

AUR 2008 Scientific Paper Abstracts

Scientific paper presentations are 8 minutes in length, followed by a 2-minute discussion period. Presenting author is identified by institution name, city, and state (or country if not United States or Canada). Presentations by trainees (residents, medical students, or first-year fellows) are noted in teal.

Wednesday, March 26, 2008 2:30–3:30 PM

SS01: AUR Scientific Session 01 Breast Imaging (Papers 1–6)

Location: Willow A

Moderator: Elizabeth S. Burnside, MD, MPH, MS

BR MO

Trainee Prize: 3rd Place

(SS01-01) 2:30 PM MR Imaging and Mammography Surveillance of Women at Increased Risk for Breast Cancer: Recommendations from Using an Evidence-based Approach

Elon J. Granader, BS, MS, *Ann Arbor, MI*; Ruth C. Carlos, MD, MS (egrnade@med.umich.edu)

PURPOSE: We used an evidence-based approach to investigate the following clinical question: “In asymptomatic women at increased risk of breast cancer (*BRCA1/2* mutation carriers or strong family history), how does MRI compare to mammography and the combination of MRI plus mammography in the detection of benign versus malignant lesions?” Recommendations were made on the basis of the current best evidence.

METHOD AND MATERIALS: Articles were collected from MEDLINE, EBM Reviews *ACP Journal Club*, the Cochrane Database, and SCOPUS by using the following medical subject headings (MeSH): “BRCA1” and “BRCA2” with “mammography,” “MRI,” “prevention,” “screening,” and “surveillance.” The abstracts were then graded according to the levels of evidence described by the University of Oxford’s Centre for Evidence-Based Medicine. Nine papers were critically appraised, and four of these were graded level 2 evidence. Three of the four level 2 articles reported results specific to the *BRCA1/2*-positive subset of the total population of women screened and were therefore described in greater detail.

RESULTS: Current best evidence from prospective diagnostic studies shows that MRI alone in asymptomatic *BRCA1/2*-positive women has a higher or comparable specificity and a greater PPV when compared to mammography alone and to the combination of MRI plus mammography. In asymptomatic non-*BRCA*-positive women with a lifetime risk of breast cancer between 15% and 50%, mammography alone has a higher specificity and PPV when compared to MRI alone and to the combination of MRI plus mammography.

CONCLUSION: On the basis of the current best evidence, we recommend that asymptomatic *BRCA1/2* mutation carriers receive MRI breast cancer screening surveillance and that asymptomatic non-*BRCA* mutation carriers with strong family histories for breast cancer receive mammography screening surveillance. Special consideration should also be given to mammography in the *BRCA2*-positive population. Further studies are necessary to investigate the optimal frequency for screening high-risk women and to explore any associated mortality benefit gained from the appropriate long-term imaging surveillance in these high-risk women.

(SS01-02) 2:40 PM Comparison of Digital Tomosynthesis Mammography versus Clinical Mammogram Spot Views for Breast Mass Characterization

John A. Williamson, MD, *University of Michigan, Ann Arbor, MI*; Marilyn A. Roubidoux, MD; Mark A. Helvie, MD*; Alexis V. Nees, MD; Sumedha Sinha; Heang-Ping Chan, PhD

PURPOSE: The purpose was to evaluate whether digital tomosynthesis mammography (DTM) images are comparable to conventional and spot mammogram views for visualization and characterization of breast masses.

METHOD AND MATERIALS: IRB approval and individual subject informed consent were obtained. A prototype combined DTM and whole-breast ultrasound system was developed with GE Global Research. DTM images were reconstructed to 1-mm slice spacing. DTM data only are presented. Subjects were 15 women with breast masses ranging in size from 9 to 24 mm (mean = 19 mm) diagnosed by mammography, sonography, or physical examination. Five (33%) masses were malignant. Mammographic breast density was classified as 1 = 0, 2 = 4, 3 = 10, or 4 = 1. Two blinded readers compared case sets of a single projection clinical mammogram view (CM) and corresponding spot view (CS) with DTM images in the same projection ($n = 23$). Readers rated visibility of mass extent, characterization of margins, and preference for CS versus DTM on a seven-point scale (better on CS = 1; same = 4; better on DTM = 7). Readers were MQSA-approved fellowship-trained breast radiologists with 5 and 21 years’ experience.

RESULTS: Responses of the two readers were combined ($n = 46$): (a) visibility of mass extent on DTM was rated as equal or better in 43/46 responses (93%); mean rating = 5.5; $P < .001$; (b) margins on DTM were equal or better in 46/46 responses (100%); mean rating = 6.0; $P < .001$; and (c) reader preference for DTM in 44/46 responses (96%); mean rating = 5.8; $P < .001$.

CONCLUSION: DTM provided significantly better characterization of mass margin and mass extent than CM and CS. This technology shows promise for characterization of breast masses compared to conventional imaging and may decrease the need for CS. Supported by USPHS grants CA91713 (a partnership with GE Global Research) and CA95153.

(SS01-03) 2:50 PM Effect of Preoperative Breast MR Imaging in Invasive Breast Cancer on Patient’s Surgical Decision Making

Jessica Hayward, *Dartmouth-Hitchcock Medical Center, Lebanon, NH*; Naomi Hartov; Petra J. Lewis, MD

PURPOSE: Breast MRI is used at our institution for preoperative staging of all patients with newly diagnosed invasive breast cancer (IBC). MRI has been shown to identify additional malignant sites in the ipsilateral breast in 10%–20% of patients and 3%–5% in the contralateral. Concerns have been raised about MRI inappropriately increasing the mastectomy rate due to its high false-positive rate. We set out to assess the effect of breast MRI on a woman’s decision to have mastectomy.

METHOD AND MATERIALS: The records of all patients who underwent preoperative bilateral breast MRI from 9/05 to 12/06 were reviewed. We identified women who underwent uni- or bilateral mastectomies and reviewed the breast MRI results. We used the shared-decision-making survey prior to the woman receiving her breast MRI results and the surgical consultation notes (after MRI results were given) to assess the patient’s preference for mastectomy and the surgical necessity of mastectomy. The comparison group was patients with IBC diagnosed in the prior 2 years.

RESULTS: Before MRI, 118/334 (35%) patients from 2002–2004 with new diagnoses of IBC underwent mastectomy. From 9/05 to 12/06, 210

* Faculty financial disclosures are located in the Faculty Index.

patients had ipsilateral breast MRI; of these, 198 had contralateral MRI. Sixty-two mastectomies were performed in 52 (25%) patients. Of these mastectomies, 32 (52%) were deemed surgically necessary due to tumor size or multifocality. Thirty mastectomies (48%) were deemed not surgically necessary. In six patients (3% of total patients), the decision regarding mastectomy changed following the MRI results. In four of these patients, the MRI had shown unsuspected abnormalities in the mastectomy breast; in two, the scans were normal. There were eight mastectomies in which the patient's choice was not known prior to the MRI.

CONCLUSION: While in a small percentage of patients, the presence of additional abnormalities on their MRI (whether benign or malignant) appears to influence their decision to have a mastectomy, in the vast majority of cases, mastectomy was either medically necessary or done for other reasons of patient preference. The mastectomy rates overall have not changed significantly since the introduction of preoperative screening MRI.

(SS01-04) 3:00 PM
MR Imaging for Further Evaluation of Lesions Considered Suspicious by Mammography or Clinical Breast Examination

Philip H. Benjamin, *Seattle Cancer Care Alliance, Seattle, WA*;
 Constance D. Lehman, MD, PhD*; Wendy B. DeMartini, MD*; Amir Kashefi, MD; Sue Peacock (lehman@u.washington.edu)

PURPOSE: MRI is recommended to screen women at high risk for breast cancer and to diagnose more accurately the extent of disease in women with a recent breast cancer diagnosis. However, there is sparse evidence that MRI is useful as a "problem-solving" tool for questionable imaging or clinical findings. The purpose of this study was to evaluate the role of breast MRI for further evaluation of lesions considered suspicious or equivocal by mammography or clinical breast examination.

METHOD AND MATERIALS: The records of 3004 consecutive breast MR examinations between 1/1/03 and 6/30/07 were reviewed to identify all examinations performed for the clinical indication of "problem solving" of a clinical or mammographic lesion. Details of clinical presentation, prior imaging, and subsequent pathology outcomes were recorded. Callback rate, positive predictive value, and cancer yield were calculated.

RESULTS: "Problem solving" was an infrequent clinical indication in our practice, with only 221/3004 (7%) of total examinations being performed for further evaluation of a questionable clinical examination or imaging finding. 49/221 (22%) examinations were called back for additional imaging or biopsy, and 23/221 (10%) women underwent biopsy. Cancer was diagnosed in 10/23 (43%) women. 9/10 women diagnosed with cancer had already had biopsy recommended prior to the MRI, on the basis of suspicious imaging findings. The overall yield of cancer was low from the MRI alone, with only 1/221 (0.5%) having a cancer diagnosed by the results of the MRI. This patient presented with abnormal nipple discharge, negative imaging, and unsuccessful ductography.

CONCLUSION: Breast MRI as a problem-solving tool may be useful in individual cases but has not been shown to be a reasonable clinical indication for groups of women presenting with a questionable clinical or imaging finding. At this time, breast MRI as a problem-solving tool should be used judiciously, given the lack of clinical evidence supporting this application.

(SS01-05) 3:10 PM
Intraoperative Radiation Therapy for Early-Stage Breast Cancer: Mammographic Changes Closely Approximate Those of Conventional Whole-Breast Irradiation

Caroline M. Cranford, MD, *Mayo Clinic Graduate School of Medicine, Scottsdale, AZ*; Patricia J. Karstaedt, MD; William W. Wong, MD; Maitray D. Patel, MD; Clinton V. Wellnitz, MD (cranford.caroline@mayo.edu)

PURPOSE: Breast-conserving surgery followed by whole-breast irradiation for early-stage breast cancer provides equivalent disease control as mastectomy and is now considered standard of care. Conventional whole-breast irradiation entails 5–7 weeks of daily radiation treatments,

which can be inconvenient to patients. Since the majority of ipsilateral breast recurrences after breast-conserving therapy (BCT) occur near the initial site of disease, targeted irradiation of the lumpectomy bed may, in selected patients, achieve excellent local control. While the mammographic findings and changes after BCT are well known, little has been reported about the differing effects, if any, of partial-breast irradiation (PBI). This study seeks to determine if PBI, in the form of intraoperative radiation therapy (IORT), alters the mammographic manifestations after BCT.

METHOD AND MATERIALS: A phase II study combining whole-breast irradiation with IORT enrolled 52 patients with T1–2N0 breast cancer from 11/2002 to 1/2005. After lumpectomy, a 10-Gy IORT boost was delivered to the tumor bed. This was followed by 48 Gy of whole-breast radiation in 24 fractions. Baseline and serial postlumpectomy mammograms were reviewed in 52 patients who remained at our institution for follow-up (mean follow-up, 2.9 years). Specifically analyzed were the well-established ipsilateral post-BCT findings of fluid collections, scarring, calcifications, edema, and skin thickening.

RESULTS: Similar to BCT, fluid collections, edema, and skin thickening gradually regressed while calcifications and scarring developed. Evaluation of the lumpectomy bed was not appreciably impaired. To date, one patient has developed a local recurrence 3 years after diagnosis, which was identified mammographically by the development of pleomorphic linear calcifications adjacent to the lumpectomy scar.

CONCLUSION: PBI is being offered to many patients as a component of BCT while randomized trials comparing it to whole-breast irradiation are still in progress. Our results suggest that the mammographic manifestations after IORT parallel those of conventional whole-breast radiation therapy, so mammographic surveillance for local recurrence in these patients is appropriate.

(SS01-06) 3:20 PM
Recurrent Breast Cancer after Breast Conservation Therapy: Spectrum of Findings on Breast MR Imaging

Glenn C. Gaviola, MD, *Brigham and Women's Hospital, Boston, MA*; Eva Gombos, MD; Juan Godinez, MD; Robyn L. Birdwell, MD (ggaviola@partners.org)

PURPOSE: Breast conservation therapy that utilizes surgical excision followed by breast radiation has emerged as a routine treatment for early-stage breast cancer. Rates of recurrence range from 7% to 22%, with higher rates in those treated without radiation. Breast MR imaging is a useful adjunct in detection and work-up of suspected locally recurrent disease. Differentiation of postlumpectomy scar from recurrent cancer is improved with contrast-enhanced breast MRI when compared with conventional imaging.

METHOD AND MATERIALS: This presentation will review the indications and technique for breast MR examination in the clinical evaluation of suspected breast cancer recurrence. We will show the normal expected appearance of the postlumpectomy bed. Using a case-based approach with pathologically proven recurrent disease, we will depict the various MR appearances of breast cancer recurrence after breast conservation therapy, particularly in relationship to the postlumpectomy bed. Finally, we will review the mimics of breast cancer recurrence.

RESULTS: We will illustrate MRI findings in breast recurrence after breast conservation therapy, including same-quadrant solitary and multifocal recurrent disease, different-quadrant solitary and multifocal recurrent disease, ipsilateral recurrence with new contralateral primary disease, chest wall recurrence, and nodal metastatic disease. Common pitfalls in MR imaging include benign scar enhancement and other enhancing benign etiologies, such as fibroadenomatous or fibrocystic changes.

CONCLUSION: Breast MRI is helpful in the evaluation of suspected breast cancer recurrence, particularly in the differentiation of lumpectomy scar from recurrent disease. MRI may provide additional benefit by demonstrating the multifocality and extent of locoregional recurrence, by further evaluation of equivocal or indeterminate findings on conventional breast imaging, and in evaluation of high clinical suspicion in the presence of negative findings on conventional breast imaging. Radiologists should be aware of common pitfalls and mimics of recurrent breast cancer, such as scar enhancement or other benign lesions.

* Faculty financial disclosures are located in the Faculty Index.

Wednesday, March 26, 2008
2:30–3:30 PM

SS02: AUR Scientific Session 02
Chest and Cardiac (Papers 7–12)
Location: Willow B

Moderator: Paul P. Cronin, MBBCh*

CA CH

Trainee Prize: 1st Place

(SS02-07) 2:30 PM
Accurate Quantification of Aortic Regurgitation:
Comparison of MR Imaging with Echocardiography

Meera Sekar, BA, *Northwestern University Feinberg School of Medicine, Chicago, IL*; James Carr; Jennifer Berliner; Issam Mikati

PURPOSE: The purpose of this study is to determine which imaging location (at, above, or below the valve) on phase-contrast MRI best correlates with Doppler echocardiography.

METHOD AND MATERIALS: A retrospective chart review identified 71 patients who were determined to have mild, moderate, or severe aortic regurgitation on PC-MRI. Phase-contrast images were analyzed by using the ARGUS program (Siemens). Regions of interest (ROIs) were manually defined around flow jets for images at the aortic valve, as well as 6 mm above and below the aortic valve. Forward and reverse volumes were obtained from each of these ROIs to calculate regurgitant fraction and regurgitant volume. Of the 71 patients who underwent PC-MRI, quantitative data were obtained on echocardiogram for 23 patients by using the velocity-time integral.

RESULTS: For the 71 patients who received PC-MRI, the means of regurgitant volume and regurgitant volume at, above, and below the valve were found to be significantly different from each other ($P = .02$ for least significant difference). This difference also held when the regurgitant fraction was calculated as the ratio of reverse volume below the valve and forward volume above the valve or the ratio of reverse volume below the valve and forward volume at the valve on MRI. No significant difference was found when comparing mean regurgitant fraction below the valve with mean regurgitant fraction calculated with forward volume above ($P = .45$) or at the aortic valve ($P = .47$) on MRI. For 23 patients, regurgitant volume was compared on MRI and echocardiogram by using a paired t test and linear regression. A positive relationship was observed between regurgitant volume on echo and regurgitant volume at the valve ($r = .61$).

CONCLUSION: The level in relation to the aortic valve is important in quantifying aortic regurgitation with MRI. The best correlation with echocardiogram occurs when the regurgitant volume is quantified at the aortic valve.

(SS02-08) 2:40 PM
Assessment of Left Ventricular Myocardial T1 Hyperintensity in Patients with Suspected Cardiac Amyloidosis by Using MR Imaging

Michael C. Yang, *Northwestern University Feinberg School of Medicine, Chicago, IL*; David J. Tuite; John Sheehan; Karin E. Dill, MD; James Carr

PURPOSE: To assess T1 signal in patients with suspected cardiac amyloidosis by using a T1-weighted gradient-echo (T1-GRE) technique and compare it to findings in an age-matched control group.

METHOD AND MATERIALS: A group of 16 patients with high suspicion of cardiac amyloidosis on MRI was compared to a group of 10 normal patients. All patients underwent cardiac MRI on a 1.5-T Siemens Sonata scanner. The MRI protocol consisted of multiplanar single-shot and cine TrueFISP, noncontrast T1-GRE imaging, cine TrueFISP "TI" scout, and delayed enhanced phase-sensitive inversion-recovery TurboFLASH. A dose of 0.2 mmol/kg of gadolinium-DTPA

(Magnevist) was injected intravenously. For quantitative assessment, signal to noise (SNR) and contrast to noise (CNR) were measured on T1-GRE images. The inversion time (TI) to null myocardium was measured using TI scout. For qualitative assessment, T1-GRE images were evaluated by observers and scored by using a Likert scale. The presence and pattern of enhancement were noted on PSIR TurboFLASH images. A cadaveric heart with autopsy-proven cardiac amyloidosis was compared to a normal cadaveric heart. Both hearts underwent MRI on a 3-T Siemens TIM Trio scanner by using Look-Locker sequence. T1 value was calculated with a curve-fit model.

RESULTS: All 16 patients in the amyloid group had characteristic diffuse subendocardial or transmural enhancement on delayed enhanced images. Three patients had biopsy-proven amyloidosis. On T1-GRE images, the mean SNR and CNR in the amyloid group were 102.8 and 42.7 versus 69.1 and 22.2, respectively, in the control group ($P < .05$). SNR and CNR were scored significantly higher in the amyloid group compared to controls ($P < .01$). The average TI in the amyloid group was 143.6 msec versus 197.1 in the control group ($P < .01$). Mean T1 of the amyloid cadaveric heart was 345.1 msec compared to 503.94 in the normal cadaveric heart.

CONCLUSION: Left ventricular myocardium is T1 hyperintense on precontrast T1-GRE imaging in patients with suspected cardiac amyloidosis, compared to controls. These findings corroborate the shortened T1 seen in an amyloid cadaveric heart and may be a useful discriminatory MRI finding in patients with suspected cardiac amyloidosis.

Trainee Prize: 2nd Place

(SS02-09) 2:50 PM
Trends in the Use of Chest CT for the Evaluation of Pediatric Trauma

Rajiv Kumar, BS, *Indiana University School of Medicine, Indianapolis, IN*; Kimberly E. Applegate, MD, MS*; Troy Markel, MD; L. R. T. Scherer III, MD; Nicholas Koontz (kiapleg@iupui.edu)

PURPOSE: Many trauma centers utilize CT for the initial radiographic evaluation of traumatic injury, sometimes abandoning initial plain film. The purpose of this study was to analyze utility and trends in the use of chest CT in pediatric trauma patients above routine radiographs, balanced against increased radiation exposure.

METHOD AND MATERIALS: A 4-year IRB-approved retrospective review was performed of children under age 16 years who underwent body CT for trauma at a level I trauma center. Radiology reports for chest x-ray and CT were analyzed and pertinent findings noted. Correlations were made between positive chest CT and CXR findings, especially vascular injuries.

RESULTS: 831 children with blunt trauma received abdomen and/or chest CT studies (492 male [59%]; mean age, 10.3 years). 333 chest CTs were performed, increasing from 37 in 2001 (20% of patients during that period) to 145 (60%) in 2005 ($P < .001$). Conversely, initial chest XR decreased from 33/37 CT cases to 61/145 CT cases over the same period (89% vs 42%; $P < .001$). Only 68/333 (20%) chest CTs had significant positive findings, and only six had emergency surgery for cardiac (three) or arterial (three) injuries; three of these had no XR, and three had abnormal XR suggesting need for CT. 47/68 (69%) with positive CT findings had chest XR prior to CT. Despite CT providing additional information in 17 cases, only 6/47 (13%) of these initial chest XRs were false-negative. Four had pneumomediastinum or pneumothorax, and two had large pleural effusions. In addition, five children had thoracic vertebral body fractures on CT, 4/5 with normal chest XR and one without chest XR.

CONCLUSION: CT use has increased for the initial evaluation of chest trauma while chest XR use has decreased. Despite this trend, chest XR appears to be an adequate screening tool to determine which patients may require CT evaluation. Currently, it is not clear that CT is indicated for the initial evaluation of traumatic chest injuries, and guidelines for children with such injuries may improve with appropriate use of radiographic imaging to decrease cost and unnecessary radiation exposure.

* Faculty financial disclosures are located in the Faculty Index.

(SS02-10) 3:00 PM**Incidence and Characteristics of Left Atrial Appendage “Pseudothrombus” on Arterial Phase CT Angiography**

Scott Akers, MD, *Veterans Administration Medical Center, Philadelphia, PA*; Tae Hoon Kim; Harold I. Litt, MD, PhD*

PURPOSE: Evaluation for left atrial appendage (LAA) thrombus is important prior to treatment of patients with atrial fibrillation; however, arterial phase CTA may demonstrate a “pseudothrombus” related to factors such as contrast mixing with unopacified blood, enlarged pectinate muscles, and volume averaging. The purpose of this study was to evaluate the incidence and characteristics of LAA pseudothrombus at arterial phase CTA.

METHOD AND MATERIALS: Images from all CTA examinations of the chest performed in 2006 were reviewed ($N = 874$). For each study, the presence or absence of filling defects in the LAA was noted, left atrial volume was determined, and the LA and LAA enhancement were measured. For those studies in which filling defects were seen, persistence on delayed imaging was noted, along with shape and other characteristics of the filling defect.

RESULTS: Incidence of LAA filling defects was 1.5% (13/847). In 1/13 cases, no delayed imaging was available; in 1 of 12 remaining cases, the filling defect persisted on delayed imaging, suggesting true thrombus. In 11/12 cases (overall incidence, 1.3% [11/846]), filling defect was not present on delayed imaging, suggesting arterial phase pseudothrombus. 2/11 pseudothrombi were felt to be related to enlarged pectinate muscles, 1 to volume averaging, and 8 to layering of contrast. Patients with pseudothrombus were significantly older than those without pseudothrombus (74 ± 6.6 vs 62.8 ± 17 years; $P < .0001$). Overall left atrial volume in patients with pseudothrombus was significantly larger than those without (100 ± 43 vs 84.6 ± 34.8 mL; $P = .04$). The contrast attenuation within the opacified portion of the LAA for those with pseudothrombus was significantly higher than those without (478 ± 113 HU vs 349 ± 107 HU; $P = .004$), suggesting that pseudothrombus is a result of layering of contrast within the LAA.

CONCLUSION: LAA arterial phase pseudothrombus is a relatively uncommon finding on CTA examinations of the chest; however, it is associated with older patients and larger left atrial volumes. Increased attenuation within the opacified portion of the LAA suggests that dependent layering of contrast is a common mechanism.

(SS02-11) 3:10 PM**Is Doppler Venous US an Adequate First-Line Diagnostic Adjunct for Pulmonary Embolism When Ventilation-Perfusion Scintigraphy Is Not Immediately Available?**

Joyce Y. Li, MD, *Rochester General Hospital, Rochester, NY* (joyce.li@viahealth.org)

PURPOSE: In our 526-bed hospital, in-house nuclear medicine is not available from 5 PM to 7 AM, whereas in-house ultrasound is available between 5 PM and 12 AM. Ultrasound is often performed to limit the number of times that the on-call technician has to come in when pulmonary embolism (PE) is suspected in patients who cannot receive intravenous contrast. We evaluate whether Doppler venous ultrasound is an adequate and cost-effective first-line diagnostic adjunct in these patients at our institution.

METHOD AND MATERIALS: Retrospective review of our hospital database identified 4608 patients who underwent CT pulmonary angiography and 1340 patients who underwent ventilation-perfusion scintigraphy in the past 3 years. Inpatients and ED patients were compared. Those patients with PE were identified, and numbers of patients with positive and negative ultrasound examinations were obtained. Both CT pulmonary angiogram and V/Q scan results were used to increase the power of analysis.

RESULTS: 6.8% of the ED patients who underwent CT pulmonary angiography had a positive examination, compared to 6.5% of the inpatients. 85% of the ED patients with positive PE went on to have a venous ultrasound. 41% of these had a DVT on ultrasound, necessitating anticoagulation. Of those inpatients who tested positive, 38.5% had a DVT on ultrasound. 12.7% of the ED patients and 7.1% of the inpatients had a high-probability V/Q scan. Only 28.5% of the ED patients and 58.3% of the inpatients had a positive venous ultrasound. Overall, only 7.5% of the patients suspected of a PE tested positive at our institution. Of these, Doppler venous ultrasound was negative in 64.9%.

CONCLUSION: A more stringent selection process should be instituted for ordering CT pulmonary angiogram and V/Q scintigraphy, given the current low pretest probability of having a PE in both ED patients and inpatients. In addition, Doppler venous ultrasound is not a cost-effective or adequate first-line adjunct diagnostic study, given that two-thirds of those patients with PE did not have a DVT on venous ultrasound. V/Q scan should be performed in a timely fashion to diagnose PE and ensure good patient care.

(SS02-12) 3:20 PM**Outside Studies in the Digital Era: Process and Findings**

Stephen D. Ramsey, *University of Michigan Health System, Ann Arbor, MI*; James Good; James H. Ellis, MD; Richard K. Brown, MD* (sdr Ramsey@med.umich.edu)

PURPOSE: Although the handling of nonstandard formats will likely be resolved by developing industry standards, radiology departments are currently facing the challenge of integrating studies obtained at outside institutions into their PACS and electronic medical records. A senior PACS analyst was assigned to determine the number and type of outside studies submitted to our department during a month period of time and the various methods utilized to integrate the studies into our system. We also evaluated the time required for each of these processes to be completed. The purpose of this project was to ascertain if there were inefficiencies in our system and, if so, could the process be improved.

METHOD AND MATERIALS: We reviewed the handling of outside studies in various sections of our departmental divisions, including nuclear medicine, MRI, CT, musculoskeletal imaging, pediatrics, and general radiology. Types of studies received included images submitted via a VPN, films, CDs with DICOM images, CDs with JPEGs, and CDs with proprietary formats.

RESULTS: The results of our internal review revealed a need for standardization of policies, procedures, training, and equipment availability in order to improve the efficiency of the outside-study integration process. There was variation in the handling of these studies within several of the divisions, based on location, time of day studies were submitted, variable divisional policies, and proximity/availability of access nodes for entering the data into our system.

CONCLUSION: Outside studies are problematic during this transitional period from the analog to the digital age. For non-film-based images, there is a need for an agreed-upon standard in which these studies should be formatted. Although DICOM is the standard for image interchange in our industry, many vendors still create systems that burn discs in proprietary, JPEG, or nonstandard formats.

* Faculty financial disclosures are located in the Faculty Index.

**SS03: AUR Scientific Session 03
Resident Training and Education
(Papers 13–24)**

Location: Willow A

**Moderators: Jocelyn D. Chertoff, MD
Beverly P. Wood, MD, PhD, MSEd***

ED

**(SS03-13) 4:00 PM
Evaluation of the Effectiveness of a US Training Program for Physicians from Developing Countries**

Oksana H. Baltarowich, MD, *Thomas Jefferson University, Philadelphia, PA*; Barry B. Goldberg, MD; Traci B. Fox, MS; Annina N. Wilkes, MD; Jon J. Veloski, MS (oksana.baltarowich@jefferson.edu)

PURPOSE: To evaluate the effectiveness of a comprehensive ultrasound training program, which utilized the “teach the teachers” approach to education, two separate groups of physicians from developing countries in Africa and Latin America were trained under the auspices of similar grants in all aspects of diagnostic ultrasound, so that they would return to their homelands to train others, with the intent of helping to standardize knowledge and improve the quality of ultrasound in their respective countries.

METHOD AND MATERIALS: Twenty-four physicians were selected for a comprehensive ultrasound program during the last 6 years at a large ultrasound teaching facility. Twelve physicians from sub-Saharan Africa and 12 physicians from the Caribbean and Central and South America underwent intensive 3-month training programs in all aspects of diagnostic ultrasound. A 100-item uncued test was used to assess knowledge of basic ultrasound principles and their application to clinical problems involving ultrasound. Learning and retention of knowledge were assessed by administration of the same test three times in each program: at entry into the program, at completion of the program, and at 6-month follow-up. Findings were compared between the African and Latin American groups.

RESULTS: The physicians’ total test scores increased significantly ($P < .001$) from a mean of 55.2% at entry to 77.7% at the end of the program. Statistically significant ($P < .001$) increases were also observed in the subtest scores for physics (+35), abdomen (+20), obstetrics (+20), and gynecology (+18). At 6-month follow-up, the mean test score was 79.4%, comparable to the end-of-program score. The test results between the African and Latin groups were not statistically significant ($P = .1$) in the categories tested.

CONCLUSION: The results of this testing process are both statistically and clinically significant because they verify an increase in knowledge at the end of an intensive 3-month training program for all 24 physicians, with similar results between the two groups. There was retention of information, even slight improvement in the physicians’ knowledge, at 6-month follow-up, a time during which they were teaching others in their home countries.

**(SS03-14) 4:10 PM
Instruction and Evaluation of Radiology Resident Dictation Skills: Effectiveness of Didactic Teaching**

Courtney A. Woodfield, MD, *Rhode Island Hospital, Providence, RI*; Martha B. Mainiero, MD (cwoodfield@lifespan.org)

PURPOSE: To determine the utility of a didactic lecture for teaching and evaluating radiology resident knowledge of the requirements for quality diagnostic imaging dictations and timely communication of examination results.

METHOD AND MATERIALS: A 23-question multiple-choice and true-false test was created to assess resident knowledge of the ACR

practice guidelines for reporting, as well as our institution-specific requirements for communication of diagnostic imaging results. The test was administered to a total of 23 residents (seven PGY 2, seven PGY 3, four PGY 4, five PGY 5) before and following a 40-minute didactic lecture covering the structure of radiology dictations and requirements for communication of imaging findings. The pre- and postlecture tests were graded on the basis of the number of correct answers. Data were analyzed by using the mixed linear model for repeated measures and the Holm test for group comparisons, with the expectation of improved performance following the lecture and with increasing resident level of experience.

RESULTS: Mean pre- and postlecture test scores for PGY 2 were $74.6\% \pm 2.73$ and $94.6\% \pm 5.94$, for PGY 3 were $88.1\% \pm 5.55$ and $95.6\% \pm 4.50$, for PGY 4 were $94.8\% \pm 2.5$ and $100\% \pm 0$, and for PGY 5 were $96.8\% \pm 1.79$ and $98.4\% \pm 2.19$. The increase of pre- to postlecture test scores was statistically significant for PGY 2, PGY 3, and PGY 4 residents ($P \leq .005$). Pre- to postlecture test improvement was greatest for PGY 2 residents. Test performance of PGY 2 residents compared to PGY 5 residents was statistically different on the basis of the Holm test.

CONCLUSION: Test scores for PGY 2 to PGY 4 residents significantly increased following didactic instruction on the dictation and communication of diagnostic imaging results. These findings suggest that a lecture and quiz format can be used to teach and assess radiology resident dictation and communication skills.

**(SS03-15) 4:20 PM
Experience with a PACS-based Methodology That Uses DICOM Data Sets for Resident Testing**

Dino P. Massoglia, MD, *University of Maryland, Baltimore, MD*; Paul Nagy, PhD; Fauzia Q. Vandermeer, MD (fvandermeer@umm.edu)

PURPOSE: We describe our experience developing and pilot-testing a novel PACS-based methodology designed to assess radiology resident performance, by using anonymous DICOM data-set test cases in a setting that simulates routine interpretation work flow.

METHOD AND MATERIALS: Using the Agfa-PACS framework in the abdominal imaging section, we created anonymous DICOM data-set test cases that were collected into a work list. This work list of cases was presented to each resident while in the normal setting of their abdominal imaging rotation. Residents were asked to review the work list of test studies and complete an attached electronic form for each case, identifying relevant findings by organ and stating an impression. Results (hits and misses) were conveyed to the reporting resident in written format during a brief meeting, where cases could be reviewed and any questions answered.

RESULTS: This novel PACS-based testing methodology worked as designed and allowed for a means of resident assessment within a simulated routine work environment. This system was well received by residents, who reported that this “point-of-care” instruction methodology was effective. We found that although completion of each test case review was more time consuming than review of a typical teaching file case, the DICOM data sets performed well in simulating the natural daily work flow, in which the radiologist often must navigate through several hundred CT images to reach a diagnosis.

CONCLUSION: Current resident testing methods focus on presenting quiz cases as single images in case conferences, in review books, or on the board examination, an approach that carries the disadvantage of “clueing” trainees to accurate findings. Moreover, this didactic method fails to assess abilities to accurately identify normal cases. We improved on this approach by implementing a PACS-based framework to present anonymous DICOM data-set test cases in the context of the normal PACS work flow. We anticipate greater application of this testing methodology in precall preparation, level-specific testing, and board examination preparation within each subspecialty rotation.

* Faculty financial disclosures are located in the Faculty Index.

(SS03-16) 4:30 PM**Development and Implementation of a Systems-based Practice (SBP) Project Requirement**

Robert F. Buchmann, DO, *Arkansas Children's Hospital, Little Rock, AR*; Linda A. Deloney, EdD; Chandra Donepudi, MD; Curtis M. Mitchell, MD; Sarah G. Klein, MD (DeloneyLindaA@uams.edu)

PURPOSE: Radiology residents will soon be required to participate in a learning activity that involves identification and analysis of system errors and implementation of potential solutions. Evidence of participation is to be documented in the learning portfolio. Systems issues abound in the resident's experience, and the newest residents are often in the best position to identify problems and propose solutions.

METHOD AND MATERIALS: We require PGY2 residents to identify and analyze a systems problem, develop and implement a solution, and evaluate the effectiveness of the intervention. Learning objectives and project guidelines are provided. A written proposal that explains the problem, hypothesizes a solution, and proposes an intervention and evaluation of the result is required. The problem may be local or national, and the project may be an individual or group effort. Participation enables the resident to increase individual knowledge of health care systems and systems-based problems; gain experience in writing a proposal, conducting an investigation, and reporting results; organize and present information in a safe and supportive environment; and document learning in the resident portfolio. A timeline was developed to promote sustained effort throughout the year. Residents receive SBP project guidelines during orientation. They identify projects and submit proposals for peer review and feedback in November. They present approved proposals to faculty and peers during a noon SBP conference in January and spend the remainder of the academic year implementing solutions and analyzing results. In July, they report their experiences during a noon SBP conference.

RESULTS: From 2006–2008, nine projects were completed by 12 residents. Problems related to communication, dictation, education, lobbying, and recruitment systems. Changes required group and individual efforts by residents, faculty, and medical students.

