

(SS06-44) 4:10 PM

**Teleconferencing in the Multicenter Radiology Residency: Review of Teleconferencing Technology and a Working Model at a Multicenter Residency**

Benjamin Liu, Boston Medical Center, Boston, MA; Luis Diaz; Paul J. McGinnis, MD; M. Elizabeth Oates, MD* (benjamin.liu@bmc.org)

PURPOSE: Our multicenter radiology residency program set out to develop a teleconferencing system to provide a uniform curriculum of educational conferences to all residents at all of our training sites. At many radiology residencies, the residents receive a diverse educational experience by training at multiple medical centers. However, residents rotating through distant or off-campus training sites may be unable to attend conferences, which are usually held at the main or central training site. If they do attend the conferences, the commute time between campuses may detract from their training experience. Current computerized video and audio teleconferencing technology offers a solution to providing a unified and cohesive curriculum of educational conferences while maintaining a diversified residency experience at multiple training sites.

METHOD AND MATERIALS: After a review of the available commercial and noncommercial teleconferencing technologies, a teleconferencing system was implemented using Microsoft Live Meeting™ video conferencing software and Polycom™ speakerphone voice conferencing system.

RESULTS: Results of a working teleconferencing model using Microsoft Live Meeting™ video conferencing software and Polycom™ speakerphone voice conferencing system at a major multicenter radiology residency are presented. Teleconferencing is compatible with lecture-based or case-based conferences, preserves interactivity, and eliminates time-consuming commutes. The benefits, hardware and software requirements, and limitations of the available video and audio teleconferencing technology are reviewed, including commercial and noncommercial conferencing software, voice conferencing systems, and voice-over-IP.

CONCLUSIONS: Our multicenter radiology residency program has developed a working teleconferencing system to provide our residents at all training sites with a uniform educational conference curriculum.

(SS06-45) 4:20 PM

**“Night Owl”: The Effect on Turnaround Time of a Teleradiology System Utilizing Overreading by a Full-Time Staff Radiologist Situated Overseas**

Yousaf Mahmood, MD, UMDNJ-University Hospital, Newark, NJ; Stephen R. Baker, MD; Curtis W. Bakal, MD; Hong Lim, MD (mahmooyo@umdnj.edu)

PURPOSE: To demonstrate the efficacy of the presence of a senior radiologist relocated to Israel and assigned full-time to night and weekend overreading through teleradiology. Advantage is taken of the international time difference, as images are reviewed in real time with on-call radiology residents overnight.

METHOD AND MATERIALS: Turnaround time (from image acquisition to completion of attending radiologist report) of night and weekend emergency cases supervised using teleradiology were compared to turnaround time when similar cases are reviewed by traditional method (on-site attending radiologist reviewing in bulk at 8 AM). Image acquisition time and completion times were obtained retrospectively from the hospital PACS unit.

* Faculty financial disclosures are located in the Faculty Index.
RESULTS: Average turnaround time during this study involving tele-radiology over-reads was 1 hour and 46 minutes, compared to average turnaround time of 5 hours and 31 minutes for the traditional method over a similar interval.

CONCLUSIONS: An advantage of an international teleradiology system using a full-time staff attending radiologist is shortening of turnaround time, benefiting emergency room physicians and patient care.

(SS06-46) 4:30 PM
Video Podcasting for Radiology Education
Michael L. Richardson, MD, University of Washington, Seattle, WA; Felix S. K. Chew, MD (mrichardson@uw.washington.edu)

PURPOSE: Podcasting is a recent innovation that allows automated dissemination of audio files across the Web to a personal audio player such as an Apple iPod. Apple’s newest iPod is now capable of playing video files as well. We have begun the creation of a library of online iPod-based lectures for our students and residents.

METHOD AND MATERIALS: Our lectures are created with iMovie and QuickTimePro software on a Macintosh but can be downloaded and played by a video iPod attached to Windows computers as well. These lectures include not only static images and videos shown by the lecturer but the audio portion of the lecture as well. The lectures themselves can be downloaded manually via the Web or automatically through a podcasting channel we have created for this purpose.

RESULTS: Early feedback from our residents on these podcasts has been promising. We are in the process of more formally evaluating the educational effectiveness of these video lectures as a supplement to our resident and medical student education programs.

CONCLUSIONS: The combination of audio, still images, and video images allows for an exciting new method of disseminating radiology educational materials over the Web. We believe that our students will enjoy this supplement to their education.

(SS06-47) 4:40 PM
Mammography Screening for Breast Cancer in the Czech Republic: Results of Analysis of 467,696 Women and 2,147 Breast Cancer Cases
Adam Svobodník, PhD, Center of Biostatistics and Analyses, Brno, Czech Republic; Miroslava Skovajsová; Jan Daněš; Helena Bartonková; Dan Klimeš (svobodnik@cba.muni.cz)

PURPOSE: As the efficiency of screening on reduction of breast cancer mortality was confirmed in several clinical trials, screening has been adopted in most European countries. In the Czech Republic, nationwide screening started in September 2002.

METHOD AND MATERIALS: Data from a total of 57 independent screening centers were analyzed. To ensure high quality of data, a thorough central system of data collection and validation was used. The system is based on (a) obligatory structure of data collected by individual centers, (b) establishment of independent data center, and (c) development of user-friendly software for data management.

RESULTS: Czech National Mammography Screening Database contains detailed data of 467,696 women. A total of 2,147 breast cancer cases were detected; hence the cancer detection rate was 46 cases per 10,000 women. The distribution of tumor sizes detected in screening was Tis, 7%; T1, 71%; T2, 20%; T3, 1%; and T4, 1%. Before screening was implemented, the percentage of breast cancers ≤2 cm was 39% (National Cancer Registry, 2002), in comparison to 78% of tumors ≤2 cm detected in screening.

CONCLUSIONS: As mammography screening is an enormously demanding project from both financial and organizational perspectives, exact evaluation of its costs and benefits should be conducted. The sophisticated system of screening data management and validation is an important motivational factor for all screening centers from the quality control perspective. Substantial quality control procedures are crucial when a chaotic system of cancer prevention is transformed into a regular service screening program.

(SS06-48) 4:50 PM
Statistical Design of an Image-guided Therapy Study via a Retrospective Sample Size Calculation
Kelly H. Zou, PhD, Brigham and Women’s Hospital, Boston, MA; Ferenc A. Jolesz, MD; Peter M. Black, MD, PhD; Ron Kikinis, MD; Lucila Ohno-Machado, MD, PhD; Ion-Fiorion Talos, MD (zou@bwh.harvard.edu)

PURPOSE: To design a retrospective study with sufficient statistical power to correlate MR-guided neurosurgical outcomes with important covariates.

METHOD AND MATERIALS: Clinical and MR data were extracted from over 100 neurosurgical patients with low-grade gliomas consecutively operated on at our institution. A total of 19 variables described the anatomic relationships of the tumor with eloquent cortical and subcortical regions, as well as tumor imaging characteristics, histopathological findings, and their influence on the extent of resection. The primary statistical sample size calculation was based on a correlation analysis between the initial tumor volume and the percentage of resection. We assumed a moderately negative correlation coefficient (r = −0.59), confirmed using pilot data. Using a two-tailed hypothesis test, the significance level (type 1 error) was fixed at 10% while the statistical power (1-type 2 error) was at 80%.

RESULTS: Based on univariate analyses, 11 statistically significant variables correlating with incomplete resection of low-grade supratentorial gliomas were identified. In the multivariate analysis, the most significant variable for incomplete tumor resection was tumor volume (P < .01). Our retrospective sample size calculation showed that N = 13 subjects are necessary per year. Thus, in a 7-year retrospective outcomes study, minimally 91 operated neurosurgical patients were included from our neurosurgical database.

CONCLUSIONS: Appropriate sample size and statistical power calculation methodology are essential to design image-guided interventional studies. Furthermore, comprehensive query databases are necessary to acquire relevant lesion- and patient-level information.

(SS06-49) 5:00 PM
Assessment of Radiology Attending, Resident, and Fellow Awareness and Knowledge of Current Peer Review Systems Utilized in Radiology Journals
Stacy E. Smith, MD, University of Maryland, Baltimore, MD (ssmith@umm.edu)

PURPOSE: Little is written about the peer review process in radiology. While most scientific journals utilize the single-blind (SB) system, 94% of radiology journals utilize the double-blind (DB) system, with little scientific assessment or review of its merits and downsfalls or of radiologists’ knowledge and understanding of the process. The objective of this study was to gain a better understanding of radiologists’ awareness and knowledge of the peer review system as it pertains to radiology.

METHOD AND MATERIALS: Radiology attendings, residents, and fellows in an academic setting anonymously filled out a multiple-choice survey regarding their knowledge/understanding of peer review in radiology journalism with regards to which type of blinding format they preferred (double, single, neither, or no preference), definitions of DB and SB review, and level of training, as well as rating their understanding of peer review in radiology journalism (not at all, not very well, moderately well, or very well).

Faculty financial disclosures are located in the Faculty Index.

70  Association of University Radiologists
RESULTS: Seventy-six individuals (36 practicing radiologists [56% of whom are current radiology journal reviewers], 24 residents, 16 fellows) were surveyed. 94% preferred DB. 100% knew the definition of DB; however, only 78% knew the definition of SB. Four attendings (also reviewers) did not know what SB was. 20% of the residents and fellows didn’t know the definition of SB. Attendings’ knowledge of peer review was split (33% very well, 44% moderately well, 11% not very well). 100% of residents and 75% of fellows answered “not very well” and 25% “not at all.”

CONCLUSIONS: An overwhelming preference for DB peer review is noted; however, the understanding of other types of peer review and their merits, as well as the process of peer review, is less obvious to some radiologists, particularly those in training. This study emphasizes the need for education on the peer review system, particularly during residency and fellowship training, as well as studies as to why the double-blind system is preferred.

(SS06-50) 5:10 PM
Accuracy of PET for Detection of Lymph Node Metastasis
Mansi Saksena, Center for Molecular Imaging and Research, Boston, MA; Marion Jantsch, MD; Marta Brasci, MD; Mukesh G. Harisinghani, MD

PURPOSE: PET scanning is increasingly being used to stage various primary malignancies. The purpose of this study was to compare established size criterion used to diagnose metastatic nodal disease to FDG uptake within nodes in patients undergoing combined PET/CT with 18F-fluorodeoxyglucose for staging of various primary malignancies.

METHOD AND MATERIALS: Thirty-seven patients (M:F, 10:27) with a mean age of 54 years (range, 20–82 years) undergoing combined PET/CT studies were included in the study. Pathological examination of the detected nodes was performed after surgical dissection or image-guided biopsy. Of the sampled nodes, 112 could be unequivocally correlated to pathology and were included in the study. Primary efficacy parameters of sensitivity, specificity, and accuracy were calculated for size criteria and FDG uptake. A McNemar test was performed to evaluate these criteria.

RESULTS: Fifty-four of the 112 included nodes were benign, and 58 nodes were malignant on histological examination. The mean short-axis diameter of malignant nodes was 9.5 mm (5–41 mm). The mean short-axis diameter of malignant nodes showing increased FDG uptake was 13.2 mm (6–41 mm). Size criterion demonstrated a sensitivity of 64%, a specificity of 80%, and accuracy of 71%. Quantitative evaluation of FDG uptake within the same nodes demonstrated a sensitivity of 78%, specificity of 63%, and accuracy of 79%. All false-negative nodes on PET were less than 10 mm in short axis. The McNemar test showed statistical significance.

CONCLUSIONS: PET imaging demonstrates a lower specificity for detecting metastatic nodal disease than size criteria on CT, probably as multiple nonmalignant conditions can also cause an increase in nodal FDG uptake. However, it has a higher sensitivity for nodal metastasis detection compared to size criteria, which have a minimally higher accuracy. This can be attributed to the decreased resolution of PET imaging compromising characterization of nodes less than 10 mm in size.

(SS06-51) 5:20 PM
Physicians’ Knowledge of Diagnostic Medical Radiation Exposure
Sabrina Covert, MD, Dalhousie University, Halifax, Nova Scotia; Mohamed Abdollel, MS; Leslie Flemming; Cupido Daniels, PhD

PURPOSE: To determine the knowledge base of practicing physicians and residents regarding diagnostic medical radiation (DMR) exposure and to assess whether physicians have an interest in improving their knowledge of DMR.

METHOD AND MATERIALS: Four hundred eighty surveys were sent to physicians and residents throughout Nova Scotia, Canada, in the following specialties: radiology (Rad), emergency medicine (EM), and family practice (FP). Questions were designed to evaluate the hypotheses that (a) physicians have limited knowledge of DMR and (b) physicians have little interest in improving their knowledge of DMR. One-way ANOVA was used to evaluate the effects of different variables on test scores. An ordinal logistic regression model was used to evaluate and compare responses according to type of medical practice.

RESULTS: Overall response rate was 49.4%. Radiologists had the highest knowledge of DMR (13.4%, 18.5%, and 14.5% higher than EM, FP, and FP/EM, respectively), with senior residents outscoring radiologists by 13.4%. Radiologists had 4–5 times more interest in improving their knowledge and were 10–13 times more likely to be aware of accessible means of acquiring knowledge compared with nonradiologists. Concerning patient awareness of DMR, EM and family physicians were 2–4 times more likely than radiologists to place higher value on patients providing informed consent prior to x-ray examinations.

CONCLUSIONS: Generally, all surveyed physicians have limited knowledge of DMR. Compared to radiologists, ER and family physicians have less knowledge and are less interested in improving their knowledge. ER and family physicians are less aware than radiologists of means to acquire information on DMR. General comments suggested that tools should be developed to improve physician understanding of DMR, particularly for those practicing outside radiology.

(SS07-50) 10:30 AM
Bayesian Filtering for the Categorization of Radiology Reports
Ays T. Pyrros, Northwestern University, Feinberg School of Medicine, Chicago, IL; Paul Nikolaidis, MD; Vahid Yaghmai, MD; Stephen B. Zivin, MD; Joseph Tracy, PhD; Adam Flanders, MD (a-pyrros@md.northwestern.edu)

PURPOSE: The objective of this study was to develop a Bayesian filter that could distinguish positive radiology reports of appendicitis from negative reports of appendicitis.

METHOD AND MATERIALS: Standard unstructured electronic text radiology reports containing the keyword “appendicitis” were obtained using a java-based text search engine from a hospital GE PACS system. A total of 500 randomly selected reports from multiple radiologists were then manually categorized and merged into two separate text files: 250 positive reports and 250 negative findings of appendicitis. The two text files were then processed by the freely available Unix-based software dba1c 1.9, a digramic Bayesian classifier for text recognition, on a Linux-based Pentium II system. The software was then trained on the two separate merged text files’ categories of positive and negative appendicitis. The ability of the Bayesian filter to discriminate a priori between reports of negative and positive appendicitis images was then tested on 100 randomly selected reports of appendicitis: 50 positive cases and 50 negative cases.

* Faculty financial disclosures are located in the Faculty Index.
RESULTS: The training time for the Bayesian filter was approximate- ly 2 seconds. The Bayesian filter subsequently was able to categorize 50 out of 50 positive reports of appendicitis and 50 out of 50 reports of negative appendicitis in under 10 seconds.

CONCLUSIONS: A Bayesian filter base system can be employed to quickly categorize radiology report findings and automatically determine after training, with a high degree of accuracy, whether the reports have text findings of a specific diagnosis. The Bayesian filter can potentially be applied to any type of radiologic report finding and any relevant category.

**RESULTS**

**METHOD AND MATERIALS**

**PURPOSE:** To validate a novel MRI scoring system for osteoarthritis of the hip and to assess its reproducibility.

**METHOD AND MATERIALS:** MR arthrography was performed in 42 patients (age median, 17-63 years; median, 37 years) using a 1.5-T magnet system (LX2; GEMS, Milwaukee, WI): fat-saturated T1 SE, TR/TE 650 msec/8 msec, 256 × 192. Two readers independently scored 10 cartilage regions for grade and size: anterior, posterior, central, medial, and lateral acetabulum and femoral head (0 = normal; 1 = signal heterogeneity; 2 = fraying; 3 = fissuring; 4 = thinning < 50%; 5 = thinning > 50%; 6 = full-thickness cartilage loss) and using a scale of cartilage loss size (0 = normal; 1 = <1 cm; 2 = 1–2 cm; 3 = 2–3 cm; 4 = 3–4 cm; 5 = >4 cm). Intra- and interreader variability measures of two observers were evaluated using percent agreement and Fisher's exact test.

**RESULTS:** The highest intrareader agreement for grade and size of cartilage loss was 0.67 (P < .03) and 0.69 (P < .01) in the medial region of the acetabulum and 0.76 (P < .001) and 0.83 (P < .001) in the anterior femoral head, respectively. The highest interreader agreement for grade and size of cartilage loss was 0.83 (P < .01) and 0.83 (P = .01) in both the medial region of the acetabulum and anterior femoral head.

**CONCLUSIONS:** The most reliable sites were medial acetabulum and anterior femoral head. Both intra- and interreader measurements of the depth and size of cartilage loss were assessed using MR arthrography. The novel scoring system yields excellent reproducibility in scoring cartilage loss in clinical studies.

**RESULTS**

**PURPOSE:** To evaluate spherical harmonics (SH) to measure volume and added geometric information to the assessment of MS lesions. This method may enable better understanding of MS pathogenesis and lesion evolution over time.

**METHOD AND MATERIALS:** To validate a novel MRI scoring system for osteoarthritis of the hip and to assess its reproducibility.

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(SS07-56) 11:30 AM

Head CT in Pediatric Patients Following Blunt Trauma: Utilization, Incidence of Traumatic Brain Injury, Injury Progression, and Outcomes

Sidhartha Chaudhry, University of Washington, Seattle, WA; William Hollingworth, PhD (sidharth@uwashington.edu)

PURPOSE: Head CT is frequently used in the evaluation of pediatric patients with traumatic brain injury (TBI). We evaluated the utilization and diagnostic yield of initial and repeat head CTs in children.

METHOD AND MATERIALS: A retrospective study of all pediatric patients (age, <15 years) admitted to the emergency department at Harborview Medical Center, Seattle, 1994–2003, following blunt trauma. Patients transferred from other hospitals were excluded. Data were gathered from the trauma registry and radiology information systems. CT reports of a subset of patients who had more than one head CT were reviewed, blinded to demographic and clinical details, to determine the incidence and progression of TBI.

RESULTS: 6,664 patients met our criteria, of whom 582 (9%) had had two or more head CTs within 1 week. The mean number of head CTs per patient increased by age group (1.45 [0–4 years] vs 1.52 [5–9 years] vs 1.71 [10–14 years]; P < .01); this relationship remained after adjustment for mechanism. Glasgow coma score, severity of head injury, and polytrauma. In the subgroup of patients with more than one head CT, the initial findings were normal (13%), epidural hematoma (14%), subdural hematoma (25%), subarachnoid hemorrhage (21%), intraventricular hemorrhage (6%), intraparenchymal hemorrhage (32%), edema (18%), diffuse axonal injury (9%), mass effect (13%), and skull fracture (51%). Skull fractures were significantly more prevalent in the youngest age group, while the prevalence of IPH, edema, and DAI increased with age. Nearly one-third of repeat CTs showed worsening TBI (13%) or a new lesion (17%). The probability of new or worsening findings increased with age (24% vs 30% vs 38%; P < .01); this was of borderline statistical significance after adjusting for injury mechanism and severity. Hospital stay and inpatient mortality were lowest in youngest patients, but not significantly so after adjustment for confounders.

CONCLUSIONS: Initial head CTs have high yields, while the yield of repeat head CTs is lower. However, both are likely useful in the diagnostic work-up of TBI. Head CTs were requested less frequently in the youngest patients. Older children were more likely to have progressive and delayed brain injuries and worse outcomes.

The Clinical Impact of FDG PET on the Management of Patients with Colorectal Liver Metastases: A Comparison with Conventional Imaging Using Evidence-based and Technology Assessment Concepts

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PURPOSE: To evaluate the relative roles of FDG PET and conventional imaging in the preoperative assessment of patients with colorectal liver metastases by the application of evidence-based practice (EBP) and technology assessment (TA) principles.

METHOD AND MATERIALS: Using EBP methods, we found PET (sensitivity, 90%) to be the most sensitive imaging method for detecting colorectal carcinoma liver metastases (CRCLM). PET TA at the technical and diagnostic performance levels was deemed complete at the efficacy level. All patients being considered for liver resection then underwent PET, in addition to prerereferral conventional imaging. We then retrospectively evaluated the clinical impact of using PET to stage colorectal liver metastases preoperatively in our practice. We selected consecutive patients with colorectal carcinoma who had PET prior to liver resection. Radiologists reviewed PET images and compared these with conventional imaging (CT/MRI). Patient records were reviewed to establish surgical intentions before and after PET. Impact on diagnostic thinking and management was assessed.

RESULTS: Over an 18-month period, 33 patients (M = 21; F = 12) met inclusion criteria. 51% (n = 17) underwent hepatic resection. Diagnostic impact: discordance between PET and conventional imaging, 75% (n = 33), which was predominantly tumor upstaging (70%) by PET. Management impact: management change after PET, 51% (n = 17); planned surgery cancelled, 78% (n = 11). Surgical findings correlated with PET findings in 89% (n = 16), with discordance in 11% (n = 2). 24% (n = 5) of patients with limited extrahepatic disease on PET underwent laparotomy and CRCLM resection. Illustrative PET images will be correlated with conventional imaging.

CONCLUSIONS: This small series shows how EBP and TA concepts can be used synergistically to evaluate new technology. Results suggest that FDG PET can have a major diagnostic and therapeutic impact at an effectiveness level. The routine use of PET in preoperative assessment of patients with CRCLM may be justified. Cost-effectiveness remains to be assessed.
**RESULTS:** The results of this investigation were consistent with the prediction that each successive group on the upward continuum of training and experience developed more accurate and more specific diagnoses when visualizing the same image. Novices with absolutely no training in radiology were able to accurately make a diagnosis 36% of the time, in-training radiology residents made the correct diagnosis 55% of the time, and experts 81% of the time. The results of this study indicate that a patient history had a significant positive effect on diagnostic accuracy and specificity of diagnosis for all three groups. The effect was greater for novices and intermediates than for experts. The provision of patient signs and symptoms had a negative effect on the salience of features reported by both intermediates and the experts.

**CONCLUSIONS:** The study indicates that recognition of salient features is essential to accurate diagnosis and that expertise promotes specific diagnoses. Tailoring training in perceptual domains to recognition of key salient features should lead to expertise. Examining for skill in recognition of salient features is a reasonable way to assess expertise. Knowledge of a patient history is beneficial in producing diagnostic accuracy and specificity, though it does not influence the salience of features mentioned. History information may activate personal “illness scripts” which automatically cue a diagnosis.

**Quality of Residents’ Radiology Reports**

Mihaa Taljancovic, MD, University of Arizona Health Sciences Center, Tucson, AZ; Tim B. Hunter, MD, Elizabeth A. Kupinsky; Jason Napoles (mihrat@radiology.arizona.edu)

**PURPOSE:** To assess the quality of residents’ radiology reports and to assess the interobserver variability in grading residents’ reports.

**METHOD AND MATERIALS:** Radiographic and MRI reports from 25 residents were evaluated on four aspects: impression, findings, information transmitted, and length of report. Three radiologist raters (two senior, one junior) reviewed the reports using scoring scales of 1 to 4.

**RESULTS:** Chi-square tests were used to analyze the data. For the MRI study, there were no statistically significant differences due to rater for impression or information transmitted, but there were for findings ($\chi^2$ value, 24.943; $P < .0001$) and length of the report ($\chi^2$ value, 11.324; $P < .0035$). For findings, the junior rater gave significantly more excellent scores than the others, and one of the senior raters gave significantly more poor ratings than the other two. For length, the single senior rater who reported on length gave significantly more too-short ratings than the junior. For the radiographic study, there were no statistically significant differences between raters for impression, information transmitted, or length of the report, but there were for findings ($\chi^2$ value, 12.886; $P < .0118$). The junior rater gave significantly more excellent scores than the senior raters and significantly fewer poor scores.