CONCLUSION: Opportunities of daily work can be feasibly used to teach and learn SBP concepts. Residents applied the scientific method to implement and test effects of change on health care systems. Residents achieved their learning objectives while improving clinical and learning environments.

(SS03-17) 4:40 PM**Is the Internship Necessary? A Nationwide Survey of Radiology Residents and Fellows**

Stephen R. Baker, MD; Christian Geannette, BA, *UMDNJ-New Jersey Medical School, Newark, NJ*; Amish Patel, BA; Michelle Romero, BA; Lawrence Pan, BS; Pranay Uppuluri, BA; et al (bakerrs@umdnj.edu)

PURPOSE: The content, length, and organization of postgraduate training in radiology are undergoing extensive critical appraisal. One of the most salient issues is the pertinence of the internship. This study was undertaken to assess the opinions of current radiology residents about the preliminary year.

METHOD AND MATERIALS: A survey was sent to US radiology residents and those 1 year after residency. The trainees were queried about whether the internship was necessary for their development as a radiologist and as a physician. They were asked to list their preferences on a Likert scale ranging from 1 ("not at all important") to 5 ("absolutely important").

RESULTS: Response rate for the study was 35.0%. 48.6% considered the internship year "mostly" or "absolutely" necessary for their development as a radiologist, whereas 39.4% answered "not at all" or "hardly." This difference was statistically significant (12.1% had no opinion). With respect to their views about the impact of the internship year on their development as a physician, 70.4% had an affirmative response, 19.0% had a negative response, and 10.6% had no opinion.

CONCLUSION: Despite criticism about the relevance of the internship year, a significant plurality of current radiology trainees deem it necessary

for their development as a radiologist, and a large majority asserted that it was necessary for their development as a physician. Those who wish to eradicate, reposition, or abridge this clinical experience should pay heed to the prevalent opinions of our current residents and fellows.

(SS03-18) 4:50 PM**Transitional-Year Internship**

Stephen R. Baker, MD; Uma J. Thakur, BA, *UMDNJ-New Jersey Medical School, Newark, NJ*

PURPOSE: Since its inception in 1982, the transitional-year program has consistently attracted prospective radiology residents (~30% of TYP graduates). Of the 125 transitional-year programs, many do not have concurrent residencies in general surgery and/or internal medicine, which are the focus of nearly all other internships taken by radiologists in their preliminary year. This study was undertaken to investigate adherence to TYP requirements.

METHOD AND MATERIALS: Current accredited transitional programs, their affiliation status with a medical school, and the roster of accompanying core residencies mandated by the ACGME Transitional Year Review Committee (TYRC) were obtained from the AMA "green book" 07–08. The ACGME provided us with the most recent data on specialty distribution of TYP graduates overall and within each program. An as yet unpublished survey polling all radiology residents and fellows about their experiences in their preliminary years was used to gauge level of satisfaction with their TYP. E-mails and phone calls were made to the 13 programs identified as having less than two endogenous core residencies.

RESULTS: Forty-one of the 125 transitional-year programs (33%) lack residencies in internal medicine (IM), general surgery (GS), or both. Two-thirds of these 41 programs are not affiliated or have limited affiliation with a medical school. Twenty-five programs do not have residencies in GS (but have IM), three programs do not have residencies in IM (but have GS), and 13 programs lack residencies in both. Of the 337 interns who graduated from these 25 programs in 2006, 121 have become radiology residents, comprising over 10% of all radiology residents in their PGY2 year.

CONCLUSION: The study reveals lack of fulfillment by multiple programs of requisite criteria set forth by TYRC. This may explain perceived level of dissatisfaction with TYP expressed by radiology residents when compared with their estimation of preliminary medicine or surgery internships. The requirements of the transitional-year internship and compliance with them need to be carefully assessed to determine their utility and efficacy as a component of postgraduate education of radiologists.

(SS03-19) 5:00 PM**The OSCE Examination in Radiology Resident Education: Evaluation of a Pre- and Postlecture Examination Format with Regard to Information Retention, Educational Assessment Value, and Overall Resident Satisfaction**

Stacy E. Smith, MD, *University of Maryland Medical Center, Baltimore, MD*; Chika I. Logie, MD

PURPOSE: The purpose of this study was to evaluate a pre- and postlecture OSCE examination format in order to evaluate resident knowledge, the degree of information retention over time, and resident satisfaction with this method.

METHOD AND MATERIALS: A "fill-in-the-blank" timed OSCE examination (56 points total) regarding MR of the knee (sequences, anatomy, and clinical abnormalities) was given spontaneously without prior notice to all radiology residents at our institution. Examinations were numbered, and only year of training was requested. After papers were turned in at the completion of the examination, an immediate review of the answers was given, followed by a detailed lecture on the preceding material. Results were not revealed. Two days later, the same examination was again administered to the residents in the same fashion. One day later, a post-OSCE questionnaire was administered regarding the pre/post educational examination format, use of immediate feedback,

* Faculty financial disclosures are located in the Faculty Index.

information retention, examination anxiety pre/post, and resident overall perceptions of education tools in radiology.

RESULTS: Twenty-two residents (eight 1st year; six 2nd year; eight upper years) took the examination. Prelecture score range was 18–54/56 (average, 31/56). Postlecture score range was 21.5–54/56 (average, 46/56). Compared to pre results, residents significantly improved their OSCE-type examination score on the post (average improvement of 7.45 points [$P < .001$]). Average test scores increased with each year of residency: As residents gained 1 year of experience, their score on the OSCE-type examination improved by an average of 7.25 points ($P = .008$). Survey results were: 20/22 (91%) felt they performed better on the post than pre examination and had retained information over time even without the knowledge of their scores. 68% (1–4 years) felt they did not have a good knowledge of knee anatomy when they took the pre examination; 100% felt the lecture helped them learn MRI knee anatomy for the post examination. 86% strongly liked this learning tool and wanted anonymous results. Level of anxiety on the pre examination ranged from 1–5 (5, worst), with 3 being the most common overall. There was no relationship between level of anxiety and year of training. Residents listed their top examination tools as oral (36%), OSCE (32%), and MCE (23%).

CONCLUSION: The pre/post lecture OSCE format is useful for radiology resident information retention and education.

(SS03-20) 5:10 PM

Assessment of Internal and External Moonlighting

Stephen R. Baker, MD; Amish Patel, BA; Pratik Panchal, BA; Christian Geannette, BA, *UMDNJ-New Jersey Medical School, Newark, NJ* (bakrsr@umdnj.edu)

PURPOSE: Time devoted to internal moonlighting is constrained by all components of ACGME duty-hour regulations. Hours spent in external moonlighting, however, are not necessarily tabulated to meet ACGME requirements. This study sought to gain a better understanding of the extent of both internal and external moonlighting.

METHOD AND MATERIALS: A survey was sent to all members of the Society of Chairmen of Academic Radiology Departments (SCARD). Respondents were asked to indicate the number of residents and fellows in the program and whether they took part in internal or external moonlighting. If internal moonlighting occurred, the chairmen were asked which postgraduate year trainees were permitted to moonlight internally and whether internal moonlighting occurred after hours, on weekends, or on holidays. If external moonlighting was permitted, the respondents were asked which postgraduate year trainees were permitted to moonlight outside of their institution. To examine trainee work hours, we queried if programs accounted for hours worked and travel time spent to the outside institution by their trainees related to external moonlighting obligations.

RESULTS: Response rate for the study was 33.3% (62 of 186 chairmen), supervising 1726 residents (approximately 40% of current radiology residents). 81% of respondents allowed internal or external moonlighting. 60% allowed internal moonlighting; of these, 44% allowed 2nd-year residents, 69% 3rd, 75% 4th, and 78% fellows. 35% of residents and 55% of fellows whose chairmen allowed them to internally moonlight took advantage. Chairmen allowed after hours, on weekends, and on holiday, respectively: 89%, 97%, and 89%. 58% allowed external moonlighting; of these, 20% allowed 2nd-year residents, 69% 3rd, 86% 4th, and 66% fellows. 23% of residents and 32% of fellows engaged in external moonlighting. 43% of programs accounted for hours worked externally, and 9% accounted for travel time.

CONCLUSION: Moonlighting is a means to decrease debt. Its practice appears to be widespread, though it can impinge on board preparation and on meeting after-hour assignments. Moonlighting activities may affect attitudes towards coterminous uncompensated after-hours call.

(SS03-21) 5:20 PM

No Call? No Problem—A New Plan for the 1st Year of Radiology Residency

Lisa V. Paulis, MD, *Bryn Mawr Hospital, Bryn Mawr, PA*; Vikram S. Dravid, MD

PURPOSE: The purpose is to utilize the call-free 1st year of radiology residency to best prepare PGY-2 radiology residents for on-call responsibilities while decompressing the added workload on senior residents.

METHOD AND MATERIALS: First-year residents regularly participate in a “buddy call” system starting in their 1st month of residency, initially paired with a senior counterpart and progressively advanced to a significant amount of attending-supervised call. Additionally, they are required to complete self-assessment modules addressing the core curriculum, participate in lectures tailored to call subjects, stamp an “on-call passport” documenting involvement in standard critical diagnostic cases, and pass a series of cases administered by subspecialty chiefs. In January, 1st-year residents graduate from buddy call to take call during attending-supervised periods.

RESULTS: The 1st-year cohort is more knowledgeable and comfortable with call material than previous years at the same stage. Additionally, 1st-year participation in attending-supervised call reduces the number of on-call hours for senior residents and eases the transition from a call-free 1st year to independent unsupervised call.

CONCLUSION: Transitioning from the current call system is challenging; however, a structured and graduated process can be effective, successful, and satisfactory to residents of all training levels. Moreover, early and frequent exposure to the call system, as well as a systematic approach to call material, provides essential learning opportunities for the 1st-year residents and improves their measurable knowledge and comfort level. Ultimately, the goal is that both anxiety and discrepancies will be reduced by the time 1st-year residents assume unsupervised call responsibilities.

(SS03-22) 5:30 PM

Resident Productivity

Rolf A. Grage, MD; Randy Parkhurst, MD, *SUNY Upstate Medical University, Syracuse, NY* (grager@upstate.edu)

PURPOSE: In order to accommodate the change in the ACGME requirements with regard to “no independent read by a first year radiology resident,” a change in the structure of the program was necessary. In addition to a standard rotation in the reading room, we implemented day and night float rotations. We evaluated resident productivity to assess if residents read more studies during the night float rotation than during the day float or standard rotation.

METHOD AND MATERIALS: Retrospective review of resident case logs was performed to compare average number of studies for a standard, day float, and night float rotation. Case totals were provided by the administrator of the radiology information system (RIS). Case totals were broken down into three categories: total number, CT/MR, and plain films.

RESULTS: For the purpose of comparing total number of studies read by a resident, a 5-day average was used. Day and night float rotations were typically emergency room cases. Standard rotations used for comparison were neuroradiology, chest, and abdomen. There are slight differences in the number of hours in each rotation. Excluding conferences, a standard rotation is 7½ hours, the day float rotation is 8 hours, and the night float rotation is 10½ hours. The average number of studies reviewed by a resident during a night float rotation for 5 days is 290 (130 CT/MR and 160 plain films). The average number of studies during a day float rotation for 5 days is 140 (55 CT/MR and 85 plain films). The average number of studies during a neuroradiology rotation for 5 days is 100 (90 CT/MR and 10 plain films). The average number of studies during a chest rotation for 5 days is 140 (35 CT/MR and 105 plain films). Lastly, the average number of studies during an abdomen rotation for 5 days is 105 (90 CT/MR and 15 plain films).

CONCLUSION: Radiology residents read considerably more cases during the night float rotation than the day float or standard rotations.

* Faculty financial disclosures are located in the Faculty Index.

(SS03-23) 5:40 PM**Resident versus Attending versus Nighthawk: How Are Residency Programs Covering 24/7 Call?**Charles D. Crum, MD, *St Joseph's Hospital and Medical Center, Phoenix, AZ*; Randy Richardson, MD

PURPOSE: With the increasing volume of patients through the emergency department (ED) and the increasing reliance of clinicians on radiology, much debate has ensued over the radiology department's responsibility to the ED. With the nationwide increase in the use of nighthawks in private practice groups, we sought to determine how hospitals with radiology residencies are currently providing 24-hour coverage.

METHOD AND MATERIALS: We conducted a survey of 50 radiology residencies across the United States and asked how their departments were currently handling 24-hour coverage of the ED. The questions revolved around the residents' responsibility and involvement in interpretation of off-hour studies.

RESULTS: Across the country, the overall majority (82%) of hospitals with radiology residencies relied on the residents' interpretation of imaging studies done after hours in the ED. In these institutions, the faculty could be contacted if needed but were not physically in-house. Seven programs had a faculty in-house with the resident on call (14%), and only two programs (4%) used a nighthawk group.

CONCLUSION: Articles in the literature state that the handling of ED cases needs to change in order to better serve our patients. However, the current standard of care for 24-hour 7-day-a-week ED coverage in teaching institutions appears to remain the radiology resident.

(SS03-24) 5:50 PM**Resident Radiation Safety and Lead Apron Use: Can Improvements Be Made?**Julie M. Franz, MD; Natalie M. Thompson, MD, *Ochsner Clinic Foundation, New Orleans, LA*

PURPOSE: Radiation exposure has been linked to an increased risk of breast cancer. In this study, we seek to identify the typical practices regarding radiation protection with lead aprons in radiology residencies and thereby determine if improvements in resident radiation safety could be made.

METHOD AND MATERIALS: A 12-question electronic survey was created which addressed lead apron availability and use by radiology residents. This survey was sent to all radiology program coordinators in the country via the Association of Program Coordinators in Radiology for distribution by e-mail to radiology residents. Questions asked included: Does your program provide each resident with his/her own lead apron free of charge? Are residents instructed in choosing a lead apron that fits properly? Does the lead apron provided for female resident use have smaller armholes to protect axillary breast tissue?

RESULTS: 606 residents responded. 67% were male and 33% female. 93% of respondents stated they consider radiation exposure an important personal safety issue. 23% of residents reported that their program provides each resident his/her own lead apron free of charge. Of the remaining 77%, only 21% reported that they are instructed in choosing a lead apron that fits properly. 81% have a variety of sizes of lead aprons available for their use. 69% said that the lead apron provided for female resident use does not have smaller armholes to protect axillary breast tissue.

CONCLUSION: Despite the fact that an overwhelming majority of residents think that radiation exposure is an important personal safety issue, the majority of them are not fitted for a lead apron or instructed about choosing a lead apron that fits appropriately. Specifically, females do not use lead aprons with smaller armholes to protect axillary breast tissue. Addressing the issue of properly fitting lead aprons could improve resident radiation safety.

**Thursday, March 27, 2008
4:00–5:30 PM****SS04: AUR Scientific Session 04
Education and Training I (Papers 25–33)****Location: Willow A****Moderator: Spencer B. Gay, MD*****ED****(SS04-25) 4:00 PM****Improving the Utilization of a MIRC-based Electronic Teaching File through User Feedback**Jacob Livermore, MD; Aaron M. Friedkin, MD, *University of Michigan, Ann Arbor, MI*; William Weadock, MD*; Hero Hussain, MD (jlivermo@med.umich.edu)

PURPOSE: The purpose of this study is to gather user opinions regarding experiences with our institution's MIRC-based electronic teaching file in an effort to improve utilization and user satisfaction.

METHOD AND MATERIALS: Our institution utilizes a MIRC server to host a Web-based radiology teaching file. Over the last 24+ months, a daily e-mail has been sent out to a user group comprised of faculty, fellows, and residents at the University of Michigan. This e-mail contains a Web link to a specific case on our MIRC server. This case is identified as the "Case of the Day (COD)." Cases are contributed to the teaching file by these same individuals. An e-mail has been sent to the 190 recipients of the COD asking users to respond to a survey regarding their experience. Respondents were directed to complete a questionnaire by using www.surveymonkey.com. Completion of the survey was voluntary, and the results were anonymous. The survey contains questions regarding user demographics, usage patterns, educational value of the cases, and miscellaneous COD feedback.

RESULTS: 108 of 190 COD recipients completed the questionnaire: 44.5% faculty and 36.1% residents. 89.8% of respondents routinely view the COD (57.7% intermittently, 32% daily, and 9.3% weekly). 48.5% view in the workday, 48.5% variable, and 2.1% in the evenings. 54.8% felt the educational value is high, 41.9% medium, and 3.2% low. 78.3% prefer a broad range of subspecialty topics (7.6% prefer cases only in their subspecialty). 54% prefer pathologically proven cases. 18% prefer problematic cases left with a differential diagnosis. 47% would like the ability to scroll through images and 39% the ability to window/level. 47.3% have created a COD. Of those who have not, 60% cited a lack of training as the reason (40% stating time constraints). 87% of individuals lacking training would participate in a training course (35.3% prefer individual sessions, 25.5% Web-based training, 20.6% group demonstration, and 18.6% a written manual).

CONCLUSION: With the information collected, we will be able to improve the user experience, educational value, and overall utilization of the MIRC-based teaching file and determine the preferred training to increase participation in COD creation.

(SS04-26) 4:10 PM**Link to Normal Anatomy: CT Loop Experience**Joshua A. Becker, MD*, *NYU Medical Center, New York, NY*; Martha Helmers, BS; Siddharth Govindan, MD

PURPOSE: Medical students have restricted skills with normal radiographic anatomy learned in their 1st-year course. Imaging sessions in transitional courses at the end of the 2nd year rarely fill the gap. When placed in challenging learning experiences with imaging studies, the students are handicapped in the analysis of images. Whether alone or in small-group learning exercises, access to appropriate normal imaging anatomy supports the educational purpose. It is the goal to expand the resources presented in the past to include CT loop images in simulating a workstation environment.

* Faculty financial disclosures are located in the Faculty Index.

METHOD AND MATERIALS: Learning modules illustrating classical imaging (eg, Page kidney, bronchiectasis, etc) will have an online availability of comparative normal images. The images can be static and labeled and a CT loop. The case image has a "NORMAL" icon. When the icon is clicked, the image frame is split-screened, with the normal anatomy replacing the text. The anatomy resource is from the elective's Radiographic Anatomy program. The connection was originally done in PowerPoint with the hyperlink program. This worked well at the individual computer stations. However, the PowerPoint file size is large, and links can become unlinked. This format is not adaptable to Web-based program. Subsequently, the process was redone with code writing for a Web-based tutorial.

RESULTS: Tutorials, part of the radiology elective, present challenging clinical exercises with supporting images. The students readily appreciate change from the normal in their analysis of the illustrated pathology. In addition, the online comparison with labeled images and CT loops assists their understanding of the disease process.

CONCLUSION: An online normal anatomy resource is a major asset when students are challenged with tutorials of imaged pathology. Image loops supply an additional resource and more closely simulate a clinical environment.

(SS04-27) 4:20 PM

Can Use of Radiology Jeopardy in a Core Medical Student Radiology Clerkship Serve as a Predictor of Success on Final Radiological Examination?

Raul N. Uppot, MD, *Massachusetts General Hospital, Boston, MA*; Anthony S. Brooks; Robert A. Novelline, MD (ruppot@partners.org)

PURPOSE: The purpose is to assess whether Radiology Jeopardy, an interactive educational game that tests radiology facts, played during the midterm (week 2) of a 4-week core radiology clerkship, can serve as a predictor of success of medical student performance on the final examination.

METHOD AND MATERIALS: Students rotating through a 3rd-year core medical student radiology clerkship between 1/30/06–8/24/07 participated in Radiology Jeopardy during their midterm. Questions for Radiology Jeopardy were selected from both material in the core clerkship textbook and material in lectures and rotations through the department. Radiology Jeopardy was conducted in the following manner: Students were randomly divided into two groups and competed against each other. Radiology Jeopardy was presented as a PowerPoint presentation mimicking the format of the popular TV game show *Jeopardy*. Students selected questions in different topics on the basis of point values. During the competition, the moderator kept track of individual student performance, identifying the top two to three students in each class on the basis of their performance during the competition. The final examination, conducted on the last day of the course, was a 100-question examination with 50 written questions and 50 visual images. Examination material was selected solely from the textbook assigned as required reading for the clerkship. Student performance in Radiology Jeopardy was compared to final examination scores.

RESULTS: Ten groups of students (106 students total) completed the rotation. Of the 106 students, 24 students were felt to perform better than the remaining 84 on Radiology Jeopardy. The average examination score of these 24 students was 89.2 (range, 81–96) and was statistically different ($P = .001$) from the average of the remaining 84 students, which was 85.3 (range, 65–92). In nine of the 10 months, the average final examination score of the students who excelled on Jeopardy was higher than students who did not (range of average examination score difference in all 10 groups: –3 to +14).

CONCLUSION: Radiology Jeopardy, an interactive educational game, conducted at the midterm of a month-long core radiology clerkship may serve as a predictor of student performance on the final radiological examination.

(SS04-28) 4:30 PM

Virtual Organization and Management of a Core Radiology Clerkship: Benefits and Potential Problems

Anthony S. Brooks, *Massachusetts General Hospital, Boston, MA*; Robert A. Novelline, MD; Raul N. Uppot, MD

PURPOSE: To determine the feasibility of using our medical school's program, MyCourses, to manage a core radiology clerkship. We attempted to determine which components of the clerkship could be managed virtually and to define the benefits and potential problems for faculty, students, and clerkship directors/coordinators.

METHOD AND MATERIALS: Our core radiology clerkship is 4 weeks in length and hospital-based; has a faculty of 60 radiologists; includes classroom sessions, observation of procedures and interpretation, and independent study in a computer learning center; and is offered for 8–15 students every other month. In April 2005, we converted from an analog to a virtual clerkship. We uploaded the course schedule of lectures, seminars, workshops, tutorials, practicums, clinical observations, self-study sessions, and examinations. We uploaded resources, such as orientation materials, instructions on use of digital imaging applications, resident and fellow photos, teaching files, lecture handouts, and links to educational Web sites. Some faculty syllabi and electronic presentations were also placed on this program. Student evaluations, containing faculty ratings and feedback on MyCourses, were completed and collected on this program. We compiled evaluation data from over 140 students.

RESULTS: The initial conversion process required a substantial time commitment, which decreased dramatically. We saved paper and printing costs and eliminated storage space for hard-copy files. Because it is Web-based, schedule changes were quickly communicated, and students gained remote access to schedules, handouts, teaching files, and other resource materials and could download schedules and materials onto handheld devices. Faculty appreciated access to their student evaluations. The clerkship director and coordinator gained immediate digital access to all aspects of the clerkship. No major problems were identified, but the directors/coordinator realized that consistent updating of materials and information was necessary for the program to be effective.

CONCLUSION: Converting to a virtual radiology clerkship saved time and cost and proved feasible and worthwhile for medical students, faculty, and clerkship directors/coordinators.

(SS04-29) 4:40 PM

Creation of and Participation in an Imaging Ethics Roundtable in an Academic Radiology Department

Nabile M. Safdar, MD*, *University of Maryland School of Medicine, Baltimore, MD*; Nancy Knight, PhD; Fauzia Q. Vandermeer, MD; Jean Jeudy, MD

PURPOSE: We describe the implementation of a weekly ethics roundtable, by using structured and free-form approaches to ethical challenges in radiology. The roundtable was designed as an educational enhancement for trainees and an ongoing opportunity for faculty discourse.

METHOD AND MATERIALS: With the cooperation of the department chair and residency director, we introduced the roundtable format at a regular journal club meeting. The format for each weekly roundtable included a point/counterpoint discussion of a precirculated article highlighting an ethical topic in imaging, followed by a free-form attendee-driven discussion of related or new topics. One session per quarter was targeted specifically at residents, and one per month was targeted at medical students (so that each group of rotating students could attend at least one roundtable). Fellows and faculty were urged to attend as schedules allowed. The four faculty workshop leaders were tasked with keeping discussion on point, ensuring that all examples raised were appropriately made anonymous, and maintaining a log of consensus areas and future discussion points.

* Faculty financial disclosures are located in the Faculty Index.

RESULTS: The initiation of a regular ethics roundtable was received well within the department and by medical school administration, with excellent participation and reviews by trainees. In addition to raising numerous issues not previously discussed in formal sessions at our institution (such as the distinction between medicolegal concerns and true medical ethics), the roundtable process has spurred informal discussions by faculty and trainees and produced an annotated core of resources on these topics. Roundtable leaders are using these results to assess the feasibility of a formal imaging ethics curriculum and specific research based on issues identified.

CONCLUSION: Radiology has been challenged to identify and explore ethical issues by new requirements from the ACGME and by the recognition that novel issues may arise at the interface between the diagnostician and the digital screen. Our experience suggests that the creation of a regular forum in which such issues can be introduced and discussed freely results in a heightened awareness that extends beyond the roundtable forum and into daily imaging practice.

(SS04-30) 4:50 PM

RaceTrack: A Simple System for Entering and Managing Cases for Follow-up and Teaching

Tarik K. Alkasab, MD, PhD, *Massachusetts General Hospital, Boston, MA*; Elena K. Korngold, MD; Laura Avery, MD; Peter Mueller; Robert A. Novelline, MD (talkasab@partners.org)

PURPOSE: Radiologists see a wide variety of cases and frequently wish to remember a case to follow up a clinical outcome or to use the case for teaching. We have created a system to capture basic information about cases from within the PACS and to facilitate tracking of these cases via links to our institution's EMR system.

METHOD AND MATERIALS: Our system was designed to work within the constraints of currently installed information technology. For simplicity, we used Microsoft Excel files on a secure shared storage area as our database. We then implemented three programs by using AutoHotKey, an open-source Windows scripting tool. First, we created a case-capture tool to extract case information and basic user input from the PACS environment to a text file. Second, we wrote a case-loading tool for creating database entries on the basis of the text files. Finally, we built a lookup tool to automatically find a relevant patient's medical record information from within the database. To test the tools, we introduced the system at the daily conferences in the abdominal and the emergency radiology sections. Radiologists in these sections mark cases to be shared at daily conference. During the conference, a fellow or resident brings up the list of cases, and each radiologist who included a case discusses it. We have added a small extra step: For each case, the resident or fellow running the case list presses a key combination and enters a brief description of the case so that it can be tracked by using the new system.

RESULTS: Using our system, radiologists in two sections of our department have created shared databases of cases for clinical follow-up or teaching. The abdominal imaging section entered 61 cases for follow-up and 66 teaching cases in 2 months. The emergency section entered 14 cases for follow-up and 96 teaching cases in 1 month. Radiologists in both sections have found it easy to create the cases from the PACS environment during conference and to use the connections to the EMR system from any computer to find further clinical data.

CONCLUSION: We have implemented a system which allows radiologists to create databases of interesting cases for either clinical follow-up or teaching.

(SS04-31) 5:00 PM

Analysis of Global Variation in the Utilization of a Radiology-Specific Vertical Search Engine

Richard E. Sharpe, Jr, BS, *Arlington, VA*; Megan J. Sharpe, BA; Eliot L. Siegel, MD; Khan M. Siddiqui, MD* (richsharpejr@gmail.com)

PURPOSE: Generic search engines are utilized by the majority of radiologists and can provide clinical, educational, and research information. However, they do not provide radiology-specific results. Consequently,

radiology-focused search engines have recently emerged. We utilize detailed data made available from one such search engine, Yottalook, which filters relevant results by using Google's technology, additional relevance algorithms, semantic ontology, and image evaluation and is now in use internationally. The purpose of our study was to analyze global variations in utilization of this search engine.

METHOD AND MATERIALS: Every 25th Yottalook search query and the geographic location of the query were analyzed. Categorization by radiological subspecialty and specified imaging modality was performed. Subspecialty categories included musculoskeletal (MSK), pulmonary (PULM), gastrointestinal (GI), genitourinary (GU), neuroradiology (NEURO), vascular and interventional, nuclear, ultrasonography (US), pediatrics, breast, and cardiac.

RESULTS: 1004 searches were analyzed. The most frequent searches by region and radiological section: North American searches (total = 793) were 24.0% MSK, 18.7% NEURO, and 9.3% GI. South and Central American (89) were 23.6% MSK, 15.7% GU, and 13.5% NEURO. European (73) were 27.4% MSK, 16.4% NEURO, and 12.3% GI. Oceania (23) were 39.1% MSK, 21.7% NEURO, and 13.0% GU. Asian (16) were 25% NEURO, 12.5% GU, and 12.5% GI. African (5) were 40% PULM. A specific imaging modality was described in 141 of 1004 searches, distributed as follows: North American (108) were 29.6% MR, 28.6% CT, and 22.2% US. European (14) were 35.7% US, 35.7% MR, and 21.4% CT. South and Central American (8) were 37.5% CT, 37.5% MR, and 25.0% US. Oceania (5) were 60% CT. Asian (4) were 50% US. African (2) were both US.

CONCLUSION: Radiological searches with a radiology-specific search engine varied by section, modality, and geographic region, probably reflecting differences in availability of various modalities and differences in the prevalence of certain diseases in these regions. It may be advantageous to include regional differences in the development of algorithms designed to optimize the effectiveness of these search engines.

(SS04-32) 5:10 PM

Provision of Accurate and Complete Clinical Information on Radiology Requisitions Is a Medical, Ethical, and Legal Duty

Michael P. McNamara, Jr, MD*, *Case Medical School/MetroHealth Campus, Cleveland, OH*; M. P. McNamara III, JD; Jessica A. Moore, PhD (mmcnamara@metrohealth.org)

PURPOSE: The purpose of this presentation is to provide compelling evidence that provision of appropriate, accurate, and timely clinical information by referring clinicians is a medical, ethical, and legal duty.

METHOD AND MATERIALS: The literature regarding the relevance of accurate, complete, and timely communication between caregivers to quality care and patient well-being will be summarized. Arguments will be made from the AMA's *Principles of Medical Ethics*, the ethical codicils of other physician organizations, and general medical ethical principles that the provision of appropriate clinical information is an ethical duty. Finally, the relevant applicable case law will be cited and explained.

RESULTS: A compelling case can be made, by arguing from patient care, medical ethics, and legal grounds, that provision of relevant, accurate, and timely information is a referring physician's duty and not optional in a health care setting. Courts have found that physicians are required to coordinate their medical evidence and communicate in the best interest of their patient. Failure to communicate relevant information regarding a patient to another physician caring for the patient can result in liability.

CONCLUSION: Relevant, accurate, and timely communication between physicians caring for patients is essential to fulfillment of medical, moral, and legal duties. We believe that referring physicians can fulfill their duty to the patient when they provide the radiologist with (1) pertinent past medical history, (2) current complaint/clinical findings, and (3) the specific reason for a requested examination.

* Faculty financial disclosures are located in the Faculty Index.

(SS04-33) 5:20 PM**A Survey-based Review of the Characteristics of the Interview Process for Diagnostic Radiology Residency Programs**Kiley Perrich, MD, *Dartmouth Hitchcock Medical Center, Lebanon, NH*; Alan Siegel; Jocelyn D. Chertoff, MD**PURPOSE:** To assess the diagnostic radiology residency interview process and determine variability among programs in order to aid directors in improving resource utilization.**METHOD AND MATERIALS:** A survey questioning the process was sent to diagnostic radiology program directors through an e-mail address list provided by the Association of Program Directors in Radiology (APDR). Questions addressed included (1) number of applicants interviewed per residency position offered; (2) number of interviews given to each applicant on the interview day; (3) whether interviews were performed by staff, residents, or both; and (4) if the interviewees were granted time away from clinical services to interview applicants.**RESULTS:** Two mailings were sent to 313 programs. Responses were received from 87 (response rate, 28%). The average number of interviews per residency position was 12.4 (range, 3–28). The average number of interviews provided by a staff member per applicant was 3.0 (range, 0.5–6.0) and by resident was 1.3 (range, 0–4.0). Fifty-eight of the programs did include residents in the interview process, and 25 did not (four, no responses). Fifty-four programs compensated their interviewing staff with time off the clinical service, and 29 did not (four, no responses).**CONCLUSION:** There is a large amount of variability present in the interview process. Applicants to residency programs may have very different experiences while interviewing. Further study of this variation may allow optimization of resource utilization while maintaining program success in the match process.**Saturday, March 29, 2008
8:30–10:00 AM****SS05: AUR Scientific Session 05
Abdominal Imaging (Papers 34–42)****Location: Willow A****Moderators: Vikram S. Dogra, MD
Fiona M. Fennessy, MD, PhD***

GI

(SS05-34) 8:30 AM**Image-guided Resection of Metastatic Ovarian Tumor Implants by Using Real-time Imaging Hardware and a Galactosamine Serum Albumin-conjugated Optical Fluorophore**Andrew J. Gunn, BS, *University of South Dakota, Sioux Falls, SD*; Michelle Longmire; Nicole Y. Morgan; Thomas J. Pohida; Paul D. Smith; Hisataka Kobayashi; et al (agunn@usd.edu)**PURPOSE:** It has been previously suggested that the intraperitoneal (ip) administration of tumor-targeted optical fluorophores could enhance the surgical cytoreduction of advanced-stage ovarian cancer by providing to the surgeon a guide to tumor location. One obstacle to the clinical application of this strategy has been the lack of imaging hardware that can provide images in near real time with minimal interference from background tissues. Thus, the purpose of this study was to evaluate the ability of newly designed real-time imaging hardware to identify fluorophore-labeled metastatic ovarian tumor implants in a murine model.**METHOD AND MATERIALS:** The green fluorophore rhodamine green (RhodG) was conjugated to bovine serum albumin (BSA) and galactosamine serum albumin (GSA). Each conjugate was analyzed

for its ability to specifically label SHIN3 cells by flow cytometry, fluorescence microscopy, and in vivo optical imaging by using a spectral fluorescence camera. The real-time imaging hardware (RT camera) was assembled by placing a 536/40-nm bandpass emission filter over the lens of a cooled monochrome CCD camera and equipping the apparatus with a fiberoptic ring light that had been passed through a 482/35-nm excitation filter for illumination. Images obtained from the RT camera during a mock cytoreduction performed on fluorescently labeled tumor-bearing mice were compared to those obtained from the spectral fluorescence camera. The efficiency of cytoreductive surgery by using the RT camera was also compared to that of cytoreduction guided by the unaided eye.