**CONCLUSIONS:** There was greater than 80% agreement among faculty and residents that the quiz improved retention of conference material. A minority (30%–40%) reported that the quiz inspired better note-taking habits, increased attention during lectures, and helped in radiology board exam preparation. In addition, there was a consensus (70%–80%) that the format and content of the quiz were optimal for learning purposes. 80% of residents reported that the quiz caused an increase in anxiety to some extent. 60% of residents and 70% of the faculty stated that the quiz was worth recommending to other programs.

**CONCLUSIONS:** There is a consensus among residents and faculty that the postconference quiz is a valuable educational tool as currently practiced at our institution. Although there is some disagreement about the degree to which the quiz enhances learning, the majority surveyed feel that they would recommend the quiz to other programs.
METHOD AND MATERIALS: The tool has two parts: a data-mining program that retrieves the information, and a Web-based reporting system. The data-mining program extracts a procedure volume by resident report for each month from an IDX Rad 9 system by using a Python-based program that telnets over to log in and extracts the data from the report repository. This program is scheduled to run in the background every month to update the resident’s progress chart.

The program uses regular expressions to segment the report and insert the pertinent data into a MySQL database. The data extracted are the name of the resident, the month, the procedure name, and the respective case volume. These data are matched to reference CPT codes and can generate synthesized reports, as proposed by the ACGME to track resident cases. A Web-based reporting system was developed using the PHP programming language on top of the Apache Web server. HTML pages are generated dynamically by querying the database using Structured Query Language (SQL).

RESULTS: The user can do retrospective analysis of an individual’s log, as well as compare it to other residents. This tool can also calculate an effective RVU value per resident to give them a perspective of the volume of work that might be expected following completion of residency.

CONCLUSIONS: This tool can assist residents and program directors in fulfilling the new ACGME resident case log requirement.

(SS08-63) 2:50 PM Utilization of a Resident Discussion Forum to Improve Resident Cohesiveness, Morale, and Job Satisfaction

Jeffrey R. Ramkaransingh, MD, University of Virginia Health System, Charlottesville, VA; Drew L. Lambert, Sr, MD; Kiran R. Nandhalur, MD; Mark W. Kringlen, MD; Christopher D. Cook, MD; Spencer B. Gay, MD*

PURPOSE: The consistent increase in radiological work flow in academic centers has made it difficult for radiology residents to develop a sense of “team.” Also, the subspecialty compartmentalization of imaging studies has decreased resident interaction. The purpose of our study was to create a routine resident discussion forum at our university and evaluate the satisfaction and value of such a program.

METHOD AND MATERIALS: Four residents per residency class (n = 16) were included in the study. Participants initially completed a survey which allowed them to rate cohesiveness, morale, job satisfaction, and education. Responses were measured using a 10-point Likert scale, with 1 = very poor and 10 = excellent. The subjects subsequently met for 15–20 minutes three times per week for a total of 10 weeks, usually shortly after the daily lecture. Discussion topics were vast but included family issues, recreation, and call and board preparation. At the end of the 10-week period, participants completed an identical survey. A Wilcoxon signed rank test was used to evaluate changes in survey response before and following the 10-week period.

RESULTS: The posttest median score for cohesiveness, 9.0 (25th–75th percentile: 8.0–10.0), was significantly greater than the pretest score, 7.0 (6.0–8.0) (P < .001). The posttest median score for morale, 8.0 (7.0–9.0), was significantly greater than the pretest score, 5.5 (4.5–6.5) (P < .001). The posttest median score for job satisfaction, 8.0 (7.0–9.0), was significantly greater than the pretest score, 5.0 (4.5–6.5) (P < .001). No significant difference was found between the posttest 7.5 (6.3–8.3) and posttest 7.5 (6.5–8.5) median scores for education (P = .333).

CONCLUSIONS: Implementation of a routine resident discussion forum is a simple and effective means for increasing resident cohesiveness, morale, and job satisfaction.

(SS08-64) 3:00 PM Radiology Reporting: Quality and Quantity as a Function of Resident Level

Kenneth Williamson, PhD, Indiana University School of Medicine, Indianapolis, IN (kenwilli@iu.edu)

PURPOSE: The developing competency of communications has received enough attention in the last decade to become a key criterion for all residency programs (ACGME). It is clear that improving the accuracy of radiological reporting, as well as the communication of that information to referring physicians, can significantly reduce the number of medical errors made in the practice of medicine. This paper conveys findings from a 2-year prospective study of both detection and communication in radiological reporting in a large midwestern radiology residency program.

METHOD AND MATERIALS: This study was granted an exempt review by the institution’s IRB. The films used were selected from faculty teaching files and posed no risk to patient care. Data are reported in aggregate and contain no personally identifying information. Materials for this study consisted of 30 cases containing one or more radiographs placed in a standard institutional film jacket with an accompanying typed requisition. Three cases were selected with urgent findings. Seven cases were written to portray common systemic errors: three with obvious errors and four with more subtle errors. Subjects in the study were radiology residents spanning all 4 years of the program. All subjects were tested within the same 2-week period in each year. Residents were seated at a light box with a dictaphone and the stack of cases. They were asked to report the cases as if they were on the emergency service. Residents were given 1 hour to complete the task. Analysis of variance was used to determine group difference on 20 study variables. Additionally, test-retest and interrater reliability analyses were performed.

RESULTS: Significant differences were found between groups and between cases, as expected. Several unexpected results were also found. Values for test-retest and interrater reliability were adequate.

CONCLUSIONS: Group differences resulting from experience in the program were expected; however, differences in how certain demographic, study, findings and impressions were surprising. These differences will be discussed in the presentation, along with procedure changes in the exam format that will increase fidelity of the simulation.

(SS08-65) 3:10 PM Evaluation of Training Needs and Measurement of End-User Satisfaction in the Implementation of New Technologies in an Academic Radiology Department

Stephen Chan, MD, Neurological Institute of New York, New York, NY (sc56@columbia.edu)

PURPOSE: The main goals of this study were to discover the training needs of end users in academic radiology, to measure their satisfaction after its introduction, and to identify end-user characteristics (such as learning style) that influence training.

METHOD AND MATERIALS: This study occurred in the setting of the introduction of PACS to our academic medical center, and just after introduction of voice-recognition technology (VRT). There were three phases of data collection: (1) 6 months before PACS introduction; (2) 6 months after PACS rollout; and (3) 4 years after PACS introduction. First, survey-based data were obtained on the “readiness” of radiologists to adopt new technology, as well as data about learning style preference. Second, I measured radiologists’ satisfaction with respect to PACS and VRT. Third, follow-up data were obtained from radiology residents about their satisfaction with both technologies and about their learning style preference.

* Faculty financial disclosures are located in the Faculty Index.
RESULTS: In 1999, academic radiologists and radiology residents were similar in having moderate experience with computer applications and existing technology, little experience with imaging workstations and PACS, and clear preference for one-on-one training sessions. In 2000, both groups found that they had received sufficient training for PACS and VRT but disclosed that only PACS made their work easier and was worth learning. In 2004, radiology residents found that this was true for both PACS and VRT. In 1999, abstract learning styles predominated among the residents (82%), as compared to attending radiologists (48%); this predominance persisted among residents in 2004 (72%).

CONCLUSIONS: Both radiology residents and attending radiologists had a clear preference for one-on-one training sessions for new work technologies such as PACS and VRT. By 2004, both PACS and VRT were thought by radiology residents to make their work easier and to be worth the time and effort to learn. One surprising result is the predominance of abstract learning styles among radiology residents, exceeding that found among attending radiologists. Studies in the IT literature suggest that abstract learning styles are most conducive for learning new computer-based technologies.

(SS08-66) 3:20 PM
The ACGME Knowledge Competency for US in Radiology Residents: Implementation of Learning Modules and the Assessment of Resident Learning

Lori A. Deitte, MD, University of Florida Jacksonville, Jacksonville, FL. (lori.deitte@jax.ufl.edu)

PURPOSE: To develop, implement, and evaluate a computer-based obstetrical ultrasound curriculum and to compare resident learning utilizing computer-based modules with the current curriculum format of didactic case-based conferences.

METHOD AND MATERIALS: Four narrated obstetrical ultrasound modules were developed and placed on our institution’s educational Web site. Didactic conferences on four general ultrasound topics were also developed; the topics consisted of gastrointestinal, genitourinary, female pelvis, and neck ultrasound. All radiology residents (n = 21) at our institution comprised the study group. A written pretest consisting of 64 obstetrical and 65 general ultrasound questions was administered. The computer-based modules were made available to all residents for a 2-month period. During this same time frame, the didactic noon conferences have been presented. Individual resident module and conference evaluation forms have been recorded, and conference attendance has been monitored. At the completion of the education intervention, a written ultrasound examination will be administered. A resident survey will assess each curriculum format.

RESULTS: For the obstetrical ultrasound pretest, the mean scores for year of radiology residency were as follows: 1st year, 46.7%; 2nd year, 60.8%; 3rd year, 66.0%; and 4th year, 71.5%. For the general ultrasound pretest, the mean scores for year of radiology residency were as follows: 1st year, 45.8%; 2nd year, 61.9%; 3rd year, 69.8%; and 4th year, 72.7%. The individual pretest and posttest scores for obstetrical and general ultrasound topics will be analyzed with a paired t test. The year of training of the radiology resident and the number of ultrasound rotations completed are covariates that will be analyzed using multivariate methods, including MANOVA. The results from the resident survey of the curriculum format will be summarized. The data analysis will be performed with 5% level of significance and 95% confidence interval.

CONCLUSIONS: A computer-based obstetrical ultrasound curriculum was introduced to our residents and compared to a conventional didactic case-based lecture series. The final results and conclusions will be presented.
METHOD AND MATERIALS: Patients with A-SAH who have received treatment for the ruptured aneurysm are enrolled in the study. The patients are followed for a 21-day period and monitored for developing vasospasm using clinical exam, daily transcranial Doppler (TCD), and digital subtraction angiography (DSA). CTP is performed at days 1–3, 7–9, 14–17, and 21. The CTP data are acquired and post-processed using a standard protocol for all patients. Cerebral blood flow (CBF), cerebral blood volume (CBV), and mean transit time (MTT) maps are generated from the CTP data. The mean CBF, CBV, and MTT quantitative values are calculated for each hemisphere.

RESULTS: Of a total of 26 patients with A-SAH: 10 patients developed vasospasm, and 16 patients had no vasospasm. The vasospasm group had mean CBF = 27.94 ml/100 gm/min, CBV = 1.55 ml/100 gm, and MTT = 5.78 sec. The no vasospasm group had mean CBF = 36.02, CBV = 1.77, and MTT = 4.86. The P values are .0007, .035, and .106 for the mean CBF, CBV, and MTT, respectively. Receiver operator characteristic (ROC) curves revealed diagnostic accuracy (area under the curve) of 0.96 for CBF, 0.81 for CBV, and 0.31 for MTT parameters. Thus far, a threshold for CBF was determined as 29.0 ml/100 gm/min, corresponding to a 95% sensitivity.

CONCLUSIONS: CBF has emerged as the parameter with the highest diagnostic accuracy. Therefore, emphasis on this parameter may be useful in following A-SAH by defining threshold definitions which can help stratify patients into high- and low-risk groups for development of vasospasm.

One Year Following MR-guided Focused Ultrasound Surgery: Assessment of an Emerging Technology
Fiona M. Tennessy, MD, PhD*, Brigham and Women’s Hospital, Boston, MA

PURPOSE: (1) To evaluate the effect of MR-guided focused ultrasound surgery (MRgFUS) on symptom relief and fibroid volume reduction at 1 year posttreatment. (2) To correlate the nonperfused volume (NPV) and thermal dose volume (TDV) with fibroid volume change from baseline to 6 months (M) and 1 year (Y) post-MR-guided focused ultrasound surgery (MRgFUS) of uterine fibroids.

METHOD AND MATERIALS: Thirty-nine consecutive patients with 48 treated fibroids were analyzed from a prospective phase III trial of women with symptomatic fibroids. MRIs and the symptom severity score (SSS) from patient-reported Uterine Fibroid Symptom and Quality of Life (UFS-QOL) questionnaire were obtained prior to, 6 months (M), and 12 M post-MRgFUS. MR images were obtained using a 1.5-T scanner (GE Signa). MRgFUS was based on T2-weighted 3D volumetrics analysis for the fibroid volumes was performed pre-treatment and 6 M and 1 Y posttreatment. Analysis for the NPVs was performed immediately posttreatment and 6 M and 1 Y posttreatment. TDVs were obtained by measuring thermal dose area in the coronal plane and multiplying by a typical length of a sonication. Statistical methods used one-sample Student’s t test and correlation coefficient.

RESULTS: Fibroid volumes at baseline, 6 M, and 1 Y were 224.6 ± 28.0 cc, 178.8 ± 24.3 cc, and 195.6 ± 29.0 cc, respectively. There is a significant decrease in fibroid mean ± SD volume (–46 ± 80 cc) at 6 M posttreatment (P < .001), which persists at 12 M posttreatment (–29 ± 73 cc, P = .04). UFS-QOL score reported was significantly decreased at 6 months (–29 ± 3 points, P < .001), and this difference was sustained 12 M posttreatment (–16 ± 4, P < .001). A weak positive correlation was found between volume change and change in SSS from baseline to 6 months, and baseline to 1 year (r = 0.1). The NPVs immediately posttreatment, 6 M, and 1 Y were 58.4 ± 9.2 cc, 20.1 ± 5.4 cc, and 14.6 ± 5.2 cc. The mean ± SE TDV was 207.9 ± 27.1 dose/cc, with a range of 9.8–683 dose/cc. NPV and TDV were found to have a strong correlation (r = 0.79). NPV had a moderately negative correlation with fibroid volume change from baseline to 6 M (r = –0.44) and to 1 Y (r = –0.32); P ≤ .01 for both time points.

CONCLUSIONS: MRgFUS of uterine fibroids results in a significant reduction in fibroid-related UFS-QOL score and a significant reduction in fibroid size at 1 year posttreatment. However, only a weak positive correlation was found between fibroid volume change from baseline to 6 and 12 months, and reduction in SSS from baseline to 6 and 12 months. NPV’s immediately posttreatment and TDVs were found to have a strong positive correlation. A larger NPV immediately post-MRgFUS is associated with a greater fibroid volume reduction.

Cost-effectiveness of Coronary Artery CT Angiography versus Catheter Angiography
Aine M. Kelly, MD, MS*, University of Michigan Health System, Ann Arbor, MI

PURPOSE: (1) To determine patient preferences for coronary artery CT angiography (CTA) when compared to conventional catheter angiography (CCA). (2) To incorporate patient preferences into a decision model in order to calculate cost-effectiveness of CCA versus CTA. (3) To determine the impact of CTA on surgical decision making compared to CCA alone.

METHOD AND MATERIALS: (1) One hundred consecutive patients who are to have CTA for clinical reasons will be surveyed. The CTA is being performed on the 64-slice CT and involves a small modification to the imaging protocol for their routine preoperative aortic CT. The survey will include the time trade-off method as well as a direct rating scale. Surveys will be administered immediately after the CCA or CTA by the PI or research assistant. IRB approval has been sought for the patient preferences survey. Patients will be referred via the cardiothoracic surgery clinics, and recruitment will begin as soon as IRB approval is obtained. (2) Using a base case of a 40-year-old male who is screened for coronary artery disease, a decision model is to be constructed to compare the strategies of CCA, CTA, exercise ECG, and SPECT. Patients will be screened every 5 years in this Markov model. This will incorporate patient preferences for the tests CCA and CTA. (3) Thirty patients who have had both CTA and CCA performed will have both sets of images de-identified. Case mix will include normal coronary arteries, insignificant coronary artery disease, and significant coronary artery disease. Three cardiothoracic surgeons will review the images in one or other modality. They will rate the presence of disease and their confidence in this decision. They will also decide on a treatment plan and rate their confidence in this decision. After a period of at least 10 weeks, the surgeons will re-review the cases using the other imaging modality. Levels of confidence will be assessed using a 10-point Likert-like scale, with 1 being least confident and 10 being most confident. If the data are normally distributed, then paired t tests will be used to compare the means. If the data are not normally distributed, the Wilcoxon rank sum or signed rank test will be used, as appropriate. Significance will be assumed at a P value of <.05.

RESULTS: (1) To date, the surveys have been devised, and IRB approval is awaited. (2) Currently, disease, cost, and clinical estimates for the decision model are being calculated. (3) The electronic radiology information database has been searched for suitable patients. Images obtained are being reconstructed and de-identified.
**Cost-effectiveness of MR Imaging for Breast Cancer Surveillance in BRCA Gene Mutation Carriers**

Janie M. Lee, MD, MS*, Massachusetts General Hospital Institute for Technology Assessment, Boston, MA

**PURPOSE:** To evaluate the clinical and economic impact of MRI screening for breast cancer in women at increased risk due to BRCA gene mutations.

**METHOD AND MATERIALS:** A Markov Monte Carlo simulation model of breast cancer was developed, which consists of three linked modules: (1) breast cancer “Development and Clinical Detection,” (2) “Treatment and Follow-up,” and (3) “Screening.” Asymptomatic 25-year-old women with BRCA gene mutations enter the model in the “Development and Clinical Detection” module. Because the cumulative risk and age-specific breast cancer incidence vary with gene mutation, cohorts of BRCA1 or BRCA2 carriers are evaluated separately. During each cycle of the model, a woman can remain healthy, develop undiagnosed breast cancer, or die of causes unrelated to breast cancer. Once breast cancer is diagnosed, the woman moves from “Clinical Detection” to “Treatment.” Each woman in the “Treatment” module can remain clinically stable, develop breast cancer recurrence, develop a contralateral breast cancer, die of breast cancer, or die of other causes. The “Clinical Detection” and “Screening” modules will be linked such that all women who are either healthy or have undiagnosed cancer will be screened when “Screening” is activated. The model will be used to evaluate four screening strategies: (1) annual mammography only, (2) annual MRI only, (3) annual combined MRI and mammography, and (4) an alternating regimen of mammography or MRI every 6 months. Subsequently, direct costs of care and quality-of-life adjustments will be added.

**RESULTS:** Preliminary output from the “Development and Clinical Detection” module for BRCA1 gene mutation carriers indicates that 65.5% of these women will develop breast cancer during their lifetimes, which approximates the observed cumulative incidence. The mean size of predicted invasive cancers is 3.3 cm. To date, the best-fitting parameter set produces the following output: (1) 35.4% of invasive cancers are <2 cm in size, and (2) 4.9% of cancers are DCIS. This output is within 5% of preselected targets. A preliminary “Treatment and Follow-up” module predicts 39.2 years of remaining life expectancy for a cohort of 25-year-old BRCA1 mutation carriers.

**CONCLUSIONS:** A natural history model of breast cancer in women with BRCA1 mutations has been developed and generates output consistent with available clinical data. Ongoing work is focused on finalizing the “Treatment and Follow-up” module and incorporating the “Screening” module involving MRI, alone or in combination with mammography. The model will then develop estimates of the costs, clinical effectiveness, and cost-effectiveness of each screening strategy.
reports. The members of the groups discussed the cases, using radiology staff as consultants, rather than instructors. As a final project, each group made a presentation on its assigned case to the other students and faculty. Students’ attitudes toward the teaching methods and the field of radiology were surveyed using a five-point scale (1 = strongly agree; 2 = agree; 3 = neither agree nor disagree; 4 = disagree; 5 = strongly disagree).

RESULTS: When compared to before taking the course, students’ understanding of the role of radiologists in the clinical management of patients increased significantly (1.5 vs 3.3; P < .00002), as did interest in radiology as a career (1.6 vs 2.2; P < .03). Students significantly preferred scrolling through images on their own, rather than being shown static images in a didactic format (1.1 vs 2.6; P < .00006). All students agreed or strongly agreed (1.3 ± 0.05) that they would recommend the elective to a classmate.

CONCLUSIONS: Case-based instruction in radiology where 1st-year medical students are actively engaged in (rather than observing) the integration of clinical and imaging information can impact students’ views on the role of radiologists and on career choice in radiology.

(SS09-68) 4:10 PM
First-Year Medical Student Attitudes about a Career in Radiology before and after a Course in Radiology
Marie M. Packer, MS, Michigan State College of Human Medicine, East Lansing, MI; Gerald R. Aben, MD; Kimberly E. Applegate, MD, MS
PURPOSE: To determine if a radiology course affected 1st-year medical students’ interest in radiology as a career, whether level of interest in the 1st year varies by gender, and factors that relate to women's interest in radiology.

METHOD AND MATERIALS: Voluntary anonymous surveys were administered to 1st-year medical students before and after a required radiology course. They rated their interest in radiology as a career from 0 to 10 (low to high). Then they rated as “negative,” “neutral,” or “positive” the influence of 10 factors on residency choice. The 10 factors were “competitive residency,” “shorter residency,” “role models,” “more patient-care,” and “more patient contact.”

RESULTS: The total number of respondents was 116 (pre course) and 80 (post course). In the precourse survey, the mean value of level of interest was 4.51 (men) and 4.0 (women). In the postcourse survey, mean values were 5.19 (men) and 4.29 (women), and fewer women rated “0” interest in radiology (10.3% pre vs 1% post). For “work is technological,” 48% of men and 21% of women rated this as a positive influence on choice of residency, and 2% of men and 11% of women rated it negatively. Responses of women in the precourse survey indicated that “level of interest” in radiology as a career significantly (<.05) correlated to the ratings for “work is technological” and inversely correlated to ratings of “more patient contact,” whereas in the postcourse survey, the level of interest correlated to “role models.”

CONCLUSIONS: After the radiology course, level of interest in radiology increased slightly, but more for men than for women, and level of interest was slightly lower for women than men. Among women, interest in radiology corresponded to ratings of “work is technological” and inversely with “more patient care” in the precourse survey, and to “role models” in the postcourse survey. Findings suggest that women might develop greater interest in radiology as a career if they are exposed to a course in radiology, if the patient-care features of radiology careers are highlighted, and if they have role models.

(SS09-69) 4:20 PM
Analysis of Radiology Resident Dictation Volumes: Relationship to American Board of Radiology Oral Examination Performance
Zeynep Yilmaz, Wayne State University School of Medicine, Detroit, MI; John W. Bonnett, MD
PURPOSE: To retrospectively evaluate the association between the number of cases residents dictate and their performance on the American Board of Radiology (ABR) oral exam.

METHOD AND MATERIALS: Records of 23 radiology residents graduating between 2003 and 2005 were reviewed. One-way analysis of variance (ANOVA) models were employed to examine the mean difference between resident outcome categories (pass vs fail or conditional) on two continuously scaled variables: total cases read and daytime cases read. Similar analyses were performed to analyze the relationship between board passage in the musculoskeletal, pediatrics, ultrasound, mammography, and nuclear medicine sections compared to total cases read in each section during residency.

RESULTS: Individuals who passed their exam (n = 13) read a mean of 11,087 ± 1,190, whereas individuals who failed (n = 10) read a mean of 10,167 ± 1,55. The mean difference of 921 cases between the pass and fail groups resulted in a P value of .08 (95% CI = −10.74 to 1.94). Two-tailed independent samples t test, t = 1.86; df = 21; P = .08). Those who passed their exam read a mean of 4,648 ± 805 daytime cases, whereas those who failed read a mean of 5,866 ± 890 daytime cases (P = .20). In addition, when analyzing board passage in individual sections, individuals who passed vs those who failed the musculoskeletal, pediatrics, ultrasound, mammography, and nuclear medicine sections read a mean of 1,492 ± 229 vs 1,263 ± 229 (P = .08), 1,411 ± 316 vs 1,292 ± 221 (P = .48), 422 ± 167 vs 362 ± 44 (P = .20), 518 ± 291 vs 630 ± 200 (P = .7), and 300 ± 142 vs 322 ± 163 (P = .73) cases, respectively.

CONCLUSIONS: Although not statistically significant, residents who passed the musculoskeletal, pediatrics, and ultrasound sections read a higher mean number of cases in those respective sections than those who failed. In contrast, those who passed the mammography and nuclear medicine sections read a lower mean number of cases than those who failed. When all sections were combined, however, residents who dictated more cases during residency tended to do better on the ABR oral exam, although there was no statistical significance between groups.

(SS09-70) 4:30 PM
The Utility of Cadaveric CT and MR Imaging to Enhance Medical Student Dissection and the Contextual Learning of Anatomy
Edward V. Staab, MD, Wake Forest University Baptist Medical Center, Winston-Salem, NC; James E. Johnson, PhD (estaab@wfubmc.edu)
PURPOSE: The intent of this study was to determine if cadaveric scans could be employed to enhance the contextual learning of anatomy by the correlation of dissection tasks with CT and MR images acquired from the specific specimens under study.

METHOD AND MATERIALS: CT and/or MR data were acquired from body cavities and the head and neck region of cadavers prior to student dissection (n = 50). In some cases, scans were completed both before and after embalming to analyze embalming artifacts, as well as changes in image contrast and resolution. The anatomy dissection laboratory was adapted for the incorporation of images into instructional tasks with the installation of a 21-inch flat-screen monitor directly over each dissection table. Students were provided a viewer
application with all acquired images for their cadaver on CDs. They also received unrestricted access to all other cadaver studies via an academic server. In addition, students were provided a summary radiology report of significant findings from all cadavers, as well as radiology consults from residents. TeraRecon thin-client software provided students with 3D rendering capabilities, including the capacity to review their cadaver after the completion of the dissection. Student behaviors were recorded over 2 years of instruction (total n = 210). Self-reporting was used to record the utilization of images and the perceived utility of resources for contextual learning.

RESULTS: Images acquired from fresh unembalmed cadavers had fewer artifacts and superior image quality when compared with scans from embalmed specimens. The majority of students reported the most frequent study of images during and after dissections, rather than before sessions, with a perception of learning from image study. Radiology consults were most helpful during sessions rather than outside of class. The utility of CT cadaver images was limited by the inability to use contrast agents and facilitated by highly focused learning tasks.

CONCLUSIONS: MRI and CT scans of cadavers can be effectively utilized during the dissection experience via faculty-directed learning tasks to enhance the contextual learning of anatomy.

**[SS09-71] 4:40 PM**
**Does Additional Training with US Enhance 1st-Year Medical Students’ Competence in Performing the Abdominal Examination?**

Thomas H. Grant, DO, FACP, Feinberg School of Medicine, Northwestern University, Chicago, IL; John E. Butler, MD; Egan Mari, MD; Marcia Kaye, MS; Diane B. Wayne; William C. McGeggie, PhD

PURPOSE: Medical students’ physical examination skills have declined concomitant with the increased accessibility of advanced imaging techniques. We investigated if addition of one-time ultrasound training enhances competence in the performance of the abdominal examination.

METHOD AND MATERIALS: First-year medical students received the standard abdominal examination curriculum consisting of demonstration and practice in small groups. We randomized students to an intervention group that received immediate ultrasound training or to a wait-list control group which received delayed training. A radiologist demonstrated the location of the abdominal organs, and students practiced on a patient model with ultrasound guidance. The intervention took place over approximately 1 hour. To assess proficiency in performing the abdominal examination, standardized patients (SP) completed a clinical skills assessment (CSA) checklist (possible score range, 0–8) at two times.

RESULTS: Data from 163 students were analyzed. There was no statistically significant difference in student proficiency as assessed by SP checklist at the first CSA (time 1) in the group which had received ultrasound compared with the group which had yet to receive ultrasound. However, at the second CSA (time 2), the group which received delayed ultrasound showed a statistically significant difference in their proficiency.

CONCLUSIONS: The addition of one-time ultrasound training early in a 1st-year medical student abdominal examination curriculum appears not to improve student proficiency as assessed by SP checklist. However, when students received ultrasound training later in the course, they had statistically significantly greater proficiency. The rate of improvement was accelerated in the group that received delayed ultrasound. Students may require a minimal level of competence before they are able to benefit from the visual feedback offered by ultrasound. More recent ultrasound training resulted in a greater improvement than less recent training. The addition of ultrasound training in the abdominal examination after 1st-year students have achieved some basic skills warrants further study.

**[SS09-72] 4:50 PM**
**Orientation of 1st-Year Radiology Residents for Night Call**

Lisa B. Bush, MD, Tripler Army Medical Center, TAMC, HI; Jay Hudson, MD; Veronica Rooks, MD; Gregory W. Petermann, MD (lisiseth.bush@haw.tmc.amedd.army.mil)

PURPOSE: Evaluation of an intervention by residents and staff to prepare 1st-year radiology residents to take night call independently.

METHOD AND MATERIALS: At many institutions, independent night call will begin after 6 months of residency. The miss rate, or rate of discrepancy between the initial reading by the night-call resident and the staff member reviewing the study, is highest during the first 2 or 3 months that the residents take call independently. The anxiety level of both staff and residents is typically highest during these initial 2 or 3 months. Within the first few months of residency, 1st-year radiology residents must assimilate a large volume of knowledge to independently manage overnight call. Often, new residents lack an organized format of learning material prioritized to their year level. An organized format with priority given to material focused on rapid acquisition of 1st-year material could be very beneficial. A lecture program was implemented where upper-level residents gave didactic instruction to incoming residents on various topics. The topics were chosen to prepare the new residents for overnight call. Added benefits were that the more senior residents developed additional skills in organizing and presenting their basic radiology knowledge. The program consisted of 30 lectures given during the residents’ lunch hour from July through October, in addition to the regularly scheduled hour-long morning staff lecture and evening resident lecture. The program also included three 4-hour staff-supervised buddy call periods prior to independent call. The resident-staff discrepancy rate was reported and compared to prior years following the implementation of this new program.

RESULTS: Subjectively, both 1st-year and senior residents felt the program was beneficial and should be continued. Staff physicians also thought the program was not only beneficial for preparing the 1st-year residents for night call but also fostered mentorship. Objective statistical analysis of the resident-staff discrepancy rate is pending.

CONCLUSIONS: Additional training increases the subjective confidence of residents and staff. Objective evaluation is pending.

**[SS09-73] 5:00 PM**
**Accuracy of Clinical History Supplied by Emergency Room Physicians**

Aaron P. Kamer, BS, Wayne State University, Detroit, MI; Jerry V. Glowniak, MD, MS; Gerald Hillman, MD, Wilbur L. Smith, Jr, MD (akamer@med.wayne.edu)

PURPOSE: The ACR practice guideline for communication of diagnostic imaging findings states that a radiologist should address any specific clinical questions posed by the referring physician relating to the patient’s condition. Often the only specific question posited by the referring physician is the “reason for exam.” This indication is often significantly abbreviated, limiting the ability of the radiologist to answer the clinician’s questions. We evaluated 50 patients to determine how often the history provided by the clinician leads to a report that does not meet the ACR practice guideline.

METHOD AND MATERIALS: Fifty patients were randomly selected who had undergone evaluation in the emergency department with a two-view chest x-ray. The patients selected had been evaluated 6 months prior in order to ensure the presence of a complete electronic record. The documented reason for exam for each of these patients was compared with the emergency physician’s dictated history and physical to evaluate for obvious inconsistencies. The reported results of the chest x-ray were also evaluated for appropriateness to both the documented reason for exam and to the actual clinical presentation.

* Faculty financial disclosures are located in the Faculty Index.

80 I Association of University Radiologists
according to the history and physical. The films were then reevaluated by a staff radiologist panel with the full clinical presentation in mind, to evaluate the influence of the new information on a final report.

RESULTS: Discrepancies were noted between the “reason for exam” and the clinician’s dictated history, resulting in unaddressed clinical questions on the image report.

CONCLUSIONS: Discrepant clinical information provided by referring physicians may lead to significantly inadequate reporting according to the ACR practice guideline for communication of diagnostic imaging findings.

(SS09-74) 5:10 PM
Error and Failure: Resident Perceptions
Jennifer L. Steele, MS, Indiana University School of Medicine, Indianapolis, IN; James Nyce; Kenneth Williamson, PhD (jelsteel@iupui.edu)
PURPOSE: To determine residents’ definition of medical error and failure and how they deal with both in residency.

METHOD AND MATERIALS: Ten 4th-year residents were interviewed prior to graduation. They were asked their definition of medical error and medical failure; their failures, circumstances, and the impact of failure; and how they recovered. Interviews were one-on-one, noted. Residents were given time as necessary to respond. Error and failure were also discussed with some faculty members.

RESULTS: Residents quickly defined error as a mistake. According to the residents, they expected to make errors as part of learning. Faculty summarized there was an inevitability and acceptability about resident mistakes. Medical failure provided a different understanding among residents. Responses were tied to delivering less than the best patient care, resulting in patient harm, suffering, or delayed care. Nine residents recalled an incident as a failure. Although the perceived failures occurred earlier in their careers, all interviewed residents could recall the circumstances of the incidents, and all still felt guilty about the outcomes. Residents believed these incidents were more than errors. Responding residents reported that recovering from failures meant they had to learn and go on, although they did not forget. All nine residents believed they could discuss not only errors, but failures as well, with faculty, but felt alone when perceived failures occurred, although no resident reported ever facing sanctions from faculty.

CONCLUSIONS: Residents believed they could talk with faculty about perceived failures, yet still felt alone because they believed they had strayed from the image of what a “good doctor” was. Residents felt comfortable with errors because faculty expected them, but failure was a self-imposed separation where residents were not able to reconcile professional behavior with that of faculty. Because they see error and failure differently, residents seek ways to deal with both, yet have not been given explicit methods by which to deal with failure. Residents believed insight into past faculty failures could help them understand their own feelings and give a better understanding about radiology practice.

(SS09-75) 5:20 PM
The Role of the Radiologist in Problem-based Learning
Tina S. Nelson, MD, Dartmouth Hitchcock Medical Center, Lebanon, NH (tina.s.nelson@hitchcock.org)
PURPOSE: Second-year students at Dartmouth Medical School are introduced to clinical medicine through a small-group case-based learning program entitled Problem-based Learning (PBL), which includes imaging studies. Facilitators are typically from medical disciplines, but the radiologist may also play an important role. The radiologist is able to provide state-of-the-art images and is best versed in up-to-date modalities. Students have little prior formal exposure to radiological studies. Student expectations of the role of radiology in this setting frequently differ from that intended by the program director (eg, image interpretation versus imaging algorithms), and this may affect their learning strategies.

METHOD AND MATERIALS: To evaluate students’ pre- and postcourse expectations and experiences of the radiology component and their concepts of the role of imaging in patient management, we administered a questionnaire before and after PBL.

RESULTS: To date, the questionnaire prior to the PBL course has been administered, with a one-third class response.

CONCLUSIONS: The data from this questionnaire are useful in directing the radiologic component of PBL and additional 2nd-year radiology instruction.

* Faculty financial disclosures are located in the Faculty Index.
Scientific posters are located in Salon C. Each poster will be presented by its author during one of four category 1 CME poster sessions scheduled for Thursday and Friday. The day and time follow the presentation number.

Presenting author is identified by institution, city, state, and country, if not United States or Canada.

Presentations by trainees (residents, medical students, first-year fellows) are noted in red.

(P-01) Thursday • 10:00 AM
Algorithmic Approach of Abnormal Patterns in Chest Imaging: A Framework for Web-assisted Diagnosis
Les R. Folio, DO, MPH, Uniformed Services University of the Health Sciences, Bethesda, MD; James G. Smirniotopoulos, MD; David S. Feigin, MD; Brian A. Singleton, MD; David Amer (ffolio@usuhs.mil)
PURPOSE: Chest radiology presents many challenges to the radiologist, resident, student, and professor because of the inherent complexity of the plain frontal x-ray and high-resolution cross-sectional imaging. We describe an algorithm of the major patterns of abnormalities found in chest imaging. It is proposed that the presented algorithm sets a common framework for interpreting abnormalities on chest images. This systematic approach provides a standard teaching method for medical students and radiology residents to learn and build their skills on the same framework.
METHOD AND MATERIALS: The algorithm was developed using the Excel macro TreePlan, typically used for decision analysis. The hierarchical structure allowed for categorization of abnormal findings on chest images into major patterns and differential diagnosis. TreePlan allowed for decision nodes to be expanded several levels for optimal graphical resolution while maintaining a universally available format (Excel). Once a pattern is chosen, the provider is guided by new choices to narrow the differential diagnosis to broad categories. This list is further refined by pattern specific, family/medical history, occupational exposure, lab values, etc, until a more specific working diagnosis is reached.
RESULTS: New techniques of teaching developed by Dr Feigin within the last year at USUHS were successfully captured onto the algorithm as a single source of all abnormal patterns on chest images that help provide a map of the complex science of chest imaging. The user develops a fairly specific diagnosis that can assist in the learning process. Providers without radiologists may use the algorithm as an adjunct diagnostic tool.
CONCLUSIONS: The unique approach presented provides a systematic breakdown of chest disease based on major patterns, then subdivided into several more levels for an accurate diagnosis. The resultant algorithm can be used as a high-level map in the chest reading room to show the student of radiology the pathway from patterns to differential diagnosis, hopefully optimizing the learning process. The framework can be continually updated and built upon to become a comprehensive single source in abnormal chest radiology.

(P-02) Thursday • 3:30 PM
Skin US in Children: Role in the Characterization and Diagnosis of Focal Nodular Lesions
Cristian J. Garcia, MD, Pontificia Universidad Catolica, Santiago, Chile; Rodrigo Parra; Cristian Vera; Sergio Gonzalez, MD; Jose D. Arce, MD; Carlos Toledo, MD; et al (cgarcia@med.puc.cl)
PURPOSE: To show a variety of superficial local and nodular skin lesions that can be seen in children, emphasizing the sonographic appearance, with clinical and pathological correlation. We have found this barely described in the literature.
METHOD AND MATERIALS: High-resolution ultrasonography (US) with color Doppler study was performed in more than 200 pediatric patients who presented with superficial focal skin nodular lesions and were referred to our hospital from 1999 to 2004. Patients were studied with 10–12-MHz transducers; no sedation was required, and a significant number of them had surgery and/or pathological study.
RESULTS: US was helpful in the characterization and diagnosis of these lesions, and the extent and invasion depth were correctly assessed by this technique. Many lesions had a constant and relatively characteristic sonographic appearance, with good histological correlation. Histologically or surgically proven cases are shown, including examples of dermoid and epidermal cysts, epidermal inclusion cysts, trichilemmal cysts, fat necrosis, foreign bodies, fibromas, pilomatrixomas, lipomas, neurofibromas, papillomas, granulomata, Langerhans cell histiocytosis, myiasis, and keloids.
CONCLUSIONS: High-resolution US with color Doppler study is helpful in the characterization and diagnosis of focal nodular skin lesions in children. The extent and depth can be correctly assessed by US. However, in many cases, the final diagnosis is made histologically.

(P-03) Friday • 10:00 AM
Imaging Characteristics of Adrenal Pheochromocytoma by CT and MR Imaging
Nilofer Firooznia, MD, New York Presbyterian Hospital, New York, NY; Peter Klieger, MD
PURPOSE: To demonstrate the imaging characteristics of adrenal pheochromocytomas by CT and MRI which allow diagnosis and differentiation from other lesions.
METHOD AND MATERIALS: A variety of cases of pathology-proven adrenal pheochromocytomas were reviewed retrospectively. Specific imaging characteristics of these tumors were evaluated which allow differentiation from other adrenal neoplasms using CT and MRI.
RESULTS: Pheochromocytomas have certain imaging characteristics on CT and MRI which are specific to these neoplasms.
CONCLUSIONS: CT and MRI have proven useful in differentiating adrenal pheochromocytomas from other adrenal neoplasms. In addition, radiologic imaging has shown great utility in the presurgical management of these tumors.

(P-04) Friday • 3:30 PM
The Management of IMG Radiology Residents’ Visas in the Wake of Hurricane Katrina
Mardjohan Hardjasudarma, Louisiana State University Health Sciences Center, Shreveport, LA; Carol Peterson; Dedrie Plette
PURPOSE: In addition to all other problems caused by Hurricane Katrina in New Orleans, displaced international medical graduates (IMGs) were faced with yet another: how to keep their visas valid under these extraordinary circumstances. The subsequent management and outcomes are discussed.
METHOD AND MATERIALS: A small group of IMG postgraduate trainees in radiology from New Orleans were temporarily displaced and accommodated by their sister program in Shreveport, Louisiana. Special federal immigration regulations were applied and administered. This was executed in coordination between Immigration Advisors in both Shreveport and (after a brief hiatus) New Orleans.
RESULTS: The timely and effective application of special federal immigration rules and regulations ensured the temporary continuation of the validity of a variety of visas in a different institution and in another geographic location.

CONCLUSIONS: The short-term outcome of the management of the visa/immigration problem was quite favorable. It did not add yet another problem to the devastation wrought by Katrina.

(P-05) Thursday • 10:00 AM
Aortoesophageal Fistula Presenting as Upper Gastrointestinal Bleeding in a Trauma Patient: A Case Review
Henry Dalsania, MD; Drew University College of Medicine, Philadelphia, Pa; Donald P. Underwood, DO
PURPOSE: Describe an uncommon cause of upper gastrointestinal bleeding.

METHOD AND MATERIALS: Review of relevant CT scans and endoscopy images of a patient presenting with upper gastrointestinal bleeding.

RESULTS: Patient presented to the emergency department following a motor vehicle accident secondary to syncope. The patient was hypotensive with upper gastrointestinal bleeding in the emergency department. The subsequent CT scan and endoscopy revealed a thoracic aortic pseudoaneurysm with an aortoesophageal fistula.

CONCLUSIONS: Aortoesophageal fistula is an uncommon cause of upper gastrointestinal bleeding and should be considered in the differential diagnosis.

(P-06) Thursday • 3:30 PM
CT-guided Percutaneous Cryoablation: A New Treatment Option for Renal Cell Carcinoma
David R. Sopko, MD, Rochester General Hospital, Rochester, NY; Jonathan D. Broder, MD; Bryan E. Scott, MD (dsopko@hotmail.com)
PURPOSE: Our goal is to review patient selection, technique, and pertinent early imaging findings related to CT-guided percutaneous cryoablation of renal cell carcinoma. We will also describe short-term results and patient complications.

METHOD AND MATERIALS: We review the clinical history, procedural history, and postprocedure follow-up of a series of patients who have undergone CT-guided percutaneous cryoablation of renal cell carcinoma.

RESULTS: CT-guided percutaneous cryoablation of renal cell carcinoma is a promising technique for tissue ablation. It has demonstrated favorable postprocedure imaging characteristics, with a high rate of technical success and no major adverse complications.

CONCLUSIONS: CT-guided percutaneous cryoablation of renal cell carcinoma is a safe and feasible option in the treatment of patients with renal cell carcinoma, particularly in patients who are not desirable surgical candidates.

(P-07) Friday • 10:00 AM
Comparison of Faculty-Resident and Resident-Resident Mentorship Programs at a University Teaching Program
Mark W. Kringle, MD, University of Virginia Health System, Charlottesville, VA; Spencer B. Gay, MD; Kathryn C. Nandalur, MD; Christopher D. Cook, MD; Jeffrey R. Ramakrishna, MD (mwk7q@virginia.edu)
PURPOSE: We have implemented a successful resident-run mentorship program at our university. However, faculty physicians can offer a different perspective with regard to residency training. The goal of our study is to compare the effectiveness of faculty-resident and resident-resident mentorship.

METHOD AND MATERIALS: We plan to implement a faculty-resident mentorship program whereby residents will routinely meet with select attending physicians to discuss such issues as work-flow management, study materials, and call preparation. Participating residents and faculty will subsequently complete a survey to reflect their satisfaction with such a program. The same residents will also complete a similar questionnaire pertaining to our current resident-resident mentorship program. The two data sets will be compared.

RESULTS: The results for each category will be compared using a one-way analysis of variance.

CONCLUSIONS: Both faculty-resident and resident-resident mentorship programs can be valuable means for improving resident education. This study is intended to identify which is superior at our university teaching program.

(P-08) Friday • 3:30 PM
Resident Preference between Two Call Schedules
Richard P. Bonsall, MD, Medical University of South Carolina, Charleston, SC; Douglas Lake, MD; Dirk Koester, MD; James G. Ravenel, MD; Leonie Gordon, MBChB (lake@musc.edu)
PURPOSE: Determine resident acceptance and preference between two call systems which both meet the ACGME-mandated 80-hour work-hour requirement.

METHOD AND MATERIALS: Seventeen of the eligible residents at a midsize academic institution who had participated in a call schedule that met the 80-hour work-hour requirement were surveyed in 6/2005 prior to changing their call schedule. Following this, a major change in the call schedule occurred which requires residents to work both more hours and weekends while on call, but provides a weekday off while on call. After this change, a second short survey was sent to each resident as they completed each new call month. A third completion survey of the 17 residents will be compiled in 3/2006 when all have rotated through the new call schedule. The results of the surveys will be compared and contrasted to determine overall resident acceptance and preference of a change between two call schedules which both meet the ACGME-mandated 80-hour work-hour requirement.

RESULTS: Seventeen initial surveys have been completed, and short monthly surveys are currently being distributed, completed, and compiled. A third summary survey will be completed in 3/2006. The preliminary results of the short monthly surveys indicate residents prefer the second call schedule despite it being more rigorous because it eliminates weekend coverage when not on call and offers a weekday off midweek while on call. Example surveys and graphical illustrations of both call schedules will be provided.

CONCLUSIONS: Preliminary results suggest residents prefer the second, more rigorous call schedule because it offers several advantages, such as a weekday off and less weekend shifts in the hospital overall, but our results are pending a summary survey at this time.

(P-09) Thursday • 10:00 AM
Wikirad: A Collaborative Residents’ Web Page
Naveen Garg, Waltham, MA; Allen Chang, BA (naveen.garg@gmail.com)
PURPOSE: On most radiology Web portals used, many links are broken or outdated or are simply irrelevant to what you are looking for. We have created a collaborative online Web page for radiology residents that allows residents to modify and contribute to it. It serves as a central repository of hyperlinks. Users of the site are allowed to modify both the organization of the data and the content itself. This bypasses the inefficient bureaucracy of traditional webmaster-operated portals.

METHOD AND MATERIALS: We have used PHPWiki, an open source tool, to create and moderate Wikirad. It contains hyperlinks to educational resources categorized in two ways: one by ACR coding standards by organ system, and another by modality. A few

* Faculty financial disclosures are located in the Faculty Index.
links were seeded by the wiki moderators, and the rest were then submitted by the community. The address of the wiki is http://www.wikirad.svrhrad.com. We compare it to two traditional radiology Web portals: (1) http://brighamrad.harvard.edu/links.html (top link in a Google search for “radiology department links”); (2) http://www.auntminnie.com/index.asp?Sec=lin&Sub=def (Aunt Minnie is the top link in BrighamRAD under “Portals and E-Publications”). Criteria compared are (a) organization, (b) number of broken links, and (c) user satisfaction.

RESULTS: The wiki had organ systems represented by anatomical location, and they were numbered according to usefulness. BrighamRAD had no subcategorization under educational resources by anatomical area. Aunt Minnie was categorized by “subspeciality,” but it was more than two link depths away from the main portal, and they were not numbered by usefulness. Broken links were quickly fixed by users of the wiki, whereas BrighamRAD had two out of 15 links that were broken and were not fixed. Aunt Minnie had too many irrelevant links that were as bad as broken links. Radiology residents reported higher satisfaction levels with the wiki.

CONCLUSIONS: Wiki is a better way for radiology residents to organize their collective educational efforts on the Web. Wikirad is a move away from commercial radiology portals to more open and resident-directed learning environments on the Web.

(P-10) Thursday • 3:30 PM Complete Bladder Duplication in Association with Colonic Duplication and Uterus Didelphys

Patricia E. Ladd, MD, Kansas University School of Medicine, Wichita, KS; Debra Desilet-Dobbs, MD; Andrew Huang, MD (laddpe@yahoo.com)

PURPOSE: Duplication of the bladder, a rare anomaly, is presented here in association with nearly complete duplication of the colon and uterus didelphys. The purpose of this poster is to present the radiographic findings of this constellation of anomalies in a newborn, as well as a review of the literature.