RESULTS: Flow cytometry, fluorescence microscopy, and in vivo spectral fluorescence imaging demonstrated that GSA-RhodG is specifically bound and internalized by SHIN3 cells both in vitro and in vivo. Still images obtained from the RT camera demonstrated that it could identify fluorescently labeled ovarian tumor implants in vivo. Image-guided mock cytoreduction identified more tumor implants than cytoreduction guided by the unaided eye.**CONCLUSION:** The development of real-time fluorescent imaging hardware in conjunction with tumor-targeted optical probes has the potential to improve clinical outcomes in advanced-stage ovarian cancer.**(SS05-35) 8:40 AM****Utilization of Search Patterns in the Interpretation of Abdominal and Pelvic Multidetector CT Studies**Jigar B. Patel, MD, *University of Maryland Medical Center, Baltimore, MD*; Avni A. Chudgar, MD; Khan M. Siddiqui, MD***PURPOSE:** Search patterns in radiology were first written about in the early 1960s, with a focus on visual perception and chest radiography. It has been suggested that two approaches to radiographic interpretation exist: free search and directed search. Trainees most often employ a “directed search” to avoid missing significant findings. With experience, radiologists demonstrate increased accuracy and efficiency utilizing a “free search” method. Medical imaging has undergone a recent significant transformation with the advent of multidetector computed tomography. We hypothesize the increased volume of data and amount of detail in a CT study demand a structured approach. We query how radiologists approach abdominal and pelvic CT studies.**METHOD AND MATERIALS:** A voluntary anonymous multiple-choice survey was administered to residents, fellows, and attendings across two university-based radiology departments. The survey consisted of eight questions and assessed the frequency of search pattern usage, pattern development, pattern type, interpretive confidence, and the use of reformatted images. Trends based on the level and location of training were statistically analyzed.**RESULTS:** Study population included 36 residents (1st through 4th year), 16 fellows, and 14 attendings (½ year to >25 years of practicing experience). Of those surveyed, 67% *always* and 27% *almost always* use a search pattern. Only 22% of the 1st-year and 2nd-year residents surveyed reported being taught a search pattern. Reformatted imaging was utilized approximately 50% of the time, despite being readily available at both institutions. While there was no relationship between interpretive confidence and usage of search patterns, there was statistically significant ($P < .01$) increased confidence with training level.**CONCLUSION:** Search patterns are utilized in interpreting abdominal and pelvic CT studies by a majority of those surveyed; however, only a small proportion of residents are actually taught a specific search pattern. We suggest trainees be instructed on how to develop such a search pattern early in their residency. An emphasis should be made on including reformatted images in routine interpretation.

* Faculty financial disclosures are located in the Faculty Index.

(SS05-36) 8:50 AM**Implementation of Simulation in the Radiology Resident Obstetrical US Curriculum**

Lori A. Deitte, MD, *University of Florida, Jacksonville, FL* (ldeitte@bellsouth.net)

PURPOSE: To develop and implement an obstetrical ultrasound radiology curriculum which includes simulation and to assess resident learning.

METHOD AND MATERIALS: A 1-month obstetrical ultrasound curriculum including simulation was developed for radiology residents ($n = 20$) at our institution. An image interpretation pretest consisting of 42 images from obstetrical ultrasound examinations was administered. The curriculum consisted of four sessions at the institution's simulation center. Each session included a didactic presentation followed by real-time scanning with an ultrasound simulator, focusing on obstetrical ultrasound anatomy and abnormalities. At the completion of this curriculum, a posttest will be given. The pretest and posttest results will be compared. A resident survey will then be administered to evaluate the curriculum format.

RESULTS: The mean pretest image interpretation scores for year of radiology residency were as follows: 1st year, 28.0%; 2nd year, 30.4%; 3rd year, 40.5%; and 4th year, 62.9%. The individual pretest and posttest scores will be analyzed with a paired t test. The results from a resident survey of the curriculum format will be summarized. The data analysis will be performed with 5% level of significance and 95% confidence interval.

CONCLUSION: An obstetrical ultrasound radiology curriculum including simulation was introduced into our residency program. The final results and conclusions will be presented.

(SS05-37) 9:00 AM**Rapid Automated Splenic Volumetry by Using Multislice Contrast-enhanced CT Images**

Senta Berggruen, MD, *Northwestern University Feinberg School of Medicine, Chicago, IL*; Alexander W. Korutz; Vahid Yaghmai, MD

PURPOSE: Accurate noninvasive assessment of splenic volume is useful in monitoring the clinical treatment of diseases that affect the spleen. Measuring splenic volume on CT can be time-consuming and may theoretically be affected by the experience of the radiologists. We compared the performance of an abdominal radiologist with that of a medical student when using a prototype automated software to automatically segment and measure splenic volume.

METHOD AND MATERIALS: Fifty contrast-enhanced CT scans of the abdomen were evaluated by a prototype software program (Siemens Medical Solutions, Forchheim, Germany) that generates 2D and 3D measurements. Splenic volume for each patient was evaluated separately by the abdominal radiologist and the medical student. Each observer used a five-point scale to evaluate the quality of segmentation: 5, requiring no correction; 4, requiring a single correction; 3, requiring two corrections; 2, requiring three or more corrections, and 1, unable to segment. Intraclass correlation (ICC) was used to measure the agreement between the two observers.

RESULTS: At the hands of the abdominal radiologist, the software was able to segment all spleens and calculate their volumes. The medical student was able to segment and measure 49 of 50 spleens by using the software. The average segmentation score was 3.96 (SD = 0.9) for the radiologist and 3.4 (SD = 1.1) for the student. ICC returned a strong correlation for both observers between the following measurements: volume (0.766; 95% CI, 0.621–0.86), auto RECIST (0.783; 95% CI, 0.623–0.876), and Z axis (0.86; 95% CI, 0.169–0.957) but showed a weak correlation in score measurements (0.234; 95% CI, –0.018 to 0.467).

CONCLUSION: Accurate measurement of splenic volume is feasible for observers at a wide range of experience levels. While the number of corrections needed to properly segment the spleen may differ between experience levels, this does not appear to affect the accuracy of the volumetric measurement.

(SS05-38) 9:10 AM**Evaluation of US Detection of Inguinal Hernias in Patients with and without Prior Inguinal Hernia Repair**

Jefferson I. Balin, MD, *University of Michigan, Ann Arbor, MI*; David A. Jamadar, MD; Elaine M. Caoili, MD; Jon A. Jacobson, MD; Tausha Stephens, MD; Michael Franz, MD (jbalin@med.umich.edu)

PURPOSE: To compare, by using ultrasound (US), the sonographic accuracy of diagnosing inguinal hernias in patients with and without prior inguinal hernia repair.

METHOD AND MATERIALS: We retrospectively reviewed 45 patients between the years 2000 and 2007 who had preoperative imaging with US prior to inguinal hernia surgical repair. We compared the accuracy of preoperative inguinal hernia diagnosis with findings at surgery. We then compared the accuracy of ultrasound for patients who had no prior inguinal hernia surgery with those who had undergone prior surgery.

RESULTS: Thirty of 45 patients had had no prior inguinal hernia surgery. Fifteen patients had undergone prior inguinal hernia repair. All patients were evaluated with US prior to surgery. Sonographic diagnostic accuracy for hernia in those patients without prior repair was 90%. In patients who had undergone prior inguinal hernia repair, sonographic diagnostic accuracy was 80%.

CONCLUSION: Evaluation of inguinal hernias with ultrasound in patients without prior inguinal hernia repair is more accurate than evaluation of patients who have had prior hernia repair. Evaluation of patients with a history of prior inguinal hernia repair may be more challenging due to altered anatomical relationships and implanted mesh. Combining CT and ultrasound for evaluation of patients who have had prior inguinal hernias may be of value in these difficult cases.

(SS05-39) 9:20 AM**Imaging Findings of Hepatic Infarction with Diffusion-weighted Imaging**

Christopher P. Murdock, DO, *Crestwood, MO*

PURPOSE: To describe the diffusion-weighted imaging findings of hepatic infarction.

METHOD AND MATERIALS: We report diffusion-weighted imaging findings in a case of hepatic infarction in a transplanted liver due to hepatic arterial occlusion. Diffusion-weighted images clearly showed diffusion restriction caused by tissue necrosis. The present case is the first to demonstrate the findings of diffusion restriction accompanying hepatic infarction. The MRI was performed on a 1.5-T superconducting MR system (Gyrosan; Philips Medical Systems, Best, the Netherlands) with a 23-mT/m maximum gradient capability and a surface phased-array coil. Diffusion-weighted images were acquired as part of the routine protocol in our institution. Breath-hold diffusion-weighted echo-planar images (TR/TE/FA, 2925.39/60/90) were performed with the application of unidirectional diffusion gradient along the section-select direction (z axis) with three increasing B values: 0, 300, and 600 sec/mm². A total of three images were obtained (one for each B value). The following imaging parameters were used: TR/TE, 2500/90; matrix size, 128 × 256; section thickness, 8 mm, with an intersection gap of 2 mm. ADC maps were derived automatically on a voxel-by-voxel basis by using commercially available software (EasyVision Workstation, Philips Medical Systems). ADC values of the normal liver and area of interest were derived from ADC map images.

* Faculty financial disclosures are located in the Faculty Index.

RESULTS: MRA confirmed hepatic artery thrombosis. T2-weighted images revealed hyperintense signal in peripheral wedge-shaped areas in the left hepatic lobe. These areas did not enhance on axial postcontrast SGE images. Diffusion restriction in the suspected infarcted segments was confirmed at $B = 0$ and $B = 600$. ADC map images showed increased intensity, interpreted as necrosis.

CONCLUSION: In conclusion, we described imaging findings of hepatic arterial occlusion resulting in hepatic infarction. MRA depicted the site of hepatic artery occlusion, and DWI revealed findings compatible with tissue necrosis.

(SS05-40) 9:30 AM Patterns of Persistent Nephrograms Observed by Noncontrast CT in Patients 24 Hours after Hepatic Arteriography with Chemoembolization

Anokh Pahwa, MD, *University of California Davis, Sacramento, CA*; Richard W. Katzberg, MD*; Wayne L. Monsky, MD, PhD; Marijo A. Gillen, PhD, MD (anokh.pahwa@ucdmc.ucdavis.edu)

PURPOSE: To describe patterns of delayed persistent nephrograms observed by noncontrast CT 24 hours after hepatic angiography with chemoembolization.

METHOD AND MATERIALS: Sixty-three hepatic angiograms (iohexol-350 or iodixanol-320; GE Healthcare, Princeton, NJ) were performed with chemoembolization of hepatic tumors in 29 patients (mean age, 62.0 years [range, 43–78 years]; male/female ratio, 17/12) having 21 hepatocellular carcinomas, four carcinoids, one insulinoma, and three colorectal carcinomas. Noncontrast CT scans were obtained 24 hours after the procedure as part of our institutional protocol and were retrospectively reviewed for the presence or absence of focal or dense persistent nephrograms. Renal parenchymal, cortical, and medullary attenuation values were measured and compared to baseline values from preprocedure base CT scans to quantify the visual impression.

RESULTS: We observed two distinct delayed nephrographic patterns: (1) bilateral, globally dense, with greater cortical than medullary differentiation in 15/63 (23.8%) procedures; and (2) one to three small wedge-like regions, either unilaterally or bilaterally, in 13/63 (20.6%) procedures. In the eight patients with globally increased nephrograms, seven had cirrhosis of the liver, and one had metastatic carcinoid tumor.

CONCLUSION: Delayed CT nephrographic patterns, either focal or global, are not uncommon following hepatic angiography and chemoembolization. The nephrographic patterns suggest as possible mechanisms either focal or global renal ischemia.

(SS05-41) 9:40 AM Duodenal Pseudotumor: Is US a Reliable Way to Diagnose Pediatric Intramural Duodenal Hematoma?

Joyce Y. Li, MD, *Rochester General Hospital, Rochester, NY* (joyce.li@viahealth.org)

PURPOSE: Intramural duodenal hematoma often occurs in the pediatric population days after very minor trauma. We highlight CT, upper GI study, and sonographic findings of a case of pediatric intramural duodenal hematoma and demonstrate sonographic characteristics that may lead to an erroneous diagnosis of neoplasm.

METHOD AND MATERIALS: We present the case of a 14-year-old boy who presented with a palpable abdominal mass and progressive epigastric pain and vomiting for a week. He was a wrestler but recalled no specific incident of trauma. He underwent contrast-enhanced CT followed by ultrasound, with findings leading to a diagnosis of duodenal neoplasm. Subsequent upper GI study demonstrated characteristic findings of intramural duodenal hematoma. The patient's symptoms improved with supportive therapy, with complete resolution on follow-up.

RESULTS: The CT scan of the abdomen demonstrated a hypodense well-defined obstructing mass in the region of the duodenum, with no definite enhancement or extravasation. Differential considerations included neoplasm, hematoma, or enteric cyst. Ultrasound was performed in an attempt to differentiate hematoma from neoplasm and demonstrated a heterogeneously echogenic duodenal mass. Doppler evaluation showed increased vascularity and perfusion, suggestive of a neoplasm. A diagnosis of duodenal tumor was made. An upper GI study was performed for preoperative planning. It demonstrated an intramural extramucosal mass, mucosal fold thickening, and coil-spring appearance of the valvulae conniventes, consistent with an intramural hematoma. The patient was treated conservatively, with gradual improvement of symptoms and radiographic resolution.

CONCLUSION: Intramural duodenal hematoma generates partial or complete obstruction that develops slowly and progressively, with delayed diagnosis. In a pediatric patient, it should be suspected even with minor trauma. CT and upper GI studies often demonstrate nonspecific but characteristic findings. Ultrasound is best used as an adjunct or for follow-up. Care should be taken when interpreting ultrasound because imaging characteristics may resemble a tumor, with vascularity and perfusion.

(SS05-42) 9:50 AM Comparison of the Accuracy of CT Volume Calculated by Circumscription to That Calculated by Prolate Ellipsoid Volume Calculation (Bidimensional Measurement Multiplied by Coronal Long Axis)

Ali M. Rkein, BS, *University of Arizona Medical Center, Tucson, AZ*; Arnold C. Friedman, MD*; Daniel O. Persky, MD (arnief51@yahoo.com)

PURPOSE: Tumor volume is one of the most important factors in evaluating the response to treatment of patients with cancer. The objective is to compare CT volume calculation by using a manual circumscribing tracing tool to the prolate ellipsoid volume calculation (PEVC; bidimensional measurement plus coronal long axis) and determine which was more accurate and consistent.

METHOD AND MATERIALS: Six patients with nine neoplasms, six phantoms, and two radiologists were utilized. The neoplasms and phantoms of varying size and shape were imaged by using multidetector CT scanners with slice thicknesses ranging from 0.5 to 3 mm. Measurements were performed on a TeraRecon 3D workstation (San Mateo, CA). Each lesion and each phantom was manually circumscribed and its three dimensions measured. The measurements were repeated 2 weeks later.

RESULTS: Manual circumscribing (MC) of the phantoms deviated from true volume by an average of 3.1% (SD, 0.7), while PEVC deviated by 11.6% (SD, 4.3). MC interobserver readings varied by 1.2% (SD, 0.6) and PEVC by 4.8% (SD, 3.3). MC intraobserver readings varied by 1.95% (SD, 1.75) and PEVC by 2.5% (SD, 1.55). The patient tumor volume predicted by MC and PEVC varied greatly; MC interobserver readings differed by 3.3% (SD, 2.1) and PEVC by 20.1% (SD, 10.6). MC intraobserver readings varied by 2.5% (SD, 1.9) and PEVC by 5.5% (SD, 3.2). Bidimensional analysis demonstrated an interobserver difference of 12.1% (SD, 8.7) and intraobserver of 5.05% (SD, 3.3).

CONCLUSION: Manual circumscribing of neoplasms provides a more accurate and consistent volume prediction than PEVC. The more complicated shapes demonstrated the superiority of MC over PEVC.

* Faculty financial disclosures are located in the Faculty Index.

Saturday, March 29, 2008
10:30 AM–12:00 PM

SS06: RAHSR Scientific Session
RAHSR/Health Services
(Papers 43–51)

Location: Willow A

Moderators: Yoshimi Anzai, MD
Ruth C. Carlos, MD, MS

HP

RAHSR-ACR Award

(SS06-43) 10:30 AM
Accuracy of Preliminary Interpretation by On-Call Residents of Neurologic CT Examination and Assessment of Patient Outcomes

Asako Miyakoshi, MD, *University of Washington, Seattle, WA*; Quynh T. Nguyen; Wendy Cohen, MD; Martin Gunn, MBChB; Lee B. Talner, MD; Yoshimi Anzai, MD (asakom@u.washington.edu)

PURPOSE: Accuracy of preliminary reports by on-call residents is one of the benchmarks for rigorous clinical training and quality assurance (QA) in academic medical institutions. The purpose of this study is to address accuracy of resident-generated preliminary reports as well as impact of misses and misinterpretations on patient clinical outcomes in a level 1 trauma center.

METHOD AND MATERIALS: From July 1, 2006 to January 15, 2007, 4020 head CT, neck CT, and CTA cases were interpreted by on-call residents off-hours. As part of an ongoing hospital QA process, all preliminary reports were reviewed by attending neuroradiologists within 12 hours. Discrepancies were graded as follows: acute intracranial discrepancy (AID), acute extracranial discrepancy (AED), or nonacute discrepancy (NAD). Discrepancies were reviewed with subsequent imaging and/or clinical information to confirm resident misses and misinterpretation versus attending overcall. For the cases of confirmed resident misses and misinterpretation, medical charts were reviewed to assess adverse clinical outcomes.

RESULTS: Among 4020 neurologic CT cases read by on-call residents, there were 78 discrepancy cases, including 26 cases of AID, 29 cases of AED, and 23 cases of NAD. Abnormalities noted by attendings were not confirmed to be present in three cases. Therefore, 75 cases were considered residents' misses and misinterpretation (1.9%). Among 75 cases, clinical follow-up was available in 60 cases. No effect on outcomes was noted in 49 cases, non-life-threatening adverse effect on outcomes was noted in 10 cases (0.25%), and a potentially life-threatening adverse outcome was noted in one case (0.02%).

CONCLUSION: The rate of misses and misinterpretation by on-call residents of neurologic CT examinations is exceedingly low in a high-volume level 1 trauma center. This is, in part, due to rigorous clinical training of emergency neuroradiology. There was only one out of 4020 cases where misinterpretation could have led to potentially life-threatening adverse clinical outcomes (0.02%).

(SS06-44) 10:40 AM
Radiology Residents versus Teleradiology Attendings: Comparison of Discrepancy Rates in Preliminary Interpretations

Kate E. Stanitski, MD, *Bryn Mawr Hospital, Philadelphia, PA*; Vikram S. Dravid, MD; Harry G. Zegel (StanitskiK@mlhs.org)

PURPOSE: Our objective with this study is to compare the discrepancy rate of resident to attending final readings to teleradiology attending service to in-house attending final readings.

METHOD AND MATERIALS: Our residency program has a unique system in which overnight emergency cross-sectional examinations are divided by campus, with initial preliminary interpretations provided independently by an on-call resident or by an overnight teleradiology attending service and reviewed by an attending radiologist the following morning. 1585 emergency examinations were evaluated overnight by radiology residents over 5 months from May 2007 through September 2007. Over the same time period, 1204 emergency studies were evaluated by a teleradiology service, which were officially read the next morning by attending radiologists. These preliminary reports were retrospectively evaluated to determine discrepancies from final attending reports, which were categorized as "major" if the results of the study emergently affected patient care, "minor" if a nonemergent change in therapy was advised, or an "additional finding" which had no impact on patient management.

RESULTS: This study has the distinct ability to compare similar resident versus teleradiology attending preliminary readings from the same patient base, which has not been previously studied. There were 33 total resident-to-attending discrepancies, for a total rate of 2.08%, including one major discrepancy (0.06%), 12 minor discrepancies (0.76%), and 20 additional findings (1.26%). The teleradiology-to-attending discrepancies totaled 42, including two major discrepancies (0.17%), 15 minor discrepancies (1.25%), and 23 additional findings (1.91%), for a total rate of 3.33%.

CONCLUSION: Our study demonstrates an acceptable small discrepancy rate between resident preliminary and attending final readings that is nearly identical to the attending-to-attending final readings. Our findings corroborate with other studies evaluating resident preliminary interpretations and reiterate that quality of patient care is maintained and similar regardless of whether a resident or attending radiologist provides an initial interpretation.

(SS06-45) 10:50 AM
Prevalence of Malignancy in Thyroid Nodules with an Initial Nondiagnostic Result after US-guided Fine-Needle Aspiration: A Quality Improvement Review

Tausha Stephens, MD, *University of Michigan, Ann Arbor, MI*; Kate Klein, MD; Ronald O. Bude, MD; Janet E. Bailey, MD; Jonathan M. Rubin, MD, PhD*; Yijun Pang, MD

PURPOSE: To assess the rate of malignancy in thyroid nodules with initial nondiagnostic results after ultrasound-guided fine-needle aspiration placed in CytoLyt. If this rate is sufficiently low, short-term imaging follow-up in place of repeat aspiration could be proposed.

METHOD AND MATERIALS: We retrospectively reviewed 1506 medical records of all patients who underwent ultrasound-guided FNA of thyroid nodules at our institution from October 2001 to April 2007. We analyzed the number of initial biopsies placed in CytoLyt and the number of nondiagnostic samples. We then reviewed the charts for follow-up pathologic correlation. A review of the nondiagnostic rate was performed on department and individual levels and further evaluated for practice quality improvement.

RESULTS: Ultrasound-guided FNAs with samples placed in CytoLyt were initially performed on 1148 nodules. Of the 859 diagnostic samples at FNA, 725 were benign, 74 demonstrated atypia or hyperplasia, and 60 were positive for malignancy. There were 289 (25.2%) nondiagnostic lesions (without atypia). A total of 114 underwent repeat FNA, five of which were found to be positive on follow-up FNA or surgery, representing a 1.7% malignancy rate. All malignancies were papillary carcinomas. Benign findings were found in 102 and atypia found in another seven. Of the seven patients with atypia, six were benign at surgery, and one refused surgery (stable on subsequent clinical follow-up). Forty-six patients went straight to surgery after the nondiagnostic result, none of which were positive. We followed 77 patients clinically and lost 52 to follow-up. An internal quality assurance was also performed due to the high nondiagnostic rate, and results will be presented.

* Faculty financial disclosures are located in the Faculty Index.

CONCLUSION: The malignancy rate of initially nondiagnostic samples after ultrasound-guided FNA placed in CytoLyt is sufficiently low to propose that short-term follow-up imaging of patients be performed in place of repeat FNA. We propose these patients could be followed with imaging and resampled only if their clinical or follow-up imaging parameters warrant. We also would like to share our commitment to practicing quality improvement by reviewing our own results for the purpose of enhancing patient care.

**(SS06-46) 11:00 AM
Intracranial Hemorrhage in Term Infants: Incidence, Etiology, and Clinical Outcome**

Mina M. Zakhary, BA, *University of Michigan Health Systems, Ann Arbor, MI*; Amy E. Sewick; Jeffrey R. Wesolowski, MD; Neha Mehrotra; Pia C. Maly Sundgren, MD, PhD

PURPOSE: To investigate the incidence and etiology of intracranial hemorrhage in term infants aged 0–24 months receiving head computed tomography (CT) scans at a tertiary care center.

METHOD AND MATERIALS: Radiological reports of head CT scans and patient medical records of term infants between 0–24 months at our tertiary care center from March 1995 to December 2003 were reviewed. These infants were subdivided into three groups based on number of days after birth they received their head CT scan: <4 days, 4–28 days, and >28 days. Radiological findings on head CT scan and the patients' medical charts were evaluated for presence and type of hemorrhage and for the most likely etiology and clinical outcome.

RESULTS: 1026 head CTs were obtained of 798 term patients (467 males, 331 females). 195 of these 798 patients (24%) had evidence of intracranial hemorrhage (ICH) on their first CT at our tertiary care center. Overall, 51% of the infants had good clinical outcome. Thirty-eight had their CT scans performed <4 days after birth, 34 were performed between 4 days and 28 days, and 123 were performed >28 days after birth. In patients <4 days old, the most common types of hemorrhage were SDH (66%) and SAH (42%). The most common etiologies in this group were perinatal events (42%) and birth trauma (39%), with good clinical outcome in 80% and 63%, respectively. In patients 4–28 days old, the most common type of hemorrhage was SDH (47%). The most common etiology in these infants was postcardiac surgery events (32%), with a 75% death rate. Overall, these infants had the highest risk of poor clinical outcome (63%). In patients >28 days old, the most common type of hemorrhage was SDH (69%). In this group, the most common etiologies were history of fall (27%) and nonaccidental trauma (23%), with good clinical outcome in 31% and 65%, respectively.

CONCLUSION: Term infants with evidence of ICH on CT have a 51% risk of having poor clinical outcome, with those aged 4–28 days at time of study having the worst prognosis (63%). Patients who were status post cardiac surgery had the worst outcome, with a 75% death rate. This high death rate likely reflects the severity of their primary illness rather than the presence of ICH.

**(SS06-47) 11:10 AM
Prospective Study Comparing CT Angiography and Conventional Angiography for the Detection of Arterial Injuries Following Extremity Trauma**

David L. Smoger, MD, *Temple University Hospital, Philadelphia, PA*; Mark Seamon; Dmitry Niman, MD; Gary Cohen, MD; Amy Goldberg; Abhijity Pathak; et al (dsmoger@alumni.upenn.edu)

PURPOSE: To prospectively evaluate the accuracy of CT angiography (CTA), as compared with conventional angiography, for diagnosing traumatic arterial injury.

METHOD AND MATERIALS: The study was approved by our institutional review board; written informed consent was obtained from all patients. Sixteen patients have been studied. The mean patient age was 26.5 years (range, 18–50), 14 males and two females (14 gunshot wounds and two stab wounds). Eight patients sustained upper extremity injuries, and eight patients sustained lower extremity injuries. Patients with clinical evidence for active hemorrhage and need for urgent surgery

were excluded. Once eligibility criteria were met and extremity trauma was established through physical examination, the patient entered into a treatment algorithm, following current standard of care for extremity trauma. For nonemergent patients, the patient's ankle-brachial indices (ABIs) were calculated and pulses palpated. If the ABIs were greater than 0.9 and there were no diminished pulses in the affected extremity, the patient was observed or discharged. If the ABIs were less than 0.9 and/or diminished pulse detected, informed consent was obtained and the patient enrolled. Enrolled patients then underwent CTA. If CTA detected life- or limb-threatening arterial injury, the patient was taken to the operating suite. Otherwise, the patient was transported directly to the interventional suite for conventional angiography performed by an interventional radiologist blinded to the CTA results.

RESULTS: In 15 of 16 patients, the CTA findings correlated with the conventional angiography findings. In one patient, soft-tissue shrapnel caused significant scatter artifact, rendering the CTA nondiagnostic. Sensitivity was 86%. Specificity was 100%. Positive predictive value was 100%. Negative predictive value was 89%. The κ coefficient of agreement was 0.86.

CONCLUSION: CT angiography of an extremity is as effective as conventional angiography for the detection of traumatic arterial injury.

**(SS06-48) 11:20 AM
Performance and Ease-of-Use Evaluation of the AngioDex Virtual Reality System for Abdominal Aortic Aneurysm Endovascular Stent-Graft Planning Using CT Angiographic Data**



Harold I. Litt, MD, PhD*, *University of Pennsylvania Health System, Philadelphia, PA*; Oluwatoyin Idowu; Darren Kwong; Mia Maamari; Ralf Kockro*

PURPOSE: To evaluate performance of AngioDex virtual reality software for AAA stent-graft planning and compare to GE Advantage Windows and M2S Preview for accuracy and ease of use.

METHOD AND MATERIALS: Fifty CTAs with AAA were measured for stent-grafts using three different systems: Dextroscope AngioDex (Volume Interactions), a VR stereoscopic interactive 3D system; Advantage Windows (AW) 4.2 Advanced Vessel Analysis (GE Healthcare); and Preview (M2S). Each study was processed on the Dextroscope and AW by three observers: a radiologist with 9 years' CTA experience and >100 cases analyzed on both systems, a technologist with 5 years' CTA postprocessing experience but few cases on either system, and an undergraduate student with no radiology or 3D postprocessing experience. The workstations were used in random order, with 1 month between evaluations of the same case. Ease of use was evaluated by counting mouse clicks and time from study load to saved results. Accuracy was evaluated by comparing AngioDex to AW results and both to the gold-standard Preview measurements.

RESULTS: Number of mouse clicks for AngioDex was lower for all users compared to AW (16 vs 32, 22 vs 45, 21 vs 29 for the radiologist, technologist, and student; $P < .001$). Analysis time for the radiologist was equal (2.90 min AngioDex vs 2.93 min AW; $P = .4$) but shorter for the technologist using AngioDex (4.3 min vs 5.16 min; $P = .002$) and trended shorter for the student (4.02 min vs 4.36 min; $P = .09$). Correlation analysis showed good agreement between AngioDex and Preview, AW and Preview, and AngioDex and AW. Bland-Altman analysis showed no bias for length measurements (eg, lowest renal to aortic bifurcation) for either system but negative bias in diameter measurements (eg, minimum left common iliac) for both AngioDex and AW compared to Preview; ie, AngioDex and AW gave smaller measurements. There was no significant bias between AngioDex and AW.

CONCLUSION: The AngioDex VR-based AAA stent-graft analysis software required fewer mouse clicks than AW and less time for the technologist and student but not an experienced radiologist. Measurements were equivalent between the two systems, but both had lower diameter measurements than the gold standard Preview.

* Faculty financial disclosures are located in the Faculty Index.

(SS06-49) 11:30 AM**Onboard Proficiency Enhancer (OPE) and Advanced Diagnostic Ultrasound in Microgravity (ADUM) Analysis and Terrestrial Applications**Leanne E. Tran, JD, MD, *Schulich School of Medicine, University of Western Ontario, London, ON*; Douglas Hamilton, MD, MPH**PURPOSE:** Assess OPE's utility and efficacy in training crew to acquire ultrasound images on the *International Space Station* (ISS) with remote guidance from NASA ground experts. Demonstrate OPE should be applied to terrestrial teleradiology.**METHOD AND MATERIALS:** Crew received 5 hours of ground-based training at NASA Johnson Space Center (JSC) on ultrasound, remote guidance, equipment setup, OPE, and hands-on scanning 4–8 months before launch. OPE multimedia CD reviewed 7 days before each ISS scan, scheduled every 30 days. Remote guidance achieved via one-way video downlink and two-way audio communication, in private mode. OPE qualitative (eg, crew feedback, keystroke monitoring) and quantitative data collected from March 2004 to May 2005. Images analyzed by NASA ultrasound experts and independent consultants.**RESULTS:** Collected 110 hours of on-orbit data. To date, 13/18 OPE sessions analyzed (versions 1, 2, English, Russian). Conducted eight musculoskeletal, six cardiothoracic, five abdominal, and three dental/sinus/eye scans. Crew produced diagnostic-quality images. Preliminary findings indicate with more OPE use, quality of images increased while time for equipment setup, subject/operator positioning, remote guidance, and scan completion decreased. OPE is easy to use, intuitive, and value-added, according to crew. Although approaches to OPE differed between astronauts and cosmonauts, OPE exercises demonstrate trainees retained information. In-flight OPE use decreased with more scanning experience.**CONCLUSION:** ISS Expeditions 8–11 demonstrated that inexperienced operators with minimal training and remote expert guidance produced ultrasound images comparable to terrestrial standards. OPE versions limited to musculoskeletal protocols have been implemented by trainers of the National Hockey League's Detroit Red Wings and the United States Committee at the 2006 Torino Olympic Winter Games; the Detroit Tigers baseball team may be the next addition to this growing list of OPE users. OPE applied to rural/remote areas, disaster relief, and developing nations will save lives, lower morbidity, and alleviate health care costs and resource shortages. OPE pilot projects in Ontario's underserved communities and developing countries are in progress.**(SS06-50) 11:40 AM****Faster Radiology Reporting through the Utilization of Standardized Macros**Aiyis T. Pyrros, MD; Nicholas P. Morley, BA; Eugene J. Huo, BS, *Northwestern University, Chicago, IL*; Vahid Yaghmai, MD; Chrestos Pyrros; Paul Nikolaidis, MD; et al (a-pyrros@md.northwestern.edu)**PURPOSE:** To determine if utilizing a standardized set of automated macros can decrease the time required to generate a preliminary report and improve overall radiologist throughput and efficiency.**METHOD AND MATERIALS:** A set of 30 examinations (15 radiographic and 15 cross-sectional imaging) was created by a radiologist not involved in image interpretation for this study. Cases were selected from studies ordered through the emergency department of a tertiary academic center. Each radiologist independently evaluated the set of studies and generated provisional reports in the institution's picture archiving and communication system (PACS) at two separate time points, one without and the other with use of standardized macros. Provisional reports were generated by typing pertinent findings at the time of interpretation. The initial interpretation was performed without the aid of standardized macros. Total time of interpretation and provisional report generation was recorded for each set of cases. Following a 2-week training period in the use of the freely available AutoHotKey software, a second interpretation session was performed utilizing the same set of imaging studies, along with a set of standardized macros. Report generation times were compared.**RESULTS:** Preliminary results involving two interpreters demonstrate a decrease in overall report generation time. Initial average interpretation time for radiographic studies was 1041 seconds (SD, 54 seconds), compared to 836 seconds (SD, 25 seconds) with macro software. Initial average interpretation time for cross-sectional studies was 4039 seconds (SD, 140 seconds), compared to 2196 seconds (SD, 65 seconds) with macro software.**CONCLUSION:** Report generation times decreased by 44% overall—by 40% for radiographic studies and 46% for cross-sectional studies—utilizing macro software. This Windows software package can be used with any Windows-based PACS solution, allowing for reduced report generation time.**(SS06-51) 11:50 AM****Academic Radiology in Recovery: LSU New Orleans 2 Years after Hurricane Katrina**Leonard R. Bok, MD, MBA, JD, *Louisiana State University Medical Center, New Orleans, LA* (lbok@lsuhsc.edu)**PURPOSE:** The purpose of this paper is to provide a narrative of the experience of the Radiology Department at Louisiana State University in New Orleans following Hurricane Katrina—a report at 2 years—where we were, where we are, and where we are going.**METHOD AND MATERIALS:** We will provide narrative and photos which will explain our journey, including successes and challenges. This may be helpful to other departments in planning for disasters and disaster recovery.**RESULTS:** There have been many unexpected challenges in post-Katrina New Orleans, as there would be in any locale after a major disaster. Most need to be handled on an ad hoc basis.**CONCLUSION:** The Academic Radiology Department at LSU Health Sciences Center is still in a rebuilding mode 2 years after Katrina. We have many challenges; however, the future looks very bright and exciting, with the construction of a new hospital designed to maintain operations through a level 5 hurricane.**Saturday, March 29, 2008****2:00–3:30 PM****SS07: AUR Scientific Session 07****Neuroradiology (Papers 52–59)****Location: Douglas**Moderators: Annette C. Douglas-Akinwande, MD*
Mark E. Mullins, MD, PhD**NR****(SS07-52) 2:00 PM****Incidence, Etiology, and Clinical Outcome of Intracranial Hemorrhage in Preterm Infants**Amy E. Sewick, *University of Michigan Medical Center, Ann Arbor, MI*; Mina M. Zakhary, BA; Jeffrey R. Wesolowski; Neha Mehrotra; Pia C. Maly Sundgren, MD, PhD**PURPOSE:** To investigate the incidence and etiology of intracranial hemorrhage in preterm infants receiving head computed tomography (CT) scans at a tertiary care center.**METHOD AND MATERIALS:** Radiological reports of head CT scans and medical charts of preterm infants aged 0–24 months at our tertiary care center from March 1995 to December 2003 were reviewed. Medical charts and reports were evaluated for presence, type, and location of hemorrhage, most likely etiology, and clinical outcome. For the purpose of this study, clinical outcome was based on follow-up data from medical charts and graded according to the scale: good, moderate, or severe.

* Faculty financial disclosures are located in the Faculty Index.