METHOD AND MATERIALS: The patient presented at birth with abnormal-appearing genitalia. Physical exam revealed an anterior anus, low-lying umbilicus, two urethral openings, septate vagina, as well as a fistula at the vaginal fourchette that drained meconium. Contrast studies revealed nearly complete colonic duplication with the second anus at the vaginal fourchette, complete bladder and urethral duplication, as well as uterus didelphys and a widened symphysis pubis.

RESULTS: Previous authors have noted an association between distal bowel duplications and urogenital malformations, with one study finding up to 56% of lower urinary tract duplications also having distal intestinal duplications (4). Dominguez et al proposed the name caudal duplication syndrome to identify this constellation of findings. Current proposed mechanisms include an insult to the caudal cell mass around the 23rd to 25th day of embryogenesis versus a partial split in the notochord early in development. The congenital anomalies are varied and may include, in addition to colon and urogenital duplication, spinal and limb anomalies and lower abdominal wall defects. Clinical presentations are also varied and include diphallia or abnormal-appearing genitalia, bladder extrophy or omphalocoele, and signs of colonic or bladder obstruction.

CONCLUSIONS: Treatment involves restoring function via surgical methods.

(P-11) Friday • 10:00 AM Imaging of Bariatric Surgery Complications

Thomas Keane, MD, New York Presbyterian Hospital, New York, NY; Alexander R. Margulis, MD; Charles Knight, MD (tkadjm@yahoo.com)

PURPOSE: The estimated lifetime complication rate from bariatric surgery is 25%. As imaging, along with laparoscopy, is the primary means of working up GI symptoms in a bariatric patient, this poster will familiarize radiologists with the imaging appearance of the most common complications of bariatric surgery.

METHOD AND MATERIALS: We examined the imaging studies done on over 350 bariatric patients in 2003–2004 at a major bariatric surgery center. The imaging appearance of normal and abnormal anatomy, common complications, and revision surgeries were noted. Key imaging features of common complications were noted and catalogued.

RESULTS: The most common early complications of a bariatric surgery were anastomotic leak and stricture, with fluoroscopy being the imaging study of choice in the weeks following surgery. The most common late complications were gallstones and internal hernias, both secondary to rapid weight loss. These complications were best imaged by a combination of CT and abdominal ultrasound. Imaging proved useful in triaging patients for observation versus laparoscopy.

CONCLUSIONS: GI symptoms in a bariatric surgery patient should be worked up with fluoroscopy in the immediate postoperative period, to rule out anastomotic leaks and strictures, and with CT and ultrasound thereafter, to assess for cholecystitis and internal hernias. These complications have several readily identifiable features, making imaging a useful first-line study in diagnosing and triaging GI complaints in a bariatric patient.

(P-12) Friday • 3:30 PM Percutaneous Three-dimensional CT Cholangiography in Liver Transplant Recipients: Technical Note and Preliminary Results

Nael E. Saad, MBCH, University of Rochester Medical Center, Rochester, NY; Nikhil Patel; Joseph Pulitano; Wael Saad, MD; Mark G. Davies; David L. Waldman, MD, PhD

PURPOSE: To determine the feasibility of CT cholangiography in liver transplant recipients.

METHOD AND MATERIALS: Two hundred milliliters of gadolinium or various dilutions of nonionic contrast was instilled by gravity drip via a surgical Turcotte tube. Attempts were also made to perform 3D CT cholangiography via transhepatic percutaneous biliary drains (PBD). Contiguous nonenhanced 5-mm axial images were obtained, followed by two postcontrast sets of axial CT images at 1.3 mm after instilling 200 mL of contrast divided into two 100-mL doses. 3D acquisition images were obtained with 0.65-mm reconstructions. Results were compared to conventional DSA cholangiography.

RESULTS: Fourteen exams were performed on seven patients. Initial attempts at obtaining 3D reconstructions using full-strength nonionic contrast failed due to streak artifacts. The ideal dilution was found to be two parts saline to one part Hypaque 60% (Amersham Health Inc, Princeton, NJ). Nondiluted Omniscan (Amersham Health Inc, Princeton, NJ) was also used in a patient allergic to iodinated contrast, with good 3D reconstruction results. Attempts at obtaining 3D reconstructions via preexisting PBDs per se (n = 1) or over a wire (n = 1) also failed due to extensive streak artifact. The only successful acquisitions were from exams performed on patients with surgically placed Turcotte tubes. Ten successful exams demonstrated improved visualization of the peripheral biliary ducts over conventional cholangiography. Their central findings were consistent with findings by conventional cholangiography. These included bile leaks (n = 1) and biliary anastomotic stenosis (n = 1). The 3D reconstructions were received well by the surgery service, particularly in complicated surgical reconstruction of a split graft, due to better anatomic characterization of the bile ducts from their perspective. However, there was no dynamic...
CONCLUSIONS: 3D CT cholangiography is a safe augmentation to conventional DSA cholangiography, providing surgeons with improved visualization of peripheral biliary ducts and better anatomic characterization of complicated biliary reconstructions in liver transplant recipients.

**CONCLUSIONS:** In our study, the initial results indicate there is an association of the morphology of the digital optical breast imaging curve and the aggressiveness of the evaluated breast malignancies.

**CONCLUSIONS:** Based on current medical literature, TEE, MRI, and helical CT demonstrate comparable high accuracy in the diagnosis of aortic dissection. While the dissemination of CT technology has been increasing in prevalence worldwide, we sought to determine if the modality actually conferred greater accuracy than TEE. The purpose of our study was to conduct an evidence-based comparison of the accuracy of CT and TEE in the detection of ATAI.

**CONCLUSIONS:** The advance in technology with CT demonstrates improved diagnostic capabilities over TEE for ATAI and should be implemented in the international community if financially feasible.

**CONCLUSIONS:** Helical computed tomography (CT) has rapidly emerged as the initial diagnostic tool in the evaluation of acute traumatic aortic injury (ATAI), secondary to its high accuracy and provision of ancillary findings, thus supplanting transesophageal echocardiography (TEE) at many institutions in the United States. This shift in approach has been less implemented in many Asian countries, especially India, where helical CT is not as available. While the dissemination of CT technology has been increasing in prevalence worldwide, we sought to determine if the modality actually conferred greater accuracy than TEE. The purpose of our study was to conduct an evidence-based comparison of the accuracy of CT and TEE in the detection of ATAI.

**METHOD AND MATERIALS:** We examined English-language studies from January 1, 1985, through February 28, 2005, using MEDLINE and Current Contents databases, bibliographies, and expert consultation. A study was included if it (a) used TEE and/or helical CT as a diagnostic test for ATAI; (b) used angiography, surgery, or necropsy as the reference standard; and (c) reported cases in absolute numbers of true-positive, false-positive, true-negative, and false-negative results. Data were analyzed using contingency tables and receiver operating characteristic (ROC) curves.

**RESULTS:** Ten studies met the search criteria. There were 10 evaluations with five data sets with 350 patients for TEE and five data sets with 3504 patients for CT. The sensitivity of CT (98.7 [95% CI: 92.9–99.8]) was significantly greater than TEE (80.7 [68.1–89.9]) (P < .001), as was the specificity for CT (98.7 [98.3–99.1]) versus TEE (92.8 [89.3–95.5]) (P < .001). The area under the curve for CT was 0.987 (0.983–0.991), compared to 0.868 (0.828–0.901) for TEE.

**CONCLUSIONS:** Helical CT is significantly more sensitive and specific than TEE in the detection of acute traumatic aortic injury. The advance in technology with CT demonstrates improved diagnostic capabilities over TEE for ATAI and should be implemented in the international community if financially feasible.

**METHOD AND MATERIALS:** We examined English-language studies from January 1, 1985, through February 28, 2005, using MEDLINE and Current Contents databases, bibliographies, and expert consultation. A study was included if it (a) used TEE and/or helical CT as a diagnostic test for ATAI; (b) used angiography, surgery, or necropsy as the reference standard; and (c) reported cases in absolute numbers of true-positive, false-positive, true-negative, and false-negative results. Data were analyzed using contingency tables and receiver operating characteristic (ROC) curves.

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weighted spin-echo techniques and similar small-part cylindrical radiofrequency coils at 1.5 and 3 T. Imaging was performed precontrast, with serial imaging at 1, 3, 5, and 10 minutes post gadoteridol (0.1 mmol/kg). The order of imaging was randomized, with a mean scan interval of 46 hours. Precontrast scans verified that tumor signal intensity had returned to baseline prior to the second MR scan. Regions of interest for contrast enhancement (defined as |S Igor(t) – S Igor|/noise), brain and tumor signal-to-noise ratios (SNRs), as well as contrast-to-noise ratios (CNRs) were evaluated at both field strengths.

RESULTS: Contrast enhancement was increased by 106%–137% (P < .05), with the maximum contrast enhancement occurring 5 minutes post contrast at both 1.5 and 3 T (1.5 T: 9.8 ± 2.2 vs 3 T: 21.1 ± 3.5; P = 0.0004). A normal brain SNR increased by 66%–76% (P < .01), and the tumor SNR increased by 70%–89% (P < .01), with an average increase of 72% and 84%, respectively. CNR increased by 101%–176% (P < .05) depending on the time post contrast, with the highest CNR for both 1.5 T and 3 T occurring at 5 minutes post contrast (1.5 T: 9.4 ± 1.1 vs 3 T: 20.3 ± 2.4; P < .0004). All lesions were confirmed on histopathology to be an intraaxial glioma with minimal to mild necrosis.

CONCLUSIONS: Using a standardized animal model of a glioma, matched scan techniques, similar coil designs, and a standard gadolinium chelate at 1.5 and 3 T, a significant improvement in contrast enhancement, SNR, and CNR close to that expected from theoretical considerations was demonstrated. In regard to lesion enhancement specifically, this improved at 3 T, when compared to 1.5 T, by more than 100%. In a clinical setting, the benefit of a standard single dose of gadolinium chelate combined with 3 T could result in greater lesion detectability.

(P-17) Thursday • 10:00 AM Evaluation of Mediastinal Lymph Nodes by FDG PET: Correlation with Pathology
Michael Lepeska, MD; Benedict Kim, DO; M. Chalfant; K. Baxter; B. Wolf, MD; Luke Maj, BS, NEUCOM, Akron, OH
PURPOSE: The purpose of the study was to correlate surgical pathology results from mediastinoscopy or thoracotomy with FDG PET results in evaluating mediastinal lymph nodes. The aim was to determine the sensitivity, specificity, and positive and negative predictive values of FDG PET imaging when trying to evaluate for mediastinal malignancy.

METHODOLOGY: All mediastinal surgical pathology reports available from 2003 and 2004 at Aultman Hospital were reviewed. All of these patients had had either mediastinoscopy or thoracotomy. Determination was made which of these patients had a PET scan completed within 60 days of the date of specimen collection. In reviewing the PET scan data, an SUV cutoff value of 2.5 was selected: 2.5 or above would be considered positive; less than 2.5 would be deemed negative for malignancy. Although some of the PET scan results contained qualitative interpretations which did not fully coincide with the quantitative data, only the SUV values were used to differentiate positive from negative for this study.

RESULTS: Of 26 patients with mediastinal pathologic reports and PET scans, there were nine true positives, nine true negatives, eight false positives, and no false negatives. Sensitivity and NPV were 100% (9/9) Specificity and PPV were 53% (9/17).

CONCLUSIONS: At our institution, FDG PET imaging is highly sensitive in detecting malignancy within the mediastinum, with a 100% negative predictive value. Given a negative PET result, the clinical or surgical oncologist may consider opting to forego mediastinoscopy. The limitation is the lack of specificity. False-positive results can be seen with many common conditions, particularly granulomatous diseases such as sarcoid or histoplasmosis. In these cases, it would seem that surgical sampling would continue to be needed.

(P-18) Thursday • 3:30 PM Melanoma Brain Metastases Treated by Gamma Knife: Evaluation by MR Imaging
Philip Loberg, MS, WAYNE STATE UNIVERsity, Detroit, MI; Alvaro C. Magalhaes, MD, PhD; Wilbur L. Smith, Jr, MD (amagalhaes@dmc.org)
PURPOSE: Melanoma is the malignancy most likely to metastasize to the brain. Gamma knife stereotactic radiosurgery (SRS) has become a primary therapeutic option in the treatment of intracranial melanoma. The purpose of this study is to characterize the MRT changes over time of SRS-treated melanoma brain metastases.

METHODOLOGY: The medical records of 29 patients with intracranial melanoma metastases treated with SRS at Detroit Medical Center during the period 2001–2005 were reviewed: eight women and 21 men with a median age of 57 years (age range, 21–80 years). SRS was performed using Leksell Gamma Knife (Elekta Instruments, Inc, Norcross, GA). The median SRS dose delivered to the tumor margins was 17 Gy (range, 12–22 Gy) and was based on the tumor volume, prior radiation therapy, and tumor location. MR imaging was performed with a 1.5-T unit (Vision; Siemens Medical Systems, Erlangen, Germany). The baseline MRI protocol performed immediately prior to SRS consisted of T1WI sagittal and axial planes obtained after contrast with stereotactic head frame in place.

RESULTS: The diagnosis of intracranial melanoma metastases was made histologically (n = 12) or presumptively secondary to known history of melanoma (n = 17). In these 29 patients, a total of 144 lesions were treated. The average number of lesions treated per patient was five (range, 1–16), with an average of 1.4 SRS treatments per patient (range, 1–3). The follow-up interval range was between 2 and 134 weeks (mean follow-up, 26 weeks), and an average of 2.6 post-SRS MR examinations were obtained per patient (range, 1–10). MRI findings in the last control exam after SRS were used to classify the patients into four groups: (a) stable appearance of the lesions (n = 7); (b) new lesions (n = 13); (c) increased size of the lesions (n = 6); and (d) decreased size of the lesions (n = 3).

CONCLUSIONS: Gamma knife is a important tool to control metastatic melanoma lesions. MRI was able to characterize the brain changes due to metastatic melanoma during gamma knife treatment.

(P-19) Friday • 10:00 AM Evaluation of Nontraumatic Subarachnoid Hemorrhage: CTA versus DSA
Lilian Wang, MD, University of Washington, Seattle, WA; Teran Cohen, MD; Wendy Cohen, MD; William Hollingworth, PhD; Basavaraj Ghodke, MD; Yoshimi Anzai, MD, MPH
PURPOSE: Although CTA is replacing DSA for detection of cerebral aneurysms at some institutions, DSA is routinely performed at our institution, a busy level I trauma center. The aim of this study is to evaluate the diagnostic accuracy of CTA in detection of cerebral aneurysms for patients with nontraumatic subarachnoid hemorrhage (SAH).

METHODOLOGY: We evaluated the effectiveness of multidetector CT in 260 consecutive patients undergoing evaluation for nontraumatic SAH with both CTA and DSA over a 1-year period. Diagnostic performance of CTA was assessed, using DSA as the gold standard, by retrospective review of radiology reports. Analysis was performed per aneurysm, stratified by size and location, and per patient. Correlation with treatment and patient outcomes was also performed.

RESULTS: Aneurysms were detected in 158 of 260 patients. In total, CTA detected 181 aneurysms versus 211 by DSA. Of the 36 aneurysms that CTA failed to detect, 75% were ≤3 mm, 22% were 4–6 mm, and 3% were 7–10 mm in size. Of the 36 CTA misses, 36% were MCA, 31% ICA, 14% PCA, 8% PCom, and 11% other.
Overall sensitivity for aneurysm detection by CTA was 82.9% (CI: 77.2%–87.8%), and specificity was 94.4% (CI: 88.3%–97.9%). There were six false positives by CTA, resulting in a total of 42 discordant aneurysms in 29 patients. Twenty of the 29 (69%) patients had correct identification of the aneurysm that underwent treatment, indicating that the aneurysms missed by CTA were incidental aneurysms in patients with multiple aneurysms. CTA failed to detect solitary aneurysms, all ≤4 mm in size, in seven patients, four of whom underwent treatment based on DSA findings. Patient-based analysis showed CTA had a sensitivity of 95.5% (CI: 91.0%–98.2%) and specificity of 98.1% (CI: 93.2%–99.8%).

CONCLUSIONS: The sensitivity of CTA for aneurysm detection in a high-volume neuroradiology practice is less than that reported in the literature. However, the majority of missed aneurysms are ≤3 mm and unruptured, incidental aneurysms in patients with multiple aneurysms. Given the natural history of aneurysms, these incidental aneurysms may be viewed as having minor clinical consequence and would likely be detected in posttreatment or follow-up DSA examinations.

(P-20) Friday • 3:30 PM

Corpus Luteum Cyst in Pregnancy: Is There Any Association with Outcome?

Nidhi Gupta, MBBS, University of Arkansas for Medical Sciences, Little Rock, AR; Lavanya Kalla; Amna A. Ajam, MD; Teresita L. Angtuaco, MD

PURPOSE: To determine whether there is a relationship between the presence and/or the size of corpus luteum cyst and pregnancy outcome.

METHOD AND MATERIALS: After IRB approval, a retrospective study of 105 consecutive patients (from July 2003 to June 2004) who had corpus luteum cyst on first-trimester ultrasound was performed (study group). The gestational age and corpus luteum cyst size were recorded. Information about the pregnancy outcome was obtained by reviewing patients’ charts. For comparison of data, 102 consecutive patients who had first-trimester ultrasound (during same time period) but did not have corpus luteum cyst were selected (control group). Pregnancy results on these patients were also obtained. Patients in whom the pregnancy outcome was unknown were excluded. Statistical analysis was performed by Student’s t test and χ² test. A P value of <.05 was considered statistically significant.

RESULTS: After exclusion, there were 50 patients in the study, as well as in the control group. Of the patients with corpus luteum cyst, 19 patients (38%) had spontaneous abortion, and 31 patients (62%) had a successful pregnancy outcome. In comparison, 11 patients (22%) in the control group had spontaneous abortion, while 39 patients (78%) had a successful pregnancy outcome. The difference in the incidence of pregnancy loss between the two groups was not statistically significant (P = .08). The average corpus luteum cyst size was 1.75 ± 0.97 cm in patients with abortion, while it was 1.89 ± 0.85 cm in patients with successful pregnancy outcome. This also showed lack of statistical significance (P = .3, t test).

CONCLUSIONS: There is no apparent relationship between presence and/or size of the corpus luteum cyst and pregnancy outcome. Therefore, presence of cystic changes in the corpus luteum does not imply poor prognostic factor.
**AUR 2006 Educational Exhibit Poster Abstracts**

Educational exhibit posters are located in Salon C. Each poster will be presented by its author during one of four category 1 CME poster sessions scheduled for Thursday and Friday. The day and time follow the presentation number.

Presenting author is identified by institution, city, state, and country, if not United States or Canada. Presentations by trainees (residents, medical students, first-year fellows) are noted in red.

**(E-022) Thursday • 10:00 AM**
The Medical Student Serving as Community Breast Cancer Screening Educator
Kelly K. Horst, Indiana University School of Medicine, Indianapolis, IN; Richard B. Gunderman, MD, PhD (rbgunder@iupui.edu)

**PURPOSE:** With increasing workloads and pressures to generate revenue, it is more difficult for radiologists to focus attention on educational endeavors and community service. However, there are needs for radiology to lead in these areas. Mammographic screening is one area in which radiology can make substantial contributions to public health education, as evidenced by large discrepancies among different socioeconomic groups. The purpose of this pilot study was to determine the feasibility of medical students serving as community breast cancer screening educators.

**METHOD AND MATERIALS:** A 4th-year medical student sought to address this issue by conducting educational sessions at community forums targeted at low-income women over 40. Such forums included community health fairs and churches. Other medical students were recruited to serve as community health educators. To recruit volunteers for the project, an e-mail was sent to the student Listserv at a large midwestern academic medical center. A separate e-mail was also sent to the Radiology Student Interest Group. Funding for the project was requested through the Medical Student Council. Additional funding was raised through a “pink ribbon” sale. Educational materials included three posters made by the group and pamphlets donated by nearby clinics.

**RESULTS:** Thirty medical students responded to the first e-mail, including one member of the Radiology Student Interest Group. Of the 22 members of the Radiology Student Interest Group, three additional members enrolled in response to the e-mail sent specifically to this group. Of the 33 volunteers, three were male. Members of the group are attending community health fairs and meetings of a community ministry that includes 32 churches.

**CONCLUSIONS:** This ongoing study is generating data that demonstrate that medical students can play an important role as radiology educators in the community. Breast cancer screening is only one such area in which students can contribute, not only helping underserved populations but also gaining valuable experience and learning more about radiology.

**(E-023) Thursday • 3:30 PM**
The Medical Student as Radiology Educator
Mark R. Tushan, MS, Riley Hospital for Children, Indianapolis, IN; Richard B. Gunderman, MD, PhD (rbgunder@iupui.edu)

**PURPOSE:** Involving medical students in educating their colleagues represents a huge opportunity in radiology education. Functioning as an educator enhances students’ understanding of the material and gives them an opportunity to make a meaningful contribution within radiology.

**METHOD AND MATERIALS:** A 3rd-year medical student enrolled in a 4-week elective worked with the radiology course director to develop lecture material for the next academic year. The student worked 40 hours per week and the faculty member 4 hours per week planning, reviewing, and revising the student’s work.

**RESULTS:** The specific goal was to add simplified basics of interpretation of commonly encountered imaging studies, including CXR, KUB, IVP, Abdominal CT, etc. The student also developed materials that provided an introduction and theoretical basis to six of the common imaging modalities (XR, CT, MRI, NM, PET, and US), the basic imaging anatomy of eight organ systems, and basic imaging findings in representative pathologies. Over 280 usable lecture slides were generated; over 100 common representative pathologies were addressed. The student used the departmental digital teaching files, Internet-based resources, and textbooks to assemble the materials. These materials provided introductions for each week’s lecture and were placed online as a study guide and reference for students outside of lecture. The student also reviewed, summarized, and addressed over 220 student evaluations and comments from the last course. Changes included altering the handouts, providing supplemental information online, and inviting different lecturers when student evaluations were negative. Having been enrolled in the same course previously, the student proved to be well qualified to gear the material to the students’ level of understanding.

**CONCLUSIONS:** This project enhanced the effectiveness of the radiology curriculum, relieved a faculty member of some of the demands of preparing class materials, and provided one of the most challenging and rewarding experiences of the student’s medical school career. The model deserves consideration in other academic departments.

**(E-024) Friday • 10:00 AM**
Problem-based Learning in Radiology: Initial Experience Examining Medical Student Satisfaction
Haydee Ojeda-Fournier, MD, University of Cincinnati Medical Center, Cincinnati, OH; Jonathan S. Moulton, MD; James L. Leach, MD

**INTRODUCTION:** Problem-based learning has been increasingly used as a teaching tool in medical student education but has been infrequently assessed in radiology clerkships. As part of the 3rd-year radiology clerkship rotation, we implemented a problem-based learning (PBL) exercise. In this study, we assessed the satisfaction of medical students rotating through radiology clerkship after the implementation of the PBL system.

**METHOD AND MATERIALS:** On the 1st day of the rotation, students are given a PowerPoint presentation containing a brief history, physical exam, and a series of images relating to the patient complaint. Students are then asked to decide which imaging modality to utilize, taking into account both test accuracy and cost-effectiveness. Students then interpret the images and offer a differential diagnosis along with management recommendations. At the end of the rotation, students make a brief presentation moderated by a staff radiologist. A five-question survey was then provided to assess satisfaction with the PBL program.

**RESULTS:** Forty-six students completed the PBL program, and all completed the survey. Forty-three students (94%) reported extensive PBL experience during the previous 2 years of medical school. Thirty-three students (72%) spent between 1 and 2 hours preparing for the PBL exercise, while 20% spent 3–4 hours. Greater than 90% felt that the experience had an appropriate level of difficulty. As a whole, the experience was excellent for 45.6%, good for 54.3%, and none thought it was poor.

* Faculty financial disclosures are located in the Faculty Index.
CONCLUSIONS: It is feasible to implement a problem-based learning program during the 3rd-year radiology clerkship to complement lectures and time spent observing clinical radiology. Students report a high degree of satisfaction with the PBL exercise. Continued development and evaluation of PBL as a teaching method in radiology clerkships are warranted.

(E-025) Friday • 3:30 PM
A Practical Approach to Introduce Vascular and Interventional Radiology to Medical Students
Luke L. Yao, MD, University of Virginia Health System, Charlottesville, VA; Warren Swee, MD, MPH; John F. Angle, MD; Klaus D. Hagspiel, MD; Alan H. Matsumoto, MD; Spencer B. Gay, MD*. (ws9e@virginia.edu)

The purpose of this exhibit is to present a step-by-step approach to introduce the field of interventional radiology (IR) to medical students. The importance of this task has become readily apparent, as fellowship applications remain low amidst an ongoing shortage of interventional radiologists (IRs). The proposed model is structured such that interactions with medical students will match their level of knowledge and stage of learning. For instance, most medical students progress from learning the basic sciences, to disease processes, to clinical management. By tailoring our interactions, we can greatly improve the effectiveness of our presentations. During the MS1 and MS2 years, the major initiative is to provide at least one lecture per year. The MS1 lecture should focus on four objectives: (1) define IR as a clinical specialty, (2) emphasize the importance of basic anatomy and physiology to image-guided procedures, (3) introduce a range of disease processes managed by IRs, and (4) introduce and encourage participation in IR research. The MS2 lecture should be integrated into the “Introduction to Clinical Medicine” curriculum and present common disease processes managed by IRs, emphasizing clinical presentation, diagnosis, and treatment options. The instructor should submit test questions to be added to the “Introduction to Clinical Medicine™” examination. During the MS3 and MS4 years, structured elective rotations with the goal of providing exposure to the practice of IR through participation in ward rounds, clinic encounters, image interpretation, and procedures should be offered. Other interventions that may be offered throughout medical school include an open-door policy to foster student interest and cultivate mentorship, an IR brochure, lists of research grants/opportunities, promotion of SIR (Society of Interventional Radiology) membership, and participation in career fairs. Implementation of these tasks should maximize efforts to reach medical students and help incorporate IR into the infrastructure of medical student education.

(E-026) Thursday • 10:00 AM
Peer Review Conference of Misdiagnosis on Imaging Studies to Assess Personal Practice Accuracy
Kathleen T. Hudson, MD, Powell, TN; Kenneth Rule; R. Kent Hutson, MD; Michael Buchler, MD (khudson3@utk.edu)

PURPOSE: To review misdiagnosis on imaging studies by faculty and radiology residents as a method of assessing personal practice accuracy.

METHOD AND MATERIALS: Interpretive errors by radiology faculty and residents are compiled from a variety of sources and referred to the department chair, with feedback to the erring physician. The chairman reviews the cases and, for faculty errors, assigns a severity level from I to IV. Selected faculty misdiagnoses and resident errors are presented anonymously at a monthly peer review conference attended by all residents and faculty. Misdiagnosis and resident errors are identified by review of prior studies or identification of errors by personnel outside the department with referral to our PI/Peer Review Committee. Practice-specific information on faculty is forwarded to the Care Management Department for use in the biennial renewal of privileges.

RESULTS: A total of 152 faculty citations for 18 months (August 2003–January 2005) were compiled and 54 resident errors (November 2003–January 2005). Of these, 182 were false-negative perceptive errors (faculty and residents), 11 false-positive cognitive errors, and 13 cognitive errors. None was a level III or IV.

CONCLUSIONS: The peer review conference is educational and informative and has aided in adapting reading styles and techniques for reviewing cases. New enhancement which links the PACS system with an encrypted e-mail notification of errors to physicians and residents will improve efficiency.

(E-027) Thursday • 3:30 PM
Diagnostic Imaging Pitfalls of Osteomyelitis in the Pediatric Patient
Christopher Bang, DO, University of Rochester Medical Center, Rochester, NY; Marat Bakman, MD; Gwy Suk Seo, MD; Johnny U. Monu, MD (christopher_bang@urmc.rochester.edu)

Acute osteomyelitis in the pediatric patient can often present as a diagnostic dilemma. Imaging modalities, including magnetic resonance imaging, computed tomography, nuclear medicine, ultrasound, and plain radiography, are in the forefront of making the initial diagnosis of musculoskeletal infection. There are, however, several diagnostic imaging pitfalls which can mimic or obscure diagnosis of acute osteomyelitis, such as chronic infection, pyomyositis, septic arthritis, infarction, trauma, or neoplasm. This presentation will address the radiographic features of acute osteomyelitis in the pediatric patient. Some of the differential considerations will be presented, and the salient distinguishing features will be illustrated using pathologically proven cases.

(E-028) Friday • 10:00 AM
Sonographic Evaluation of Acute Knee Pathology
Matthew G. Aagesen, MD, University of Michigan, Ann Arbor, MI; Gandikota Girish, MBBS; Sean D. Paulsen, MD; Jon A. Jacobson, MD; David Jamadar

BACKGROUND INFORMATION: In the setting of acute knee pathology, radiography is the first-line imaging modality but is limited in its usefulness for soft-tissue injuries. MRI has proven utility in evaluating internal derangements and other soft-tissue pathologies, but it is not always available in the acute setting and may be difficult or impossible to obtain in the severely ill or polytrauma patient or because of contraindications. Sonography is cost-effective, portable, widely available, and optimized for evaluation of the soft-tissue structures of the knee. Where quick diagnosis is vital, sonography is an ideal imaging modality to guide subsequent treatment.

AIM OF PRESENTATION: To present the spectrum of acute knee pathology imaged by sonography. To emphasize the advantages of sonography as an ideal imaging modality for acute knee pathology.

FORMAT: This exhibit provides a pictorial review of acute knee pathologies readily imaged by sonography. The use of sonography to evaluate postero-lateral corner injuries is emphasized. Examples of sonographic imaging of injuries to the extensor mechanism and the collateral ligaments of joint effusions and soft-tissue infections are presented. The sensitivity of sonography in evaluating meniscal and cruciate ligament pathology is discussed.

TEACHING POINTS: The combination of availability, resolution, and portability makes sonography an ideal imaging modality for evaluation of the soft-tissue structures of the knee in the acute setting, particularly when early diagnosis and treatment are vital to reduce long-term morbidity.

(E-029) Friday • 3:30 PM
PET/CT Imaging in the Head and Neck: Benign and Inflammatory Causes of FDG Accumulation
Todd M. Blodgett, MD*, University of Pittsburgh School of Medicine, Pittsburgh, PA; Barry McCook, MD (toddblodgett@yahoo.com)
PURPOSE: Our goal was to develop an atlas of the most common benign causes of FDG uptake in the head and neck using combined PET/CT scanners.

METHOD AND MATERIALS: All anatomical (CT), functional (PET), and fused anatomical-functional (PET/CT) images were acquired and selected from combined PET/CT scans of approximately 15,000 patients scanned at our institution on five different PET/CT scanners since 1998. Patients were referred for a variety of malignancies. All abnormal findings were confirmed by histopathology or follow-up imaging.

RESULTS: Examples of benign lesions in the head and neck include focal asymmetrical brown fat, tonsilar hyperplasia, Téton thyroplasty causing asymmetrical vocal cord uptake, dental abscesses, radiation-induced FDG uptake, and other posttreatment causes such as lingual hemiatrophy secondary to denervation. Several patients included in this atlas were misdiagnosed as having primary or recurrent malignancy. Some patterns mimicked malignant patterns of FDG uptake, while others mimicked physiologic or benign patterns.

CONCLUSIONS: We present an atlas of common and atypical nonmalignant causes of FDG uptake in the head and neck using combined PET/CT. Recognition of these patterns and an awareness of the overlap between benign and malignant causes of FDG uptake are essential for interpreting physicians to avoid misdiagnosis.

(E-030) Thursday • 3:30 PM Pitfalls in the Interpretation of PET/CT Imaging Todd M. Blodgett, MD*, University of Pittsburgh School of Medicine, Pittsburgh, PA; Barry McCook, MD (toddblodgett@yahoo.com)

PURPOSE: There are several pitfalls involved in the interpretation of PET/CT imaging. Many of these pitfalls are due to limitations of FDG, the most common tracer used in PET/CT imaging. We have put together an anatomical, functional, and fused atlas of the most common and atypical interpretive pitfalls encountered in PET/CT imaging.

METHOD AND MATERIALS: Images were gathered from 15,000 PET/CT scans performed at our institution. PET, CT, and fused PET/CT images best representing typical and atypical appearances of cases demonstrating pitfalls encountered by PET/CT interpreting physicians were included.

RESULTS: Pitfalls were categorized into physiologic, altered physiologic, iatrogenic, inflammatory, infectious, and benign and malignant causes of misinterpretation. Although there were many more potential false-positive etiologies, there were also several cases of false-negative exams from non–FDG-avid tumors. In addition, we noted several artifacts unique to PET/CT imaging, including IV and oral contrast, ports, metallic devices, and calcified lymph nodes. Several atypical appearances were clinically relevant and may be misinterpreted as FDG-avid lesions.

CONCLUSIONS: There are several interpretive pitfalls related to PET/CT imaging. We critically evaluated and will discuss typical and atypical presentations of the most commonly encountered pitfalls in PET/CT imaging in order to minimize misinterpretation.

(E-031) Thursday • 10:00 AM TB Today: Thoracic Imaging Features of Mycobacterium tuberculosis in the 21st Century Laura Faix, MD, University of Pittsburgh Medical Center; Pittsburgh, PA; Diane Strollo, MD

In the past 20 years, the United States has seen a tremendous resurgence of disease due to Mycobacterium tuberculosis, and while the rate of rise in incidence has leveled somewhat in recent years, most of the factors contributing to its initial growth still exist today. Despite improved awareness of the disease in the medical community, significant delays in diagnosis persist. Within radiology specifically, both uncommon and classic radiographic appearances of thoracic TB can go unrecognized early in the patient’s clinical presentation, which contributes to delays in appropriate treatment and management. The objective of this exhibit is to review the typical imaging features of thoracic TB, as well as to highlight some of the less common presentations that still have great clinical significance. This overview includes the specific disease entities of primary infection, which features lower lobe consolidation with concurrent lymphadenopathy; postprimary infection, with classic upper lobe involvement and cavitation; and hematogenous disease, manifest as miliary spread. In addition, chest manifestations of TB in special patient populations will be reviewed, namely in the context of AIDS-related illness, both in the immunocompromised state and the immune reconstitution syndrome. Extrapulmonary tuberculous infection of the chest will be reviewed as well, including Pott’s disease and empyema necessitans. Lastly, we will provide a differential diagnosis for all of the radiographic appearances discussed.

(E-032) Friday • 3:30 PM Spectrum of Incidental Findings on US, CT, and MR: What You Can Find Dana R. Rausch, MD, Mount Sinai Medical Center, New York, NY; William L. Simpson, MD

PURPOSE: We reviewed CT, MR, and ultrasound studies in which important incidental abnormalities were noted. An abnormality is considered incidental if it is seen outside of the area to which the study was directed. Radiologists should be familiar with the wide range of abnormalities which can be incidentally identified on various imaging studies, as their potential impact on patient care is significant. The spectrum of those cases which will be presented involved various organ systems, some of which included lung cancer on a coronary calcium-scoring CT, hydrenephrosis and ovarian mass on MR of the spine, significant carotid atherosclerosis on thyroid ultrasound, limb-threatening arterial thrombus on a venous duplex ultrasound, intrahepatic biliary dilation and an asymptomatic pancreatic mass on renal ultrasound, bladder mass on pelvic ultrasound, soft-tissue mass on abdominal ultrasound, and a pelvic kidney on pelvic ultrasound. Strategies to optimize detection of these findings will be outlined.

(E-033) Friday • 10:00 AM Imaging of Renal Transplantation: What the Radiologist Needs to Know David M. Krakowski, MD, Mount Sinai Medical Center, New York, NY; Dana R. Rausch, MD; William L. Simpson, MD

Cadaveric and living-related-donor renal transplantation is a common surgical treatment of patients with end-stage renal disease. Ultrasound and CT and MR angiography are routinely used in the preoperative evaluation and selection of potential living renal donors. A brief discussion of the surgical procedure as well as the normal sonographic appearance of the transplanted organ will be presented. Postoperatively, ultrasound is routinely employed to evaluate for the potential complications, such as vascular compromise, parenchymal pathology, collecting system obstruction, and peritransplant collections, and their possible image-guided interventions. It is essential that radiologists be familiar with the pre- and postoperative imaging assessment of renal transplants.

(E-034) Thursday • 3:30 PM PET/CT Artifacts Todd M. Blodgett, MD*, University of Pittsburgh School of Medicine, Pittsburgh, PA; Barry McCook, MD (toddblodgett@yahoo.com)

PURPOSE: There are several artifacts unique to PET/CT imaging. In addition, protocol variables (eg, arm positioning; contrast type, rate, and timing) and diaphragmatic position during CT acquisition can substantially affect image quality. Common artifacts are usually readily recognized by the experienced reader, but several atypical appearances of artifacts can mimic FDG-avid lesions. Our goal was to identify, characterize, and report potential solutions to artifacts and protocol variables affecting image quality in PET/CT imaging to decrease misinterpretation.

* Faculty financial disclosures are located in the Faculty Index.
METHOD AND MATERIALS: Images were gathered from over 15,000 PET/CT scans performed at our institution. PET, CT, and fused PET/CT images best representing typical and atypical appearances of artifacts unique to PET/CT scanners were included. In addition, the impact of patient and protocol variables on image quality is included.

RESULTS: We noted several CT-based attenuation correction artifacts, including those from IV and oral contrast, ports, metallic devices, and calcified lymph nodes. These are not seen on PET cameras using other methods of attenuation correction. Several atypical appearances were clinically relevant and may be misinterpreted as FDG-avid lesions. Alternative CT-based attenuation correction algorithms can correct many of these artifacts. Protocol variables, such as arm positioning and respiratory status during the CT acquisition, also impacted image quality. These protocol variables can be adjusted to maximize image quality and reduce the chance for misinterpretation.

CONCLUSIONS: There are several clinically relevant artifacts unique to PET/CT scanners. In this presentation, we will present and discuss these artifacts and protocol variables significantly affecting image quality that need to be considered to minimize misinterpretation.

(E-035) Thursday • 10:00 AM
Visual Mnemonics as an Educational Tool: A Picture May Be Worth a Thousand Words
Robert Schloss, MD, New York Presbyterian Hospital, New York, NY; Keith D. Hentel, MD, MS (keh9003@med.cornell.edu)
Successfully completing a radiology residency requires a resident to learn a vast range of information encompassing nearly all fields of medicine. One method that has traditionally been employed to assist in this task has been the use of mnemonics. FEGNOMASHIC, SATCMHO, and PORK CHOPS are just a few of the many known to most radiologists. However, traditional mnemonics remain a language-based learning technique with varying effectiveness based on individual linguistic skills and preferences. One skill that is fostered in all radiologists is the ability to process an image. Visual mnemonics, illustrations constructed with familiar images, offer an alternative technique for learning differential diagnoses, disease manifestations, and hard-to-remember eponyms. The purpose of this poster is to present examples of visual mnemonics that could be used in radiology training. Such mnemonics include those for the surgical shunts for congenital heart disease, the differential diagnosis of a hyperdense liver, findings and associations of Mounier-Kuhn syndrome, fracture eponyms, including the Galeazzi and Monteggia fractures, pediatric dysmyleinating conditions, the differential diagnosis of small bowel wall thickening, and manifestations of the Kornohann-Woltman notch phenomenon.

(E-036) Friday • 3:30 PM
MR Imaging for the Diagnosis of Occult Hip Fracture: What You Need to Know on Call
Tarang V. Patel, DO; Keith D. Hentel, MD, MS, New York Presbyterian Hospital, New York, NY (keh9003@med.cornell.edu)
Hip fractures are becoming an increasingly common problem as our population ages. Some estimates predict a 300% increase over the next 35 years. Radiographs remain the primary tool in the diagnosis of such but have limited sensitivity in elderly osteopenic patients. In the past, these patients were often admitted, placed on bed rest, and imaged with bone scintigraphy at a 72-hour delay. Magnetic resonance imaging (MRI) is a highly accurate alternative for the diagnosis of hip fracture, with sensitivities up to 100% reported. A major advantage over bone scan is that it may be performed immediately following injury. Consequently, MRI is now often performed on patients with suspected hip fracture and negative radiographs as part of the emergency room evaluation. In most academic departments, it is the residents, often junior, who are required to provide the initial reading on such studies. While this often invokes anxiety in those not comfortable with the modality in general, diagnosing/excluding fractures of the hip on MRI should be simple when compared to the often-complex task of doing so on radiographs. The purpose of this poster is to provide a method of performing and evaluating MRI in patients with suspected hip fracture. The findings of hip fracture, as well as the common entities that may clinically mimic hip fracture, will be illustrated.

(E-037) Friday • 10:00 AM
The Utility of Breast MR Imaging as an Adjunct to Mammography and US in the Screening of Patients for Breast Cancer
Rebecca Obedian, MD, Long Island Jewish Hospital, Great Neck, NY (rebobed@yahoo.com)
PURPOSE: The purpose of this abstract is to review critical aspects of breast MRI as an adjunct to mammography and ultrasonography in evaluating patients for breast cancer.

METHOD AND MATERIALS: A review of the literature was performed to determine background information, indications, sensitivity, and specificity of breast MRI. In addition, textbooks and leaders in the field of breast MRI were questioned about key technical issues regarding the proper imaging technique. Our institutional policy regarding imaging technique, pre- and postcontrast sequences, and key anatomic issues were also reviewed.

RESULTS: Background information: Breast MRI has been shown to be capable of detecting mammographically and sonographically occult breast cancers. Therefore, screening high-risk patients with breast MRI may be of value. However, breast MRI is best performed in centers capable of proceeding with MRI-guided biopsies. Indications for breast MRI: equivocal findings on mammographic compression views and/or ultrasound, strong family history of breast cancer, prior history of familial breast cancer, history of BRCA1/2 mutation. Risk of occult MRI-detected contralateral breast cancer in newly diagnosed breast cancer patient: 4%. Sensitivity of breast MRI: 75%–85%. Specificity of breast MRI: 65%–75%. Key technical and anatomic issues: Patients are positioned in the prone position with both breasts hanging freely into a cushioned recess containing the breast coil. Both breasts are imaged. Images are obtained pre and post administration of gadolinium. Images are obtained in the sagittal, coronal, and axial planes. Small enhancing lesions are further evaluated using fat-suppressed subtraction images. If the prior mammogram or ultrasound was equivocal, then special attention is directed to the region in question.

CONCLUSIONS: Breast MRI can detect mammographically and sonographically occult breast cancers with high sensitivity. MRI-guided biopsy should be available at institutions with breast MRI programs.

(E-038) Thursday • 3:30 PM
Spontaneous Biliary Perforation in Infancy: A Case Report
Ricardo D. Garza-Gongora, MD, Scott and White Memorial Hospital, Temple, TX; Bradley Trotter, MD (rggongora@gwmail.org)
Spontaneous biliary tree perforation is uncommon in infancy. We present a 15-week-old white female who presented with a 3-day history of emesis, irritability, hyperbilirubinemia, abdominal distension, and discomfort. Initial CT of the abdomen and pelvis demonstrated intraperitoneal fluid, trace pneumoperitoneum, and possible choledocholith. Further evaluation with 99m Tc-disofenin hepatobiliary imaging suggested possible biliary leak with lack of physiologic bowel activity. Subsequent exploratory laparotomy revealed bowel stain fluid, and an intraoperative cholangiogram demonstrated free flow to the pancreatic duct and duodenum and confirmed leak at the cystic duct and common bile duct junction; a drain was placed at this site. An additional cholecystostomy tube was also placed, and the patient returned home on breast feeding without known sequelae.
RATIONAL AND OBJECTIVES: Osteomyelitis represents a complex disease process with a variety of imaging manifestations. There are acute, subacute, and chronic forms of osteomyelitis, as well as focal and disseminated disease. This pictorial review outlines the basic physiology of pyogenic and atypical osseous infections. We show the spectrum of imaging characteristics of osteomyelitis from its early acute phase to its chronic and disseminated forms, utilizing different radiological modalities plus correlation with the intraoperative and histopathologic findings.

METHODOLOGY AND MATERIALS: We selected representative radiographic, computed tomography (CT), magnetic resonance (MRI), sonographic, and radionuclide images to demonstrate the spectrum of early and late imaging characteristics of different types of bone infections. The algorithm and recommendations for clinical and radiological work-up are discussed. Main intraoperative and histopathologic findings are also outlined.

RESULTS: Radiographic findings of acute osteomyelitis are delayed by 7–14 days. Therefore, if clinically suspected, diagnosis is frequently made by MRI or radionuclide studies. CT and sonography are occasionally used. Subacute and chronic types of osteomyelitis are usually first diagnosed on radiographs, but local extent of disease is evaluated by MRI and occasionally by CT. Dissemination of disease is evaluated by bone scan. The importance of radiological imaging for treatment planning and correlation with intraoperative findings is emphasized. Advantages and disadvantages of each imaging modality are discussed.

CONCLUSIONS: Proper radiological work-up for early recognition and treatment of osteomyelitis is important to preclude disease dissemination and complications resulting from delayed diagnosis.

Purpose: To educate residents on the pertinent business issues in radiology as part of systems-based practice education.

METHODOLOGY AND MATERIALS: The business manager for the academic radiologists presents quarterly lectures to the residents on issues such as reimbursement, contracts, fringe benefits, and current issues in radiology. He also presents monthly coding sessions with certified coders from the business office. A different exam is selected each month for review.

RESULTS: The residents have rated the lectures by the business manager to be very important to their overall education. They have consulted with him when negotiating their own personal contracts after residency. The faculty and staff have demonstrated improved documentation of studies, which has improved reimbursement, after education on the criteria for various exams.

CONCLUSIONS: Systems-based practice must include the business aspect of radiology in order to be comprehensive and complete. A business manager is one valuable resource for teaching this important competency.

Purpose: To learn the imaging features of non-Hodgkin’s lymphoma using multiple modalities.

METHODOLOGY AND MATERIALS: Pathologically proven cases of non-Hodgkin’s lymphoma of the genitourinary system involving the kidneys, urethra, ureters, bladder, prostate, and testes imaged by multiple modalities, including ultrasound, computed tomography, and magnetic resonance imaging, will be presented.

RESULTS: Multiple cases demonstrating the imaging features of non-Hodgkin’s lymphoma will be presented by poster format.

CONCLUSIONS: The viewer will learn the imaging features of non-Hodgkin’s lymphoma of the genitourinary system by multiple modalities.
In our institution, ultrasound has been instrumental in the initial detection and therapy of early rheumatoid arthritis. Our methodology involves a comprehensive approach to ultrasonography to detect early erosions and synovitis, which can aid in early diagnosis and intervention.

**METHOD AND MATERIALS:** In our institution, ultrasound evaluation of the small joints of the hands and feet is performed to detect early erosions and synovitis in patients with a suspected diagnosis of early rheumatoid arthritis. A lesser extent, it is used in the large joints to evaluate for synovitis and joint effusion. All exams are performed on a General Electric Logiq 9 machine with a 9–12-MHz hockey-stick linear transducer by the same operator. The imaging planes are longitudinal followed by transverse to the joint. Erosions are seen as cortical interruptions starting in the bare area of the joint. The location and size of erosions, size of synovial fluid complex, thickening of the synovial membrane, and amount of increased vascularity about the joint are reported.

**RESULTS:** Both MR1 and ultrasound are proven to be more sensitive than radiography in detection of early erosions and synovitis. Ultrasonography is comparable to magnetic resonance imaging (MRI) in showing early erosive disease and synovitis. The advantages of ultrasound when compared to MRI in evaluation of arthritis are accessibility, low cost, and power Doppler ultrasound. The disadvantages are operator-dependency, long learning curve, and inability to evaluate bone marrow.