RESULTS: Two hundred eighteen head CTs were obtained of 177 premature patients (123 males, 54 females). The mean age at time of first head CT at the university hospital was 108 days after birth. Fifty (28%) of the 177 patients had evidence of intracranial hemorrhage (ICH). Twenty-three of these patients had had a prior ultrasound revealing the bleed. The most common types of hemorrhage were subdural hematoma (SDH) and intraventricular hemorrhage (IVH) in 54% and 50%, respectively. Twenty-one of the 50 patients had more than one type of hemorrhage, including all four patients with birth trauma. The first and second most common causes of hemorrhage were perinatal events (26%) and nonbirth trauma (20%), respectively. In eight of the 50 patients, no underlying etiology was documented. Twenty-three of the 50 patients with evidence of ICH had good clinical outcome. Out of 13 patients with ICH secondary to perinatal events, eight (62%) had poor clinical outcome, with three deaths. All three patients with accidental trauma had good clinical outcome, but all six patients with nonaccidental trauma had poor long-term clinical outcome, with one death. Six patients were either on ECMO at the time of head CT or had recently been on ECMO, with four of them having no other etiology for the identified hemorrhage.

CONCLUSION: Premature infants with evidence of ICH on CT have a 54% risk of having long-term clinical sequelae, with nonaccidental trauma patients at highest risk (100%).

(SS07-53) 2:10 PM
Evaluation of MR Perfusion and Imaging Changes with Dynamic Susceptibility Contrast MR Imaging in Recurrent Glioblastoma Multiforme in Response to Bevacizumab: Initial Clinical Experience

Carina W. Yang, MD, *Northwestern University Feinberg School of Medicine, Chicago, IL*; Sandra W. Horowitz, MD; Rahul Sawlani, BS; Wanyong Shin, MS; Maulin Shah, BS; Timothy J. Carroll, PhD; et al

PURPOSE: Parameters related to tissue perfusion have been shown to correlate with underlying pathophysiology in a number of neurological diseases. The purpose of this study is to evaluate dynamic susceptibility-weighted contrast-enhanced perfusion magnetic resonance imaging (DSC MRI) in assessing response of high-grade gliomas, such as glioblastoma multiforme (GBM), to bevacizumab (Genentech, San Francisco, CA), a monoclonal antibody which blocks vascular endothelial growth factor (VEGF). The tumoral changes in relative cerebral blood volume (rCBV) are reported, and correlation is also made to imaging findings.

METHOD AND MATERIALS: In this ongoing study, a retrospective review was performed of MR examinations of 24 patients with pathologically proven recurrent high-grade gliomas: GBM ($n = 21$), anaplastic astrocytoma ($n = 2$), and oligodendroglioma ($n = 1$). Baseline imaging immediately prior to initiation of bevacizumab and follow-up imaging approximately every 6 weeks were obtained. Imaging was performed on 1.5-T Magnetom Avanto (Siemens Medical Systems, Iselin, NJ) according to our departmental tumor protocol, which includes both a gradient-echo sequence and a spin-echo sequence. The tumors were evaluated for response to bevacizumab, with regard to contrast enhancement, FLAIR signal abnormalities, and changes in perfusion. Both perfusion metrics acquired by ROI and whole-tumor histogram rCBV analysis will be presented.

RESULTS: The MRI in six patients demonstrated persistent decreased overall tumor size and enhancement. In six patients, only transient improvement in tumor burden was seen. In three patients, there was improvement in tumor burden, but no further imaging was done. In two patients, there was no improvement in tumor burden, but again, no further imaging was done. Seven patients had no response to bevacizumab, one of whom subsequently expired. Detailed perfusion ratios are still to be determined and will be correlated to response and outcome.

CONCLUSION: MRI response of high-grade gliomas to the anti-angiogenic agent bevacizumab was seen. Response to therapy will be demonstrated and correlated with DSC MRI.

(SS07-54) 2:20 PM
Predicting Response to Bevacizumab in Patients with High-Grade Gliomas by Using MR-based Relative Cerebral Blood Volume Measurement Corrected for Contrast Agent Extravasation

Rahul Sawlani, BS, *Northwestern University Feinberg School of Medicine, Chicago, IL*; Timothy J. Carroll, PhD; Sandra W. Horowitz, MD; Jeffrey J. Raizer, MD* (r-sawlani@md.northwestern.edu)

PURPOSE: The purpose of this study was to evaluate dynamic susceptibility-weighted contrast-enhanced (DSC) perfusion MRI data in predicting response of high-grade gliomas to bevacizumab, a monoclonal antibody which blocks vascular endothelial growth factor (VEGF). DSC MRI measurement of relative cerebral blood volume (rCBV) assumes that the blood-brain barrier is intact and there is minimal leakage of contrast agent, which is not the case in the newly formed vessels of a primary brain tumor. We hypothesized that looking at the volume of hyperperfusion ($rCBV > 1.75$) relative to the tumor size can predict patient response to therapy. In addition, we looked at the predictive ability of this measurement after correction for contrast agent leakage.

METHOD AND MATERIALS: Ten patients with pathologically proven recurrent high-grade gliomas were evaluated. All patients received bevacizumab every 3 weeks at a dose of 15 mg/kg. Baseline images were acquired before administration, and follow-up images were taken every 6 weeks thereafter until (1) clinical or radiographic tumor progression or (2) death. Images were obtained on a 1.5-T Avanto MR scanner (Siemens) by using gradient-recalled echo (GRE) DSC imaging after injection of gadolinium (Gd)-based contrast agent. Image postprocessing and analysis were performed by using MATLAB R2006a.

RESULTS: Our data compare (1) the percentage drop in fractional volume with $rCBV > 1.75$ from before treatment to the first scan after start of treatment to (2) the number of days on study. Results show a correlation without correction for leakage, with shorter study lengths corresponding to a rise in rCBV (nonresponders) and a sudden increase in study length when looking at drops in rCBV (responders). Interestingly, there is a similar but less well-defined correlation after correction for leakage.

CONCLUSION: While the preliminary data show that there is a pattern that may be helpful in predicting patient response to therapy, more data are needed to make a statistically significant conclusion. As this project moves forward, collecting data by using quantification of CBV and a comparison to rCBV will allow us to draw further conclusions as to the predictive value of CBV in patient response.

(SS07-55) 2:30 PM
Patient Dose in Cervical Spine CT

Joshua W. McCain, MD, *Medical University of South Carolina, Charleston, SC*; Walter Huda, PhD; Scott Steenburg, MD; Uwe J. Schoepf, Jr, MD*

PURPOSE: To investigate organ and effective doses to adult patients undergoing cervical spine CT examinations.

METHOD AND MATERIALS: We collected data on 33 consecutive patients who underwent a cervical spine CT examination at our institution. All examinations were performed on a Siemens Sensation 64 scanner, operated using the body filter. We recorded CT technique factors (kV, effective mAs), as well as the displayed dose indices (CTDIvol and dose-length product). Organ doses and the corresponding effective dose were determined for a representative scan (120 kV; 230 effective mAs; 22-cm scan length), which permitted the determination of an effective dose per unit dose-length product value.

RESULTS: Average dose-related parameters for these patients were 230 ± 36 mAs, 18 ± 3 mGy for CTDIvol, and 412 ± 134 mGy-cm for the dose-length product. The highest organ dose was the thyroid gland, which receives 38 mGy, about four times higher than the brain (8.9 mGy) and the bone surfaces (10 mGy). The effective dose per unit dose-length product (E/DLP) factor for this type of examination was 0.0087 (body filter). The average patient effective dose was 3.6 mSv.

* Faculty financial disclosures are located in the Faculty Index.

CONCLUSION: Cervical spine CT E/DLP conversion factors (0.0087 mSv/mGy) are a factor of two lower than corresponding chest and abdomen E/DLP conversion factors. Effective doses to patients undergoing cervical spine CT examinations (3.6 mSv) are intermediate between typical head CT doses (1–2 mSv) and typical body CT doses (5–10 mSv).

(SS07-56) 2:40 PM
MR Findings in Acute Brachial Neuritis (Parsonage-Turner Syndrome)

Patrick S. Conklin, MD*, *St Vincent's Medical Center, Bridgeport, CT*; Joseph Gagliardi, MD; Freddie R. Swain, MD

PURPOSE: To demonstrate the MR findings in Parsonage-Turner syndrome by using patient case series.

METHOD AND MATERIALS: Multiple patients presented with shoulder pain and/or weakness for evaluation. Patients were evaluated with dedicated shoulder surface coils in multiple planes.

RESULTS: MR examination demonstrated patterns of isolated muscle atrophy without evidence of compressing mass or focal nerve lesion, leading to the diagnosis of Parsonage-Turner syndrome.

CONCLUSION: MR is an effective tool in the diagnosis of acute brachial neuritis. Familiarity with various MR appearances can lead to more accurate and consistent diagnosis of this condition.

(SS07-57) 2:50 PM
Intra- and Interobserver Variability in Cranial US Interpretation

Nicholas G. Kujala, BA, *Wayne State University School of Medicine, Detroit, MI*; Aparna Joshi, MD; Jeffrey M. Zerin, MD; Wilbur L. Smith, Jr, MD; Ronald Thomas

PURPOSE: The purpose was to determine the interobserver variability in cranial ultrasound interpretation among radiologists and neonatologists.

METHOD AND MATERIALS: Three CAQ-certified pediatric radiologists and three neonatologists independently reviewed 58 neonatal cranial ultrasound studies performed at our institution on premature infants born between 24 and 32 weeks gestation. Reviewers scored each ultrasound for the grade of intracranial hemorrhage, degree of ventricular dilatation, and presence of increased periventricular echogenicity. The κ coefficient was then calculated to assess interobserver agreement among the reviewers.

RESULTS: For right-sided pathology on the 58 studies, an estimated κ , asymptotic standard error, and test of null hypothesis of 0 population value were obtained for all six readers: κ , -0.03810959; ASE, 0.03304212; Z value, -1.15336389; and P value, .24876106. The left-sided pathology results were: κ , -0.19317225; ASE, 0.04216824; Z value, -4.58098929; and P value, .00000463.

CONCLUSION: At this time, there exists significant variability among the six readers and their interpretations of 58 cranial ultrasound studies. Further investigation will take place to determine the consistency of results among radiologists and neonatologists. The 58 studies will be read again by the same six readers within the next month. At that point, intrareader variability will be determined.

(SS07-58) 3:00 PM
Intravenous Contrast Material for Initial Head CT Evaluation of New-Onset Headache: Is There Added Diagnostic Utility?

Jessica Y. Leung, MD, *University of Washington, Seattle, WA*; Franklin Liu; Fidel C. Rebeles, MD; William Hollingworth, PhD; James R. Fink, MD (jyleung04@yahoo.com)

PURPOSE: Head CT is often used for initial imaging of adults with new-onset headache. In this retrospective study, we evaluated the diagnostic accuracy of noncontrast head CT (NECT) compared to pre- and postcontrast head CT (CECT) for evaluation of new-onset headache.

METHOD AND MATERIALS: A database of all radiological examinations performed at our institution between 1/1/00 and 8/31/06

was searched for all head CECT studies where the indication included "headache" and/or "migraine." Cases were limited to adults with new-onset headache and no known predisposing factors for intracranial pathology. Our data set included 113 head CECT studies, for which each study was subdivided into NECT and CECT examinations. Two fellowship-trained neuroradiologists who were blinded to all subject data except stated examination indications reviewed all 113 studies; 226 studies were reviewed. NECT portions were reviewed for the presence of bleed, sinus disease, mass, aneurysm, other abnormalities, and the need for additional imaging. CECT examinations were later evaluated by using the same parameters, and the postcontrast portions were subjectively graded for the "utility of contrast" on a four-point scale. CECT interpretations were considered "gold standard" for calculation of diagnostic accuracy.

RESULTS: Our study population of 113 patients included 60 females and 53 males (mean age, 44 years; range, 19–86). Of 226 cases, 46 (20.4%) were categorized as "positive" for findings that could explain new-onset headache. Of these 46 cases, the "positive" findings were missed on the NECT review in five cases (false-negative rate, 2.2%; 95% CI, 0.3%–4.1%). In five other cases, CECT review led to negation of a significant finding detected on NECT alone (false-positive rate, 2.2%; 95% CI, 0.3%–4.1%). Sensitivity and specificity of NECT compared to CECT were 89.1% (95% CI, 85.0%–93.2%) and 97.2% (95% CI, 95.1%–99.4%), respectively.

CONCLUSION: CECT is of limited incremental utility compared to NECT in evaluation of patients with new-onset headache. Additional risks and costs of CECT should be carefully considered when imaging this patient group.

(SS07-59) 3:10 PM
Use of Human Tissue Simulators (Phantoms) for Training of Radiology Residents for US-guided Interventional Procedures

Tariq A. Hameed, MBBS*, *Indiana University, Indianapolis, IN*; Jennifer Steele, MS; Ronald Fraley

PURPOSE: The purpose was to assess if training of radiology residents for US-guided interventional procedures by using human tissue simulators (commercially available phantoms) improves the confidence and skills of the residents prior to performing the procedures on patients.

METHOD AND MATERIALS: The study comprised 14 first-year residents. These were divided into two groups of seven each. Commercially available small and large phantoms to simulate breast and liver with target lesions were evaluated. Large phantom was evaluated for freehand technique as well as with needle guide. Small phantom was evaluated for freehand technique. Residents were evaluated for their subjective confidence in performing US-guided procedures by a questionnaire on a five-point scale. The performance of the US-guided procedure was evaluated on the basis of time in identifying and hitting the target lesion with a needle by using US guidance. Group 1 was evaluated before and after self-based practice/training session on US phantoms with target lesions. Group 2 was also given dedicated training on the phantom prior to the self-based practice/training session and was evaluated before and after teaching and after self-based practice/training. Paired two-tailed *t* test was utilized.

RESULTS: Subjective confidence of the residents in performing US-guided procedures improved significantly ($P < .01$) in both groups. Time to perform the procedures decreased for both groups, which was significant in group 2 but not in group 1. There was no significant difference in the time after self-based practice between group 1 and 2. There was very high variation among residents for the time measurements to perform a procedure, and this reduced the ability to detect significant differences.

CONCLUSION: Human tissue simulators (US phantoms) are useful in the training of radiology residents for US-guided interventional procedures, as these improve the confidence and skills of the residents. Commercially available phantoms can be utilized to train radiology residents for US-guided procedures prior to performing the procedures on patients.

* Faculty financial disclosures are located in the Faculty Index.

GERRAF Session

Location: Willow A

Moderator: Ronald L. Arenson, MD*

RS

Cost-effectiveness of Screening for Hepatocellular Carcinoma in Cirrhotic Patients

Cynthia S. Santillan, MD*, *University of California San Diego, San Diego, CA* (csantillan@ucsd.edu)

PURPOSE: To determine the cost-effectiveness of screening for hepatocellular carcinoma (HCC) in patients with cirrhosis using different imaging modalities while adhering to current clinical practice guidelines.

METHOD AND MATERIALS: A Markov Monte Carlo simulation model was developed to simulate screening of patients with cirrhosis secondary to hepatitis C virus (HCV) infection. The model will initially be used to evaluate screening with ultrasound, computed tomography, or magnetic resonance imaging in comparison with no screening. The patients will undergo screening every 6 months. Patients who are found to have an HCC that is not in an advanced stage may undergo local ablative therapies (such as radiofrequency ablation or transarterial chemoembolization), have a resection, have continued close follow-up, and/or receive a liver transplant. Patients with advanced disease may undergo palliative therapies. Those patients with stage T2 HCC on presentation or who can be down-staged to stage T2 using local treatment will also receive priority on the transplant waiting list for a liver transplant. Patients who do not have evidence of HCC on initial screening will be rescreened in 6 months. Throughout the model, the patients will also continue to experience morbidity and mortality due to their underlying cirrhosis, as well as be eligible for transplant based solely on the severity of their cirrhosis. Costs and outcomes will be discounted at an annual rate of 3%.

RESULTS: The initial cohort is a population of 50-year-old patients with cirrhosis and a MELD score of 10. If these patients are not screened for HCC and are not offered liver transplantation, the model estimates a discounted life-expectancy of 55.4 years at a cost of \$5,100 per year of life. Offering liver transplantation on the basis of the MELD score results in an incremental cost-effectiveness ratio of \$51,040 per year of life saved.

CONCLUSION: A Markov Monte Carlo simulation model for a population of patients with cirrhosis due to HCV has been developed. Ongoing work will focus on refining the screening arm of the model, which can then be used to produce estimates of the costs and cost-effectiveness of the various screening strategies.

Development and Application of a Predictive Model for Breast Carcinoma Using MRI Features and Patient Characteristics

Wendy B. DeMartini, MD*, *Seattle Cancer Care Alliance, Seattle, WA*; Constance D. Lehman, MD, PhD*; C. Craig Blackmore, MD, MPH*

PURPOSE: MRI is an important new tool for the detection and characterization of breast carcinoma. Assessment of MRI lesions is challenging due to moderate specificity and the need to consider multiple imaging and patient features. We hypothesize that combinations of Breast Imaging Reporting and Data System (BI-RADS) MRI features and patient characteristics can be used to predict the probability of malignancy for lesions identified on breast MRI. Our objective is to develop a multivariate model that predicts the likelihood of malignancy for lesions with different characteristics.

METHOD AND MATERIALS: This is a retrospective cohort study of all patients with MRI-detected breast lesions assessed to be BI-RADS 3 (probably benign), BI-RADS 4 (suspicious abnormality), or BI-RADS 5 (highly suggestive of malignancy) from 5/03 to 11/06 at our institution. Benign versus malignant outcomes are determined by results of biopsy, MRI follow-up, and linkage with the Western Washington Cancer Surveillance System (CSS) registry. The following variables will be compared for benign and malignant lesions: (1) MRI features of size, morphology, and kinetics; (2) patient characteristics of clinical indication leading to MRI, age, and mammographic breast density. Univariate analyses will identify the variables most strongly associated with malignancy. Subsequent multivariate analyses will use those variables to generate a predictive model.

RESULTS: The outcomes for lesions with biopsy or imaging follow-up have been determined. Lesions without follow-up have been identified and linked to the CSS. Results to-date are: 1117 lesions total, 367/1117 (33%) with no documented follow-up, 750/1117 (67%) with follow-up, of which 581 (77%) are benign and 169 (23%) are malignant. Initial univariate analysis is ongoing and will be followed by development of the multivariate predictive model.

CONCLUSION: If validated in a larger study, a predictive model for malignancy could aid in clinical decision making by identifying breast MRI lesions with feature combinations conferring a sufficiently low probability of malignancy to avoid imaging follow-up or biopsy.

Cost-effectiveness Analysis of Percutaneous Biopsy in the Diagnostic Workup of the Small Solid Renal Mass

Marta E. Heilbrun, MD*, *University of Utah, Salt Lake City, UT* (marta.heilbrun@hsc.utah.edu)

PURPOSE: The purpose of this study is to evaluate if adding percutaneous biopsy to the diagnostic workup of renal masses that meet imaging criteria of a T1a tumor (4 cm or smaller and limited to the kidney, without spread to lymph nodes or distant organs) will be cost-effective by preventing patients from undergoing unnecessary treatment.

METHOD AND MATERIALS: A simple decision model will be constructed with four arms comparing percutaneous biopsy, surgical treatment, percutaneous treatment, and imaging surveillance. Rates of mortality and morbidity associated with small renal masses and their treatments, and the efficacy of the different arms of the model will be obtained from the published medical literature. Utility states will be extracted from general utility scores from patients with malignancies and end-stage renal disease, as these have not been directly measured in patients with RCC. After the decision model is created, a cost-effectiveness analysis will be added utilizing cost center information from a limited data set based on the clinical database at Wake Forest University/North Carolina Baptist Hospital. Best-guess assumptions will be made where the published and available data are insufficient and will be tested in a sensitivity analysis. If the decision model proves to be too limiting in its format to extract useful conclusions, the model will be converted to a Markov model.

RESULTS: Preliminary literature search suggests that between 16%–44% of solid renal masses are benign on resection. A definitive negative/benign diagnosis is made on a percutaneous biopsy for between 5%–33% of biopsies. Efficacy data comparing surgical treatment, ablation to watchful waiting are being reviewed. The initial steps of creating a clinical database that can be used to extract a limited data set regarding cost data in the percutaneous biopsy and treatment of renal lesions are in place.

CONCLUSION: This is the midterm progress report of a 2-year project, the first component of which is primarily focused on intensive course work in study design, epidemiology, and statistical modeling. The analysis is incomplete to determine if percutaneous biopsy will be cost-effective in the workup of the small solid renal mass.

* Faculty financial disclosures are located in the Faculty Index.

Evaluation of Hyperpolarized ^3He MRI in Young Adults with Asthma: Assessment of Technology and Functional Ventilatory Status

Edward Y. Lee, MD*, *Children's Hospital, Boston, MA*

PURPOSE: To evaluate prospectively ^3He MRI for its ability to facilitate early diagnosis, identify areas of impaired ventilation, assess disease activity, and aid in treating young adults with asthma.

METHOD AND MATERIALS: Twenty (20) healthy and twenty (20) asthmatic young adult study subjects will undergo hyperpolarized ^3He MRI and pulmonary function testing (PFT). We will, first, compare the ventilation status of enrollees *with and without* asthma; second, evaluate ventilation function in asthma patients during acute versus recovery phases; and third, compare the results of MRI to those produced by PFT. We will perform data analysis with respect to ventilation function using the Student's *t*-test or Mann-Whitney U-test, as appropriate. We will compare asthma patients during the acute vs. recovery phases using a paired sample approach (paired *t* or Wilcoxon signed-ranks test); we will compare the ventilation function of patients and controls; and we will evaluate the correlation between ^3He MRI and PFTs using the Kolmogorov-Smirnov test.

CONCLUSION: To date, nine healthy young adult study subjects have successfully undergone both hyperpolarized ^3He MRI and PFT. Once all study data are collected and analyzed, we anticipate hyperpolarized ^3He MRI will prove *equal or superior* to PFT in (1) assessing areas of impaired lung function; (2) evaluating the degree of disease activity; and (3) facilitating early diagnosis and treatment without exposure to the potentially harmful effects of ionizing radiation. Assuming feasibility is established, we ultimately aim to transfer this promising technology from young adults to children with asthma and other lung diseases, which is our long-term goal.

Reducing Cardiovascular Risk: Tailored Patient Education Using Screening CT for Coronary Artery Disease in a Teachable Moment

Paul P. Cronin, MBBCh*, *University of Michigan Health System, Ann Arbor, MI*

PURPOSE: SPECIFIC AIM 1: To determine the prevalence of undiagnosed CAD in patients undergoing chest CT for noncardiac indications using coronary CT angiography (CTA). a. To correlate unsuspected CAD prevalence with Framingham risk factors. b. To correlate unsuspected CAD severity and the level of sub/clinical symptomatology in patients. *Study Design:* A prospective cohort study to quantify the prevalence of CAD in patients undergoing thoracic CT, as a surrogate population for screening at-risk patients for CAD, with ascertainment of patient characteristics and cardiovascular risk factors. The protocol and informed consent are subject to IRB approval and are currently undergoing a second round of assessment at the IRB. *Outcomes Measured:* The overall prevalence of CAD will include all patients with a calcium score >0 , and/or and noncalcified plaque on coronary CTA, stratified into those with mild, moderate, and severe CAD.

SPECIFIC AIM 2: To evaluate the use of the screening coronary CTA as a teachable moment for cardiovascular disease risk reduction by delivering educational and tailored clinical information. *Study Design:* A survey instrument assessing current lifestyle habits and intentions to adopt or maintain cardiovascular risk reducing behaviors (smoking cessation, healthy diet, ideal weight, and regular exercise) will be administered. Patients will receive publicly available educational print material on cardiovascular risk reduction. *Questionnaire:* The questionnaire will be composed of standard questions for assessment of current cardiovascular risk reducing behavior and intentions for future adoption or maintenance of these behaviors. *Educational Intervention:* Educational print material will include materials from the American Heart Association on CAD risk factors, dietary improvements and weight control, and optimizing physical activity. Subjects who indicated they were current smokers will also receive materials on smoking cessation.

SPECIFIC AIM 3: To correlate unsuspected CAD severity on coronary CTA with physician decision-making and treatment strategies. *Study Design:* The patients' referring physician will receive a survey to assess the

physician's intention to treat or alter treatments based on the results. Six months after the CT scan, a similar survey instrument assessing treatment will be re-administered to assess actual treatment changes.

Creating a Framework for Analyzing "Hidden" Variables in Imaging Research, with a Case Study Assessing the Effect of Extended Work Hours on Task Vigilance

Nabile M. Safdar, MD*, *University of Maryland Medical System, Baltimore, MD*

PURPOSE: Our purpose is to develop and pilot test a PACS-based methodology designed to seamlessly "seed" research images into radiologists' daily interpretation workflow. By enabling a workflow that is potentially indistinguishable from routine interpretation activities, we hope to establish a methodologic framework within which substantial research into factors (for example, extended wakefulness, age, biases based on gender and ethnic cues about patients, etc.) affecting radiologist performance may be assessed. Furthermore, we plan to use that system to evaluate the role late-night shifts and extended wakefulness may have in affecting diagnostic accuracy.

PROGRESS REPORT: Progress in the development of a PACS-based application to seed research studies into the clinical workflow will be reviewed. The project is ongoing, but initial results are encouraging. Initial field tests were performed in which 20 radiologists and IT staff were given the opportunity to interact with clinical worklists containing research studies. When offered three trials to identify the research study from among the clinical studies, there was only one successful identification among the 60 attempts. Policy and ethical issues specific to the project and concerns raised by departmental and hospital administrators will be discussed. Progress made in the recruitment of radiologists for the testing of the system to evaluate the role of extended wakefulness on affecting diagnostic accuracy will be reviewed.

Utilization and Therapeutic Efficacy of FDG PET in the Evaluation of Patients with Colorectal Cancer Following Curative Resection

Hanna M. Zafar, MD*, *University of Pennsylvania Health System, Philadelphia, PA*

Colorectal cancer is the second leading cause of cancer-related death in the United States. Approximately 75% of patients with newly diagnosed colorectal cancer present with stage I, II, or III disease and are treated with curative resection. Despite this high resection rate, up to 40% of patients treated with curative resection experience recurrent or metastatic disease. Medicare began to reimburse for fluorodeoxyglucose positron emission tomography (FDG PET) in the diagnosis, staging, and restaging of colorectal cancer in July 2001. Among patients with colorectal cancer status post curative resection, FDG PET has been shown to be more sensitive and specific than CT alone for the evaluation of suspected recurrent or metastatic disease. Despite this, recommendations for FDG PET have been incorporated into few specialty society guidelines for management of this population. This project aims to determine (a) trends in utilization and (b) therapeutic efficacy of FDG PET in the follow-up of this population by using two different databases. First, we will measure the adoption and utilization of FDG PET imaging in patients with stage I, II, or III colorectal cancer who have undergone curative treatment between 1998 to 2004 by using Medicare claims data linked to tumor registry data (Surveillance Epidemiology and End Results). Using this national database to study patients, we will assess the following: (1) examine trends in FDG PET utilization following reimbursement changes in July 2001; and (2) measure appropriate utilization of FDG PET by using a single proven indication—utilization of FDG PET prior to intervention. Second, we will use aggregated clinical data from an integrated health system to evaluate adoption and therapeutic efficacy of FDG PET among patients who have undergone potentially curative treatment for stage I, II, or III colorectal cancer. Patients will be identified by using the health system pathology database between 1998 to 2004 and refined through an electronic clinical database to study the following: (1) establish whether patients in whom FDG PET demonstrates operable disease

* Faculty financial disclosures are located in the Faculty Index.

have improved survival compared to those patients in whom FDG PET demonstrates inoperable disease; and (2) determine if FDG PET improves accuracy of detecting recurrent or metastatic disease, thereby avoiding futile interventions in inoperable disease. Results of this work will direct future education of ordering physicians in the appropriate use of this modality and will serve as a construct for future prospective research in therapeutic efficacy of FDG PET.

Saturday, March 29, 2008
4:00–5:15 PM

SS08: AUR Scientific Session 08
Education and Training II (Papers 60–66)

Location: Willow A

Moderator: Robert A. Novelline, MD

ED

(SS08-60) 4:00 PM

How Do I Write Letters of Recommendation for Medical Students Going into Radiology?

Judith K. Amorosa, MD, *UMDNJ-New Jersey Medical School, Newark, NJ* (amorosa@umdnj.edu)

PURPOSE: In the increasingly competitive field of diagnostic radiology, medical students are looking for letters of recommendation (LORs) which will increase their chances of matching into the program of their choice. The LOR is one data point in their overall application process. I present a systematic approach to gathering data and writing LORs.

METHOD AND MATERIALS: I have reviewed 60 LORs which I had written over the last 7 years for medical students applying to diagnostic radiology residency programs from our medical school. I have created a database containing the essential points of information necessary to write a comprehensive LOR. From this database, I present the challenges and optimal ways of presenting data. I have reviewed the match rate of our students for whom I have written LORs.

RESULTS: The data set includes personal statement, review of preliminary transcript, and analysis of CV items, including education, research, personal goals, and accomplishments. Meeting with the student (unless I have worked with him/her in the past) to assess personal attitudes, enthusiasm, demeanor, discussion of goals, and personal issues is another point in the data set. Over the last 7 years, 98% of the 60 students for whom I have written LORs successfully matched into diagnostic radiology. How heavily LORs are weighted by programs is a very subjective issue, and therefore the effectiveness of the LOR is speculative.

CONCLUSION: LORs are required by diagnostic radiology programs. I present my method of preparation and writing LORs for medical students applying to diagnostic radiology programs.

(SS08-61) 4:10 PM
The Resident Passport

Barbara N. Weissman, MD*, *Brigham and Women's Hospital, Boston, MA*; Bruce Boynton; Michael Baldwin, MD; Jenna M. Hastings; Anna M. McCormick; Steven E. Seltzer, MD (bweissman@partners.org)

PURPOSE: We have initiated a passport for 1st-year residents, designed to facilitate communication between residents and staff in an effort to improve performance, feedback, and learning.

METHOD AND MATERIALS: A passport-style booklet was created for each entering resident. Each page was designed for a specific clinical rotation. Three areas were common to all pages, providing lines for the staff to sign indicating that (1) expectations had been discussed with the resident at the start of the rotation, (2) feedback had been provided at the midpoint of the rotation, and (3) feedback had been provided at the end of the rotation. Certain critical tasks and skills were verified by the staff as complete or incomplete.

RESULTS: For optimal performance, a resident must be aware of the expectations placed upon him/her during a particular clinical service.

Often, these expectations are inadequately conveyed or incompletely understood. In addition, for staff to provide effective feedback, expectations should be clear and communication timely. The passports were carried by the entering-year class for the first 6 months of residency. The staff and residents felt communication improved and expectations were clarified.

CONCLUSION: The passports developed for our 1st-year class provided a structure helpful for communicating expectations and feedback to residents. They also reminded staff of their responsibility to provide this information in a timely way and facilitated this communication. Once these habits have been inculcated, it may not be necessary to continue to use these printed passports.

(SS08-62) 4:20 PM

Impact of a Radiology Elective Offered to Preclinical Medical Students in Stimulating Interest in a Career in Radiology and in Changing Students' Perceptions and Improving Students' Understanding of the Field of Radiology

Manisha Bahl, BA, *University of California, San Francisco, San Francisco, CA*; Richard S. Breiman, MD (manisha.bahl@ucsf.edu)

PURPOSE: To assess the impact of a radiology elective offered to preclinical medical students in stimulating interest in a career in radiology, changing perceptions of the field, and improving understanding of the appropriate utilization and basic interpretation of radiographic examinations.

METHOD AND MATERIALS: Twenty-two students voluntarily enrolled in a 10-week student-coordinated radiology elective. A 1-hour lecture was delivered every week by an attending radiologist in each of the major radiologic subspecialties. At the conclusion of the course, students completed a questionnaire detailing their pre- and postcourse attitudes.

RESULTS: Seventeen of 22 enrolled students completed an online anonymous evaluation form. As compared to their attitudes before the course, students reported a stronger interest in pursuing a career in radiology after completing the course ($P < .05$). Students reported stronger agreement with the statements that "radiologists provide vitally important care through the treatment of disease" and that "radiology is an exciting field of medicine that utilizes cutting-edge technologies" after the course as compared to before (all $P < .05$). Student agreement with the statement that "radiologists provide vitally important care through the diagnosis of disease" remained high before and after the course. Students also reported a significant increase in their understanding of the various subspecialties in the field of radiology; in their understanding of the fundamental theory, clinical utility, and limitations of various imaging modalities; and in their ability to read and interpret radiographic images (all $P < .001$).

CONCLUSION: A radiology elective offered to preclinical medical students significantly stimulated student interest in pursuing a career in radiology, heightened student awareness of the importance of diagnostic and interventional radiology, and improved student understanding of the use of various imaging modalities and self-perceived ability to read and interpret radiographic images.

(SS08-63) 4:30 PM

Problem-solving Algorithm

Joshua A. Becker, MD*, *NYU Medical Center, New York, NY*

PURPOSE: The medical student, in patient evaluation, is faced with symptoms and clinical findings. A need for imaging will evolve as part of a diagnostic algorithm. The design of this small-group learning tutorial emphasizes the need for a logical approach incorporating imaging factors as to efficiency, possible hazard, cost, etc.

METHOD AND MATERIALS: A series of four to six clinical vignettes, giving history, complaints, and associated laboratory information, represent a database within the problem-solving tutorial. These vignettes are organized in specialty areas of chest, GI, pediatrics,

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GU, musculoskeletal, interventional, and ER radiology. Teams consisting of four to five students, dependent upon elective enrollment, are formed. The teams develop a group consensus algorithm designed to make a diagnosis with an emphasis upon imaging. The students construct their algorithm in one PowerPoint frame. This PowerPoint presentation is e-mailed to the Medical Student Learning Lab coordinator. The specialty attending created a PowerPoint presentation of appropriate images to illustrate findings associated with specific disease(s). The students are not responsible for image acquisition. The algorithm is inserted as the frame after the clinical vignette. The students rotate cases in presentation of the algorithms to the class and specialty attending. The attending emphasizes the pros/cons and criteria for the diagnosis.

RESULTS: Small-group learning sums the knowledge and experiences of the participant students—an advantage over solo efforts. The team students participate in all the case material. The team students present to their classmates and attending—far better than a formal attending lecture. A positive factor for the attending is the different approaches with each student group. End-of-course examination confirms the success in learning by this method.

CONCLUSION: Students working in small groups come to a consensus work-up of the patient and have their efforts confirmed by a panoply of images and discussion by the attending. Their classmates are a welcoming audience.

(SS08-64) 4:40 PM

Utilization of Volume Image Processing Protocol to Improve US Work Flow and Resident Training

Susan J. Ackerman, MD; Dobrinka Dimitrova, MD, *Medical University of South Carolina, Charleston, SC*; Abid Irshad, MD

PURPOSE: Volume image processing is a new technology that enables one to increase efficiency and work flow of examinations by obtaining the volume data during the scans. The volume imaging protocol stores the volume data in real-time sequences, and these can be viewed at a later time and manipulated by postprocessing to reformat the images in different planes. For routine examinations, the patients can be released without waiting for the technologist to show the studies to the radiologist.

METHOD AND MATERIALS: GE LOGIQ 9 ultrasound system was used to acquire the raw data. A GE LOGIQworks workstation was used to analyze and manipulate the data. Real-time volume-acquiring sweeps through various organs were incorporated along with the static images. The data were saved for postprocessing, if needed.

RESULTS: Volume imaging showed significant improvement in the work flow and efficiency of US scanning. The real-time sweeps were valuable in oral board examination preparation for the residents.

CONCLUSION: Volume image processing increases the scanning efficiency in a busy academic practice and enables the residents to benefit from it by evaluating the time frame sweeps or cine images for preparation of oral board examinations.

(SS08-65) 4:50 PM

Distribution of Contrast Material in the Wrist on MR Arthrography: A Review of Tendon Sheath Filling

Charles M. Hubeny, MD, *University of Rochester Medical Center, Rochester, NY*; J. Carmen Timberlake, MD; Gwy Suk Seo, MD; Johnny U. Monu, MD (carmen_timberlake@urmc.rochester.edu)

PURPOSE: Filling of tendon sheaths is a common observation on wrist MR arthrograms. The literature is mostly silent on the significance, if any, of this observation. The purpose of this study is to determine which tendon sheaths fill on MR arthrography and the significance of fluid and/or contrast material in various tendon sheaths during MR arthrography.

METHOD AND MATERIALS: Wrist arthrograms performed over a 30-month period (January 2005–July 2007) were identified. MR images were reviewed for the presence and the location of contrast within tendon sheaths. Tendon sheaths are designated by dorsal compartment

(I–VI). The radiologic observations were then correlated with symptoms, physical examination findings, and surgical findings.

RESULTS: There were 53 MR arthrograms performed on 25 males and 28 females aged between 16 and 60 years (mean = 38 years). Contrast filled dorsal tendon sheaths in compartment II or III in 63% of cases and filled both dorsal tendon sheaths II and III in 53% of cases. Contrast was present in tendon sheath locations IV and VI in 12% and 10%, respectively, and was present on only one occasion (2%) in tendon sheaths of compartment V. When fluid that did not contain contrast was present in tendon sheaths, the overall distribution pattern among the six dorsal compartments was similar to that seen with contrast filling of tendon sheaths. Review of clinical information and surgical findings reveals no convincing correlation with the pattern of contrast and/or fluid distribution within tendon sheaths.

CONCLUSION: Contrast filling of dorsal tendon sheaths in compartments II and III is a frequent observation in MR arthrography of the wrist. Our study suggests that the presence of fluid in these tendon sheaths may be considered a non-clinically significant finding, either an incidental normal finding or related to arthrographic technique. Additional study of the distribution of synovial fluid within tendon sheaths in patients who have undergone conventional MRI of the wrist, rather than MR arthrography, may further clarify which tendon sheaths are commonly surrounded by fluid. Our study suggests that distribution of synovial fluid is similar to observed contrast distribution.

(SS08-66) 5:00 PM

Using MR Imaging to Differentiate Septic Arthritis from Transient Synovitis

Sara A. Majewski, MD, *University of Rochester School of Medicine and Dentistry, Rochester, NY*; Malin Cesarz, MD; Uchendu Azodo, MD; Gregory Dieudonne, MD; Gwy Suk Seo, MD; Johnny U. Monu, MD

PURPOSE: Joint aspiration and microbiologic study of the aspirate are the basis for the diagnosis of septic arthritis. However, transient synovitis presents similarly to septic arthritis in children. There has been suggestion in the literature that MRI observations can reliably distinguish septic arthritis from transient synovitis.

METHOD AND MATERIALS: A 10-year review of the English literature was performed. Articles supporting the use of magnetic resonance imaging alone to separate these two entities were identified, and criteria advocated by the authors of these articles were culled and summarized. Our radiology database was queried for patients aged 1–17 years who have had MRI and joint aspiration to evaluate a septic joint. The MR images were reviewed by using criteria advocated by earlier authors. Review was performed by three radiologists who were blinded to the microbiology findings. Criteria advocated by earlier authors include presence of and degree of effusion, whether unilateral or bilateral, and presence of and degree of marrow enhancement following IV contrast administration.

RESULTS: Ten patients (five boys and five girls) were found who satisfied our criteria. Three aspirates (from one boy and two girls) were infected on microbiologic studies. No infective organisms were isolated from the aspirates of the other patients (four boys and three girls). By using the criteria advocated by the earlier authors, four patients were predicted to have septic arthritis, two cases were felt to be aseptic joint, and three cases were considered equivocal. Correlating with microbiology showed that only one case of septic joint was predicted accurately. One septic joint had MRI findings that were considered equivocal.

CONCLUSION: Although transient synovitis is a diagnosis of exclusion and MRI may give additional information in cases of joint pathology, MRI should not be used as a stand-alone technique to accurately differentiate between septic arthritis and transient synovitis.

* Faculty financial disclosures are located in the Faculty Index.

AUR 2008 Scientific Poster Abstracts

Scientific posters are located in Grand Ballroom B. Each poster will be presented by its author during one of four *AMA PRA Category 1 Credit™* poster sessions scheduled for Thursday and Friday. The day and start time follow the presentation number.

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

(P-01) Thursday • 10:00 AM Retrospective Analysis of Clinical Breast MR Imaging, Breast US, and Mammography in Correlation with Surgical Pathology in Patients Diagnosed with Breast Cancers

Refky Nicola, DO, *UMDNJ-Cooper University Hospital, Voorhees, NJ*;
Lydia Liao, MD, PhD; Elizabeth Tinney (rnicola04@yahoo.com)

PURPOSE: A retrospective analysis of breast MRI, ultrasound, and mammographic studies from a women's outpatient imaging center was performed and compared to surgical pathology in patients who were diagnosed with breast cancer. The sensitivity for each modality is calculated. The factors impacting on the sensitivity of each modality are analyzed and described in detail from a case-by-case illustration. Comparison of breast cancer size on pathological specimen has been made to the measurement determined by breast MRI, ultrasound, and mammogram for size correlation.

METHOD AND MATERIALS: Twenty patients with known breast cancer who underwent surgical excision/mastectomy in our center from April 2006 to July 2007 have had staging breast MRI before surgery, in comparison with a second-look breast ultrasound or diagnostic mammography (images and/or reports of breast ultrasound or mammography if the studies were performed at an outside institution). Siemens Espree 1.5T with a specialized seven-channel breast coil (In-vivo) was used for breast MRI studies. Philips iU22 with a 5–12-MHz linear probe (SonoCT, XRES, and Harmonics) was used for primary or second-look breast ultrasound studies. Siemens Mammomat 300 was used for diagnostic mammography.

RESULTS: The sensitivity is 100% (20/20) for breast MRI, 82% (9/11) for breast ultrasound, and 66% (10/15) for mammography. Breast ultrasound is less sensitive for fatty breast, while the sensitivity of mammography is significantly weakened by dense breast tissue. Breast MRI correlates best with the tumor size, with surgical pathology used as the gold standard, when compared to breast ultrasound or mammography, especially for multicentricity analysis.

CONCLUSION: Although breast MRI has the highest sensitivity among all three modalities, its specificity is suboptimal, which could result in increased numbers of invasive procedures. Combining three modalities, especially the second-look target breast ultrasound and/or previous imaging studies, for comparison can improve the specificity of breast MRI. Breast MRI is the best modality for imaging evaluation of tumor size.

(P-02) Thursday • 3:30 PM Enhancing Partnership in Patient Care: Internal Medicine's Evaluation of Radiology Services, Including Nighthawks

Luke Maj, MD; Homer O. Wiland IV, BS, *NEOUCOM, Canfield, OH*;
Linda Ha, MD; Joseph R. Grajo, BS; Emily L. Albertson, BS; Craig M. Johnson, DO; et al (hwiland@neoucom.edu)

PURPOSE: This study assesses the satisfaction of internal medicine physicians with their respective hospital radiology services within five of the hospitals in the Northeastern Ohio Universities College of Medi-

cine consortium. Satisfaction focused on communications, resources, availability, and accuracy.

METHOD AND MATERIALS: A voluntary 20-question survey was developed and distributed.

RESULTS: Seventy-one physicians participated in the study. 1% of internists claim "outstanding" communication with their in-house radiologists, 47% "satisfactory," 31% "good," and 20% "poor." 99% of internists feel that their hospital's radiology department is adequately equipped. 78% believe that digital imaging has improved patient care; however, 21% are unsure of its impact. 6% of internists are very satisfied with their radiologists' accuracy, 69% satisfied, 20% undecided, and 6% unsatisfied. 4% of internists believe that availability of results delays important decisions in patient care. 82% state that their hospital uses an overnight nighthawk service, but 76% would prefer in-house overnight radiology service. Individual comments could not be statistically analyzed.

CONCLUSION: Surveyed internists are satisfied with their communication with radiologists. They are also satisfied with the impact of digital imaging. Most approve of their radiologists' accuracy and timeliness of producing results. We also saw a strong desire to abandon nighthawk reading services and adopt in-house overnight radiologists. These results suggest a trend toward increasing interaction between internists and in-house radiologists to optimize patient care, which partly has been taken away by nighthawks. On the basis of each question, the surveyed internists also provided valuable information in the comments sections on what they would like to see changed in radiology.

(P-03) Friday • 10:00 AM Scintigraphic Patterns of Transthoracic Tc-99m MAA Injection for Intraoperative Localization of Small Lung Nodules



Bora Lee, MD, *University of Virginia, Charlottesville, VA*

PURPOSE: Histology of small pulmonary nodules may be required when there is high risk for primary or secondary malignancy. Subcentimeter pulmonary nodules cannot be biopsied reliably percutaneously. Thoracoscopic excision of small nodules or larger ill-defined lesions is limited by the inability to see, palpate, or instrumentally locate these lesions, which results in conversion to open thoracotomy or thoracoscopic removal of a larger specimen. Both maneuvers may result in increased morbidity and mortality. CT-guided transthoracic injection of Tc-99m MAA near the target lesion for intraoperative probe localization of lung nodules has been reported in the surgical literature. With IRB approval, we retrospectively reviewed the scintigraphic results of our experience with this procedure.

METHOD AND MATERIALS: Medical and PACS records of all patients who underwent the procedure from 2004 to 2006 were reviewed. Scans were classified as typical if preoperative scan demonstrated solitary focal uptake in the lung near the lesion. All others were classified as atypical. Scans were further characterized by patterns. Complications related to injection and surgical outcome were recorded.

* Faculty financial disclosures are located in the Faculty Index.

RESULTS: Complete records were available for 87 patients: 85 had scans; 87 went to surgery. There were 33 typical and 52 atypical scans. Of 52 atypical, 43 were found with intrathoracic activity in more than one focus: 5 endobronchial, 8 dispersed in pleural space, 5 multifocal, 14 lymph node (LN), and 11 other intrathoracic. Extrathoracic activity was present in 6 (2 skin/external contamination; 2 GI tract; 2 GI tract plus LN). In two, no scan was obtained due to OR schedule (delay from complications during injection). Dispersed activity was associated with pneumothorax in 6/8 patients. Eleven patients developed pneumothorax; 5/11 required chest tubes. Surgical localization/excision failed in 5/87 patients.

CONCLUSION: Scintigraphy following transthoracic Tc-99m MAA injection commonly shows radiotracer at sites other than focal intrapulmonary. Atypical scans usually relate to injection procedure and do not prevent successful intraoperative probe localization.

(P-04) Friday • 3:30 PM
Application of an Institutional 360° Evaluation for the Diagnostic Radiology Residents: Innovation or Irritation?

Linda A. Deloney, EdD, *University of Arkansas for Medical Sciences, College of Medicine, Little Rock, AR*; Michael E. Petty, PhD; Robert F. Buchmann, DO (DeloneyLindaA@uams.edu)

PURPOSE: The 360° assessment is a widely used personal and professional development strategy. In 2008, the RRC for Diagnostic Radiology will require an annual 360° as a performance measurement of resident competence in interpersonal and communication skills and professionalism. Previous medical education studies have attempted to establish reliability and validity; none provide evidence of value to residents and/or training programs. This study aimed to determine the feasibility and value of using an institutional 360° process for radiology residents.

METHOD AND MATERIALS: The college's institutional 32-item questionnaire was used (reliability, >0.90 for all items and >0.84 for group surveys), with minor changes to adapt items to radiology practice. Resident performance of each behavior was rated by using a five-point scale anchored by "poor" and "excellent," with "not observed" available. Written comments were encouraged. Responses were confidential. A self-evaluation and at least three rating groups with 5–10 persons each were required for each resident. Multiple individuals who had opportunities to interact with and observe residents were invited to participate and trained for the process. Surveys were distributed and data were collected electronically by using New Innovations Residency Management Suite. At the close of the reporting period, data were downloaded for statistical analysis and reported by rating group for individual residents.

RESULTS: All 2006–07 residents ($n = 27$) were rated by administrative staff ($n = 186$), nurses ($n = 52$), peers ($n = 129$), and radiology technologists ($n = 369$). Only one resident had mean ratings below 4.0. Patient ratings were desirable but required ≥ 30 responses, which we could not achieve. No residents completed the self-evaluation. Systems problems were identified, and proposed solutions will be tested during 2007–08.

CONCLUSION: Multiple individuals who have opportunities to interact with residents can provide constructive feedback. Repeating the evaluation annually can document professional growth and skills improvement. Feasibility concerns include implementation time and training, number of raters, number of assessments, and technology issues.

(P-05) Thursday • 10:00 AM
Evaluation of the Objective Structured Clinical Examination within the Radiology Residency Training Program as Another Method of Resident Education: Resident Attitudes on Initial Introduction

Chika I. Logie, MD, *University of Maryland School of Medicine, Baltimore, MD*; Stacy E. Smith, MD (ssmith@umm.edu)

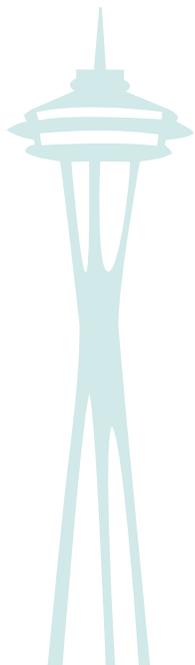
PURPOSE: The purpose of our study was to evaluate the objective structured clinical examination (OSCE) in our radiology residency program within the realm of MSK radiology.

METHOD AND MATERIALS: A 25-question (open-ended) OSCE was created, with all questions related to MSK findings (trauma, non-trauma, and normal variants) on plain radiographs, timed to appear every 20 seconds. Residents were blinded to the categories, and all levels of difficulty were included. All years of radiology residency training took the examination without preeducational training or knowledge of an upcoming examination. Demographic information included year of training and whether they had rotated through MSK. Answers were reviewed immediately after examination. Twenty-four hours later, students took a postquiz survey evaluating the OSCE, its format and value, their desire/lack of desire for feedback, examination-related anxiety, and their own preferences for learning radiologic material.

RESULTS: Fifteen residents (five 1st years; five 2nd years; five 3rd and 4th years combined) took the examination. Score range was 3–16/25, with overall mean of 10/25 (40%). Mean test scores (OSCE as a function of residency year) were 7.8 (1st), 13 (2nd), and 13.4 (upper years) (no significant difference in performance between 2nd year vs 3rd/4th years) with 1st years scoring

CONCLUSION: The OSCE is felt to be a useful evaluation tool in radiology residency. Residents prefer anonymity, individual results, and immediate review of answers.

* Faculty financial disclosures are located in the Faculty Index.



(P-06) Thursday • 3:30 PM

Use of 3D CT to Correct for Pelvic Tilt in the Evaluation of Acetabular Version: Establishing a Range of Normal—Early Results

Michael D. Setton, DO, *University of Maryland Medical Center, Baltimore, MD*; Michael E. Mulligan, MD; Stacy E. Smith, MD; Joseph P. Mazzie, DO

PURPOSE: The purpose of this study is to establish a range of normal values for the version angle of the acetabulum by using 3D volume-rendered CT on a large randomized population of patients, to correct for pelvic tilt. Once a normal range has been established, 3D CT can be further investigated both as a potential screening tool in patients suspected of having FAI (as the tool has already been investigated in evaluation of cam-type impingement), as well as in the potential preoperative planning for patients undergoing corrective acetabular surgery.

METHOD AND MATERIALS: One hundred sixty acetabula of 80 patients were retrospectively evaluated. All were trauma patients having CT evaluation of the pelvis in conjunction with CT of the chest and abdomen for evaluation after a variety of blunt and penetrating traumas. Patient demographics included age (range: 18–64), race (mixed), and gender (male predominance), with gender-specific data statistically evaluated. Patients with traumatic abnormalities, such as fracture or dislocation, as well as any significant degenerative changes, were excluded. 3D volume-rendered images of the patients' pelvis were manipulated on a 3D workstation to the "neutral" position, and acetabular version angle measurements were subsequently obtained from axial images linked to the reformatted images. Statistical analysis was performed.

RESULTS: The mean acetabular angle measured 69.3° for the right side, with a standard deviation of 6.1° , and 69.8° for the left side, with a standard deviation of 4.9° . The range of acetabular angles was from 52.5° to 86.2° .

CONCLUSION: Our early results found that both left and right acetabular angles were similar in measurement, with a greater standard deviation on the right than the left, of which the latter was not statistically significant. These measurements may be useful in future screening of patients with pincer-type FAI and may be of benefit to the radiologist and surgeon in patient management. This study is ongoing, and our goal is to gather enough data to be considered a true representation of our mixed population.

AUR Joseph E. and Nancy O. Whitley Award

(P-92) Thursday • 3:30 PM

Factors Affecting Agreement with Resident Early Readings of CT and MR Imaging of the Head, Neck, and Spine

Chris L. Sistrom, MD, MPH*, *University of Florida College of Medicine, Gainesville, FL*; Lori Deitte, MD

RATIONALE AND OBJECTIVES: This study examines the joint effect of several factors on radiology resident performance in the task of interpreting neuroradiology examinations after hours.

METHOD AND MATERIALS: As part of a quality assessment process, we conducted a prospective evaluation of all ($N = 21,796$) after-hours preliminary readings of neuroradiology examinations performed by radiology residents over a 62-month period at our academic medical center. Each one was scored by the interpreting neuroradiologist as follows: agree; disagree with minimal clinical impact; or disagree with significant clinical impact. Coded resident and attending identities were also recorded for each case, along with modality, body area studied, and the date of examination. These raw data were used to create an analytic data set with level of resident/attending agreement as the outcome and six predictors, including two date-derived variables: (*a*) month (1–62), representing when the case occurred during the study; and (*b*) quartile (1–4), accounting for the timing of the case in each resident's own experience. Cross tabulations, plots, bivariate statistics, and logistic regression were used to examine the relationships between study variables and the outcome (level of agreement).

RESULTS: Over roughly 5 years of the study, the absolute number of significant disagreements remained stable at about three per month. The total case load increased at a rate of 4.1 per month, with most of the increase falling into the agree category, while the minimal disagreements actually decreased slightly (0.2 per month). In the logistic model for disagreement, three of the factors accounted for most of the variance: attending (61%), resident (15%), and month (15%). Study type (modality and area examined) accounted for another 10%. There was no significant contribution from the variable (quartile) constructed to test for individual resident learning during the on-call experience.

CONCLUSION: Though residents do differ somewhat in the extent of attending agreement with their on-call work, evaluation or remediation made on the basis of simple comparison of these rates should be done with caution. Improved agreement over time seems to be a collective experience shared by residents.

* Faculty financial disclosures are located in the Faculty Index.

AUR 2008 Education Exhibit Poster Abstracts

Education exhibit posters are located in Grand Ballroom B. Each poster will be presented by its author during one of four *AMA PRA Category 1 Credit™* poster sessions scheduled for Thursday and Friday. The day and start time follow the presentation number.

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

(E-07) Thursday • 10:00 AM Complex Techniques in Retrieval and Manipulation of Intravascular Foreign Bodies

FDA

Clint E. Wood, MD, *University of Arkansas for Medical Sciences, Little Rock, AR*; Mary Atherton, MD; Mark A. Wendel, MD; Whitney J. Goodwin, MD; Lonnie B. Wright, MD; William C. Culp, MD; et al (clintewood@gmail.com)

PURPOSE: To review our clinical experience with intravascular foreign-body removal and repositioning and to demonstrate complex techniques often required for success.

METHOD AND MATERIALS: A retrospective review of all intravascular foreign-body retrieval and manipulation cases in 50 consecutive months was performed. IRB approval was obtained. The cases were identified from the HI-IQ database, and each was reviewed. Cases were categorized as either (1) device/fragment removal or (2) device repositioning. Cases were also categorized as low or high complexity, depending on the perceived difficulty and number of steps performed. Success and complication rates were calculated. The location and nature of each case were analyzed, with attention to technique variations and type of device used for manipulation of the foreign body.

RESULTS: Of 56 cases, 77% were for device/fragment removal, and 23% were performed for device repositioning. 59% of the cases were categorized as low complexity and 41% as high complexity. 95% were successful. 82% of procedures were performed in the central venous system, heart, or pulmonary arteries. The peripheral venous system was involved in 13%, and the arterial system was involved in 5%. Most cases involved the use of a nitinol loop snare, but many required more innovative techniques, such as using snares of varying design and size and multiple access points, with a physician at each point to coordinate the snares and wires. The overall complication rate was low, at 3.5%, and included one major complication with a mediastinal hematoma requiring fluid replacement and monitoring. Minor complications such as arrhythmias or contrast extravasation were seen in other cases but promptly resolved without further treatment.

CONCLUSION: Percutaneous retrieval and manipulation of intravascular foreign bodies required complex techniques in 41% of cases. Still, the procedure has a high success rate, is safe, and is the treatment of choice in these cases. Illustrative cases will be presented to demonstrate several of the most complex techniques.

(E-08) Thursday • 3:30 PM Three-dimensional Virtual CT Bronchoscopy Tour of the Top 10 Pediatric Nodules Commonly Found in the Airway

Alison M. Robinette, MD, *St Joseph's Hospital and Medical Center, Scottsdale, AZ*; Anne Yost, DO; Randy Richardson, MD

Three-dimensional CT bronchoscopy is a useful noninvasive modality for imaging the pediatric airway. It obviates the risks incurred with conventional bronchoscopy, including hypoxia, perforation, and conscious sedation. In addition, if conventional bronchoscopy is necessary, the detailed imaging assists the physician to localize the area of interest so that the procedure is time-saving and focused for biopsy. Furthermore, virtual bronchoscopic CT can delineate enhancement characteristics in the evaluation of vascular lesions which might appear as nodules. Lesions not visualized sufficiently by conventional bronchoscopy may be evaluated thoroughly by this modality as well.

We describe virtual CT bronchoscopy's usefulness, following the imaging from axial CT to reconstructive 3D bronchoscopy to pathology-proven diagnosis. The top 10 nodules include (1) airway hemangioma, (2) Wegener's granuloma, (3) lymphoma, (4) papilloma, (5) broncholith, (6) carcinoid, (7) pulmonary sling imitating an airway lesion, (8) squamous cell carcinoma, (9) granuloma, and (10) tracheal disruption from a vascular lesion appearing as a mass. The tour includes detailed imaging with acquisition protocols, discussion of reformatting accuracy, interpretation options, and recommendation choices for definitive diagnosis. This pictorial education exhibit will familiarize radiologists with the most commonly found lesions in the pediatric airway and allow for rapid, accurate interpretations.

(E-09) Friday • 10:00 AM Introduction to Breast Imaging, the "Aunt Minnies" of Breast Cancer, and Future Directions in the Field

Sharon L. Shin, MD, *University of Arizona, Tucson, AZ*; Nancy C. Fleming; Amy D. Tempkin, MD; Per Granstrom, MD

Breast cancer is the second most common cancer and the second leading cause of cancer-related death for women in the United States. This didactic education exhibit highlights the epidemiology and subtypes of breast cancer and reviews mammographic screening guidelines, patient positioning and mammographic views, the BI-RADS reporting lexicon, and advantages of digital versus screen-film mammography. The exhibit also includes a pictorial essay of classic imaging findings of malignancy of the breast on mammography, ultrasound, and MRI. We review the various image-guided interventions involving the breast, as well as future directions and technologies in the field.

(E-10) Thursday • 10:00 AM Pediatric Parotid Gland Disease

Asha Goud, BA, MD, *University of California Irvine, Orange, CA*; Lisa H. Lowe, MD

A variety of lesions occur in the pediatric parotid glands. With modern imaging techniques (Doppler ultrasound, helical CT, and MRI), identification of a specific etiology for pediatric parotid gland disease is often possible. Clinical information and knowledge of normal anatomy and imaging characteristics of parotid space pathology are essential for appropriate radiological evaluation. Various congenital, neoplastic, and inflammatory entities of the parotid gland will be illustrated and discussed.

(E-11) Thursday • 10:00 AM CT and MR Imaging of Cardiac Masses

Angela E. Sroufe, MD; Michael S. Portillo, MD, *University of South Florida College of Medicine, Tampa, FL*; Todd R. Hazelton; Lynn Copping, MD

Cardiac tumors are rare, with a reported cumulative prevalence of 0.002%–0.3% at autopsy and 0.15% from echocardiographic series. The majority of primary cardiac tumors are benign, with myxoma being the most common. Cardiac involvement by metastatic disease is 40 times more prevalent and can occur by direct invasion, hematologic spread, or transvenous extension via the great veins. Primary cardiac malignancies are rare—the majority are sarcomatous in origin. The initial imaging modality likely to be employed in the evaluation of cardiac masses is transthoracic echocardiography. Although this method is noninvasive, inexpensive, and readily available, it offers little information regarding the extent of involvement and no information with

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regard to tissue characterization. Magnetic resonance (MR) imaging has emerged as an important tool in the evaluation of cardiac masses. MR imaging provides improved localization of cardiac masses, with improved assessment of the extent of involvement and tissue characterization. It does not, however, provide information regarding the presence of calcium, which is an important diagnostic limitation. Thus, it is expected that MR should be combined with computed tomography (CT) to assess for the presence of calcium. We present selected images of cardiac masses, both benign and malignant, from our institution. These include benign cardiac masses, primary malignancies, metastatic lesions, and tumorlike masses. The relevant CT and MR imaging characteristics of these lesions will be reviewed.

(E-12) Thursday • 3:30 PM **Medical Student Radiology Groups: Emory Medical School's Model**

Riley A. Smyth, BA, *Emory University Hospital, Atlanta, GA*; Mark E. Mullins, MD, PhD (rsmlyth@learnlink.emory.edu)

PURPOSE: In many medical schools, there is a dearth of reliable, readily accessible information about radiology as a specialty and career, particularly in the preclinical years. The purpose of the Emory Radiology Interest Group (ERIG) is to provide this information to at least our own medical students and perhaps eventually those outside of our community as well.

METHOD AND MATERIALS: This group sponsors introductory talks on basic radiology principles and provides information about radiology careers and guidance in the residency application process. Currently, the ERIG is assembling a database of papers, alumni contacts, and other useful information to become a permanent, cumulative, renewable, and continuously refined resource of information. The group will both passively and actively recruit new members each year to replace those who have graduated, thus ensuring continuity and ongoing improvement of the organization.

RESULTS: Thus far, our group has been a success by any standard. For example, since the start of the training year on July 1, 2007, the group has accomplished the following: 1. It has hosted an informational meeting for 4th-year students intending to pursue radiology as a career. 2. It has spawned a committee of students interested in revamping radiology education at Emory. 3. It has created another committee awarding faculty and teaching excellence. 4. It has developed plans for the remainder of the year, including faculty lectures, resident teaching, and a meeting in spring where students recently matched in radiology will share advice on matching with more-junior students. 5. It has recruited and maintained a membership of roughly 30 students.

CONCLUSION: While in its infancy, the ERIG aims to be an integral part of medical student radiology education at Emory University and the definitive source of information for medical students interested in radiology as a career. It also hopes to expand its reach beyond Emory by providing a model other institutions may use to foster student interest in radiology and, more specifically, academic radiology.

(E-13) Friday • 10:00 AM **Awarding Educational Excellence in Medical Student Radiology Education**

Riley A. Smyth, BA, *Emory University Hospital, Atlanta, GA*; Mark E. Mullins, MD, PhD (rsmlyth@learnlink.emory.edu)

PURPOSE: Many educators of medical students on radiology rotations produce outstanding work that merits formal recognition. The aim of the Emory Radiology Teaching Excellence Committee (ERTEC) is to create a credible and ratified set of nominations and awards recognizing superlative teaching on our required and elective radiology courses and clerkships.

METHOD AND MATERIALS: The ERTEC will first create awards honoring different aspects of educational achievement based upon group consensus of medical students and selected faculty advisors. This group will then review a comprehensive list of faculty involved in medical student education, including the preclinical years, required radiology courses, and elective rotations. Finally, it will nominate faculty

in each of these categories for awards to be voted by students as part of an online exit survey (also formulated by the ERTEC) of each radiology course and rotation. The Emory Department of Radiology has pledged support, including funding of plaques, placement of plaques on display in our department, recognition at the year-end residency celebration, and possibly cash prizes.

RESULTS: The ERTEC's goal is to use this process to generate enthusiasm for and enjoyment of teaching among faculty, which, in turn, should result in higher-quality education for students. A secondary goal is to provide tangible marks of teaching achievement to deserving faculty that could be listed in their teaching portfolios and be useful in their academic promotion. We communicate this methodology in this forum in part to assist other medical schools in achieving a similar process.

CONCLUSION: Awarding those faculty members who dedicate additional energy to teaching through a student-driven process credits educators for an often underrewarded task, provides incentives for teaching, and involves students in their own education. The ERTEC hopes that this model will benefit the academic radiology community by providing a framework that other institutions can use to award their own noteworthy faculty.

(E-14) Friday • 3:30 PM **Creation and Utilization of Standardized Forms for Resident Preliminary Reports**

Daniel R. Karolyi, MD, PhD, *Emory University Hospital, Atlanta, GA*; Mark E. Mullins, MD, PhD (dkarolyi@emory.edu)

PURPOSE: Create preliminary report forms that provide a standard format to (1) help residents early in their call experience with systematic review and reporting, (2) facilitate easier clinician interpretation of the report, and (3) facilitate faster and easier comparison at the time of final interpretation.

APPROACH: Currently used preliminary report forms were modified with check boxes adjacent to commonly evaluated pathology for multiple-modality and anatomy-specific CT examinations. Each set of check boxes simply denotes the presence or absence of the pathological finding. For example, the preliminary report for a noncontrast head CT includes check boxes for the presence and absence of subarachnoid hemorrhage. If subarachnoid hemorrhage is present, the "yes" check box is marked, and further description is written in the report. If no pathological findings are present, all of the "no" check boxes are marked.

ADVANTAGES: There are several advantages to this technique: (1) faster and more detailed reporting for negative examinations by checking all of the "no" boxes, (2) more legible and systematic reports for the referring physicians, and (3) more legible and systematic reports for comparison at the time of final interpretation.

IMPLEMENTATION: These forms were created with input from faculty and residents and made freely available on a resident-based Web site (<http://userwww.service.emory.edu/~dkarolyi/Call/CallForms.html>). On-call residents were encouraged, but not required, to use the forms. Feedback from the radiology residents, radiology faculty, and ER faculty was elicited in the form of a survey.

CONCLUSION: In residency programs that utilize written on-call preliminary reports, forms with check boxes to flag common pathological entities may result in faster, more standardized, and more legible/understandable communication between the on-call resident, the referring physicians, and the radiology faculty.

(E-15) Thursday • 10:00 AM **Progression of Untreated Squamous Cell Carcinoma of the Head and Neck**

Indravadan J. Patel, MD, *Chicago, IL*; Luke Maj, MD; Craig M. Johnson, DO (danwpny@hotmail.com)

PURPOSE: The purpose is to illustrate the progression of untreated squamous cell carcinoma (SCC) of the head and neck from initial presentation to mortality.

METHOD AND MATERIALS: Cases were compiled from a thorough review of our medical center's in-house patients, by using the

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computerized medical records system. Included within the presentation will be a review of various squamous cell carcinomas of the head and neck. The focus will be on aggressive untreated cases of SCC delineated from the head and neck.

RESULTS: Normal/variant anatomical relationships of various head and neck structures will be discussed by using both CT and MRI. Following this will be a case-by-case presentation of the various pathologies obtained. Each case of squamous cell carcinoma will be represented by multiple imaging modalities. The aggressive untreated squamous cell carcinomas will depict the progression of cancer throughout its natural course.

CONCLUSION: Understanding of variant anatomical relationships of head and neck structures, by using multiple imaging modalities, can allow for proper localization of pathology. Furthermore, knowledge of the fast progression of an invasive squamous cell carcinoma of the head and neck allows for the anticipation of future complications. This knowledge can help to guide crucial lifesaving intervention. Overall, the ultimate goal of this presentation is to familiarize the radiologist with the initial presentation and progression of invasive SCC of the head and neck.

(E-16) Thursday • 3:30 PM **MR Imaging of Benign Ovarian Lesions**

Kasey Morden, BS; Helena Gabriel, MD; Vahid Yaghmai, MD; Senta Berggruen, MD; Nancy A. Hammond, MD; Paul Nikolaidis, MD, *Northwestern University, Chicago, IL* (kasey.morden@gmail.com)

PURPOSE: While sonography remains the mainstay in the evaluation of female pelvic pathology, MR may add information which can lead to the correct diagnosis in more difficult or complex cases. An important indication for pelvic MRI studies is the evaluation of ovarian lesions. In many instances, MR can be useful in differentiating benign from malignant, due to specific imaging features on MR.

METHOD AND MATERIALS/RESULTS: This exhibit will illustrate imaging findings on MR associated with a variety of benign ovarian lesions. Precise and correct diagnosis is imperative in order to avoid unnecessary intervention and guide appropriate medical therapy. Images of several pathologically proven benign conditions will be shown, including, but not limited to, endometriomas, functional and corpus luteum cysts, polycystic ovary syndrome, ovarian torsion, mature cystic teratoma, ovarian fibroma, Brenner tumor, and ovarian cystadenomas. Basic pathophysiology, clinical presentation, and management of the entities covered will be discussed.

CONCLUSION: This is a didactic poster presentation of the MR features of a variety of benign ovarian lesions. In many instances, MR can be useful in differentiating benign from malignant lesions, based on specific imaging features on MR.

(E-17) Friday • 10:00 AM **MR Arthrography of the Shoulder: Illustration of Anatomical Structures and Common Sports-related Injuries**

Jeremy B. Nguyen, MD, MS, *Tulane University Hospital and Clinics, New Orleans, LA*; Juan Gomez, MD; Ewa Wasilewska, MD; Kenneth Lee, MD; Harold R. Neitzschman, Jr, MD (jeremy.nguyen@hcahealthcare.com)

Magnetic resonance (MR) shoulder arthrography involves direct injection of gadolinium-based contrast into the joint space. This approach allows improved visualization of the anatomical structures and detection of diseases. This poster intends to present the techniques in obtaining the arthrographic images and demonstration of pertinent anatomical structures of the shoulder. Basic kinesiology of the shoulder will be discussed in text and illustrations. In addition, some common sports-related injuries that are optimally evaluated by MR arthrography will be presented. The poster will include actual MR images of the shoulder. Complementary modalities such as computed tomography, nuclear scintigraphy, or radiography will be included as needed. Drawings will be provided to further clarify and complement the text explanations.