**CONCLUSIONS:** Ultrasound is useful in the initial diagnosis and follow-up of early rheumatoid arthritis, as it is more sensitive than radiography. It aids the rheumatologist in decision making involving more aggressive types of treatment for patients with early erosions to prevent progression of disease, irreversible joint damage, and disability.

**E-045** Friday • 3:30 PM
**Spectrum of Extramammary Findings on Breast MRI: What You Can Find**

Dana R. Rausch, MD, Mount Sinai Medical Center, New York, NY

Breast MRI can be a powerful and useful adjunctive tool in breast imaging. Although breast MRI is tailored to the evaluation of the breast parenchyma, there is a gratuitous view of a portion of the upper abdomen, chest, and osseous structures. Radiologists should be familiar with the wide range of abnormalities which can be incidentally noted, as their potential impact on patient care is significant, particularly in those patients with a recent or remote history of breast cancer. A spectrum of clinically relevant extramammary findings noted on breast MRI of hepatic, renal, osseous, pulmonary, cardiac, nodal, and dermal origin will be presented, as will the more complete and tailored correlative imaging studies. Strategies to optimize the detection of these findings will be outlined.

**E-046** Thursday • 10:00 AM
**Multidetector CT Angiographic Evaluation of Renal Vascular Disease**

Alpa Garg, MD, University of Massachusetts, Worcester, MA; Young H. Kim, MD; Ajay K. Singh, MD; Sridhar Shankar, MD; Ducksoo Kim, MD; Krishna Kandarpa, MD, PhD (kimy@ummhc.org)

Multidetector computed tomography (MDCT) angiography with 3D demonstration offers considerable advantages in the assessment of renal vascular disease. The purpose of this exhibit is to illustrate the spectrum of imaging findings of renal vascular disease and highlight the roles, advantages, and limitations of MDCT angiography in the differential diagnosis. This exhibit will stress the important distinctive patterns that may distinguish variable causes of renal vascular disease. The spectrum of MDCT, with multiplanar reformatted and 3D images, including common (atherosclerosis, fibromuscular dysplasia, dissection, aneurysm) and rare (polyarteritis nodosa, neurofibromatosis, Takayasu’s arteritis) diseases, will be illustrated.

**LEARNING OBJECTIVES:** 1. To learn the optimal MDCT technique for evaluation of renal vascular disease. 2. To discuss and illustrate the spectrum of appearance of renal vascular disease on MDCT and the role of 3D and multiplanar reformatted images.

**E-047** Thursday • 3:30 PM
**Acetabular Fractures: What the Surgeon Needs to Know**

Heidi R. Umphrey, MD, University of Alabama at Birmingham, Birmingham, AL; Tamera H. Matheme, MD; Phillip Lander, MD; Robert Lopez; Jorge Alonso (matheme@uabmc.edu)

**BACKGROUND:** In 1967, Letournel and Judet designed a conventional radiographic method for classifying acetabular fractures. Today, we routinely cross-sectionally image these patients and reformat anatomy in 2D and 3D projections for detail characterization and surgical planning. Multiple methods of classifying these fractures have been developed to correlate with cross-sectional imaging and to improve communication between radiologists and orthopedic/trauma surgeons.

**KEY ISSUES:** We discuss and illustrate acetabular fracture classifications using radiography and computed tomography and discuss the pros and cons of each system based on published research data and our experience at UAB.

**FORMAT:** Didactic poster presentation discusses imaging classification/characterization and its relationship to mechanism of injury, orthopedic treatment, and prognosis. Emphasis is on computed tomography and its role in surgical planning and postoperative imaging.

**TEACHING POINTS:** 1. Letournel and Judet’s conventional radiographic classification of acetabular fractures created a landmark in advancement of treatment in this population of patients. Multiple methods have been designed to simplify this classification and correlate with computed tomography. 2. The goal of imaging is to describe major fracture orientation and characteristics that will negatively influence surgical reduction or increase postoperative complications. 3. Understanding of pathophysiology, surgical goals, and possible complications will improve radiologic interpretation.

**E-048** Friday • 10:00 AM
**The Typical and Atypical Imaging Characteristics of Meningiomas**

Bryan E. Scott, MD, Rochester General Hospital, Rochester, NY; William D. Bowen, MD; Ahmad Monajati, MD

**PURPOSE:** To demonstrate the typical and atypical features of meningiomas using multiple imaging modalities.

**METHOD AND MATERIALS:** A retrospective review of select cases of meningiomas collected over a 3-decade time period from a busy community-based hospital was performed. Multiple imaging modalities were used to demonstrate the typical and atypical appearances of these commonly encountered tumors.

**RESULTS:** Numerous examples of the common and uncommon presentations of meningiomas using multiple imaging modalities were demonstrated.

**CONCLUSIONS:** A thorough understanding of the typical appearance of meningiomas, as well as the uncommon atypical characteristics, is useful for generating an accurate differential diagnosis. This review should assist the novice radiologist and the more experienced radiologist in their daily practice.

**E-049** Friday • 3:30 PM
**Spectrum of Imaging Findings in Chronic Pulmonary Embolism**

Amit Newman, MD, Long Island Jewish Medical Center, New Hyde Park, NY (annew1@gmail.com)

Chronic pulmonary embolism is a rare but serious sequela of acute pulmonary embolism occurring when pulmonary emboli fail to completely lyse, thus forming an organized clot that can lead to partial vascular occlusion. Pulmonary artery hypertension can result over time, which is associated with considerable morbidity and mortality. Recognition of chronic pulmonary embolism is important and must be differentiated from acute pulmonary embolism, since the treatment is surgical rather than anticoagulation therapy. Imaging
findings on CT include visualization of an organized thrombus that generally appears as an eccentric or crescentic filling defect. Calcifications can occasionally be present. Chronic pulmonary emboli also have higher HU attenuation values than acute emboli. Other important distinguishing features include dilated pulmonary arteries associated with pulmonary hypertension, asymmetry of the pulmonary vasculature, intercostal artery enlargement from collateral circulation, and/or right ventricular enlargement. Finally, a mosaic pattern of attenuation can be seen, due to vascular occlusion of the small arteries supplying the secondary pulmonary lobe. This exhibit will demonstrate each of these imaging findings and utilize the aid of multiplanar reformations where appropriate. Timely recognition of this entity can significantly improve patient outcome, since chronic pulmonary embolism is amenable to surgical thrombectomy.

(P-E050) Thursday • 10:00 AM
Imaging the Soft-Tissue Complications of Diabetes Mellitus
Karen Chan, MD, University of Rochester, Rochester, NY; Christopher Bang, DO; Marat Bakman, MD; Gwy Suk Seo, MD; Johnny U. Monu, MD
Diabetes mellitus is increasing worldwide, and radiologists are increasingly required to image patients with the disease. Some of the manifestations of the disease in the musculoskeletal system are well known and easily recognized, whereas other manifestations, especially in the soft tissues, are less easily recognized. This presentation reviews some common and the less-well-known complications of diabetes in the soft tissues, especially in the lower extremity. Our radiology department data bank was used to identify patients with diabetes mellitus who have been imaged and diagnosed with complications attributable to diabetes mellitus. Using a multimodality approach, some soft-tissue complications are illustrated, and the pathologic bases of radiographic observations are discussed. Peripheral vascular calcifications, soft-tissue ulcerations, abscesses, and the spectrum of changes in diabetic myopathy are presented. Some differential diagnoses and appropriate management for these entities will be discussed. Readers will learn (a) some frequent and less frequent manifestations of diabetes, (b) how to differentiate these manifestation from other similar entities, and (c) usual management and course of these complications.

(P-E051) Thursday • 3:30 PM
Fournier’s Gangrene: Imaging Features
Ajay K. Singh, MD, University of Massachusetts, Worcester, MA
Fournier’s gangrene is a rapidly spreading soft-tissue infection, the optimum management of which requires early diagnosis, aggressive resuscitation, and surgical exploration and débridement. Early clinical and imaging identification of Fournier’s gangrene is imperative to avoid delay in the surgical débridement, antibiotic therapy, and sometimes hyperbaric oxygen treatments. CT evaluation prior to surgery is recommended in patients with Fournier’s gangrene to make early diagnosis and determine the extent of the disease. Early diagnosis can prevent orchectomy, fecal diversion, loss of muscles, and intraperitoneal spread. The poster will comprehensively discuss the CT imaging features of Fournier’s gangrene. Radiographic and US findings will also be briefly discussed.

(P-E052) Friday • 10:00 AM
Imaging of Penetrating Trauma to the Abdomen
Ajay K. Singh, MD, University of Massachusetts, Worcester, MA
The role of a radiologist in assessment of penetrating trauma is in determining the extent of injury to solid and hollow viscera, presence of active vascular extravasation, and guiding urgent patient care. Radiological assessment is more accurate than clinical assessment in determining the depth of penetrating injury and assessing the path of the projectile causing traumatic injury. Although exploratory laparotomy traditionally has been considered mandatory for management of patients with gunshot wounds to the abdomen, there has been growing interest in selective laparotomy with the help of diagnostic procedures such as peritoneal lavage, laparoscopy, US, and CT. This poster provides a comprehensive review of penetrating injuries to the abdomen. This exhibit includes cases of stab injuries, as well as gunshot injuries, to liver, pancreas, kidneys, and hollow viscera. Abdominal x-ray shows the bullet, pneumoperitoneum from bowel perforation, bone injuries, vertebral trauma, and subcutaneous emphysema. CT is a good predictor of the need for hemostatic arteriographic embolization, based on contrast medium extravasation. Helical CT with contrast administered intravenously, orally, and rectally (triple-contrast helical CT) for patients with abdominal penetrating trauma has 97% sensitivity, 98% specificity, and 98% accuracy for peritoneal violation.

(P-E053) Friday • 3:30 PM
Endometriosis of the Renal Pelvis: A Case Report with a Review of Current Etiologic Theories and Spectrum of Disease Presentation
John R. Gaughen, Jr, MD, University of Virginia Health Sciences Center, Charlottesville, VA; Gia A. DeAngelis, MD
Present the case report of an uncommon manifestation of endometriosis: a multicystic cystic mass of the right renal pelvis mimicking a urothelial tumor. Diagnosis and treatment included CT urography, endoscopic biopsy, and surgical excision. A unifying theory explaining the occurrence of endometriosis throughout the body, as well as in patients without endometrium (ie, males), is difficult. Endometriosis is likely multifactorial, and three major theories of histogenesis are proposed. In addition, hormonal, growth, immunologic, and genetic factors are increasingly being recognized as having important roles. The three major hypothesized etiologies include the metastatic, metaplastic, and induction theories. These theories will be discussed in detail, in addition to other potential contributing factors, with supportive case illustrations.

(P-E054) Thursday • 10:00 AM
Portal Vein Thrombosis: Etiology, Spectrum of Findings, and Complications
Margaret V. Revzin, MD, MS, North Shore University Hospital, New York, NY; Sabiba P. Karakas, MD
Portal vein thrombosis in acute cases is usually asymptomatic and primarily incidentally found on CT. If missed at an early stage, delayed recognition of portal vein thrombosis may lead to increased patient morbidity and mortality. Therefore, it is important to recognize various etiologies that can cause portal vein thrombosis and be able to diagnose portal vein thrombosis before complications develop. We will review cases in which portal vein thrombosis was caused by neoplastic processes (breast cancer, gastric cancer, pancreatic cancer, colon cancer, and neuroendocrine liver tumor), surgical intervention (colectomy, splenectomy, and Whipple procedure), liver disease (cirrhosis, hepatitis, and primary liver neoplasms), hypercoagulable state (polycythemia vera, protein C deficiency), infectious/inflammatory processes (pancreatitis, diverticulitis, acute cholecystitis, sepsis, Crohn’s-associated sclerosing cholangitis), and de novo portal vein thrombosis. We will particularly discuss radiographic presentations of acute and chronic portal vein thrombosis, as well as transient increased liver attenuation and cavernous transformation of the portal vein. Complications associated with acute and chronic portal vein thrombosis should be readily recognized. These may include mesenteric bowel ischemia and liver infarction as acute complications, and variceal bleeding, development of portal hypertension, and spontaneous portacaval anastomosis as long-term complications. We will review radiological findings on CT, MRI, and US demonstrating these various pathologies.
Common imaging features with respect to size (<1 cm, >5 cm), location (other than the anterior sigmoid colon), appendagitis in a hernial sac, and appendagitis secondary to diverticulitis. It is important for radiologists to be familiar with these uncommon variants of a benign self-limiting disorder to avoid radiological misdiagnosis, unnecessary surgery, hospitalization, and overuse of hospital resources.
RESULTS: Our experience demonstrates the importance of a detailed understanding of the anatomy of the ITF for the accurate diagnosis of relevant pathologies by cross-sectional imaging techniques, including CT and MRI. We present our experience with several tumors of the infratemporal fossa, including meningioma, orbital pseudotumors, adenocarcinoma, and metastatic disease.

CONCLUSIONS: The ITF is a complex potential space in the skull base in which tumor occurrence, although infrequent, is rarely inconsequential, given the proximity of critically important anatomic structures which bound this space. Resident awareness of pertinent anatomy and pathologic processes which occur in the ITF is a crucial aspect of residency training, reviewed in this presentation.

(E-061) Friday • 10:00 AM
Soft-Tissue Signs of Fracture
Ankur Gupta, MD, New York, NY

Soft-tissue findings provide indirect evidence of a fracture and may be more prominent on plain films than the fracture itself. In some cases, soft-tissue findings alone may be considered sufficient for presumptive diagnosis of a fracture. Each soft-tissue sign is demonstrated best on specific views and associated with specific common fractures. The soft-tissue signs discussed and illustrated on this poster include the elbow fat pad sail, supinator fat stripe, pronator quadratus fat stripe, scaphoid fat stripe, knee lipohemarthrosis, ankle effusion, cervicocranial prevertebral soft-tissue swelling, maxillary sinus air-fluid level, orbital emphysema, and scalp swelling. The radiographic views that best demonstrate these signs, as well as the associated fractures, are also described.

(E-062) Thursday • 3:30 PM
Pediatric Posterior Fossa Tumors
Gaurav Khatri, MD, Long Island Jewish Medical Center, New Hyde Park, NY; Amit Newatia, MD; Alan Johnson, MD; Craig Warshall, MD; James Amend, MD

Most posterior fossa masses in the pediatric population are of glial origin and present as either intraaxial or intraventricular lesions. Nonglial tumors are rare in children. Primitive neuroectodermal tumors (PNETs), juvenile pilocytic astrocytomas, brainstem gliomas, and ependymomas are the most frequently occurring posterior fossa tumors in this population. Primitive neuroectodermal tumors, also known as medulloblastomas, most commonly arise from the ventricular roof or the cerebellar vermis just posterior to the ventricular roof. They are characteristically dense on noncontrast CT imaging and are known to compress the fourth ventricle. Juvenile pilocytic astrocytomas (JPAs) are the other common posterior fossa masses in this population. JPAs characteristically have a very circumscribed pattern of growth and are seen as a partially cystic mass with a “mural nodule.” The mural nodule is the neoplastic burden that is limited to a nodule along the wall of the cystic mass. Another type of astrocytoma that is seen in children is the brainstem glioma. They typically arise within the pons. Pontine gliomas, unlike JPAs, are diffusely infiltrating; however, the infiltration is not typically accompanied by destruction of the surrounding tissue. Thus they usually present with relatively minor symptoms. The presence of contrast enhancement may indicate a higher grade of pontine glioma. Ependymomas are the other commonly seen posterior fossa masses, and about 70% present in childhood. These glial tumors arise from the ependymal lining within the fourth ventricle. In contrast to medulloblastomas, ependymomas arise from the floor of the fourth ventricle and may actually assume the shape of the ventricle. A thorough understanding of the characteristic imaging findings of the posterior fossa tumors is essential to differentiate among these entities. Accurate diagnosis is imperative for clinical management and patient outcome. The characteristic appearance and associated findings of these four most common pediatric posterior fossa tumors are described using index cases from our institution.

(E-063) Thursday • 10:00 AM
Calcific Tendinitis in the Shoulder: The Radiology and the Clinical Management
J. Carmen Timberlake, MD, University of Rochester Medical Center, Rochester, NY; Christopher Bang, DO; Marat Bakman, MD; Gwy Suk Seo, MD; Johnny U. Monu, MD

This benign condition of unknown etiology may present dramatically with sudden and excruciating pain, which inspires some excitement and urgency in the clinician. It frequently mimics rotator cuff tear in presentation, yet radiographic visualization of calcium in the tendon ensures an intact tendon. Frequently, MRI is the first imaging study available, yet diagnosis with plain radiography is straightforward. Moreover, there is limited information among radiologists about its clinical course and management. Using cases from our teaching file and a multimodality approach, this presentation will illustrate the radiologic spectrum of calcific tendinitis in the shoulder, as well as its clinical management. Possible differential diagnosis will be discussed. A relatively simple radiographic diagnosis with a pleasingly benign appearance, calcific tendinitis provides the radiologist immediate diagnostic satisfaction.

(E-064) Friday • 3:30 PM
Adrenal Hemangioma: A Case Study with Review of Literature
David Kenny, MD, Drexel University/Hahnemann Hospital, Philadelphia, PA; Alice Chen; Mark Hysell; Robert A. Koenigsberg, DO

PURPOSE: To review the imaging characteristics and incidence of adrenal hemangioma.

METHOD AND MATERIALS: A 59-year-old man underwent chest CT for the evaluation of chest pain, revealing an adrenal mass. Subsequently, abdominal CT/MR imaging was performed.

RESULTS: Imaging demonstrated a unilateral 4-cm adrenal mass demonstrating mixed attenuation and suspicious enhancement by MR for malignancy. Surgical pathology revealed adrenal hemangioma.

CONCLUSIONS: Adrenal hemangioma is a rare cause of adrenal enlargement, rarely described in prior case studies. In this exhibit, we review our case with a review of the literature.

(E-065) Friday • 10:00 AM
Osteopetrosis in the Pediatric Population
Mark A. Auler, MD, Medical University of South Carolina, Charleston, SC

Osteopetrosis is a rare hereditary disorder that is characterized by diffuse osteosclerosis. The radiological manifestations of the disease will be reviewed and correlated with pathological findings. Potential complications of the disease and the therapeutic options will be discussed.

(E-066) Thursday • 3:30 PM
Approach and Spectrum of Disease in the Interpretation of Technetium-99m MAG-3 Renal Radionuclide Imaging in Renal Transplant Patients
Sudhakar Satli, MD, Drexel University-Hahnemann Hospital, Philadelphia, PA; Christopher Carniglia, DO, MEng; Junseok Suh, MD

Technetium-99m MAG-3 renal scanning in renal transplant patients is an important tool in assessing function. Radionuclide imaging is a noninvasive method to detect a broad range of functional renal pathology, from cellular level to distal obstruction. Radionuclide imaging is of particular importance in renal transplant patients because of the relative risk from radiographic contrast. This precludes them from contrast-enhanced computed tomography, the modality which residents are usually most comfortable interpreting. Although renal radionuclide imaging is commonly performed, understanding
technetium-99m MAG-3 kinetics and recognizing common pathology in renal transplants can be challenging for residents. The goal of this poster is to review the renal radionuclide imaging and to expose residents to pathology they might not see at their own institution if they do not routinely image renal transplants.

(E-067) Thursday • 10:00 AM
Traumatic Facial Fractures: Test Your Skills!
Cliff Bernstein, MD, New York, NY
This educational exhibit poster shows selected plain radiographic and CT images of patients being imaged for facial trauma and asks the viewer to match the radiographs with the appropriate CT correlate. The educational purpose of the exhibit is to help the viewer improve recognition of facial fractures on plain films. Selected plain radiographs are presented and are to be matched by the viewer with the appropriate CT correlate. The answer key is printed upside down at the bottom of the poster and includes a very brief description of the pathology.

(E-068) Friday • 3:30 PM
Introduction to MR Diffusion Imaging
Terry Chun, MD, University of Rochester Medical Center, West Henrietta, NY; Toshio Moritani, MD, Svenkholm E. Ekholm, MD; Per-Lennart A. Westesson, MD, PhD
MR diffusion-weighted imaging (DWI) is based on random motion of water molecules. This can occur isotropically (identical in all directions) or show some degree of directional restriction (anisotropy). Isotropic diffusion is seen in large volumes, where water molecules have “no boundaries,” allowing for free diffusion in all directions. There are some restrictions in CSF, but for all practical purposes, this can be regarded as isotropic. In brain parenchyma, restrictions are set up at the cellular level that will create preferential directions of diffusion anisotropy. MR diffusion imaging is made possible by the application of spatial gradients in the pulse sequence. These gradients “mark” the specific location of a water molecule. In general, two gradients are used, the first to “dephase” the water signal and the second to “rephase” it. Full rephrasing, creating maximal signal in the image, will occur only if the molecule remains stationary. Diffusion imaging will thus allow for the measurement of water mobility in a specific environment, and the signal intensity will depend on the degree of diffusion, the apparent diffusion coefficient (ADC). Disease processes can be evaluated based on changes in the normal diffusion pattern. The interest in DWI for stroke is easy to understand. Hyperacute ischemia (<6 hours) is generally easy to detect, and much earlier (<30 minutes) with DWI than with other imaging modalities. Thrombolysis has proven successful in preventing infarction in ischemic tissue. To improve outcome, thrombolytic agents have to be administered within 3 hours of symptom onset. DWI is easy and fast to execute, and since both CT and conventional MR have low sensitivity in detecting hyperacute ischemia, DWI has become important when treatment is considered. This exhibit presents the fundamental principles of diffusion imaging and its use in clinical practice. It will include the evaluation of different types of edema in the brain, including cytotoxic, vasogenic, and interstitial, and how they can be differentiated on diffusion imaging. The discussion will also include exponential DWI, anisotropy maps, and tractography.

(E-069) Friday • 10:00 AM
Complications of Breast Augmentation: Mammographic and MR Imaging Findings
Kari J. Nelson, MD, University of Virginia, Charlottesville, Va; Jennifer A. Harvey, MD (kn6s@virginia.edu)
PURPOSE: To review the distinguishing mammographic features of breast augmentation and its complications and to discuss the role of additional imaging with MRI.

METHOD AND MATERIALS: Distinguishing features of common and uncommon complications of breast augmentation will be reviewed. Illustrative cases will include complications associated with implant aging and rupture, as well as gel bleed, explantation, silicone adenopathy, and free silicone injection, on mammography and/or MRI.

RESULTS: Complications of breast augmentation are commonly seen on mammography, although the etiology may not be readily apparent. MRI is useful in evaluation of intracapsular rupture and in clarification of difficult or ambiguous cases.

CONCLUSIONS: Common and uncommon complications of breast augmentation can often be readily identified at mammography; however, MRI is useful in suspected cases of intracapsular rupture and in clarification of difficult or ambiguous cases.

(E-070) Thursday • 10:00 AM
Survey to Evaluate the Use of a Research Fair to Promote Increased Radiology Resident Involvement in Research Projects
Eric Handley, MD, Brigham and Women’s Hospital, Boston, MA; Justin Genant, MD; Carole A. Dowd; Steven E. Seltzer, MD*; Barbara N. Weissman, MD (ehandley@partners.org)
PURPOSE: To evaluate the effectiveness of a residency research fair to promote resident interest and involvement in research projects.

METHOD AND MATERIALS: A research fair was held to expose the residents to departmental research projects soliciting resident participation. A survey was created to investigate the residents’ opinions on the utility of the research fair and to determine its role in promoting their involvement in research projects. The survey was sent via e-mail 7 months after the event to the 26 residents who were potentially available to attend the 2005 research fair.