(E-18) Friday • 3:30 PM **Formal Education in Producing Effective Radiology Reports: A Pilot Study**

Maureen G. Heldmann, MD; Brian Dupree; Andrew E. Gomes, MD; Shannon Storrs, BS, *Louisiana State University Health Sciences Center, Shreveport, LA*; Stacey Simpson, BS; Kathryn Richardson, MD; et al (mheldm@lsuhsc.edu)

With the inception of template reporting and speech-recognition technology, instruction in the structure and components of the written radiology report may seem obsolete. However, radiology report quality has significant impact on patient care and institutional reimbursement. Radiology residents receive little education in billing and coding, and federal quality acts will influence third-party payment for services in 2008. We sought to determine the standard of educational practice in US radiology residencies and to evaluate the effect of didactic lectures upon the overall quality of written radiology reports. In the first of this two-part project, surveys were sent to members of the APDR regarding the composition of their trainees and instructors, template or speech-recognition use, and whether their curriculum includes instruction in the technical and professional components of an effective report. In the second component, 50 medical students with little or no experience in dictation will receive two 1-hour lectures provided by the same faculty radiologist with 12 years of academic experience: one each in (a) basic CXR interpretation and (b) the components of an effective radiology report, incorporating *Current Procedural Terminology* codes. Three abnormal chest x-rays will be interpreted by the medical students before and after the lectures. Transcribed reports will be blindly reviewed by three faculty clinicians and a certified professional medical coder in the departments of radiology, internal medicine, and surgery—with a combined experience of >30 years of practice—and graded for grammar, clarity, content, documentation of medical necessity, and billing compliance. *Preliminary Results, Part 1:* 53 of 206 (25.7%) residency programs responded. The mean program size was 28 residents, and the entire range of template and speech-recognition use was reported, from 0% to 100%. 75.47% of training programs provided some instruction in the components of an effective report, although fewer (41.4%) included billing or coding training. The second phase of the pilot study is in progress, with data expected in November.

(E-19) Thursday • 10:00 AM **Lawsuits in Musculoskeletal Radiology: What Every Radiologist Should Be Aware of When Reading Musculoskeletal Cases**

Joseph P. Mazzie, DO, *University of Maryland, Baltimore, MD*; Stacy E. Smith, MD; Michael D. Setton, DO; Douglas S. Katz, MD; Jonathan S. Luchs, MD; Kevin R. Math, MD; et al (jmazzie@gmail.com)

Musculoskeletal imaging accounts for a large portion of cases in radiological imaging, and about one in five radiologists will be involved in a medicolegal case. The most common lawsuits encountered include fractures and dislocations (ie, Lisfranc). Additionally, examples of pertinent findings seen only on localizers will also be reviewed. It is the intent of this presentation to review a variety of examples of lawsuits we have encountered after performing a search in the law literature and to present examples of such lesions. The goal of this presentation is to aid both radiologists in training and those in practice to recognize subtle clues for underlying injuries that can be easily overlooked, especially in the current high-volume practice conditions, and to stress the importance of reviewing all of the images acquired, including the often-ignored localizer. A variety of plain radiographs, CT, and MRI examples will be presented.

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(E-20) Thursday • 3:30 PM
“My Hip Hurts!”—How Can We Help Referring Clinicians?

Joseph P. Mazzie, DO, *University of Maryland, Baltimore, MD*; Stacy E. Smith, MD; Michael D. Setton, DO; Charles S. Resnik, MD; Michael E. Mulligan, MD; Douglas S. Katz, MD (jmazzie@gmail.com)

The history accompanying radiographs of the pelvis and hip from the emergency room will often say, “Hip pain.” What exactly does that mean for the resident on call? And, more importantly, what do we as radiologists want to assess on every radiograph of the pelvis and hips that we are given to interpret? The purpose of this education exhibit is to present the imaging findings of common and uncommon causes of hip pain. Different pathologic entities to be presented include fractures, both traumatic and pathologic, impingement syndromes related to an os (os acetabuli), inflammatory processes, and femoral acetabular impingement syndrome. Additionally, findings such as bursitis, labral tears, and osteonecrosis will also be reviewed. Other nonprimary hip pathologies will also be reviewed, such as sacral insufficiency fractures and disk herniations, which can cause referred pain, as well as intra-abdominal pathology such as hernias, renal calculi, and vascular lesions. Normal anatomy will also be reviewed on multiple imaging modalities. Additionally, normal variants which can be confused with pathology will also be presented, such as synovial herniation pits. A variety of imaging modalities will be presented, including plain radiographs, CT scans, and MRIs.

(E-21) Friday • 10:00 AM
Accessory Ossicles and Sesamoid Bones from Head to Toe: Innocent Bystanders or Mischievous Neighbors?

Joseph P. Mazzie, DO, *University of Maryland, Baltimore, MD*; Stacy E. Smith, MD; Michael D. Setton, DO (jmazzie@gmail.com)

Inevitably, while interpreting studies on any given day in our reading room, we will often encounter an accessory ossicle or sesamoid bone. These ossicles are not without consequence and can contribute to patients’ symptoms of pain and discomfort. The purpose of this education exhibit is to remind the radiologist that these bones are not always as innocent as they appear and to help them decipher the difference in the imaging appearance among fractures, dislocations, foreign bodies, and such ossicles. The common and uncommon accessory ossicles and sesamoid variants of the foot will be reviewed in an organized fashion from head to toe anatomical region, with possible associated complications related to their presence, if applicable. Examples to be presented will include the os acetabuli- and os acromiale-related impingement syndromes, as well as os styloideum and os trigonum syndromes. Additionally, complications of the accessory navicular bone will also be presented. Cases of fractures of these accessory ossicles will be presented, as well as images of cases of osteonecrosis. Various imaging modalities will be presented, including plain radiographs, CT, and MRI when appropriate. Where appropriate, variations of the presence or absence of the ossicle will be provided.

(E-22) Friday • 3:30 PM
“My Foot Hurts, Doc. What Do You Think?”

Joseph P. Mazzie, DO, *University of Maryland, Baltimore, MD*; Stacy E. Smith, MD; Michael D. Setton, DO; Douglas S. Katz, MD; Jonathan S. Luchs, MD (jmazzie@gmail.com)

Foot pain is a common clinical complaint heard not only by our orthopedic and podiatric colleagues, but also commonly by our primary care colleagues. The purpose of this exhibit is to present a wide range of traumatic and nontraumatic conditions that can cause foot pain. Such entities to be discussed will include common traumatic fractures, such as Jones fractures, Lisfranc injury, and talar neck and calcaneal fractures, as well as other categories, including infectious processes, neuropathic disease of joints, and overuse injuries such as stress fractures. Additionally, chronic causes of foot pain, including plantar fibromas, plantar spurs, osteochondral lesions within the talus, and osteonecrosis (ie, Freiberg’s necrosis) will be reviewed. Other lesions to be presented

include the many accessory ossicles of the foot and their possible complications (ie, os trigonum syndrome, bursitis, and sesamoiditis). A variety of imaging modalities will be presented, including plain radiographs, CT, US, and MRI, as well as nuclear medicine. Additionally, the current literature will be reviewed and presented. Following review of this exhibit, the individual will have a concise knowledge of the imaging appearances of the variety of entities which cause foot pain. When presented with a patient with foot pain, the evaluation of the imaging studies and the direction of the imaging algorithm will be more focused, helping the radiologist to avoid missing potential causes of foot pain.

(E-23) Thursday • 10:00 AM
The Injured Patient’s Knee: Clinical Correlation and MR Imaging

Joseph P. Mazzie, DO, *University of Maryland, Baltimore, MD*; Stacy E. Smith, MD; Michael D. Setton, DO (jmazzie@gmail.com)

The injured knee is probably one of the most common sport injuries encountered in our practice, and while MRI is the gold standard with regards to assessing possible internal derangement, sometimes subtle abnormalities can be missed, or they are beyond the resolution of the MRI despite recent advances. The radiologist responsible for reading knee MRIs should be aware of the types of physical examination techniques utilized clinically prior to the patient coming for MRI, so as to better understand the clinical/imaging correlation. Often the clinical history given to us may provide only the words “+ve Lachman test” and a result, so we should be aware of the variety of tests these patients may have undergone prior to seeing the doors of the radiology department. The goal of this education exhibit is to present a visual correlation between the specific orthopedic physical examination tests or maneuvers of the knee and the MRI findings of the knee with that specific injury. This will be an interactive PowerPoint exhibit to allow the users to review and test themselves as they read about each entity. Each example will include visual descriptions or videos and diagrams of the orthopedic examination or maneuver with corresponding MR images, each with detailed descriptions and arrows pointing to the areas of abnormality. Clinical tests to be discussed will be organized according to the anatomic region for which they are used in evaluating the knee (ie, patellofemoral joint, menisci, cruciate ligaments, etc). These tests include such examinations as (in no particular order) the Lachman-Trillat maneuver, anterior drawer sign, patella grind and pivot shift tests (including Dejour’s test, which is a pivot shift test in extension), McMurray’s test, Apley’s grinding test, Cabot’s maneuver, and many others used in clinical practice that are described in the literature. Other tests that will be presented include recently described tests or maneuvers such as the Thessaly test, which has been described as a first-line screening clinical examination for meniscal tears. Recent literature (for the newly described clinical tests) as well as a review of the literature with regards to the common clinical examinations and their history as well as MRI findings will be presented.

(E-24) Thursday • 3:30 PM
Name the Mechanism: Pattern Recognition of Musculoskeletal Injuries

Joseph P. Mazzie, DO, *University of Maryland, Baltimore, MD*; Stacy E. Smith, MD; Michael D. Setton, DO; Nabileh T. Safdar, MD* (jmazzie@gmail.com)

The R. Adams Cowley Maryland Shock Trauma Center is one of the largest trauma centers in the United States, seeing a diverse number of injuries from various mechanisms. Review of these injuries over time has resulted in a long list of named or unnamed fractures or dislocations on imaging, all of which are associated with unique or specific mechanisms of injury. The purpose of this education exhibit is to present multiple fractures on plain radiographs and CT, as well as bone contusion patterns on MRI. By using an interactive PowerPoint program, the exhibit will not only test but reinforce the different mechanisms that are responsible for each injury. This will be organized according to anatomic structures in order to enhance the learning and review of the material. Mechanisms of injuries and their associated

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types of fracture-dislocations that will be reviewed will include many different anatomic regions. If a specific contusion pattern is associated with the particular injury, MR images of the characteristic bone bruise pattern of edema will be presented. Cases to be presented in this interactive exhibit will include, but are not limited to, the following examples, each within its own anatomic category: (1) cervical spine: dens fractures, hyperextension/flexion fractures, Hangman's fracture, clay shoveler's fracture, and others; (2) wrists and forearm: fall on outstretched hand (FOOSH) with distal radial fracture, chauffeur's fracture, lunate and perilunate dislocations, Galeazzi and Monteggia fracture-dislocations, and others; (3) knee: pivot shift, dashboard, axial loading, valgus and varus injuries, Segond fracture with ACL tear (bone contusion pattern, [kissing contusions]) will be included on MRI in this case; (4) ankle fracture with posterolateral corner syndrome, and others; and (5) pelvis: vertical shear injury, open-book injuries, acetabular fractures and hip dislocations, both anterior and posterior, and others. The treatment options for each of the described injuries will also be reviewed when appropriate. The clinical severity of the injuries and significant urgent findings that should be made according to the imaging findings will also be reviewed.

**(E-25) Friday • 10:00 AM
Incidental Musculoskeletal Findings on Radiographs of the Chest**

Joseph P. Mazzie, DO, *University of Maryland, Baltimore, MD*; Stacy E. Smith, MD; Michael D. Setton, DO; Douglas S. Katz, MD; Robert W. Perone, MD (jmazzie@gmail.com)

Despite all of the technical advances in radiology, the chest radiograph is still the most commonly ordered imaging study in the emergency room. While it is primarily done to evaluate for lung pathology, pertinent musculoskeletal findings are often encountered and, in some cases, overlooked. The purpose of this poster is to present various musculoskeletal findings that we have encountered at our institutions on chest radiographs from the emergency room. The spectrum of pathological conditions that will be reviewed includes infectious diseases, such as tuberculosis and diskitis, and various primary benign and malignant tumors, such as osteochondroma, fibrous dysplasia, enchondromas, hemangiomas, plasmacytomas, or early lymphoma. Additionally, various presentations of metastatic disease and arthritides, as well as normal variants that have been misinterpreted as disease or trauma (pseudoarticulation of the coracoclavicular joint), all of which were seen in our collection, will be presented. The radiologic and clinical literature with respect to these entities will be reviewed, with appropriate CT and MRI correlation.

**(E-26) Friday • 3:30 PM
Musculoskeletal Nononcological Imaging with PET/CT**

Joseph P. Mazzie, DO, *University of Maryland, Baltimore, MD*; Stacy E. Smith, MD; Perry Gerard, MD; Michael D. Setton, DO; Bahar Dasgeb, MD; Laura M. Fayad, MD; et al (jmazzie@gmail.com)

Currently, PET/CT is the gold standard for imaging in the oncological setting; however, often radiologists come across lesions which are nonmalignant and often incidental. It is imperative that the interpreting radiologist does not mistake these benign conditions, as it can have significant consequences on patient care. The purpose of this exhibit is to present a variety of nononcological findings that we have encountered in our practice. The wide array of cases that we will present includes benign muscular uptake related to glucose levels and recent exercise; rotator cuff pathology, such as tears and calcific tendinosis; bursitis (greater trochanteric); and meniscal pathology. Additionally, benign soft-tissue lesions such as sebaceous cysts, lipomas, and other skin conditions will be discussed. Benign osseous lesions will also be reviewed, including degenerative and nondegenerative arthropathies, fractures, and osteomyelitis. Cases will be correlated with a wide array of other imaging modalities, including MRI as appropriate.

**(E-27) Thursday • 10:00 AM
Multimodality Imaging Spectrum of Anterior Cruciate Ligament Reconstruction: Normal Findings, Variants, and Postoperative Complications**

Michael D. Setton, DO, *University of Maryland Medical Center, Baltimore, MD*; Stacy E. Smith, MD; Joseph P. Mazzie, DO

Magnetic resonance imaging (MRI) has become the gold standard with regards to the type of imaging modality utilized in evaluation of the postoperative knee following ACL reconstruction. With the implementation of newer surgical techniques, including double-bundle repairs and the use of bone-tendon-bone grafts, the spectrum of both normal and abnormal postoperative findings is constantly evolving. The radiologist should be aware of these types of grafts and their appearance on radiographs, computed tomography (CT), and MRI, as well as secondary imaging findings and complications. The purpose of this education exhibit is to review the spectrum of postoperative imaging appearances of ACL reconstructions and their complications. This review will include the characteristic appearance of ACL reconstructions on radiographic examinations for each type of reconstruction, with additional examples of radiographic, CT, and MR evaluation of tunnel positions. MR evaluation of graft integrity and the imaging appearances of associated complications, including impingement, secondary fluid collections, mucoid degenerative disease, cyclops lesions, cystic tibial tunnel changes, and other characteristic postoperative degenerative, infective, and inflammatory processes, are reviewed. After review of this exhibit, the radiologist should be familiar with the variety of orthopedic techniques used by our orthopedic colleagues for ACL reconstruction and be able to confidently diagnose the unexpected complications that may arise.

**(E-28) Thursday • 3:30 PM
Orthopedic Hardware: An Update on Devices with Which the Radiologist Should Be Familiar**

Michael D. Setton, DO, *University of Maryland Medical Center, Baltimore, MD*; Stacy E. Smith, MD; Joseph P. Mazzie, DO

Orthopedic hardware, much like many other aspects of medicine, is a constantly evolving technology. As radiologists, we should be familiar with the various fracture-fixation devices, joint replacements, prostheses, and other hardware that our orthopedic colleagues are using so that we recognize normal from abnormal postoperative appearances and may assist in diagnosing hardware malfunctions. Several papers and education exhibits have been devoted to familiarizing radiologists and orthopedic surgeons with the devices in use, general principles behind them, and what type of complications may occur. However, as these devices evolve, so must our knowledge of them. The purpose of this education exhibit is to review several newer devices which have not been thoroughly described in the radiology literature, in order to create a greater awareness and understanding by the radiologist as to the types of devices that are currently in use. This education exhibit will provide examples of several of the newer orthopedic hardware devices which have not been thoroughly described in the literature to date. These devices include fracture-fixation plates, a variety of screws, and several newer prostheses with radiographic appearances which may be confusing. Our experience at a major level I trauma and tertiary care referral center with emerging technology has provided the opportunity to image a variety of such devices, which will be reviewed and described.

**(E-29) Friday • 10:00 AM
Imaging of the Thumb and First Metacarpal: A Multimodality Pictorial Review of Anatomy and Pathology, with Emphasis on Musculoskeletal US**

Aaron M. Friedkin, MD, *University of Michigan, Ann Arbor, MI*; Jon A. Jacobson, MD; Jacob Livermore, MD; Catherine Brandon, MD; Gandikota Girish, MBBS; Peter Jebson; et al

PURPOSE: Imaging of the thumb and first metacarpal warrants specific attention, given the unique mechanics of these structures and their importance in daily activities. Our goal is to review thumb anatomy and demonstrate the imaging characteristics of thumb pathology,

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including traumatic, neoplastic, infectious, vascular, and inflammatory processes. Review of thumb anatomy will rely on cadaveric dissection as well as imaging findings.

CONTENT ORGANIZATION: 1. Anatomy and mechanics of the thumb and first metacarpal, including examples of cadaveric dissection and imaging findings. 2. Imaging modalities of the thumb: (a) limitations and advantages of radiographs, CT, MRI, and ultrasound; (b) indications for each modality; and (c) techniques of thumb/metacarpal ultrasound. 3. Examples of thumb/metacarpal pathology, with discussion of management (examples will focus on ultrasound, although radiographic and MRI correlation will be included): (a) trauma, (b) neoplasm, (c) infection, (d) inflammation, and (e) vascular malformations.

SUMMARY: 1. Understand the unique anatomy and mechanics of the thumb and first metacarpal. 2. Understand the advantages and limitations of various imaging modalities in evaluating thumb/first metacarpal pathology, including radiography, MRI, and ultrasound. 3. Understand the basic technique of ultrasound of the thumb. 4. Review the imaging characteristics of common and unusual pathology involving the thumb and first metacarpal, including traumatic, neoplastic, infectious, inflammatory, and vascular etiologies.

(E-30) Friday • 3:30 PM **Cystic Lesions of the Genitourinary System**

Amit R. Vyas, MD, *William Beaumont Hospital, Ann Arbor, MI*; Syed Z. Jafri, MD

PURPOSE: To learn the imaging features of a broad spectrum of cystic lesions involving the genitourinary system by using multiple modalities.

METHOD AND MATERIALS: Various cystic lesions of the genitourinary system involving the adrenal glands, kidneys, ureters, bladder, urethra, seminal vesicles, prostate gland, cervix, ovaries, and testes imaged by multiple modalities, including ultrasound, computed tomography, and magnetic resonance imaging, will be presented. Lesions will include, but are not limited to, congenital anomalies, simple and complex cysts (with appropriate classification and management guidelines), cystic neoplasms, and infectious and traumatic “cystic” lesions.

RESULTS: Multiple cases demonstrating the imaging features of numerous cystic lesions will be presented in poster format.

CONCLUSION: The viewer will learn the imaging features and how to differentiate among numerous cystic lesions of the genitourinary system.

(E-31) Thursday • 10:00 AM **Medical-Legal Issues in Teleradiology: What You Need to Know**

Anthony Pavel, JD*; Justin L. Brown, JD*; R. James Brenner; William Weadock, MD*; Richard K. Brown, MD*, *University of Michigan Health Systems, Ann Arbor, MI*

The purpose of this exhibit is to improve awareness of legal issues relating to the practice of teleradiology. It focuses on ways in which radiologists can reduce their liability by organizing their practice in ways that are compliant with ACR guidelines, states’ statutes, and federal regulations. Topics discussed include HIPAA, CMS, international teleradiology, and local teleradiology coverage. Examples from case studies will be presented.

(E-32) Thursday • 3:30 PM **Diagnostic Patterns in FDG PET Brain Imaging in Patients with Dementia, Epilepsy, and Tumors**

Ka Kit Wong, MBBS; Kirk Frey; Richard K. Brown, MD*, *University of Michigan Health Systems, Ann Arbor, MI*; Nicolaas Bohnen

The purpose of this exhibit is to demonstrate the characteristic findings on FDG PET brain imaging in patients with dementia, epilepsy, and tumors. The exhibit focuses on the indications and technical aspects of the study, reviews normal structures and anatomy, and presents illustrative cases with common and uncommon findings that can be encountered. The findings are further illustrated with computer-aided diagnosis utilizing statistical voxel-based comparison to a normal control database.

(E-33) Friday • 10:00 AM **Education-Specific PowerPoint Training for a Radiology Department**

Vanessa J. Brazeau, *University of Michigan, Ann Arbor, MI*; Sarah C. Abate, BS; William Weadock, MD*; James H. Ellis, MD

Certain elements of radiological presentations require a specific set of PowerPoint skills. This presentation will emphasize the fundamentals necessary to bring departmental staff PowerPoint competencies to a higher level. The presentation will discuss general topics needed for any presentation, as well as focus on elements of particular interest, such as video, image alignment and compression, and animation. Some of these skills may be infrequently used by individual faculty, fellows, and staff and may be forgotten. The Media Division of the University of Michigan Department of Radiology has assessed the needs of our department and developed an easy-to-follow comprehensive PowerPoint manual targeted for our radiology department. By developing a specialized manual for creating radiological focused presentations, we have been able to provide department staff with the high-level skill set needed to produce quality presentations in a timely fashion with ease.

(E-34) Friday • 3:30 PM **Results of Lymph Node Fine-Needle Aspiration in 40 Consecutive Patients**

Ron Gefen, MD; Albert Yeung, MD, *Cooper University Hospital, Camden, NJ*; Joshua D. Brody, DO

PURPOSE: We present a series of patients where image-guided fine-needle aspiration of lymph nodes was essential in the diagnostic work-up.

METHOD AND MATERIALS: Fine-needle aspiration is a cost-effective and minimally invasive approach in the diagnosis of enlarged lymph nodes. Depending on the disease process, its diagnostic accuracy can be greater than 90%. Forty patients presented to our radiology department for image-guided fine-needle aspiration of lymph nodes in 2007. On the basis of the accessibility of the enlarged node(s), the choice was made to utilize computed tomography (CT) or ultrasound (US) as the imaging modality. The specimens were immediately inspected by a pathologist, and the decision was made whether or not to perform flow cytometry. Cell block material was obtained on all biopsies.

RESULTS: There was a total of 40 patients; 17 were evaluated by ultrasound and 23 by CT. We are continuing to accumulate data to include the entire calendar year. Eleven patients were given a new diagnosis. Sixteen patients had their preprocedure diagnosis confirmed. Five patients had their diagnosis changed. Nonspecific inflammatory cells were obtained in five patients, while three biopsies resulted in no definite diagnosis. Images presented here are a few unique examples.

CONCLUSION: Image-guided fine-needle aspiration is a simple and effective tool in assisting physicians in the work-up of enlarged lymph nodes.

(E-35) Thursday • 10:00 AM **Referring Physicians Need to Know the Appropriate Imaging Method for Their Patients: Do They? Do They and Medical Students—Future Physicians—Know about the ACR Appropriateness Criteria?**

Judith K. Amorosa, MD; Andre Bautista, MD, *UMDNJ New Jersey Medical School, Newark, NJ*; Anthony Burgos, MD; Sagar Parikh, BA; Richard Jiao, MD; Tim Chen, MD; et al (amorosa@umdnj.edu)

We conducted an online and also paper/pencil survey of staff physicians at a 500+ bed acute care hospital. We posed the following question: When deciding what is the best imaging modality for your patient, select the source you usually use: (1) your specialty journal, (2) Google, (3) recent CME meetings, (4) ACR appropriateness criteria, (5) PubMed, or (6) radiologist. On the basis of the response by our current referring physicians, we are including in the online Clerkship Companion for Medical Students corresponding to medicine, surgery, obstetrics-gynecology, and pediatrics a link to the ACR appropriateness criteria to familiarize future referring physicians with this reliable,

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expert resource to aid them in decision making. The development of the Clerkship Companion for Medical Students is funded by 2005–06 and 2006–07 GE Healthcare/RSNA World Wide Web-based Educational Program Grant.

(E-36) Thursday • 3:30 PM US Imaging of the Digits: A Pictorial Review

Daniel Peterson, BA, *Albert Einstein College of Medicine, Bronx, NY*; Marc Friedman, MD; Jin Y. Hur, MD

PURPOSE: To illustrate an array of digital pathology and highlight the utility of ultrasonography as a potential first-line imaging modality for digit-related patient complaints.

METHOD AND MATERIALS: Nine cases of focal digital complaints (pain or palpable abnormality) are evaluated by gray-scale and color Doppler sonography. Correlation is made with available surgical pathology, radiographs, CT, and MR images.

RESULTS: Although ultrasound findings can be nonspecific, with additional focused imaging the causes of the patient's complaints were correctly diagnosed or appropriate clinical management was directed in seven of nine cases (78%). The underlying etiologies represented are nodular tenosynovitis related to rheumatoid arthritis, osteoarthritis, ganglion cyst, epidermoid inclusion cyst, intravascular pyogenic granuloma, vascular malformation, and capillary hemangioma. The remaining two cases, scarring of the extensor hood and hematoma of the extensor sheath, were not corroborated with further imaging or pathologic examination.

CONCLUSION: Ultrasound can be used as an effective first-line diagnostic imaging modality for digital complaints such as pain or palpable abnormality. Ultrasonographic evaluation offers many advantages over other modalities, such as CT or MR, but remains relatively underutilized in the United States.

(E-37) Friday • 10:00 AM Omental Cakes, Cookies, and Crumbs: Whetting the Appetite for Diagnosis—Correlation of CT and Clinical Findings

Diego A. Covarrubias, MD, *Long Island College Hospital, Brooklyn, NY*; Jada J. Anderson, MD; Peter M. Nardi, MD; Douglas S. Katz, MD; Robert E. Mindelzun, MD

Primary disease processes involving the omentum are often nonspecific and entail a broad radiographic diagnosis. In addition, the greater frequency of secondary involvement adds to the confounding clinical and imaging picture. The purpose of this exhibit is twofold: first, to briefly review omental anatomy and physiology and define normal imaging appearance, as well as pathways of disease propagation; and, secondly, to describe the imaging findings of specific disease entities, including primary and secondary tumors (benign and malignant), inflammatory processes, and posttraumatic changes, and correlate these with relevant clinical histories. Upon the completion of this exhibit, the viewer will have (1) developed an understanding of omental physiology and pathology, including basic routes of disease spread; (2) become familiar with a variety of common (and not so common) forms of omental pathology and their relevant clinical histories; and (3) developed an approach to using CT findings and clinical history to confidently diagnose omental lesions.

(E-38) Friday • 3:30 PM Spectrum of Intussusception: A Pictorial Review

Nora Yousefzadeh-Grinin, MD, *Columbia College of Physicians and Surgeons, New York, NY*; Irina Kaplan, MD; Joan C. Prowda, MD, JD

Intussusception is telescoping of one portion of bowel into a more distal portion. Individuals with intussusception can present with abdominal complaints and obstructive symptoms. In adults, unlike in children, an underlying mass lesion captured by bowel peristalsis is frequently identified. Diagnosis is possible by CT or US, and the growing utilization of CT has led to identification of increasing numbers of intussusceptions. When an intussusception is identified with CT, it is

often difficult to determine if there is a mass at the lead point and, if so, whether it is benign or malignant. Clinical presentation, location of the intussusception, and patient history can help with the differential diagnosis of the underlying etiology. The purpose of this pictorial essay and education exhibit is to review common and uncommon causes of intussusception and their radiographic appearance.

(E-39) Thursday • 10:00 AM Fetal MR Imaging: Evaluation of Fetal Anomalies and the Maternal Abdomen



Hwayoung K. Lee, MD, *Columbia University College of Physicians and Surgeons, New York, NY*; Irina Kaplan, MD; Sherelle Laifer-Narin, MD (hw19001@nyp.org)

Traditionally, sonography has been a primary tool for evaluation of the maternal abdomen and fetus, due to low cost and widespread availability. Once a complement to sonography, fetal MRI is continuing to gain more and more popularity, as it offers operator-independent imaging, a multitude of different sequences, multiplanar approach, excellent soft-tissue contrast detail, and a larger field of view. While still evolving, this imaging modality is helpful in the decision-making process regarding pregnancy, patient counseling, delivery management, and planning for prenatal or postnatal care. The purpose of this education exhibit is to familiarize radiologists with a variety of anomalies involving the fetus, some of which include conjoined twins, sacroccygeal teratoma, and gastroschisis, as well as complications involving the maternal abdomen, such as a pregnancy in the rudimentary horn of a unicornuate uterus.

(E-40) Thursday • 3:30 PM Abdominal Hernias: Imaging Features and Complications



Hwayoung K. Lee, MD, *Columbia University College of Physicians and Surgeons, New York, NY*; Joan C. Prowda, MD, JD

Abdominal hernias are a commonly encountered entity in which a majority of patients are asymptomatic and undergo elective repair. However, complications associated with abdominal hernias can be devastating, and a delay in diagnosis is associated with greater morbidity. Furthermore, clinical evaluation may often be of limited value. Therefore, prompt diagnosis and management of these complications are crucial, and cross-sectional imaging studies have become important tools for the detection and diagnosis of hernia and associated complications. The purpose of this education exhibit is to familiarize radiologists with a variety of abdominal hernias using imaging modalities such as CT or MRI.

(E-41) Friday • 10:00 AM Chronic Deep Venous Thrombosis on CT Venography

Peter A. Loud; Cheng T. Lin, BA; Zachary D. Grossman, MD; John P. Fantauzzi, MD; Jason C. Hoffmann, MD; Douglas S. Katz, MD, *Winthrop University Hospital, Mineola, NY* (dkatz@winthrop.org)

CT venography may be performed routinely at the same time as CT pulmonary angiography, as has been the case at our two institutions over the past decade. One of the major potential problems and pitfalls of CT venography is the correct identification of chronic, as opposed to acute or subacute, DVT. This exhibit will review this problem in detail. The identification of chronic DVT on initial CT venography and distinguishing it from acute or subacute DVT can be difficult, analogous to the same problem on sonography. We have found sonography and CT venography to be complementary in this situation. Chronic DVT can present as small veins with or without collaterals, with partial filling defects, poor opacification, wall calcification, luminal calcification, and webs. Other pitfalls include small veins for other reasons and diffuse wall calcium. We plan to demonstrate a series of cases of chronic DVT on CT venography, to review the limited literature on the topic, and to highlight several cases from our two centers (one an oncology referral

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hospital), where serial CT venography or follow-up abdominal and pelvic CT (the former performed in conjunction with CT pulmonary angiography) has given us the opportunity to show the evolution of DVT on serial examinations in a small subset of patients.

(E-42) Friday • 3:30 PM Ethical Issues in Radiology Journalism, Peer Review, and Research

Douglas S. Katz, MD, *Winthrop University Hospital, Mineola, NY*; Jason C. Hoffmann, MD; Kimberly E. Applegate, MD, MS* (dkatz@winthrop.org)

The purposes of this poster are (a) to review ethical issues in radiology-related journalism, peer review, and research; (b) to review the literature that has addressed these issues; and (c) to present position statements and potential solutions by radiology journal editors. Much attention has been focused, in medical journals as well as in the lay media, on ethical problems and dilemmas which face medical researchers and medical journal editors. We will review the radiology and medical literature in general on ethical issues relevant to imaging research and publication, including academic fraud, plagiarism, duplicate publications, criteria for authorship, institutional review boards (IRBs), informed consent, HIPAA, conflicts of interest, disclosures, industry relationships, and reviewer unblinding. Radiology authors and researchers are increasingly under scrutiny for their research and publications. Some research and publication practices are clearly unethical and are not permitted, including fraud, duplicate publication, and plagiarism. Other aspects of research and publication, such as IRB approval, informed consent, conflicts of interest, and unblinding may fall into less-clear policy areas. We wish to call attention to these issues as they pertain to the academic radiology community.

(E-43) Thursday • 10:00 AM Clostridium difficile Colitis: CT Findings and Review of Clinical Implications



Benjamin Yam, BS; Cheng T. Lin, BA; James Kim, MD; Eugene Im, MD; James Grendell, MD; Douglas S. Katz, MD, *Winthrop University Hospital, Mineola, NY* (dkatz@winthrop.org)

PURPOSE: To review the CT findings of *Clostridium difficile* colitis, as well as the clinical implications of the disease in its current state.

METHOD AND MATERIALS/RESULTS: In the past several years, *C difficile* colitis has become a more virulent disorder, with substantially increased morbidity and mortality. Although CT has an important role in the work-up and management of patients with known or suspected *C difficile* colitis, the findings may be nonspecific, and the severity may not indicate appropriate patient management or predict patient outcome. Representative CT images from numerous cases of *C difficile* colitis identified at one tertiary-care hospital over the past 3 years will be demonstrated, along with follow-up CT examinations and correlative clinical information. The current literature will be briefly reviewed.

CONCLUSION: It is important for the radiologist to be aware of the current status of *Clostridium difficile* colitis, the CT findings and differential diagnosis, and the implications of the CT findings, when combined with the clinical history, for patient management.

(E-44) Thursday • 3:30 PM Cognitive Errors in Diagnostic Imaging and Minimization Strategies

Jocelyn W. Park, MD, *Beth Israel Medical Center, New York, NY*; Marlene E. Rackson, MD (marlene@chnpnet.org)

PURPOSE: The purpose is to define cognitive errors in medical decision making; to illustrate these errors in diagnostic imaging with representative imaging studies, including clinical information and reports; and to provide strategies to avoid and minimize errors.

METHOD AND MATERIALS: PACS-based representative diagnostic imaging studies; radiology information system's database; research literature of medical decision making and cognitive error.

RESULTS: The following errors will be defined: affective error, anchoring, attribution error, availability, cherry-picking, confirmation bias, representativeness error, and search satisfaction. Each error will be discussed and illustrated with at least one clinical example, including the diagnostic images, the clinical information, the radiology report, and the follow-up. Strategies for prevention will be identified, including systematic deconstruction of images, communication of uncertainty, consideration of "worst-case scenario," avoiding selective attention to key features of a diagnosis, awareness of stereotypes and avoiding/considering diagnoses against prototype, and double readings. The current literature on inter- and intraobserver concordance rates in diagnostic imaging will also be reviewed. Emerging technology such as computer-assisted diagnosis to reduce medical error will be discussed.

CONCLUSION: Increased awareness and education about common medical errors will improve accuracy in diagnostic imaging and will positively impact patient care.

(E-45) Friday • 10:00 AM Method for Formally Assessing the Quality of Resident Dictations

Omar K. Khalaf Al-Tawil, MD, *Beth Israel Medical Center, New York, NY*; Marlene E. Rackson, MD (okhalaf@chnpnet.org)

PURPOSE: ACGME requirements for diagnostic radiology effective July 1, 2007, require that programs formally evaluate the quality of resident dictations. We describe and illustrate how our program fulfills this responsibility regarding formal instruction in radiology report quality, the process of reviewing the reports, and the documentation of the review.

METHOD AND MATERIALS: ACGME requirements for diagnostic radiology; ACR standard for communication; Talk speech-recognition system; IDX radiology information system; New Innovations computerized residency management suite; resident portfolio.

RESULTS/DISCUSSION: The following points are described/illustrated: (1) Formal didactic lecture curriculum regarding components of effective radiology reports, including organization, conciseness, standardized language, pertinent negatives, and definitive results, with emphasis on communication of results. Didactic instruction on template reports, speech recognition, and *CPT/ICD-9* coding. (2) Assignment of faculty to review a specific number of dictations from core rotation during the first 6 months of training. Procedure for reviewing reports of upper-level trainees to assess for maintenance of quality and increasing sophistication. (3) Individual resident spreadsheet to assess the reports for format (title, indication, procedure, findings, discussion, impression, and communication of positive results), grammar, syntax, completeness of findings, appropriate radiologic terms, understanding of reader intent, and appropriate *ICD-9* codes. (4) Feedback to resident, illustrated with copies of original and corrected reports. (5) Use of resident portfolio to document the review of reports.

CONCLUSION: The written report must be accurate and concise and communicate results clearly and effectively. Trainees receive formal instruction in the components of a report with respect to format, grammar, writing style, and communication of abnormalities. Formal review of the residents' reports with feedback will improve the quality and consistency of radiologic communications, with the larger goal of improving patient care and reducing liability risk.

(E-46) Friday • 3:30 PM Fluoroscopically Guided Adjustments to Gastric Banding Systems: A "How-To" Guide

Irina Rapoport, MD, JD, *Beth Israel Medical Center, Brooklyn, NY*; Marlene E. Rackson, MD; Reena A. Vashi, MD (mrackson@chnpnet.org)

PURPOSE: To familiarize radiologists with how gastric banding systems work (radiographic appearance of the device, complications associated with use); define the fluoroscopic procedure to evaluate a band (eg, optimal patient positioning); teach the radiologist how to assess the function of the band so as to advise the surgeon on the optimal tightness of the band and be familiar with the adjustment technique to decrease or increase the stoma.

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METHOD AND MATERIALS: Patients undergoing surgery and adjustments at our institution, including pre- and postoperative barium studies.

RESULTS AND DISCUSSION: A general introduction to obesity surgery will be provided, including history of the LAP-BAND®, patient selection criteria, advantages, and disadvantages. The function of the LAP-BAND and the steps of the fluoroscopic evaluation of the gastro-esophageal junction will be defined and illustrated with regard to position of the band, degree of restriction, esophageal contractility, emptying, dilatation, and reflux. Technique to access the port and adjust the band will be demonstrated. The template report for the procedure will be demonstrated.

CONCLUSION: As adjustable gastric banding systems for the treatment of obesity become more popular in the United States, radiologists may be asked to perform more fluoroscopically guided adjustments. This presentation will familiarize the radiologist with the usage of the LAP-BAND and provide instruction on the fluoroscopic examination needed to provide real-time guidance to the surgeon to optimize the adjustment.

(E-47) Thursday • 10:00 AM
Necrotizing Fasciitis: Imaging Characteristics and Diagnostic Algorithm for the On-Call Radiologist

Michael S. Gurian, MD, *New York-Presbyterian Hospital, New York, NY*; Keith D. Hentel, MD, MS (MSGur18@hotmail.com)

Necrotizing fasciitis is a rapidly progressive infection which spreads by tracking along anatomic fascial planes. Early diagnosis and extensive surgical débridement have been demonstrated to result in improved prognosis and lower mortality rates. For the clinician, diagnosis may be delayed, as the clinical presentation is often nonspecific and difficult to distinguish from other more indolent soft-tissue infections. Imaging is frequently used to assist in confirmation or exclusion of this diagnosis. As a result of the progressive nature of this disease and the fact that treatment must be initiated emergently, it is frequently the on-call radiology resident or attending who is responsible for guiding the imaging work-up and making the diagnosis. However, with varying degrees of expertise in musculoskeletal radiology, these radiologists may not be familiar with the important imaging features necessary to make such a diagnosis. The purpose of this exhibit is to provide an algorithm for imaging evaluation and to illustrate the imaging findings of necrotizing fasciitis.

(E-48) Thursday • 3:30 PM
The Anomalous Coracoclavicular Joint: Identification on Conventional Radiograph, CT, and MR Imaging

Navjeet K. Hansra, MD, *Harlem Hospital Center, New York, NY*; Scott C. Hollander, DO; Daniel Frank; Rama Sharma

The coracoclavicular joint is an anomalous articulation between the conoid tubercle of the clavicle and the coracoid process of the scapula and is a rare genetic variant occurring in 0.82%–1.78% of the population. Although patients with this anomalous joint are often asymptomatic, they can be symptomatic, as this entity predisposes to osteoarthritis of the acromioclavicular and sternoclavicular joints, which can be a source of significant shoulder pain. Furthermore, this anomaly has been implicated as a predisposing factor in surgical neck fractures of the humerus. We present a patient with a coracoclavicular joint and surgical neck humerus fracture noted on conventional radiography, CT, and MRI, to emphasize the importance of recognizing this anomalous articulation, given the association with surgical neck humerus fractures and as a source of unexplained shoulder pain.

(E-49) Friday • 10:00 AM
Endometriosis: Spectrum of Severe Disease

Scott C. Hollander, DO, *Harlem Hospital Center, New York, NY*; Rochele Goldfisher; Bahrang Amini, MD, PhD; Daniel Frank (hollan1702@yahoo.com)

Endometriosis is the presence of regular endometrial glandular and stromal tissue outside its normal location within the uterine cavity. Endometriosis may cause significant morbidity, including increasingly

severe dysmenorrheal and/or chronic pelvic pain. The abnormally located endometrial implants are known to retain their same steroid receptors capable of responding to hormonal stimulation, corresponding to the clinically characteristic cyclic pain cycle. Proper diagnosis is therefore essential, as medical and surgical treatments are available. Here, we will discuss atypical sites of pathology-proven endometriosis, as well as the associated radiologic findings on advanced imaging, including ultrasound, computed tomography, and magnetic resonance imaging.

(E-50) Friday • 3:30 PM
Radiographic Evaluation of the Limping Patient: A Systematic Approach

Jonathan K. Kazam, MD, *New York-Presbyterian Hospital/Weill Cornell Medical Center, New York, NY*; Keith D. Hentel, MD, MS
Limping is a frequently encountered complaint in children and adolescents. Arriving at the correct diagnosis presents a challenge, as limping represents the common end point of several varying underlying etiologies. The task can be especially daunting for radiology residents and nonpediatric radiology attendings who may encounter these cases in the emergency and general practice settings. The goal of this presentation is to provide a systematic approach to the radiographic evaluation of the limping patient. Common etiologies will be presented for the toddler, child, and adolescent age groups in order to optimize diagnostic accuracy in these sometimes challenging cases.

(E-51) Thursday • 10:00 AM
Benign (and Often Incidental) Osseous Findings of the Pelvis Detected on CT: A Pictorial Review

Kathleen M. Doherty, MD, *New York-Presbyterian Hospital/Weill Cornell Medical Center, New York, NY*; Keith D. Hentel, MD, MS (keh9003@med.cornell.edu)

As utilization of computed tomography of the abdomen and pelvis increases, nonmusculoskeletal radiologists are increasingly confronted with evaluating the bony pelvis. Radiologists will frequently encounter incidental musculoskeletal findings with which they may not be familiar. Frequently, these patients are referred for additional imaging tests and even orthopedic consultation. However, many of these osseous abnormalities can be characterized as benign without the need for additional evaluation. In addition to decreasing unnecessary imaging examinations, accurate initial diagnosis will reduce the anxiety felt by the patients during the additional work-up. The purpose of this poster is to provide a pictorial review of common and uncommon osseous entities that involve the pelvis, including the CT appearance of such. Entities which will be illustrated include fibrous dysplasia, characteristic postoperative changes, typical degenerative changes, osteochondroma/hereditary multiple exostoses, myositis ossificans, Paget's disease, osteitis condensans ilii, osteitis pubis, sacroiliitis, hyperparathyroidism, intraosseous lipoma, pelvic digit, and Fong's disease.

(E-52) Thursday • 3:30 PM
Paget Disease of Bone: Spectrum of Imaging Findings and Diagnostic Pitfalls

Richard Hong, MD, *New York-Presbyterian Hospital/Weill Cornell Medical Center, New York, NY*; Kevin W. Mennitt, MD; Keith D. Hentel, MD, MS (ritchie065@yahoo.com)

Paget disease of bone is a disorder frequently encountered by radiologists, often as an incidental finding on radiological studies performed for other reasons. While most radiologists are familiar with the classic findings of coarsened and thickened trabeculae, Paget disease can present with a broad spectrum of imaging findings, depending on the disease phase. It is not uncommon for lytic lesions in the early lytic phase or sclerotic lesions in the blastic phase to be mistaken for metastatic disease. Moreover, the diagnosis of Paget disease may not be obvious when the initial findings are made on MRI or CT without a plain film for correlation. The purpose of this exhibit is to illustrate the various manifestations of Paget disease on plain film, CT, MRI, and bone scintigraphy throughout the various stages of the disease (ie, lytic,

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mixed, and blastic phases). Differentiating Paget disease from other diseases, particularly metastatic disease, will be emphasized. Additionally, associated complications such as fracture, bowing deformity, arthritis, and malignant transformation will be addressed.

(E-53) Friday • 10:00 AM Evaluation of the Donor Transplant Liver: What the Surgeon Needs to Know

Stuart Bentley-Hibbert, MD, PhD, *New York-Presbyterian Hospital, New York, NY*; Kevin W. Mennitt, MD

With the ever increasing demand for liver transplants, living donor transplantations are becoming more prevalent. The radiologist plays a vital role in preoperative assessment. The goal of this presentation is to provide the radiologist with the tools necessary to evaluate the liver completely by using MRI and CT and to provide the surgeon with information regarding exclusionary factors and detailed relevant descriptions of the arterial, venous, and biliary systems.

(E-54) Friday • 3:30 PM Gallium Scan with SPECT/CT: A Method to Differentiate Hepatic Abscess from Metastatic Lesions in a Patient with Cholangiocarcinoma

Varghese Cherian, MD, *New York, NY*; Stephen Scharf, MD

Gallium scanning has been effectively utilized in diverse clinical settings. Gallium scan with SPECT/CT offers a superior modality for patient care in certain cases. The advantages of such a combined imaging resource are demonstrated in the case of a patient with metastatic cholangiocarcinoma and unexplained fever. Gallium scan with SPECT/CT was used to identify and locate hepatic abscesses among multiple liver metastases. Subsequently, patient treatment was modified, and the liver abscesses were drained via interventional radiologic techniques. Major teaching points of this exhibit include: 1. Gallium SPECT/CT imaging is a useful modality in the evaluation of certain patients. 2. Gallium SPECT/CT enables the identification and localization of abscesses among multiple liver metastases. 3. Gallium SPECT/CT may have an impact upon the therapy and prognosis of patients with metastatic disease and unexplained fever.

(E-55) Thursday • 10:00 AM Imaging of Tumors and Tumor Mimics of the Temporomandibular Joint

Ajay Malhotra, MD, *University of Rochester Medical Center, Rochester, NY*; Rajiv Mangla, MD; Virendra Kumar; Per-Lennart A. Westesson, MD, PhD; Tore Lorheim (ajay_malhotra@urmc.rochester.edu)

PURPOSE: The purpose of this exhibit is to illustrate the imaging findings of various benign and malignant lesions involving the temporomandibular joint and discuss the tumorlike conditions at this site.

METHOD AND MATERIALS: This exhibit is based on high-quality CT and MR imaging studies of tumors of the temporomandibular joint, with clinical and pathological correlation. We retrospectively reviewed these images, and we will illustrate the pertinent imaging findings. We will briefly review the normal anatomy of the temporomandibular joint and discuss the common tumors found in this location, with a systematic approach to analyzing tumor characteristics and extension. Thus, synovial chondromatosis, osteochondroma, osteoma, sphenoid meningioma, osteosarcoma, local extension of neoplastic lesions, and metastasis will be illustrated. We will also discuss tumorlike conditions of pseudogout, pigmented villonodular synovitis, traumatic bone cyst, and normal variants.

RESULTS: CT and MR imaging have been widely used for imaging the temporomandibular joint, helping to provide differential diagnosis and accurately determine the extent of lesions. CT improves the diagnostic information and serves as the standard diagnostic instrument for cartilaginous or osseous neoplastic lesions. MRI is especially useful in evaluating soft-tissue extent with multiplanar techniques and has high spatial resolution. Marrow infiltration is also best evaluated on MRI. CT and MR imaging are often complementary in the diagnosis and characterization of temporomandibular lesions.

CONCLUSION: Radiological diagnostic procedures are essential for the diagnosis and treatment planning of neoplastic lesions of the temporomandibular joint. Neoplastic lesions of the temporomandibular joint are often incidental findings, and radiologists need to be confident about interpretation of these lesions. This exhibit will provide the practicing radiologist an opportunity to become familiar with their imaging characteristics.

(E-56) Thursday • 3:30 PM Cerebral Amyloid Angiopathy

Ajay Malhotra, MD, *University of Rochester Medical Center, Rochester, NY*; Rajiv Mangla, MD; Virendra Kumar; Barbara Germin; Per-Lennart A. Westesson, MD, PhD (ajay_malhotra@urmc.rochester.edu)

PURPOSE: To review the imaging findings, clinical presentations, and histopathologic features of cerebral amyloid disease. Cerebral amyloid angiopathy (CAA) is an important cause of cerebral hemorrhages, although it may also lead to ischemic infarction and dementia. It is an underrecognized cause of cerebrovascular disorders affecting elderly patients. Imaging findings are important in guiding clinical decision making.

METHOD AND MATERIALS: Amyloidosis is caused by extracellular deposition of β -amyloid in tissues. Cerebral amyloid deposition may occur in three morphologic patterns: cerebral amyloid angiopathy, amyloidoma, and diffuse white matter involvement. Cerebral amyloid angiopathy is not associated with the presence of systemic amyloidosis. Although commonly seen at autopsy, cerebral amyloid angiopathy remains an underrecognized cause of cerebrovascular disease. Diagnosis often requires a combination of clinical and imaging evaluation.

RESULTS/CONCLUSION: Cerebral amyloid disease is an important but underrecognized cause of cerebrovascular disorders, mostly in elderly patients. Many patients are asymptomatic, and clinical presentations can be varied. Early recognition of neuroimaging findings, especially small or chronic cortical hemorrhages, helps to identify this condition. This exhibit should help the practicing radiologist understand this important clinical condition and its accurate neuroimaging interpretation.

(E-57) Friday • 10:00 AM MR Angiography of the Head: How It's Done, Normal Anatomy, and Pathological Cases

Salman S. Mirza, DO, *University of Rochester, Rochester, NY*; Henry Z. Wang, MD, PhD (salman_mirza@urmc.rochester.edu)

Contrast-enhanced MR angiography has rapidly become a clinically accepted and diagnostically useful tool. MR angiography has not replaced intra-arterial digital subtraction angiography but rather aids the work-up and diagnosis of intracranial vascular lesions. MR angiography has advanced over the past decade to become a useful noninvasive adjunct to intra-arterial DSA. Initial time-of-flight MR angiography has given way to contrast-enhanced dynamic MR angiography.

LEARNING OBJECTIVES: 1. Understand the basic physics behind MR angiography techniques. 2. Become familiar with the steps involved in real-time auto-triggered elliptic centric-ordered 3D gadolinium-enhanced MR angiography of the head. 3. Understand post-image processing steps. 4. Understand normal intracranial vascular anatomy. 5. Become familiar with vascular lesions of the head as seen on contrast-enhanced MR angiography.

(E-58) Friday • 3:30 PM Cystic Lesions of the Pediatric Neck

Edward P. Lin, MD, *University of Rochester Medical Center, Rochester, NY*; Per-Lennart A. Westesson, MD, PhD (Edward_Lin@urmc.rochester.edu)

Cystic lesions of the neck are common in the pediatric population. The majority of these lesions are congenital, followed by benign neoplasms and inflammatory disease. When presenting with a neck mass, a child or infant is often initially evaluated by ultrasound to determine whether the mass is cystic or solid. CT or MR allows further characterization of the mass and its relationship with surrounding structures. This is particularly helpful with surgical planning. The most common cystic lesions include

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branchial cleft anomalies, thyroglossal duct cysts, venolymphatic malformations, teratomas and dermoids, and infectious etiologies such as suppurative lymphadenitis and abscess. Understanding the pathology and differential of cystic lesions requires knowledge of the embryology of the head and neck, which this exhibit will briefly review. Knowledge of the clinical history helps to focus the differential. Finally, this exhibit will review the imaging characteristics of each of these lesions.

LEARNING OBJECTIVES: 1. Review the embryology of the head and neck. 2. Discuss the clinical manifestations, pathology, and differential of pediatric cystic lesions of the neck. 3. Review the imaging findings of pediatric cystic neck masses.

(E-59) Thursday • 10:00 AM
Idiopathic Tumoral Calcinosis: Radiologic-Pathologic Correlation

Navid A. Zenooz, MD, *Case Western Reserve University, Cleveland, OH*; Shervin Rafie, MD; Peter C. Young, MD

This poster has been withdrawn.

(E-60) Thursday • 3:30 pm
Stress Injuries in the Adolescent Athlete: A Review of MR Imaging Features

Navid A. Zenooz, MD, *Case Western Reserve University, Cleveland, OH*; Shervin Rafie, MD; Peter C. Young, MD

This poster has been withdrawn.

(E-61) Friday • 10:00 AM
Review of Pancreatic Neoplasms: What a Radiologist Needs to Know

Navid A. Zenooz, MD, *Case Western Reserve University, Cleveland, OH*; Shervin Rafie, MD; Nami R. Azar, MD; Dean Nakamoto, MD (Navid.Zenooz@case.edu)

This poster has been withdrawn.

(E-62) Friday • 3:30 PM
Paranasal Sinuses: Embryology, Anatomy, and Pathology, with Emphasis on Imaging Characteristics of Inflammatory and Neoplastic Processes

Yasamin Tarassoli, DMD, *Tufts University School of Dental Medicine, Boston, MA*; Navid A. Zenooz, MD; Daniel Hsu, MD (Navid.Zenooz@case.edu)

This poster has been withdrawn.

(E-63) Thursday • 10:00 AM
Noncompaction of the Myocardium: A Comprehensive Review

Navid A. Zenooz, MD; Shervin Rafie, MD, *Case Western Reserve University, Cleveland, OH*

BACKGROUND: Noncompaction of the myocardium (NCM), also referred to as “spongy myocardium,” was thought to be very rare, but it has recently been more frequently reported. This syndrome appears as excessive and prominent trabeculations with deep intertrabecular recesses within the ventricular walls, usually involving the left ventricle (LV). NCM is seen in both genders and all races.

KEY ISSUES: Patients may present with cardiac arrhythmias (the major cause of death), thromboembolic events, or LV failure. Associations with other diseases, including neurologic or other cardiac syndromes, have been noted. NCM is primarily diagnosed by Doppler echocardiography; however, CT scan and MRI are useful tools for determining case severity and patient’s prognosis. With these methods, high-resolution images of the myocardium are obtained that enable better recognition of the areas over which the trabeculae are distributed. Early diagnosis can improve patients’ survival by premature heart transplantation or implantation of a defibrillator. Also, since there are many reports of occurrence of this syndrome in several members of the same family (mainly

X-linked inheritance), upon accurate and early diagnosis, the patient’s family can be further screened.

FORMAT: This presentation is organized to (1) review the pathophysiology of NCM, (2) focus on imaging features of NCM in cross-sectional modalities (CT and MRI), and (3) discuss the value of early diagnosis and treatment of NCM and also the importance of screening of the family members.

TEACHING POINTS: We hope to make the reader more familiar with (1) pathophysiology of NCM; (2) clinical presentation and associations of this syndrome; and (3) characteristic imaging features of NCM, which are helpful in diagnosis and prognostication of this syndrome.

(E-64) Thursday • 3:30 PM
A Helping Hand with Hand Tumors

Paul P. Harkey, MD, *MetroHealth Medical Center, Cleveland, OH* (pharkey@metrohealth.org)

METHOD AND MATERIALS: Soft-tissue lesions of the hand may provide a diagnostic challenge for physicians. These lesions often may present with pain, skin discoloration, temperature insensitivity, and deformity. By distinguishing the soft-tissue constituents of fat, fluid, flow voids, and solid enhancing lesions, MR provides excellent tissue characterization. A 4-year retrospective review of confirmed hand cases which were examined by MR was performed. The results were correlated with pathologic and clinical data. We identified seven cases which are representative of a spectrum of soft-tissue lesions of the hand, including ganglion cyst, giant cell tumor of the tendon sheath, hemangioma, glomus tumor, arteriovenous malformation, necrobiotic nodule, and lipoma. The MR imaging findings of each entity are discussed in this pictorial essay, with emphasis on classic findings as well as atypical pitfalls in interpretation.

RESULTS: From this exhibit, the viewer will be able to: (1) Identify different types of soft-tissue lesions of the hand using MR and their clinical features. (2) Properly establish protocols directed towards identifying hand anomalies. (3) Understand the diagnostic pitfalls to avoid when diagnosing soft-tissue lesions of the hand.

CONCLUSION: This exhibit highlights the clinical issues, techniques, imaging findings, and pitfalls of different types of soft-tissues lesions of the hand.

(E-65) Friday • 10:00 AM
US-guided Biopsy Workshop: Improvement in Confidence and Reduction in Resident Anxiety

Troy A. Blagrave, MD, *NEOUCOM-CAH, Canton, OH*; Craig M. Johnson, DO; Elizabeth A. Russ, MD; Zachary Redus, BS; David Brine, MD

PURPOSE: To find the utility of an ultrasound-guided workshop for diagnostic radiology residents and its role in increasing confidence and competency while reducing resident anxiety.

METHOD AND MATERIALS: A total of 20 diagnostic radiology residents with varied experience in ultrasound-guided biopsy were given instruction and allowed to demonstrate technique on turkey-breast, commercially produced, and Jell-O mold phantoms. A mixture of olives with pimiento, medallion onions, capers, and fruit in the Jell-O mold were used to simulate tumors. Both before and after the procedure, surveys were completed, addressing experience level, confidence, and anxiety. All residents made at least three attempts on multiple phantoms.

RESULTS: Confidence related to procedure performance increased with all levels of training. Anxiety was shown to increase in the post-workshop survey for 1st-year residents, which was attributed to underestimation of procedural technical difficulty. Anxiety was decreased after the workshop for all other levels of training. All levels of experience rated the workshop as very to extremely beneficial to their training.

CONCLUSION: An ultrasound-guided workshop with a variety of phantoms can be beneficial in increasing both resident confidence and competency, as well as reducing anxiety. Beginning trainees commonly underestimate the technical difficulty of the procedure.

* Faculty financial disclosures are located in the Faculty Index.

(E-66) Friday • 3:30 PM

Primary Splenic Neoplasms Mimicking Hemangioma: Radiographic and Histopathologic Correlation

Elizabeth A. Russ, MD, *NEOUCOM-CAH, Canton, OH*; Craig M. Johnson, DO; Manish Goyal, MD; Marilyn J. Goske, MD; Daniel Wasdahl, MD

Primary splenic neoplasms are rare. Littoral cell angioma (LCA) and inflammatory myofibroblastic pseudotumor (IMT) of the spleen are extremely rare primary splenic tumors which can mimic the more common hemangioma on cross-sectional imaging studies. There are few multimodality radiographic characteristics described for either tumor. These characteristics may be the most helpful in differentiating LCA and IMT from other primary vascular splenic tumors. We present two patients found on CT to have splenic masses within enlarged spleens. Both patients were successfully treated with laparoscopic splenectomy. Multimodality imaging characteristics are described, along with histologic and immunohistochemical correlation. Differentiating LCA and IMT from hemangioma is important, with both tumors recently found to have an association with concurrent malignant neoplasms and autoimmune disorders.

(E-67) Thursday • 10:00 AM

Finding Your Roots: Disease Processes of the Cauda Equina, with Review of the Normal Anatomy

Eric M. Nyberg, MD, *University Hospitals Case Medical Center, Cleveland, OH*; Amanda M. Wiant, MD; Michael D. Coffey, MD

PURPOSE: This education exhibit will (1) review the normal anatomy of the cauda equina, (2) depict the normal imaging appearance of the cauda equina, (3) review selected pathological entities affecting the cauda equina, and (4) focus on the MR appearance of selected disease processes of the cauda equina.

CONTENT: 1. MR anatomy and signal characteristics of the cauda equina. 2. Review of disease processes affecting the cauda equina. 3. Case-based review of MR appearance of disease processes of the cauda equina, with an emphasis on inflammatory and neoplastic processes.

SUMMARY: The findings of nerve root enlargement or abnormal enhancement of the cauda equina can be seen in a variety of clinical settings, including autoimmune, infectious, and neoplastic etiologies. This exhibit will aid the clinician in identifying the abnormalities and generating a differential appropriate to the clinical picture.

(E-68) Thursday • 3:30 PM

The Many Faces of Ischemic Bowel

Sharon L. D'Souza, MD, MPH, *University of Oklahoma, Oklahoma City, OK*; Logan D'Souza, BS; Theresa Thai, MD (sharonlisa1222@yahoo.com)

The diagnosis of intestinal ischemia is challenging on many levels, complicated by varied symptomatology and an often insidious clinical presentation. Radiographic appearance is generally nonspecific and can be seen in other inflammatory diseases of bowel, thus necessitating the use of computed tomography for further evaluation and exclusion of other disease processes. Even then, imaging findings exhibited in association with ischemia encompass a broad spectrum, the at times subtle appearance of which can easily be overlooked or attributed to other entities. The purpose of this exhibit is to provide a pictorial review of intestinal ischemia by utilizing case-based examples to illustrate the varied appearance on imaging. High clinical suspicion and correlation of clinical and radiographic findings are the keys to diagnosing intestinal ischemia.

(E-69) Friday • 10:00 AM

Traumatic Injuries of the Cervical Spine

Sharon L. D'Souza, MD, MPH, *University of Oklahoma, Oklahoma City, OK*; Logan D'Souza, BS; Theresa Thai, MD (sharonlisa1222@yahoo.com)

Posttraumatic injuries of the cervical spine encompass a wide spectrum of disease, with the potential for a variety of subsequent clinical syndromes, depending on the type and severity of injury. Assessment of the trauma patient is often inherently problematic secondary to a number of factors. A thorough, timely evaluation of the cervical spine is an important component of the initial trauma work-up. Of particular interest are the craniocervical and cervicothoracic junctions, given their unique biomechanical properties. The purpose of this education exhibit is to provide a pictorial review of patterns of cervical spine traumatic injury. In doing so, key anatomical landmarks and techniques for evaluating the cervical spine in the setting of trauma will be reviewed. As injury to this region can be devastating, often resulting in significant morbidity and mortality, prompt and accurate radiological evaluation is necessitated. The trauma radiologist can thus play an essential role in ensuring timely treatment and perhaps preventing delayed neurological deficits.

(E-70) Friday • 3:30 PM

Misplaced IUD: Where Did It Go?

Luke Ballard, MD, *Oregon Health and Science University, Portland, OR*; Roya Sohaey, MD; Karen Oh, MD; Anne M. Kennedy, MD (ballardl@ohsu.edu)

The intrauterine contraceptive device (IUD) is considered an effective means of contraception when appropriately positioned within the uterus. Following insertion, the position of an IUD can be monitored clinically through history, pelvic examination, and patient self-examination. Routine ultrasound evaluation is not typically indicated. However, position comes into question when the strings attached to the device can no longer be identified within the vagina or are too long, if the IUD cannot be removed easily with gentle retraction, or if the patient becomes pregnant in spite of IUD use. Other indications for imaging may include excessive vaginal bleeding, late menses, cramping pelvic or abdominal pain, and infection. Pelvic ultrasound is the first imaging modality used to evaluate the IUD position and identify other potential complications. Abdominal radiographs, CT, and MRI are also useful in further work-up of the misplaced IUD. Here we demonstrate appropriate sonographic localization of an IUD and present a series of several cases illustrating some of the complications of IUD insertion and malpositioning, including myometrial penetration, uterine perforation, expulsion, and pregnancy. Recognizing inappropriate IUD positioning can help plan removal and potentially prevent unwanted pregnancies.

(E-71) Thursday • 10:00 AM

On-Call Passport

Ellana J. Rodriguez, MD, *Bryn Mawr Hospital, Bryn Mawr, PA*; Vikram S. Dravid, MD

PURPOSE: (1) To provide a preparatory tool, as well as a reference, for residents preparing for independent call. (2) To illustrate commonly seen traumatic/inflammatory "must-see" pathology from head to toe. (3) To present commonly occurring pitfalls/false positives in diagnosis. (4) To learn the optimal imaging modality to be used in specific clinical scenarios.

CONTENT ORGANIZATION: (1) Exemplify classic imaging findings from a comprehensive compilation of the most commonly seen pathology from head to toe. (2) Concise description of imaging findings referenced with commonly occurring false positives.

CONCLUSION: (1) This exhibit will serve as a primer for junior residents preparing for independent call, illustrating typical findings on a variety of modalities and providing help to recognize false positives. (2) The user will learn the most commonly seen on-call pathology and the appropriate imaging modality for that pathology. (3) This will serve as a preparatory tool prior to independent call or as a future reference resource.

* Faculty financial disclosures are located in the Faculty Index.

(E-72) Thursday • 3:30 PM
Diverse Manifestations of Benign Thyroid Nodules

Albert J. Parlade, MD, *Geisinger Medical Center, Danville, PA*; Robert R. Snowden, MD; Nathan G. Gee, MD; Anne P. Dunne, MD

Thyroid nodules are common in the adult population. At autopsy, 50% of patients have thyroid nodules. Of these, 98% are benign. Of the 2% that are malignant, 85% are well-differentiated papillary carcinomas, with a 30-year survival rate of 95%. Many thyroid nodules are found incidentally on imaging studies for unrelated indications. Much has been published in the literature on the sonographic criteria to distinguish benign from malignant thyroid nodules. However, in daily practice, it is not infrequent that recommendation for biopsy is made only because the nodule measures at least 1.0 cm in size. This exhibit will display the various sonographic appearances of benign thyroid nodules. Characteristic features of malignant thyroid nodules will be included for comparison. Our experience with the sonography and cytology results of ultrasound-guided fine-needle aspiration biopsies of approximately 800 thyroid nodules over 3 years (July 2004 to June 2007) will be reviewed. It is hoped that this exhibit will aid the learner in the critical assessment of thyroid nodules with sonography. This may reduce the number of recommendations for biopsy. It may result in more moderate wording of reports to lessen both the patient's and the referring clinician's anxiety. In the long term, there may be more prudent management of limited health care resources.

(E-73) Friday • 10:00 AM
Developing Visual Grammar and Logic

Saurabh Jha, MBBS, *Hospital of the University of Pennsylvania, Philadelphia, PA*; William W. Boonn, MD*; Neil Isaac, MD (saurabh.jha@uphs.upenn.edu)

The art and science of radiology is intricately linked to visual reasoning. Traditional teaching methods emphasize the variations of normality and the recognition of pathology. Amongst residents, there is a variation in the aptitude for picking up subtle pathology, yet there is no formal training in developing and improving, or even testing, visual logic and reasoning. Just as grammar and syntax form the building blocks of English literature, it follows that strong familiarity with visual logic will enable trainees to navigate their radiology curriculum with greater ease. A test of visual logic will help program directors identify residents early on who may need greater help in their residency programs. The aim of this exhibit is to provide an outline of methods that are currently available to develop, improve, and test visual logic. It is hoped that the methods described will enable both the interested trainee and the seasoned radiologist to think better with their eyes.

(E-74) Friday • 3:30 PM
Three-dimensional and Advanced Imaging Curriculum for Radiology Residents

William W. Boonn, MD*, *University of Pennsylvania, Philadelphia, PA* (william.boonn@uphs.upenn.edu)

With recent advances in imaging technologies, particularly in CT and MRI, knowledge of advanced imaging techniques, such as 3D imaging, perfusion imaging, spectroscopy, and functional imaging, has become increasingly necessary to render complete interpretation for optimal clinical care. Background knowledge of advanced imaging, as well as the ability to create, manipulate, and interpret these images, should be incorporated into the training of current and future radiology residents. This exhibit will outline a proposed 3D and advanced imaging curriculum for radiology residents, defining the knowledge base, skill sets, and learning objectives for both junior and senior residents. Sample topics include defining and determining differences among types of 3D imaging (MPR, MIP, MinIP, VR, SSD, etc), 3D imaging artifacts, imaging planes versus anatomical planes, image reconstruction versus reformatting, and functional imaging calculations. The curriculum will also include practical exercises to ensure that residents demonstrate practical competence in manipulating data sets in addition to basic background knowledge.

(E-75) Thursday • 10:00 AM
Cardiac CT and MR Imaging Applications in the Diagnosis and Management of Arrhythmogenic Heart Disease

William W. Boonn, MD*, *University of Pennsylvania, Philadelphia, PA*; Neil Isaac, MD; Saurabh Jha, MBBS; Harold I. Litt, MD, PhD*

Advances in cardiac CT and MRI have increased their role in the diagnosis and management of a number of arrhythmogenic heart diseases. This poster will outline and provide an overview of the major arrhythmogenic heart diseases that are imaged using CT and MRI. Topics will include (1) CT and MR imaging of patients with atrial fibrillation for preablation mapping, anatomy, and postablation follow-up for pulmonary vein stenosis or other complication; (2) diagnosis and characterization of arrhythmogenic right ventricular dysplasia/cardiomyopathy by using CT and MR; (3) evaluation of other cardiomyopathies which predispose patients to arrhythmia, including ischemic cardiomyopathy, hypertrophic cardiomyopathy, dilated cardiomyopathy, cardiac sarcoidosis, and Chagas disease; and (4) strategies for optimal CT and MR imaging of arrhythmogenic heart disease.

(E-76) Thursday • 3:30 pm
Spontaneous Abdominal Hemorrhage: CT Findings

Saeed Fakhran, MD, *University of Pittsburgh Medical Center, Pittsburgh, PA*; Alessandro Furlan, MD; Michael Federle, MD (fakhrans@upmc.edu)

This poster has been withdrawn.