RESULTS: Preliminary results are based on a 57% response rate. Sixty percent of respondents attended the research fair. Overall utility averaged 4.3 (range of 1–5, with 5 corresponding to very useful). Seventy-seven percent of attendees signed up for one or more projects. Every resident who signed up for a project met with at least one faculty member to further discuss the project. Sixty-seven percent of the residents who attended the research fair and 86% of residents who enrolled for research projects continue to work on at least one of the research projects. Sixty-seven percent of the residents who attended the research fair reported that it facilitated their work on a project(s). Furthermore, 56% of the attendees responded that the research fair resulted in work on a research project(s) in which they would not have otherwise participated.

CONCLUSIONS: A research fair is an effective method to encourage resident involvement in research and to facilitate their work on research projects.

(E-071) Thursday • 10:00 AM
Approach to Acute and Chronic Trauma to the Knee
Samuel W. Kim, MD, Long Island Jewish Medical Center, New Hyde Park, NY (wonmin_kim@yahoo.com)
With the use of the ACR appropriateness criteria, the approach to acute and chronic trauma to the knee will be discussed. Detailed technique of the knee x-ray and MRI protocols will be discussed. The reasoning behind why and which knee MRI sequences are done will also be reviewed. Finally, normal anatomy of the knee in x-ray and MRI (multiple planes: COR, SAG, AXIAL) will be presented; then various cases will be seen that are related to injuries secondary to acute and chronic trauma.
Carcinoma of the cervix is the 12th most common form of cancer in women in North America. The age of patients dying from the disease has been decreasing over the past years. There is significant correlation between tumor volume, parametrial invasion, nodal spread, and tumor stage on prognosis. In recent years, there has been a move to perform fertility-preserving surgery, such as trachelectomy. Therefore, accurate preoperative staging is essential. Clinical FIGO staging may differ from surgical staging in 17%–32% for stage IB tumors and up to 95% for a stage IIIB tumor. MR examination is performed using a phased-array coil on a 1.5-T magnet. A SSFSE sagittal localizer is followed by T2 FSE sequence in three planes (TR/TE/ETL: 4,000/102/16), 20–24-cm FOV, matrix size 512 × 256, four signal averages, and 5-mm slice thickness with 1-mm interslice gap. FSE images have higher contrast-to-noise between the tumor and parametrical tissue than the older SE images, and FSE is the most useful sequence to determine parametrical invasion. Dynamic Gd-enhanced imaging is useful for detecting small preinvasive tumors, which show strong early enhancement and which may not be visualized on T2 FSE sequences. Dynamic studies are also useful for detecting or confirming invasion of adjacent organs and for early postradiation recurrence. On FSE images, the tumor presents as a high-signal-intensity mass against the low-signal cervical stroma and vagina. The earliest stage appreciated reliably is stage IB, when tumor is completely surrounded by low-signal-intensity stroma. Tumor disrupting low-signal-intensity stromal ring into parametrium makes curative resection unlikely (stage IIIB), while extension to cardinal ligaments or pelvic wall muscles constitutes stage IIIB. Tumors with less than 5 mm of stromal invasion are less likely to have metastatic spread. Disruption of low-signal-intensity upper vaginal wall is best seen on sagittal images. MR precedes cystoscopy in demonstration of bladder involvement. Bladder and rectal invasion is seen as abnormal nodularity or increase in signal of wall and abnormal enhancement.
(E-076) **Friday • 10:00 AM**
Complications of Abdominal and Pelvic Procedures: CT Diagnosis
Bobbi Wax, MD, *Winthrop-University Hospital, Mineola, NY*; Douglas S. Katz, MD; Ruth L. Badler, DO; Michael Khalili, MD; Kevin R. Math, MD; Joseph P. Mazzie, DO; et al (dkatz@winthrop.org)
The postprocedural period is a critical time in which serious manifestations can occur. Identification, localization, and characterization of suspected complications following abdominal and pelvic procedures can be difficult on clinical evaluation alone. For example, abdominal pain after a colonoscopy may result from simple colonic spasm, colonic perforation, hemoperitoneum, or even splenic rupture. Vague symptoms of abdominal pain following a renal biopsy may be due to minimal postprocedural bleeding into and around the kidney or may be due to potentially life-threatening hemorrhage. In such patients, CT can play a crucial role in the rapid identification of complications, as well as to guide subsequent patient management. The purpose of this exhibit is to demonstrate the benefit of CT-assisted diagnosis in unforesen and uncommon complications associated with routine procedures in the abdomen and pelvis, such as colonoscopy, cardiac catheterization, IVC filter placement, and renal biopsy.

(E-077) **Friday • 3:30 PM**
Retroperitoneal Fibrosis Revisited: Review of Current Diagnostic Methods, Radiologic Presentations, Treatment, and Follow-up
Galina Levin, MD, *Winthrop-University Hospital, Mineola, NY*; Douglas S. Katz, MD; Andrew Choi, MD; John Hines, MD; Barak Friedman, MD; Deirdre Coll, MD; et al (dkatz@winthrop.org)
Retroperitoneal fibrosis is a rare condition which is challenging both for establishing the correct diagnosis based on imaging findings and for determining the appropriate clinical management. RP fibrosis may be idiopathic or may be due to an underlying process such as an aneurysm. The radiologist’s role is crucial in early recognition of this disease, since clinical symptoms are usually nonspecific and may initially be absent. Additionally, the imaging findings may vary, depending on the chronicity of the fibrosis. Timely intervention and treatment can help to avoid detrimental consequences of this infiltrating and progressive disease. The purpose of this educational exhibit is to review the clinical, radiologic, and pathologic features of retroperitoneal fibrosis, as well as current treatment options. A variety of examples will be shown using multiple modalities, especially CT, as will complications of the disorder and imaging following treatment. The differential diagnosis will also be illustrated, including lymphoma and retroperitoneal sarcoma.

(E-078) **Thursday • 10:00 AM**
Disorders of the Breast: CT Diagnosis
Bobbi Wax, MD, *Winthrop-University Hospital, Mineola, NY*; Lily Belfi, MD; Galina Levin, MD; Susana H. Fuchs, MD; Anca Kranz, MD; Douglas S. Katz, MD (dkatz@winthrop.org)
A wide variety of disorders of the breast may be identified on CT of the chest and/or abdomen, whether intentionally or not. With the advent of multidetector CT and the use of increasingly thinner slices for routine imaging, we have increasingly noted findings, usually incidentally, in the breasts on a minority of these CT examinations. Such findings can be easily missed if the interpreting radiologist does not include the breasts in the routine search pattern. Alternatively and less commonly, CT may be specifically ordered for local or regional evaluation of known or suspected breast pathology. The purpose of this educational exhibit is to review our experience over the past decade with the identification of breast pathology on CT examinations usually performed for unrelated reasons. We have now prospectively identified several previously unknown breast carcinomas, which will be demonstrated. Examples of benign breast pathology, including asymmetric tissue, gynecomastia, cysts, fibroadenomas, and parenchymal and vascular calcifications, will be shown, as will breast implant rupture. Infectious and traumatic processes will also be shown, including cellulitis, abscess, and hematoma, as will postsurgical changes, including findings related to recent percutaneous or open surgical biopsy procedures, as well as breast reconstruction. Regionally advanced cancer will also be demonstrated, as will lymphoma involving the breasts. Axillary adenopathy due to a variety of benign and malignant etiologies will also be shown. Radiologists need to be aware that a wide variety of breast findings may be seen on thoracic and abdominal CT.

(E-079) **Thursday • 3:30 PM**
Successful Endovascular Treatment of an Intracystic Ruptured Left Gastric Artery Pseudoaneurysm Complicating Pancreatitis
Craig M. Johnson, DO, *Northeastern Ohio Universities College of Medicine, Fairlawn, OH*; Barry S. Rose, MD; Chadi Chahin, MD; Manish Goyal, MD (Craig.M.Johnson@dmu.edu)
Left gastric artery pseudoaneurysm is an extremely rare but life-threatening complication of pancreatitis. To the best of our knowledge, only five other cases have been reported, and only one other case of successful coil embolization of a ruptured left gastric artery pseudoaneurysm complicating pancreatitis is described. We present a 45-year-old white male with severe left abdominal pain who was found to have acute pancreatitis complicated by a 9.9-cm pseudocyst containing a ruptured 2.4-cm left gastric artery pseudoaneurysm. The patient was successfully treated with endovascular coil. A 14-month follow-up revealed no postprocedural complications.
We have developed a Web site – electronic exhibits Tuscon, AZ Santiago Cornejo, MD, three-dimensional Models teaching radiologic Abdominal Anatomy with (e-103) important research aspect of systems-based practice. This Web site can help fulfill competency requirements in an of instruction and can also be used for distance learning of this mate.

CONCLUSIONS: incorporating them into practice. that the user will begin cultivating critical thinking skills and incor.

A grasp of anatomy remains a prerequisite for any health care professional to make diagnostic sense of plain or cross-sectional imaging of the abdomen and pelvis. For physicians in training, we created a series of three-dimensional teaching models aimed at bridging gross and radiologic abdominal anatomy. Cine loops of rotating models of the gastrointestinal tract, biliary tree, vasculature, genitourinary system, and skeletal structures were created from MR and CT images of the abdomen and pelvis and labeled using a commercially available workstation. Three-dimensional teaching models currently used to teach radiologic anatomy to our rotating medical students and residents have enhanced understanding of abdominal anatomy and have been well received as teaching media.

(E-102) Web-based System of Instruction and Self-Evaluation in Critical Thinking and Technology Assessment
Spencer B. Gay, MD*, University of Virginia Health System, Charlo tetsville, VA; Bryan S. Jeun; Kimberly E. Applegate, MD, MS (blues@virginia.edu)
PURPOSE: The aim of this Web site is to teach members of the medical community key aspects of technology assessment and critical thinking in evaluating scientific publications. METHOD AND MATERIALS: We have developed a Web site instructing medical students and residents in basic principles of the critical thinking process, using examples from the literature. Topics such as believable research and how it pertains to validity, reliability, and generalizability, as well as common sources of bias, are included. The hierarchy of research is described, as well as methods of study design. Following each section, questions reviewing these principles are presented. On completing the Web site, a quiz for self-assessment and documentation of competency is provided. We hope that the user will begin cultivating critical thinking skills and incorporating them into practice. CONCLUSIONS: Web-based instruction in the basics of critical thinking and technology assessment can serve as an effective method of instruction and can also be used for distance learning of this material. This Web site can help fulfill competency requirements in an important research aspect of systems-based practice.

(E-103) Teaching Radiologic Abdominal Anatomy with Three-dimensional Models
Santiago Cornejo, MD, University of Arizona School of Medicine, Tuscon, AZ; Kiamar Massrouv; Mihaela Pop; Randy Richardson, MD

A grasp of anatomy remains a prerequisite for any health care professional to make diagnostic sense of plain or cross-sectional imaging of the abdomen and pelvis. For physicians in training, we created a series of three-dimensional teaching models aimed at bridging gross and radiologic abdominal anatomy. Cine loops of rotating models of the gastrointestinal tract, biliary tree, vasculature, genitourinary system, and skeletal structures were created from MR and CT images of the abdomen and pelvis and labeled using a commercially available workstation. Three-dimensional teaching models currently used to teach radiologic anatomy to our rotating medical students and residents have enhanced understanding of abdominal anatomy and have been well received as teaching media.

(E-104) An Introduction to Genitourinary Radiology: An Educational Web Site for Medical Students and Radiology Residents
Jonathan Brandon; Nathan Ruden; Bryan S. Jeun; Matthew J. Bassignnani, MD, University of Virginia Health Sciences Center, Charlottesville, VA; Spencer B. Gay, MD* (mjb4f@virginia.edu)
Continuing our tradition of utilizing Web technologies to disseminate radiologic education to our medical students, residents, and fellows at the University of Virginia and providing access to these same valuable training materials to trainees throughout the world via the Internet, three medical students at the University of Virginia present their work creating an educational Web site geared towards training anatomy, embryology, imaging techniques, and pathology that is seen in the GU section of the department of radiology at the University of Virginia. This Web site shows the breadth of pathology that the department sees referred from the university’s busy urologic practice but also through referrals from outside urology groups that send cases to UVA for consultation. The technology employed allows for high-quality images and movies to illustrate particular aspects of GU anatomy and/or pathology. A posttest is provided for serious users who want to ensure they have mastered the material contained in the Web site. There are links to the department’s other Web sites also geared toward instructing early trainees (medical students and 1st-year radiology residents).

(E-105) Web-based Diagnostic Radiology Teaching Module
John W. Bell, MPH, MBA, University of Utah, Salt Lake City, UT; Jeffrey Nackos, BS; David E. Avrin (John.Bell@hsc.utah.edu)
This project is a Web-based teaching module designed for 4th-year medical students taking a 4-week diagnostic radiology rotation. The module uses a case-study approach to cover fundamental topics in musculoskeletal, thoracic, abdominal, and neuroradiology. Students complete five cases per day, 25 cases in each area, for a total of 100 cases. Each case includes a case history, diagnosis, description of disease pathology, and pertinent radiologic issues. In addition, the module includes 80 labeled radiologic images of normal anatomy, over 200 case images, and a study guide with over 300 questions taken from the cases. http://uhsc.utah.edu/rad/medstud/index.htm

* Faculty financial disclosures are located in the Faculty Index.
(E-106) Pediatric Nuclear Imaging: A Chronology of Cases for Medical Students
Joseph A. Monteiro, Boston University Medical Center, Boston, MA; Brian L. Dunfee, MD; M. Elizabeth Oates, MD* (elizabeth.oates@bmc.org)

Human anatomy and physiology are fundamental to medical education. Although most medical students are exposed to anatomic imaging, functional modalities such as nuclear radiology are often overlooked until residency or beyond. Nuclear radiology plays an important role in the diagnosis and management of many common pediatric conditions during various stages of development. Through the presentation of 12 pediatric cases involving the endocrine, gastrointestinal, genitourinary, and skeletal systems, this interactive educational module outlines a methodology for helping medical students learn the fundamentals of nuclear radiology. Students develop appropriate clinical and radiological differential diagnoses for each age group while simultaneously reviewing the anatomy, physiology, and pathology of each final diagnosis. The module allows students to work at their own pace, providing tools to assess their own learning. Feedback from medical students continues to validate the educational value of this interactive module, which may serve as a model to supplement a radiology clerkship curriculum.

LEARNING OBJECTIVES: (1) To review basic principles and terminology of diagnostic nuclear imaging. (2) To demonstrate how nuclear imaging studies assist with diagnosis and management of clinical conditions from infancy to adolescence. (3) To review anatomy, physiology, pathology, and management for each diagnosis. (4) To encourage student self-assessment with multiple-choice questions based on clinical cases presented.

(E-107) Case-oriented Radiology Education (CORE): Teaching Radiology through a Case-based Online Radiology Curriculum
Petra J. Lewis, MD, Dartmouth-Hitchcock Medical Center, Lebanon, NH; Tina S. Nelson, MD; Xi Huang (petra.lewis@hitchcock.org)

PURPOSE: Students learn radiology most effectively when it is placed in the context of typical clinical scenarios, ideally during clinical clerkships. Standardizing this teaching is difficult and time-consuming. There is some excellent material available online, but identifying appropriate sites can be challenging. We are designing a case-based radiology curriculum on the Web (CORE), which will be introduced to students during their 3rd- and 4th-year clinical clerkships to supplement the 2nd-year radiology course and 4th-year radiology elective.

METHOD AND MATERIALS: The AMSER medical student curriculum is used as the basis for designing the cases. The authoring module is CASUS™, which is a HyperCard-based software that integrates text, multimedia (images, video, audio), questions, and hyperlinks into cases. Both access frequency and responses to questions can be tracked. Several cases are planned for each of the AMSER curricula areas (estimated 20 cases required). Each case includes both clinical information and multiple imaging scenarios that follow a “real” patient through several clinical episodes. Images and hyperlinks to appropriate Web sites are used extensively during the case, and students must answer questions related to the case. Students use the cases at any time during the clerkship. CORE will be a requirement of the clerkships, with testing during the final exam.

RESULTS: To date, eight cases have been developed for the chest, abdominal, and women’s imaging curricula. These cases have been tested on the 4th-year elective before being introduced to the 3rd years and have been enthusiastically received.

CONCLUSIONS: Integrated Web-based radiology taught through patient scenarios is a logical and effective means of introducing radiology to students on clinical clerkships.

(E-108) Using an Open-Source 3D Modeling Software to Enhance Teaching of Radiologic Anatomy
Sonia Pujol, PhD, Brigham and Women’s Hospital, Boston, MA; Kitt Shaffer, MD, PhD (spujol@bwh.harvard.edu)

Anatomy teaching remains a vital element of the medical educational curriculum. An essential aspect is for students to recognize the degree of variation from one body to another. Traditional teaching could be enhanced with digital methods based on rapid building of models from patient data to demonstrate this variation in a graphic manner. This article presents a pilot study on the development of teaching modules for anatomy education of 1st-year medical students using 3DSlicer, an open-source platform for research in medical image analysis. Our goal is to provide 3D visualization capabilities to enhance understanding of the structures and to demonstrate anatomical variations. Our first session focused on the mediastinum. We collected five anonymized CT patient data sets, including a normal case and four variant cases, and used semiautomatic segmentation methods of 3DSlicer to reconstruct models of anatomical structures. For the normal case, we built 3D models for the airways, the esophagus, the aorta, and the pulmonary artery. From the other cases, we reconstructed 3D models of an aortic aneurysm, a thick left ventricle, a normal left atrium and right ventricle, a dilated esophagus, and a right-arch aorta with venous structures, including superior vena cava, brachiocephalic, jugular, and subclavian veins. The average time required to build the models was 20 minutes per structure. 3DSlicer and the data sets were installed on 12 workstations, and the students participated in an optional teaching session. A short lecture introduced the concept of 3D modeling of the anatomy and included a 15-minute tutorial on the software. During the hands-on session, the students used the models in 3DSlicer to perform a series of exercises on the anatomical cases. User interactions included superimposing models on CT slices, zooming in and out, and rotating the models. The Web-based evaluation questionnaire that we designed received a response rate of 75%. Most students gave positive feedback on the value of 3D visualization, suggesting to add more models. Future plans include new teaching modules for anatomical areas difficult to understand, such as liver segments and the pelvis.

(E-109) Using 3D CT to Teach Classification of Complex Tibial Plateau Fractures
Adam P. Myhre, MD, University of Washington, Seattle, WA; Michael L. Richardson, MD (amyhre@uw.edu)

INTRODUCTION: Tibial plateau fractures are a common and often complex injury to the knee. The Schatzker classification system is used by many trauma radiologists and orthopedic surgeons to estimate prognosis and to plan the most appropriate treatment. CT, with the use of 3D reconstructions, has been shown to better evaluate the extent of tibial injury than plain radiographs. We believe that 3D CT can also be used to better teach radiologists about these complex fractures and their classification.

FORMAT: This interactive Web-based program will teach the Schatzker classification using line drawings, plain films, CT, and 3D CT. The user will have the opportunity to test his or her knowledge against several unknown cases, both before and after viewing the program. Usability and efficacy of the program are currently being evaluated by residents at our institution.

TEACHING POINTS: 1. After using the exhibit, the user will have gained a better understanding of the Schatzker classification system and its ramifications for prognosis and treatment planning. 2. The user will have a better understanding of the plain film, CT, and 3D appearance of tibial plateau fractures. 3. The user will be able to reinforce this knowledge against a set of unknown cases.
E-110 Imaging the Pregnant Patient
Shital J. Patel, MBBS, Long Island College Hospital, Brooklyn, NY; Deborah Reede, MD; Raja Subramaniam (sjpatel@chpnet.org)

LEARNING OBJECTIVES: 1. Learn current recommendations for diagnostic imaging of the pregnant patient in different clinical scenarios. 2. Learn to use the appropriate imaging modality to evaluate the pregnant patient while keeping the fetal radiation dose as low as reasonably possible. 3. Learn answers to commonly asked questions regarding imaging the pregnant patient.

The use of diagnostic imaging studies on pregnant patients poses a dilemma for referring physicians and radiologists due to concerns regarding fetal radiation exposure. If physicians are made aware of the actual risks and recommendations based on the data available on this subject, uncertainty in recommending the appropriate imaging study can be greatly reduced. We endeavor to condense these data and present them as a computer-based module, to be used as a quick reference by the referring physician and radiologist. This module will outline the fetal risks from various imaging modalities as quantitatively as possible, thus helping the physician choose the appropriate study, as well as communicate the risks to the patient in a scientific manner. A step-by-step approach for the evaluation of patients in certain clinical scenarios, such as “rule out pulmonary embolism,” acute appendicitis, and urolithiasis, will be presented. Information regarding use of contrast material is also provided.

E-111 Imaging Criteria for Femoroacetabular Impingement: Defining the Predisposing Factors and Radiologic Appearance of Hip Impingement
Justin Q. Ly, MD, Wilford Hall Medical Center, Lackland Air Force Base, TX; Douglas Beall, MD; Craig L. Lastine, MD; Clifford F. Sweet; James D. Wolff; David E. Grayson, MD (jly15544@hotmail.com)

PURPOSE: To illustrate the imaging appearance found in patients with femoroacetabular impingement (FAI) and to define the anatomic criteria for this diagnosis across multiple modalities.

METHODOLOGY: Femoroacetabular impingement occurs secondary to various anatomic anomalies of the femoral head-neck junction and acetabulum. Patients with clinical signs and symptoms of impingement have been found to have characteristic radiologic and anatomic characteristics that predispose them to the development of this impingement process. Measurements and morphologic observations of FAI were determined by evaluation with plain film radiography, computed tomography, and magnetic resonance imaging.

RESULTS: Anatomic findings of FAI included a decreased tapering at the femoral head-neck junction (decreased femoral head-neck offset) and a reduction in femoral anteversion. Primary radiologic findings of FAI included reduced concavity of the anterolateral femoral head-neck junction, an abnormal femoral head-to-neck ratio, differences in scaled width of the femoral neck, and a convex-appearing femoral head-neck junction that may be quantified with the α angle measurement. Secondary findings seen in patients with anatomic evidence of FAI include anterosuperior acetabular labral tears, adjacent impaction injury to the anterolateral femoral head-neck junction, lateral acetabular cartilage damage (with or without early-onset degenerative arthritis), and synovial herniation pits.

CONCLUSIONS: The process of femoroacetabular impingement is based on an impaction phenomenon resulting from anatomic anomalies of the acetabulum and proximal femur. These anomalies have typical appearances on plain film radiography and cross-sectional imaging and may be divided into primary and secondary imaging findings. The recognition of these anatomic criteria and imaging findings may result in the proper characterization of FAI and an expedited process of treatment.

E-112 MR Imaging of Hip Injuries That Are Common in Runners
Michael Moak, MD, Wilford Hall Medical Center, Lackland Air Force Base, TX; Justin Q. Ly, MD; Douglas Beall, MD (jly15544@hotmail.com)

Running is a popular athletic and recreational sport; and, as such, running injuries of the lower extremity are relatively common and include acute, subacute, and chronic overuse injuries. The successful treatment of running injuries requires a specific diagnosis, which is best obtained noninvasively with MR imaging and MR arthrography, as symptoms and physical examination findings are often nonspecific. The MR evaluation of athletic injuries of knee and ankle have been well described in the literature, with less written about hip injuries. Conventional MR imaging is useful for evaluating extraarticular soft tissue and osseous structures. The visualization of intraarticular structures such as the acetabular labrum and articular cartilage is best obtained with direct MR arthrography. In this presentation, we review the MR imaging and MR arthographic findings that are characteristic and/or specific to running injuries involving the hip.

E-113 Web-based Tutorial on the Basics of PET/CT and the Reimbursable Indications
Rodney R. Bowman, MD, University of Virginia Health System, Charlottesville, VA; Anup Agarwal; Brian R. Williamson, MD; Patrick K. Rehm, MD; Spencer B. Gay, MD* (rh22ua@virginia.edu)

PURPOSE: The purpose of this exhibit is to provide a basic introduction to and description of positron emission tomography/computed tomography (PET/CT). Many clinicians and radiologists are not entirely familiar with the basic principles of and reimbursable indications for this modality. Although PET/CT has been available for some time, we feel that it is still underutilized, possibly somewhat due to poor understanding of its utility and indications.

METHOD AND MATERIALS: This Web site is developed using JavaScript and HTML. It can be accessed by anyone worldwide with a computer and an Internet connection. The site includes a self-guided introduction to PET/CT as an imaging modality, a description of its clinical utilities, and a listing of reimbursable indications for PET imaging. Examples of representative clinical cases are used for reinforcement.

RESULTS: Our goal is that this tutorial be used by clinicians and radiologists as an educational tool and guide to the appropriate use of PET/CT in clinical practice. The Web-based tutorial can be updated periodically to reflect inevitable changes in the reimbursable indications for PET imaging.

CONCLUSIONS: Web-based tutorials for radiology-related education have been shown to be well received and effective. This Web-based module will fulfill a need for more education and guidance regarding a relatively new imaging modality. www.med-ed.virginia.edu/courses/rad/

E-114 Vascular Anomalies of the Brain
Anthony M. Sajewicz, MD, Long Island Jewish Medical Center, New Hyde Park, NY; Jenifer Gross-Slone, MD; Craig Marshall, MD (sajewiczmd@yahoo.com)

Vascular lesions of the brain and spinal cord are responsible for causing strokes, transient ischemic attacks, and bleeding episodes. These lesions include aneurysms, vascular malformations, and narrowing of the major blood vessels of the brain. This presentation format will be didactic and encompass the “classic” vascular anomalies affecting the brain and spinal cord, including various cases of aneurysms, arteriovenous malformations, fistulas, arteriovenous lesions, and moyamoya disease. This review will consist of many of the common vascular lesions radiologists see every day, as well as a few of the zebra that occur only a few times a year. Emphasis will be placed on the imaging
MR Imaging of Muscle and Tendon Injuries of the Hips and Pelvis

James P. Picotte, Jr, MD; William Beaumont Hospital, Royal Oak, MI; David Fessell, MD; Duane G. Mezwa, MD; Sailaja Yadavalli, MD, PhD; Jon A. Jacobson, MD (picotte1@msu.edu)

Muscle and tendon injuries about the hips and pelvis are common and range in severity from mild muscle strain and ligament sprain to complete muscle and tendon rupture. Osseous avulsion can also occur at the site of tendon insertions. Knowledge of the anatomy of the muscles and tendons of the hips and pelvis is essential and will be reviewed and illustrated. Specific muscle and tendon injuries will also be depicted, including injury to the gluteal, rectus femoris, sartorius, hamstring, and adductor muscles. The piriformis muscle syndrome can mimic musculoskeletal injury and will also be demonstrated. Ligamentous injuries will also be illustrated, including injury to the iliofemoral ligament. A thorough knowledge of normal anatomy and pathologic appearance of musculoskeletal injuries to the hips and pelvis will be gained.

Radiology Orientation Curriculum Based on Readings from The Radiology of Emergency Medicine, 4th edition, by Harris and Harris

Paul R. Silk, MD, Albany Medical Center, Albany, NY (silkp@mail.albanymed.edu)

Often the most traumatic period for radiology trainees is the first night of call. To better prepare the resident for this moment, our department, upon the recommendation of past residents, has installed The Radiology of Emergency Medicine, 4th edition, by John H. Harris and William H. Harris, as the department’s introductory text. Reading assignments are followed by tests given in a conference setting. The tests are comprised of basic anatomy and illustrative cases taken from our teaching files or from the Internet. This has proven to be a successful introduction to ER coverage and provides a solid introduction to clinical radiology.

Commonly Missed Fractures and Dislocations in the Musculoskeletal System, with an Emphasis on the Upper and Lower Extremities: A Multimodality Review

Jarett Burak, MD, Beth Israel Medical Center, New York, NY; Kevin R. Math, MD; Marlene E. Rackson, MD; Robert E. Irish; Catherine N. Petchprapa, MD (jburak@chpnet.org)

As CT scanning in the emergency department has proliferated, radiology residents have become proficient at cross-sectional diagnoses. Since residents may only have 6 months of training before assuming duty in the emergency department, sometimes this expertise comes at the expense of fundamental radiographic diagnoses. This educational exhibit will review many of the most commonly missed injuries of the musculoskeletal system, with emphasis on the upper and lower extremities. Multiple modalities will be used, including plain film radiography, CT, MRI, and nuclear medicine studies, to diagnose various entities, including sternoclavicular joint dislocations, posterior shoulder dislocations, radial head dislocations, scaphoid fractures, various hip fractures, tibial plateau fractures, fifth metatarsal fractures, calcaneal fractures, and Lisfranc fracture-dislocations, as well as other commonly missed injuries. Complications that arise as a result of missing some of the various injuries will also be discussed. Special radiographic views that will maximize detection of often subtle injuries will also be illustrated. Our goal is to provide radiology residents with a heightened awareness of commonly missed musculoskeletal injuries in the extremities and to present a systematic approach for reviewing radiographs before dismissing them as negative. www.med-ed.virginia.edu/courses/rad/

Gastrointestinal Imaging: A Dynamic Teaching Modality

Jessica Robbins, MD, University of Michigan, Ann Arbor, MI; Katherine Klein, MD; Marilyn A. Roubidoux, MD (kleink@umich.edu)

The purpose of this exhibit is to display an effective, interactive program that can be used either as a learning tool or self-assessment module for an individual or as a competitive stimulus for group learning in the classroom setting. Using a game-show format, several facets of gastrointestinal imaging are demonstrated, including plain radiography, CT, barium, and management of interventional dilemmas. In the classroom, this design allows for a departure from the traditional didactic lecture by encouraging active participation by the attendees. Alternatively, an individual can either test his or her fund of knowledge or can learn new information by interacting with the game in a flash-card–like fashion. As each topic includes increasingly difficult material, this modality is effective for individuals at all levels of training.

Multislice CT Enteroclysis of Small Bowel Crohn’s Disease Subtypes with Pathologic Correlation

Susan T. Crook, MD, Indiana University School of Medicine, Indianapolis, IN; Dean Maglinte, MD (stheobal@iupui.edu)

Precise characterization of the different subtypes of Crohn’s disease is important in triaging patients for medical or surgical treatment and choosing the appropriate medications or surgical management. This electronic educational exhibit will demonstrate and discuss the different subtypes of small bowel Crohn’s disease as shown on multislice CT enteroclysis, correlating surgical pathology and biopsy-proven histologic subtypes of the disease. Multiple patients were reviewed who had small bowel surgical resection or biopsy within 1 month of CT enteroclysis. Disease is classified into the following subtypes: active inflammatory (minimal or severe), fibrostenosing, fistulizing/perforating, and regenerative. The imaging features of each subtype will be reviewed, with examples of each. Pathological descriptions and sections illustrating the different features of each subtype will also be reviewed. The treatment of each subtype will be briefly described. The key differences in therapy for each subtype will be explained. The format of the exhibit will be primarily didactic, with a review of key points and a self-test at the end. Multiple radiographic images with their pathologic correlates will be displayed with descriptions of pertinent findings. The goal is for radiologists to understand the different imaging criteria that categorize the Crohn’s disease process into each clinical subtype and why it is helpful to do so. The pathologic correlates will help to illustrate the radiographic findings and reinforce the differentiating imaging features. This is important information for the referring clinician in the treatment decision process. By accurate description and classification, radiologic interpretations will be more pertinent and ultimately result in better patient care.

The Effect of Audience-Response System on Resident Education

Eva I. Rubio, MD, University of Virginia Health System, Charlottesville, VA; Matthew J. Bassignani, MD (rubioeva@yahoo.com)

Techniques of radiology resident education have traditionally included didactic lectures and case conference “hot-seat” formats. Previous studies suggest improved retention of new material using audience-
response system (ARS) software. In an era of increasing clinical volume and longer workdays, the time devoted to education is diminished in many medical centers; therefore, developing techniques which optimize educational time are well worth the investment. In our study, on the designated morning of a midday lecture on pediatric renal masses, residents will be randomized into one of two groups, without prior knowledge of either the day’s lecture topic or of the recent acquisition of ARS software at our institution. Randomization will be performed separately for all four resident classes to ensure balanced representation of the various levels of knowledge between the two groups. The identical lecture will be presented separately to the two groups at 12 PM and 1 PM on the same day, with only the first group receiving the lecture with ARS integrated into the lecture. The intent of utilizing ARS is to increase resident interest while maintaining improved attention span, thereby augmenting long-term retention of the material presented during the lecture. The second group will receive the standard lecture format without ARS. At the end of each lecture hour, the respective groups will be administered a quiz comprised of 10 images requiring a diagnosis. Each image of the quiz will have five possible answers, of which only one will be correct. The specific images of the quiz will differ from the images presented during the lecture. This is done to avoid skewing results by attaining correct answers due to recognition of material posed a short interval previously (approximately 30–40 minutes). Additionally, in order to cancel the potential effect of better quiz performance in the second group due to improved lecture delivery, which often results from practice, the ARS group will be the first lecture group. The quiz will be readministered to the residents after a 3-month interval, to assess for potential differences between the two groups in long-term retention of the material.

(E-121) Utilizing a Digital Database for Teaching Gastrointestinal Imaging over Multiple Modalities
Paul M. Knechtges, MD, University of Michigan Medical Center, Ann Arbor, MI; William Weadock, MD*

The shift from radiographic/fluoroscopic studies to CT, MRI, and endoscopy has changed the imaging work-up of gastrointestinal disease. It would follow that teaching files should be updated in order to demonstrate these different disease entities over multiple modalities. Combining multiple imaging modalities in a single digital database/teaching file would provide an invaluable tool for teaching both the imaging characteristics of gastrointestinal pathology and the role of each modality in a patient’s diagnostic work-up. Utilization of a digital database which can be searched by both database field and free text provides a number of advantages. The images and the accompanying text can then be used to rapidly generate presentations/lectures, to provide a tool for independent learning, or to rapidly access publication-quality pathology-proven images for use in papers and textbooks. Most importantly, such a database could be continuously updated to maintain its relevance to resident education as the diagnostic work-up of gastrointestinal disease continues to evolve. The following presentation outlines a method for creating and maintaining an evolving teaching file utilizing the Radiological Society of North America’s Medical Imaging Resource Center (MIRC) program.

(E-122) Development of an Online Library of Grand Rounds Conference Videos for Access across Departmental Intranet
Kevin Daly, MD, University of Virginia, Charlottesville, VA; Spencer B. Gay, MD* (kgd06@virginia.edu)

PURPOSE: Radiology grand rounds and visiting professor conferences are routinely archived on video for those who are unable to attend the conference or those who would like to review the conference at a later time. Residents have found these conferences particularly valuable for board preparation and review. Conferences have been archived in standard VHS format but are difficult to access, and it is frequently difficult to find an available TV/VCR combo and suitable place to view the videos. Few residents actually make use of this resource. Our goal was to develop an online library of digital video to facilitate improved access to these conferences throughout the department using the existing departmental PC infrastructure.

METHOD AND MATERIALS: Different methods of digital video conversion and compression were evaluated. Image quality, file size, portability, compatibility, and cost were principal considerations. A subset of the existing VHS library was converted to digital format using a professional-grade VCR, PC video-capture card, and standard Windows-based PC using Windows Media Video (.WMV) file format. Resultant digital video files were placed on a secure shared network drive for access throughout the department. A library index was created using HTML, facilitating easy access to all the digital video files from a standard Web-browser interface.

RESULTS: A total of 25 hours of videotaped conferences were converted to digital format. Any one of the lectures can be easily accessed for playback directly on a user’s PC through a simple Web interface throughout the department. Residents have found the resource valuable as supplementary review material when starting a new rotation and for board preparation.

CONCLUSIONS: Creation of a Web-based online digital video library is practical and useful and can be implemented at minimal cost using existing departmental network and PC infrastructure. No special expertise or large investment was required. We believe this online library is a valuable educational resource and will be expanded with future conferences.

(E-123) Ocular Trauma: CT Imaging
Ajay K. Singh, MD, University of Massachusetts, Worcester, MA

The correct recognition and prompt management of ocular trauma are the keys to treat and salvage ocular function after traumatic ocular injury. Cases of ocular trauma secondary to blunt or penetrating injury, presenting to the emergency department over the last 3 years, will be used to elicit various imaging findings on multidetector CT. This will be a didactic presentation to elicit the multitude of CT imaging appearances of ocular injury secondary to blunt and penetrating trauma. The ocular pathologies to be included are intraocular foreign bodies, retinal detachment, choroidal detachment, eyeball rupture, lens dislocation, and vitreous hemorrhage. Reformat and 3D reconstructions will be used whenever relevant to the pathology.

(E-124) Enhancing Your Academic Portfolio: Use of Online Lecture Evaluations
Michelle M. Bittle, MD, University of Washington/ Harborview Medical Center, Seattle, WA; Frederick Mann, MD (mbittle@u.washington.edu)

Evaluation of teaching performance is an essential component of the academic portfolio. Lectures given at a physician’s parent institution may not be evaluated individually but only included in annual summary resident evaluations of faculty. As such, criticism necessary for faculty development is not focused. Furthermore, evidential records of instruction quality may be deficient in lecturers’ academic files. We sought an efficient means to obtain real-time anonymous feedback and documentation after resident lectures. Catalyst Web Tools is an institutional Web site that provides Web-based instruction for development of online evaluations and surveys, Web site construction, and Web-based courses. We used Catalyst to construct evaluation forms that assess (1) lecture content, (2) preferred lecture format, (3) instructor’s performance, and (4) requests for future lecture topics. Each collection of student evaluation responses can be archived in a database that tracks lecture topics, dates, and summary data. The automated Web-
based survey tool requires three simple administrative actions: (1) assigning a unique lecture name to the evaluation template, (2) creation of a “blinded” e-mail group containing student e-mail addresses, and (3) automated release of a group e-mail containing the survey link and requesting students to complete the postpresentation survey. Students not completing the survey may be automatically reminded by Catalyst. Catalyst automatically tabulates and statistically summarizes student responses, which can be exported for more comprehensive analysis. Similar Web-based survey tools are widely available and are finding increasing use in medical training. The use of Web-based anonymous lecture evaluations provides rapid and efficient assessment of student needs and guides improvement in lecturer performance. We found online surveys easy to implement, even for the more frequent in-house lectures that are the backbone of radiology residency didactic education. The format provides support for the teaching mission and documentation requisite in a personal academic portfolio.

(E-125) Imaging Evaluation of the Reverse Shoulder Arthroplasty
Ahmad F. Haidary, MD, William Beaumont Hospital, Royal Oak, MI; Monisha Shetty, MD, Sailaja Yadavalli, MD, PhD; David Fessell, MD; J. Michael Wiater; Duane G. Mezwa, MD

While shoulder arthroplasty can be used to successfully treat shoulder arthropathy in the setting of an intact rotator cuff, results are poor when the rotator cuff is torn. A reverse-design shoulder prosthesis, with a cup placed within the proximal humerus and a hemisphere fixed to the glenoid, allows the deltoid to provide active elevation of the arm while relieving pain from the arthropathy. Active external rotation can also be achieved postoperatively if the teres minor is intact. This exhibit illustrates the indications, preoperative imaging evaluation, and postoperative imaging evaluation with radiographs, CT scan, and MR imaging. Associated complications of this surgery and prostheses will also be discussed. A thorough understanding of the imaging evaluation of these patients, both preoperatively and postoperatively, will be gained.

(E-126) Bony “Lumps and Bumps”: A 3D CT Atlas for Teaching Normal Anatomy of Tubercles, Tuberocities, and Trochanters
Michael L. Richardson, MD, University of Washington, Seattle, WA (mrich@u.washington.edu)

A variety of osseous protuberances are commonly seen on plain radiographs of the skeleton. Important muscles attach to some of these structures, and important tendons run past others. Fractures and other disorders of these “bumps” can compromise the function of the associated musculotendinous structures. To assist radiology residents and medical students in assessing these “bumps” and their pathology, we have created an online Web-based atlas of many of the common tubercles, tuberocities, and trochanters using 3D CT data sets. We have depicted these “bumps” and their adjacent musculotendinous structures using volume-rendered 3D images. These are available online in the format of not only static JPEG images, but also QuickTime (Apple computer) and QuickTimeVR (virtual reality) files created from the CT data using OsiriX, a free DICOM 3D workstation for the Macintosh. These images are hyperlinked to our online atlas of muscle illustrations (http://www.rad.washington.edu/atlas/), adding information about muscle origins, insertions, action, innervation, and arterial supply. We hope that this atlas will follow in the footsteps of our previously produced muscle atlas, which has proved to be not only a great study aid to medical students first learning the anatomy, but also an excellent real-time review of the anatomy for residents and attendings during interpretation of actual clinical cases. We intend to evaluate the educational effectiveness of this innovative atlas as it is used by our students and residents.

(E-127) The Effects of Changes in Fluoroscopic Examination Referral Patterns on How Residents Are Taught to Perform and Interpret Fluoroscopy Procedures
Siddhartha Thanawala, Beth Israel Medical Center, New York, NY; Syed Furqan Zaidi, MD; Marlene E. Rackson, MD (mrackson@chpnet.org)

The number of routine diagnostic UGI and barium enema examinations has sharply decreased because of endoscopy. There are also many more examinations on patients with complex postsurgical anatomy, due to an increase in the number and variety of surgeries and endoscopic procedures, such as gastric bypass procedures. Indications for studies include both early and late complications of surgery, eg, leaks, fistulas, perforations, obstructions, and strictures, as well as evaluation of the position and functionality of various catheters and stents. Both the attending radiologists and residents are challenged with learning (1) typical postoperative appearance of a wide variety of surgical procedures, (2) common early and late complications of each procedure, and (3) how to tailor each study to the individual patient. These studies require more planning and differ significantly from the UGI and barium enema procedure recipes that were taught in past years. In this exhibit, we review the change in the spectrum of fluoroscopic examinations performed at our institution over the last 10 years and how we have modified resident training as a result. We provide a tutorial including (1) a schematic and radiograph of postoperative anatomy of common procedures, (2) possible complications with examples, and (3) techniques of examination. Beginning with the esophagus, we include studies performed after laryngectomy, balloon dilatation, or myotomy to exclude leak or perforation. We proceed through the entire GI tract, with special emphasis placed on studies performed after gastric bypass procedures and evaluation of fistula tracts. Evaluations after enteric feeding tube placement, cholecystostomy tube, and biliary/colonic stent placement are included. Genitourinary tract examinations include “loopograms” or “stentograms” after ileal conduit creation and nephrostograms after nephrolithotomy procedures. We hope that this exhibit will enable both attending radiologists and radiology residents to better adapt their fluoroscopy curriculum to the challenges presented by the current demands of medical and surgical health care.

(E-128) Head and Neck PET/CT: Normal Physiologic Distribution and Avoiding Pitfalls in Oncologic Imaging
Victor Shin, MD, St Luke’s Roosevelt Hospital, New York, NY; Munir Ghesani, MD; Peeyush Bhargava, MD; Naoko Kagetsu, MD

(18)F-fluoroethylglucose positron emission tomography (FDG PET) is being increasingly used in oncologic imaging because it provides functional information not demonstrated in computed tomography (CT) and magnetic resonance imaging (MRI). Combined PET/CT improves diagnostic accuracy by aiding anatomic localization of FDG activity. This is particularly true in the head and neck, where abundant and complex anatomy can confound accurate diagnosis. Learning both physiologic patterns of activity and normal anatomic morphology is important to avoid diagnostic pitfalls. We will present the head and neck anatomy and uptake in 20 adult oncology patients with no known pathology in this region. We will also review clinical and radiologic features that help to narrow the differential diagnosis.

* Faculty financial disclosures are located in the Faculty Index.
(E-129) **Approach to ERCP Interpretations Focusing on Anatomy, Technique, and Pathology**
Kerry Sibert, MD; Beth Israel Medical Center, New York, NY; Syed Furqan Zaidi, MD; Marlene E. Rackson, MD; Seth Cohen, MD (mrackson@chpnet.org)

Endoscopic retrograde cholangiopancreatography (ERCP) has long been the diagnostic and therapeutic procedure of choice for evaluation of abnormalities in the pancreatic and biliary ductal system. Typically, ERCPs are usually performed in endoscopy suites by gastroenterologists, far away from the radiology department. A radiologic technologist then delivers the radiographs to the radiologist for interpretation after the procedure is completed. Often, no clinical history is provided, and there is no companion study to review. The radiologist is then left to reconstruct the entire procedure on the basis of a few images. Interpreting the images in isolation can be very difficult, and the net result is often a report that is incomplete and does not accurately reflect the procedure that was performed. Our intent is to help radiologists develop a systematic approach to interpreting ERCP examinations in order to provide an accurate and relevant report to the referring physician. We discuss and illustrate the anatomy of the pancreaticobiliary system on ERCP, including congenital variants such as pancreas divisum, and a variety of postsurgical appearances. We discuss the indications for performing ERCP, distinguishing between biliary and pancreatic indications. We describe the technique of performing ERCP, including scope positioning in the normal and postoperative stomach, stent placement, and stone retrieval, as well as complications such as perforation. We discuss and illustrate the appearance and treatment of both pancreatic and biliary disease on ERCP, including pancreatitis, cholangitis, biliary stones, pancreatic adenocarcinoma, and cholangiocarcinoma. In this exhibit, we provide an algorithm to look at ERCP images in order to provide an accurate and meaningful report. We hope that this exhibit will become a part of the teaching curriculum for radiology residents in abdominal radiology.

(2010) **Breast Imaging: A Dynamic Teaching Modality**
Katherine Klein, MD, University of Michigan, Ann Arbor, MI; Jessica Robbins, MD; Marilyn A. Roubidoux, MD (kleink@umich.edu)

The purpose of this exhibit is to display an effective, interactive teaching tool that can be utilized either by an individual or in a classroom setting. Using a familiar game show as a model, all aspects of breast imaging are demonstrated, including mammography, ultrasound, MRI, interventions, management of complex cases, and review of the recent literature. In the classroom, this design allows for a departure from the traditional didactic lecture and encourages active participation of the attendees. There is also the ability to add a didactic component to the lecture. Alternatively, an individual can test his/her knowledge of the subject in a flash-card-type fashion. As each topic includes increasingly difficult material, this modality is effective for learners at all levels.

(E-131) **Detecting Changes in Follow-up Studies Using Image Fusion**
Eduardo C. Gonzalez Toledo, MD, PhD; William Gregg, MS; Melchor Rodrigo, MD, Louisiana State University Health Sciences Center, Shreveport, LA; Horacio D’Agostino, MD (egonz1@lsuhsc.edu)

PURPOSE: To show advantages to use of fused images to detect new lesions, increase in size of previous lesions, and enhancing lesions. METHOD AND MATERIALS: Fusion images from the same slice and sequence in two examinations (CT or MR), one in negative, the second one in positive, were added using Photoshop 7.0 software. Infarcts (n = 10), neoplasms (n = 10), and multiple sclerosis (MS)(n = 10) follow-up studies were compared. RESULTS: Increase or decrease in size of infarcts and tumors, new plaques in MS, and enhancing plaques in MS were features easily detected through this method. CONCLUSIONS: Using a standard software and a PC, we fused a negative past image and a positive present image, highlighting the lesions involving only one of the images and differences in size or contrast in lesions found in both images.

(E-132) **Radiologic Pathology Correlation of Neonatal Diseases: A Collaborative Interactive Educational Computer Exhibit**
Gregory Stringfellow, Phoenix, AZ; Randy Richardson, MD; Susan Galarza, MD

The old adage “a picture is worth a thousand words” is a concept radiologists and pediatricians understand, but often each specialty only sees half the picture. Radiologists use different imaging modalities to evaluate patients, often without ever seeing the patient. Pediatricians see the outward manifestations of disease but often only see the written report of imaging studies of neonates. In a collaborative effort between pediatric radiology and neonatology, we have created an interactive educational computer exhibit. We have combined the findings from advanced imaging modalities used in radiology with digital photographs and video clips of morphologic changes in infants to better understand the entire picture of common neonatal diseases.

* Faculty financial disclosures are located in the Faculty Index.

106  I  Association of University Radiologists