(E-77) Friday • 10:00 AM
Volume CT Data Set Manipulation on a 3D Workstation: A Primer for Residents—The Basics (Part I)

Jeffrey C. Markham, MD, *University of Texas Southwestern Medical Center, Dallas, TX*; David P. Chason, MD (david.chason@utsouthwestern.edu)

Volume CT scanning has transformed the practice of radiology in the ED. Isotropic volume data sets are now routinely acquired for the rapid evaluation of patients with multitrauma, PE, aortic dissection/vascular injury, stroke, or suspected intracranial aneurysm, often obviating the need for more invasive procedures such as catheter angiography. For accurate interpretation, it has become essential that the radiologist, not the technologist, be able to manipulate the CT volume data set on a 3D workstation. The purpose of this exhibit is to describe and illustrate the basic postprocessing techniques available on a 3D workstation for evaluating CT volume data sets.

LEARNING OBJECTIVES: 1. Understand isotropic CT volume data sets and how they are acquired. 2. Outline the method for generating source images from the volume data set prior to postprocessing. 3. Review postprocessing options available for manipulating source images on a 3D workstation, including multiplanar reconstructions (MPRs), maximum intensity projection (MIP) images, volume rendering (VR), and vessel analysis techniques. 4. Familiarize the reader with bone removal/editing methods. 5. Recognize the diagnostic strengths and limitations of each postprocessing technique.

(E-78) Friday • 3:30 PM
Volume CT Data Set Manipulation on a 3D Workstation: A Primer for Residents—How to Evaluate the Neurovasculature by CT Angiography (Part II)

Ethan O. Cohen, MD, *University of Texas Southwestern Medical Center, Dallas, TX*; Jeffrey C. Markham, MD; Seth Toomay, MD; David P. Chason, MD (david.chason@utsouthwestern.edu)

Recent advances in MDCT technology have made volume CT scanning a reality in the modern ED setting, allowing for rapid noninvasive evaluation of the neurovasculature with CTA. It is important for radiology trainees to be able to evaluate volume CT scans of the head and neck for neurovascular disease. Developing a systematic method and understanding the strengths and limitations of various postprocessing techniques allow for efficient and accurate interpretation. The purpose

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of this exhibit is to describe and illustrate a basic but complete approach for the CTA evaluation of the neurovasculature on a 3D workstation by employing the postprocessing techniques discussed in part I.

LEARNING OBJECTIVES: 1. Illustrate the utility and limitations of the various postprocessing options (including bone removal techniques) available for evaluation of the neurovasculature. 2. Outline a standard approach for the CTA evaluation of the neurovasculature by using a 3D workstation. 3. Discuss additional postprocessing strategies for optimizing the detection and characterization of traumatic vascular pathology, aneurysm/AVM, CVA, atherosclerotic disease, and vasculitis. 4. Provide solutions for common problems encountered in neuro CTA.

(E-79) Thursday • 10:00 AM
Volume CT Data Set Manipulation on a 3D Workstation: A Primer for Residents—How to Evaluate the Thoracic, Abdominal, and Peripheral Vasculature by CT Angiography (Part III)

Seth Toomay, MD; Ethan O. Cohen, MD; Jeffrey C. Markham, MD; Shellie C. Josephs, MD; David P. Chason, MD; Todd Buersmeyer, MD, *University of Texas Southwestern Medical Center, Dallas, TX* (david.chason@utsouthwestern.edu)

Recent advances in MDCT technology have made volume CT scanning a reality in the modern ED setting, allowing for rapid noninvasive evaluation of the vessels of the thorax, abdomen, and extremities with CTA. It is important for radiology trainees to be able to evaluate volume CT scans for vascular disease. Developing a systematic method and understanding the strengths and limitations of various postprocessing techniques allow for efficient and accurate interpretation. The purpose of this exhibit is to describe and illustrate a basic but complete approach for the CTA evaluation of the thoracic, abdominal, and peripheral vasculature on a 3D workstation by employing the postprocessing techniques discussed in part I.

LEARNING OBJECTIVES: 1. Illustrate the utility and limitations of the various postprocessing options (including bone removal techniques) available for evaluation of the thoracic, abdominal, and peripheral vasculature. 2. Outline a standard approach for the CTA evaluation of the thoracic, abdominal, and peripheral vasculature by using a 3D workstation. 3. Discuss additional postprocessing strategies for optimizing the detection and characterization of PE, aortic dissection, aortoiliac/mesenteric/renal occlusive disease, peripheral vascular disease, and aneurysm. 4. Provide solutions for common problems encountered in body CTA.

(E-80) Thursday • 3:30 PM
MR Imaging of Pediatric Knee Pain

Larry A. Kramer, MD, *University of Texas Medical School, Houston, TX*; Anuradha Rao, MD

Magnetic resonance imaging, due to the lack of ionizing radiation and its ability to evaluate muscles, ligaments, tendons, fibrocartilage, hyaline cartilage, and bone marrow, is an excellent modality in the evaluation of pediatric knee pain. In contrast to adults, knowledge of the developmental features unique to pediatric knee imaging, including evolution of the appearance of bone marrow, primary and secondary ossification centers, articular cartilage, and the growth plate, is critical to the assessment of the pediatric knee. These components will be reviewed in detail and compared to a gamut of disease entities presenting with knee pain.

(E-81) Friday • 10:00 AM
ACGME-identified Core Competencies in Interventional Radiology Fellowship Training: A Portfolio-based Approach

Rajeev Suri, MD, *University of Texas Health Science Center, San Antonio, TX*; Neal C. Dalrymple, MD* (suri@uthscsa.edu)

INTRODUCTION: The core impetus of medical training has traditionally been medical knowledge and patient care. ACGME has identified four additional core competencies as essential requisites for a wholesome education. Though well integrated in specialty residency training, the six-competency-based education has only recently been introduced

into subspecialty fellowship training (July 2007). The implementation of competency-based training has been assigned to individual institutions under the supervision of subspecialty Residency Review Committees (RRCs).

PURPOSE: 1. Describe the comprehensive approach taken by the interventional radiology (IR) program at our institution to implement competency-based education and to define the core competencies as they relate to interventional radiology. 2. Introduction of the portfolio-based approach that has been an effective tool for assessing compliance with competency-based training in our diagnostic radiology program. 3. Describe modifications in the interventional radiology portfolio to suit its role as an assessment tool for subspecialty training and to highlight its role as a continuum for the maintenance of certification process after CAQ certification.

CONTENT ORGANIZATION: 1. ACGME-identified six core competencies for subspecialty training in the U.S., and the integration of these competencies into our IR curriculum. 2. Portfolio-based documentation and assessment approach to foster self-assessment: (a) Measurable competency-based goals/objectives and their assessment for individual trimesters of the 1–2-year IR training program. (b) 180°/360° evaluation forms created by our program for a competency-based assessment of trainees against set benchmarks. (c) Monthly/semiannual tools for evaluating achievement of proficiency in individual competencies.

SUMMARY: Competency-based education, conceptualized by ACGME in 1999, is a stepwise advancement of the trainee against measurable goals and objectives for each level of training. Successful implementation of a portfolio-based approach in our interventional radiology program shall achieve the ultimate aim of a competent trainee, as was true for the success of a similar approach in our diagnostic radiology residency program.

(E-82) Friday • 3:30 PM
Gastrointestinal Fluoroscopy in the Emergent Setting: Review of Imaging Findings and Techniques

Christopher P. Ho, MD, *University of Virginia, Charlottesville, VA*; Drew L. Lambert, MD

PURPOSE: In the age of CT and MRI, fluoroscopy still continues to play an important role in certain gastrointestinal emergencies. The purpose of this exhibit is to review the wide spectrum of fluoroscopic gastrointestinal emergencies, including their radiographic appearances and techniques in performing the appropriate examination.

CONTENT ORGANIZATION: Radiographic appearances and appropriate imaging techniques for the following entities will be presented: esophageal perforation, foreign-body evaluation/retrieval, intussusception, internal hernias (paraduodenal or transmesenteric), volvulus including stomach (organoaxial or mesenteroaxial), and malrotation.

SUMMARY: Fluoroscopy still has an essential role in the diagnosis and even possible treatment of gastrointestinal pathology in the emergent setting. The modality can be critical in making a timely diagnosis and possible referral for surgical intervention or other appropriate management. However, proper technique remains necessary in order to maximize the utility of fluoroscopy, and there should be persistent emphasis on education regarding procedural skills.

Trainee Prize: 1st Place

(E-83) Thursday • 10:00 AM
Creating Future Leaders in Radiology: A Unique Elective Experience for Radiology Residents

Thomas M. Carr III, MD, *University of Virginia, Charlottesville, VA*; Spencer B. Gay, MD* (tmc6w@virginia.edu)

BACKGROUND: Resident education in radiology programs has traditionally focused on preparing residents to be skilled interpreters of diagnostic imaging studies and performers of image-guided interventions. Few opportunities exist for residents to develop an understanding of the administrative and business aspects of radiology practices or the leadership skills needed in the increasingly complex world of radiology practices.

* Faculty financial disclosures are located in the Faculty Index.

PURPOSE: To design and implement an elective experience which provides an understanding of the practice model of a radiology department and which fosters the development of leadership skills needed for future success.

METHOD AND MATERIALS: An elective period was defined during which the resident would interact closely with the leadership of an academic radiology department. The goals of the elective experience were generated by collaboration of the program director, department chairman, and the resident: (1) Develop an understanding of business model, basic operations, and organizational structure of a radiology department. (2) Observe, discuss, and begin to develop business and leadership skills to better prepare the resident for leadership roles in future career. (3) Propose a project to involve the resident in a long-term effort to improve the practice of radiology by the department. (4) Establish a resident elective to provide exposure to the leadership and administrative aspects of a radiology department and to better educate residents about issues which will impact them beyond residency.

RESULTS: The specific activities of the elective primarily included discussions and daily participation in the administrative and leadership activities of the department under the guidance of the department chairman, chief operating officer, and chief executive officer.

CONCLUSION: An elective experience in the administrative and leadership activities of a radiology department can be an educational opportunity for residents. Residents who participate in such an elective develop a better understanding of the function and operations of the departments in which they work and may be better prepared to assume leadership roles after residency.

(E-84) Thursday • 3:30 PM Assessment of Valvular Heart Disease with Cardiac MR Techniques

Jason M. Johnson, MD, *University of Vermont/Fletcher Allen Health Care, Burlington, VT*; George E. Gentchos, MD (george.gentchos@vtmednet.org)

PURPOSE: 1. To review the cardiac MR imaging sequences used for assessment of valvular heart disease, including steady-state free precession and velocity-encoded techniques. 2. To review the cardiac MRI techniques to quantify stenotic and regurgitant valvular lesions. 3. To illustrate the MRI appearance of valvular abnormalities.

CONTENT/ORGANIZATION: 1. Pulse sequence diagram and explanation of steady-state free precession and velocity-encoded MRI techniques. 2. Illustration and description of cardiac MRI techniques used for quantification of stenosis and regurgitation, including the modified Bernoulli equation, continuity equation, pressure half time, and direct planimetry. 3. Illustration and description of common valvular heart disease, including aortic, mitral, tricuspid, and pulmonic stenosis and regurgitation. Illustration of unusual valve disorders (elastofibroma, subaortic membrane, Ebstein's anomaly, prosthetic valves).

SUMMARY: After reviewing this exhibit, the reader will be familiar with MRI techniques for imaging cardiac valves and assessing blood flow. The reader will then learn how to use these data to apply principles from echocardiography to quantify regurgitant and stenotic lesions. Finally, the reader will become familiar with the imaging appearance of common and some unusual cases of valve abnormalities.

(E-85) Friday • 10:00 AM Imaging of the Transmissible Spongiform Encephalopathies

Joshua P. Nickerson, MD, *Fletcher Allen Health Care/University of Vermont, Burlington, VT* (joshua.nickerson@vtmednet.org)

The human transmissible encephalopathies include the sporadic and familial forms of Creutzfeldt-Jakob disease (CJD), fatal familial insomnia, Gerstmann-Sträussler-Scheinker disease (GSSD), variant Creutzfeldt-Jakob disease (vCJD), and kuru. These conditions are unique and fascinating in that the current infectious model revolves around prion protein (PrP) rather than a DNA- or RNA-based mechanism. The neuroimaging findings in all but kuru, which has not been

described since cannibalism was outlawed in New Guinea, have been documented. These include basal ganglia abnormalities on T2-weighted MRI, high signal in the cortical ribbon on diffusion-weighted MRI, regional changes in metabolic activity on PET, and abnormal levels of metabolites on MRS. All lead to a final common pathway of spongiform degeneration and vacuolization on pathologic examination. While there is no treatment yet available for these diseases, diagnosis is important to differentiate the nonspecific early clinical findings from other correctable conditions.

Trainee Prize: 1st Place

(E-86) Friday • 3:30 PM Task-based Method for Medical Student Radiology Education

Rachel F. Gerson, MD, *University of Washington Medical Center—Roosevelt, Seattle, WA*; Felix S. K. Chew, MD, MBA; Annemarie Relyea-Chew, MSc (rfgerson@u.washington.edu)

PURPOSE: Our goal is to design, implement, and evaluate a task-based self-directed educational activity that provides an active and engaging learning experience for students while making more efficient use of faculty.

METHOD AND MATERIALS: In the setting of a 4-week elective radiology course offered during the 4th year of medical school, we created an unknown case assignment consisting of three groups of four unknown musculoskeletal radiology cases. Each group of unknowns was designed to illustrate a different category of musculoskeletal disease. Small groups of students were given the cases, as well as online access to multiple radiology references, and asked to work together to “solve” the unknowns by using these references. Students then came together as a larger group with an instructor to discuss the cases and their conclusions. A written evaluation of the entire experience, with both Likert items and unstructured response items, was conducted at the end of each session.

RESULTS: The course was given during 3 consecutive years. The evaluation was conducted in the 3rd year over a 1-year period. The response rate was 100%. Students gave above-average scores to each of the three assigned tasks in terms of educational effectiveness (73%–86%), appropriateness of content (77%–82%), and overall educational value (77%–82%). Additionally, the students gave the faculty-led interactive group session above-average scores in each of these three areas as well: educational effectiveness (91%), appropriateness of content (91%), and overall educational value (86%). Unstructured responses indicated that the students valued the interactive nature of the assigned tasks and subsequent group discussion and took away specific knowledge of the covered areas of musculoskeletal radiology.

CONCLUSION: An educational activity based on self-directed small-group tasks followed by a faculty-directed interactive classroom discussion was well received by students, met its educational objectives, and made more efficient use of faculty time. Activities of this type have the potential for widespread application in radiology education.

(E-87) Thursday • 10:00 AM Skull Base Lesions at the Petrous Apex and Cerebellopontine Angle: A Pictorial Review

Jeffery Hogg, MD; Gloria J. Guzman Perez-Carrillo, MD, *West Virginia University/Robert C. Byrd Health Sciences Center, Morgantown, WV* (jhogg@hsc.wvu.edu)

The purpose is to provide an education exhibit illustrating major disease entities that affect the the complex regions of the mid and posterior skull base. Important anatomic variations and inconsequential findings that may mimic or suggest more significant disease are also illustrated and described. The approach is based on anatomical localization of disease, with emphasis on the importance of combining clues from imaging and clinical context in differential diagnosis. Retrospective case review of a broad range of pathologically and clinically proven cases from a tertiary referral center was undertaken. Cases

* Faculty financial disclosures are located in the Faculty Index.

represent a broad spectrum of skull base diseases in the petrous apex and cerebellopontine angle, with case examples of secondary changes related to the primary disease, such as denervation atrophy in a variety of locations, providing additional imaging clues that may aid in diagnosis. These are organized by location, with reference and anatomic orientation to major skull base landmarks and foramina. Entities for each location are reviewed, with appropriate differential diagnostic points and recommended imaging approaches for common clinical presentations. High-quality images illustrate the findings and complement the succinct review of diseases affecting this region. Diagnosis of lesions of the petrous apex and cerebellopontine angle region is challenging. Images with didactic material describing clinical manifestations and imaging recommendations in this exhibit can aid the radiologist in providing the appropriate diagnosis.

LEARNING OBJECTIVES: 1. To gain or refresh knowledge about skull base lesions at the petrous apex and cerebellopontine angle for clinical practice and review for certifying examinations. 2. To emphasize the utility of clinical context for differential diagnosis. 3. To provide proven case examples to aid in recognition of typical and atypical manifestations of lesions of petrous apex and cerebellopontine angle.

(E-88) Thursday • 3:30 PM **Orbital Neoplasms: A Pictorial Review**

Jeffery Hogg, MD; Gloria J. Guzman Perez-Carrillo, MD, *West Virginia University/Robert C. Byrd Health Sciences Center, Morgantown, WV* (jhogg@hsc.wvu.edu)

The purpose is to provide an education exhibit illustrating major neoplastic disease entities that affect the orbit. The approach is based on anatomical localization of disease, with emphasis on differential diagnosis and clinical context. Histopathological correlation is provided for select cases. Retrospective case review of a broad range of pathologically and clinically proven cases from a tertiary referral eye center was undertaken. Cases represent a broad spectrum of orbital malignant neoplastic diseases. These are organized by location into skull base and bony orbit, orbital contents, and ocular globe. Major neoplastic entities for each location are reviewed, with appropriate differential diagnostic points and recommended imaging approaches for common clinical presentations. High-quality images illustrate the findings and complement the succinct review of neoplastic disease of the orbital region. Diagnosis of neoplastic disease of the orbit is challenging. Images with didactic material describing clinical manifestations and imaging recommendations in this exhibit can aid the radiologist in providing the appropriate diagnosis.

LEARNING OBJECTIVES: 1. To gain or refresh knowledge about neoplastic diseases of the eye, orbit, and adjacent skull base for clinical practice and review for certifying examinations. 2. To emphasize the utility of clinical context for differential diagnosis. 3. To aid in recognition of typical and atypical manifestations of neoplastic orbital disease.

(E-89) Friday • 10:00 AM **Nonneoplastic Disease of the Orbit: Pictorial Review**

Jeffery Hogg, MD; Gloria J. Guzman Perez-Carrillo, MD, *West Virginia University/Robert C. Byrd Health Sciences Center, Morgantown, WV* (jhogg@hsc.wvu.edu)

The purpose is to provide an education exhibit illustrating major nonneoplastic disease entities that affect the orbit. The approach is based on anatomical localization of disease, with emphasis on differential diagnosis and clinical context. Histopathological correlation is provided for select cases. Retrospective case review of a broad range of pathologically and clinically proven cases from a tertiary referral eye center was undertaken. Cases represent a broad spectrum of orbital nonneoplastic diseases. These are organized by location into skull base and bony orbit, orbital contents, and ocular globe. Major nonneoplastic entities for each location are reviewed, with appropriate differential diagnostic points

and recommended imaging approaches for common clinical presentations. High-quality images illustrate the findings and complement the succinct review of nonneoplastic disease of the orbital region. Nonneoplastic disease of the orbit can present a diagnostic challenge. Images with didactic material describing clinical manifestations and imaging recommendations in this exhibit can aid the radiologist in providing the appropriate diagnosis.

LEARNING OBJECTIVES: 1. To gain or refresh knowledge about nonneoplastic diseases of the eye, orbit, and adjacent skull base for clinical practice and review for certifying examinations. 2. To emphasize the utility of clinical context for differential diagnosis. 3. To aid in recognition of typical and atypical manifestations of nonneoplastic orbital disease.

(E-90) Friday • 3:30 PM **Assessment of Undergraduate Radiology Education: Results of 1 Year's Experience**

Robert J. Tallaksen, MD, *West Virginia University, Morgantown, WV* (rtallaksen@hsc.wvu.edu)

PURPOSE: The curriculum of the School of Medicine at West Virginia University includes basic correlation of gross anatomy with imaging during the 1st year, but there is no formal instruction in diagnostic radiology except for the optional 4th-year clerkship and whatever knowledge a student manages to assimilate during clinical rotations. Assessment was made, over the course of 1 year, of the fund of radiology knowledge of 47 fourth-year medical students who were beginning either the 2-week basic radiology rotation or the 4-week extended rotation.

METHOD AND MATERIALS: A computer presentation of cases to illustrate 21 from the list of 25 "must-see" diagnoses suggested in the National Medical Student Curriculum in Radiology developed by the Alliance of Medical Student Educators in Radiology was given to students on the 1st day of the rotation as a pretest.

RESULTS: The ability to recognize important imaging diagnoses is seriously deficient among 4th-year medical students, whether they intend to pursue radiology as a specialty or not.

CONCLUSION: Undergraduate education in diagnostic radiology requires considerable improvement.

(E-91) Thursday • 10:00 AM **Evaluation of Neural Tube Defects by Using Motion-Insensitive and T2-weighted MR Imaging Sequences**

Stephany S. Swart, MD, *West Virginia University, Morgantown, WV*

The purpose of this presentation is to review the multiple types of neural tube defects and to demonstrate the exquisite contrast and detail that fast-acquisition and motion-insensitive MRI contributes to the diagnosis and treatment planning. Neural tube defects are a group of severe nervous system defects that occur because of an impaired neurulation process. The incidence of neural tube defects is approximately 6%–8%. The mortality and morbidity, as well as the prognosis, are widely variable and depend on the type and severity. This presentation demonstrates and reviews, in a pictorial essay form, approximately 20 cases of various types of neural tube defects, including myelomeningocele, meningocele, split-cord malformations, diastematomyelia, and encephalocele. The motion-insensitive MRI sequences will also be reviewed, highlighting the exquisite contrast and detail needed in identifying these defects for proper treatment planning. MRI strengths and limitations will also be reviewed, such as motion artifact, polyhydramnios, age of fetus, FOV, slice thickness, time of acquisition, coil type, and slice spacing. MRI is the study of choice for detailed imaging of neural tube defects and is usually performed following initial ultrasound screening that has raised a concern for a neural tube defect.

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AUR 2008 Electronic Education Exhibit Abstracts

Electronic education exhibits will be displayed on Friday, March 28, 2:00–4:00 PM, and will be located in the Metropolitan Ballroom A, Level 3. *AMA PRA Category 1 Credit™* will be awarded for attending this session.

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

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

(E-101) Standardized Color-coded 3D Reconstructions of Complex Congenital Heart Disease by Using Cardiac CT Angiography

Jon A. Machayya, MD, *St Joseph's Hospital and Medical Center, Phoenix, AZ*; Taruna Ralhan; Nathan J. Linstrom, MD; Randy Richardson, MD; Amy Trahan, MD

PURPOSE: To standardize color-coding of the anatomical structures in 3D reconstructions of congenital heart diseases by using cardiac CTA.

METHOD AND MATERIALS: ECG-gated cardiac CTA was performed with a multidetector CT scanner. A retrospective review of 53 patients with complex congenital heart disease who underwent cardiac CTA was performed. 3D reconstructions of the anatomy were performed by using a commercially available workstation. Postsurgical confirmation of anatomy was ascertained at a weekly cardiology conference. A color-coding scheme for the various thoracic structures was developed and standardized. The aorta was colored bright red, along with its branches, including the great vessels and the coronaries. The pulmonary arteries were colored dark blue, and the pulmonary veins were colored pink. The ventricles were colored in a lighter shade of their respective outflow tracts to delineate the two chambers. Hence, the left ventricle was colored a lighter shade of red, and the right ventricle was colored a lighter shade of blue. The left and right atria were colored pink and aqua, respectively. The trachea was depicted in yellow. This color-coding scheme was used to display multiple congenital heart anomalies.

CONCLUSION: Cardiac CTA is a viable noninvasive modality well suited to detect different types of congenital heart disease. The 3D reconstructions and color standardization facilitate presurgical planning and clearly demonstrate the anatomy for teaching purposes.

(E-102) Life-Support Lines in the Chest in the Intensive Care Unit Setting: Where Are They, and Are They Real?

Jeffrey J. Gronkiewicz, BA, *University of Miami, Miami, FL*; Humberto O. Martinez, MD (JJGronkiewicz@med.miami.edu)

This Web-based interactive computer exhibit will review the expected positioning of common lines and tubes used in the intensive care unit setting. Emphasizing the importance of the knowledge of normal portable CXR anatomy, we will present several cases of malpositioned life-support lines and their potential life-threatening complications. The reader will also be challenged in identifying common radiographic artifacts often mistaken for a catheter or an abnormal radiographic finding. Whenever available, the viewer will be provided with other imaging modalities which confirm the findings on the plain film. The exhibit will provide the indication for the case presented, and self-assessment will be offered through a multiple-choice question format. Feedback on correct and incorrect answers will be provided. The interactive format will allow viewers to easily navigate through the exhibit and also to supplemental information not included within the cases.

(E-103) Development and Implementation of a Resident-based Departmental Web Site

Daniel R. Karolyi, MD, PhD, *Emory University Hospital, Atlanta, GA*; Mark E. Mullins, MD, PhD (dkaroly@emory.edu)

PURPOSE: To outline an approach toward developing and implementing a resident-based departmental Web site.

APPROACH: A resident-based departmental Web site was created (<http://userwww.service.emory.edu/~dkaroly/>) with content based on three major topics: (1) work flow, (2) resident education, and (3) on-call issues. The work flow section includes a centralized portal to frequently dialed phone numbers and frequently used Web sites such as electronic medical records and various PACS systems used in the Emory system. The resident education section includes recommended resident-level texts, pertinent articles, and orientation materials for incoming as well as continuing residents. The on-call section includes extensive information on ultrasound machine operation, frequently used forms for preliminary reports, and written departmental policies regarding issues such as contrast reactions/premedication and contrast extravasation protocols. Managerial components include an easily updated calendar of resident-related events/conferences and readily accessible departmental documents such as vacation request and book fund reimbursement forms. The Web site also serves as a resident recruitment tool by providing information that is not readily available on the main departmental Web site. Issues including implementation, utilizing university resources, and legal implications will be addressed. Results from a resident/faculty survey regarding perceptions and utilization of this resource will also be presented.

CONCLUSION: A resident-based departmental Web site is an efficient and easily accessible resource for resident education and communication.

Trainee Prize: 2nd Place

(E-104) Computer-based Educational Tool for Residents to Learn Essentials of Billing, Compliance, and Re-imbursement

Alicia C. Arnold, BS, MD, *Brigham and Women's Hospital, Boston, MA*; Peter M. Doubilet, MD, PhD (acarnold@partners.org)

Radiology residents generally have little training in the administrative and business aspects of radiology, despite their importance to professional success in both academic and private practice. We have developed a computer-based educational tool, aimed primarily at residents, to provide instruction in the fundamentals of billing, compliance, and reimbursement. The first portion of this training module covers basic concepts and terminology, including *Current Procedural Terminology (CPT) codes*, *ICD-9 (International Classification of Diseases: 9th Revision) codes*, *RBRVS (resource-based relative value scale)*, *RVUs (relative value units)* and their components (including work and facility RVUs), professional versus technical billing, inpatient versus outpatient billing, and the Medicare conversion factor. Topics such as the development process for new *CPT codes* and their correct application are covered. The second portion briefly addresses relevant general Medicare billing compliance regulations. The third and major part of the training module is devoted to a presentation of radiology-specific billing compliance rules, including issues of medical necessity, documentation requirements for diagnostic and interventional radiology services, and common errors in radiologists' documentation. After studying these topics, residents will be able to evaluate their knowledge with self-assessment questions. This exhibit, consisting of our computer-based teaching module, covers the essentials that residents should know about billing, compliance, and reimbursement before completing training.

* Faculty financial disclosures are located in the Faculty Index.

(E-105)**ResHub: An Internal Web Site for Gathering and Organizing Resources for Radiology Residents**

Tarik K. Alkasab, MD, PhD, *Massachusetts General Hospital, Boston, MA*; Christopher Kagay, MD; Manjil Chatterji, MD; Ashraf Thabet, MD; Theresa C. McLoud, MD (talkasab@partners.org)

Radiology residents focus on two tasks: learning radiology and performing clinical work. They need pointers to many kinds of resources to perform these tasks. For their education, recommendations for books, for review articles, and for external Web sites are extremely valuable. For performing clinical work, basic introductions to the rotations and quick reference to useful clinical articles and policy documents are needed. To simplify access to these resources important to radiology residents, we have created an internal Web site which assembles them according to a resident-centric organization. That is, after gathering the resources (including policy documents, Web site links, suggested reading references), we designed a structure for the Web site based on different resident contexts: starting a particular clinical rotation; deciding protocol for a set of scheduled examinations; dealing with a contrast issue with a patient; or moonlighting in one of the department's outpatient imaging centers. Then connections to the various gathered resources were embedded in basic documents of tips regarding these different contexts. As part of this process, we also realized that some resources were relevant to multiple contexts. For example, a useful brain tumor Web site should be linked from both a page of information about the neuroradiology rotation and from a page of useful Web sites. To prevent duplication of effort, we created a system based on a central database of all resources, including policy documents, journal articles, Web sites, and books, each of which can be flagged to be included in several different contexts. This improves the likelihood of a user finding the desired resource regardless of the context from which he or she approaches the site. We have improved the accessibility of resources for radiology residents both by organizing our internal Web site according to resident-centric contexts and by creating a central database of documents and links which are included in many of these contexts. Response from both faculty seeking to disseminate information and the residents themselves has been positive.

(E-106)**Creation of Annotated Cine US Videos for Use in Radiology Education**

Aaron M. Friedkin, MD, *University of Michigan, Ann Arbor, MI*; William Weadock, MD*; Jacob Livermore, MD (friedkin@umich.edu)

The advent of stored cine ultrasound images has allowed ultrasound examinations to be easily interpreted by individuals who were not present at the time of the examination. Relationships of structures to their surroundings are often much better understood when dynamic cine files are presented, as opposed to static images. Unfortunately, the limitations of print media have restricted ultrasound teaching to static images. While these images can be easily annotated for teaching purposes, they do not provide a real-world example of how anatomy and pathology are actually encountered by ultrasound. As electronic teaching files have become more prevalent, cine video files can now be easily incorporated into ultrasound education. For the ultrasound novice, however, viewing cine ultrasounds without an understanding of what is being presented can be frustrating. Over the course of an ultrasound cine, the anatomy will typically change, and the ultrasound novice can become confused. We demonstrate a method of easily annotating cine ultrasound files which can be used for ultrasound education. While these files can be incorporated into PowerPoint® teaching lectures, the primary method in which they have been utilized for education at our institution is as part of our electronic teaching file. Our institution utilizes a MIRC server, which hosts our teaching file cases. MIRC stands for Medical Imaging Resource Center and was developed by the RSNA as a library for sharing medical imaging. Links to case-of-the-day teaching files are distributed by an e-mail Listserv throughout the department of radiology. These cases are created and contributed by residents, fellows, and attending radiology staff. We believe that

the ability to easily create annotated cine ultrasound images is a much-needed addition to modern ultrasound education. We present a means of creating such files, which have been successfully incorporated into radiology education at our institution.

Trainee Prize: 3rd Place**(E-107)****What Do Medical Students Know about Cost, Charges, and Reimbursement of Imaging Examinations on Their Patients? Teaching Radiology Economics Is Part of Clerkship Companion for Medical Students, Based on Medical Student Survey**

Barbara Nickel, BA; Anthony Burgos, MD; Judith K. Amorosa, MD, *UMDNJ-New Jersey Medical School, Newark, NJ*; Sujoy Menon, MA, BA; Ajay Nemade, BA; Eugene Kennedy, MD (amorosa@umdnj.edu)

E-mail survey was conducted on three medical school campuses in one state to assess medical students' knowledge about the cost of imaging patients. Second-, 3rd-, and 4th-year medical students were included in the survey. Three theoretical examples were presented to the medical students, with several choices for imaging modalities. They were instructed to consider the best examination, to their knowledge, and the cost of the examinations, although no information was given to them regarding the cost of these imaging modalities. The answers were analyzed to determine students' knowledge of the appropriateness of the imaging modalities for the clinical conditions and their knowledge of the cost of these examinations. After taking these results into consideration, a comprehensive list of Medicare charges for all imaging procedures was placed into the clerkship companion. The student has immediate access to this information as he/she is considering working up a clinical problem with a specific imaging modality. By referring to this database regarding cost, the medical student (future physician) can make decisions. As to the appropriateness of the imaging modality for the condition, the student (future physician) can hyperlink to the ACR appropriateness criteria.

(E-108)**Development of Radiology Clerkship Companion for Medical Students Corresponding to Medicine, Surgery, Obstetrics-Gynecology, and Pediatrics: Progress Report and Assessment by Expert Panel**

Judith K. Amorosa, MD, *UMDNJ-New Jersey Medical School, Newark, NJ*; Anthony Burgos, MD; Sujoy Menon, MA, BA; Salim Samuel, MD; Barbara Nickel, BA; Ahlawat Shivani, MD; et al (amorosa@umdnj.edu)

Assessment of learning materials in the Web-based Clerkship Companion for Medical Students to correspond to medicine, surgery, obstetrics-gynecology, and pediatrics by AUR (especially AMSER) attendees is the purpose of this computer exhibit. The clerkship companion is being developed by AMSER, funded by 2005–06 and 2006–07 GE Healthcare/RSNA World Wide Web-based Educational Program Grant. This Web-based learning material is intended to introduce the medical student (future referring physician) to the use of radiology during his/her core clerkship in medicine, surgery, obstetrics-gynecology, and pediatrics. Assessment of the draft of this learning material is planned as an education exhibit. The overall functionality, format, appearance, ease of use, methods of instruction, clinical content, image quality, image description, imaging sequences, references, and test-question validity are to be evaluated with a six-point scale by individual members of the expert group of teachers in radiology. The exhibit will consist of a double computer setup. The attendee will be able to study the clerkship companion, which is on a Web site, on one side of the table. A second computer next to the first will have a program with the questions to be evaluated and room for comments. The attendee's demographics will be noted. The assessment by the attendees will be considered in the further drafting of the Web site development.

* Faculty financial disclosures are located in the Faculty Index.

(E-109)

Computer-based MR Imaging of the Knee, with Emphasis on MR Anatomy, Pathology, and Arthroscopic Correlation

Mark R. Robbin, MD, *Case Western Reserve University, Cleveland, OH*; Navid A. Zenooz, MD; Alejandro N. Bugnone, MD; Brian N. Victoroff, MD (Robbin@uhrad.com)

BACKGROUND: While radiographic imaging of the knee is an essential component of the evaluation of patients with knee pain and trauma, MRI has become the most accurate noninvasive method for diagnosing intra-articular pathology. Meniscal and ligamentous tears are rather common among athletes and predispose the joint to early osteoarthritis. In addition to history and physical examination, diagnosis of knee pathology is often made or confirmed with imaging studies. The high sensitivity and specificity of MRI for diagnosis of soft-tissue abnormalities have made it the modality of choice for assessing articular cartilage, meniscal, and ligamentous injuries. MRI is also considered the most useful imaging tool for the evaluation of muscular injuries, bone marrow contusion, and radiographically occult fractures.

KEY ISSUES: This computer-based exhibit will provide a comprehensive review, in an interactive format, of MR anatomy and mechanisms of injury, with emphasis on the MR appearance of common meniscal and ligamentous injuries. A discussion of reviewed cases with arthroscopic and radiographic correlation will be presented.

FORMAT: More than 1000 MRI cases of the knee were reviewed and analyzed. Images were uploaded into an interactive exhibit to display the anatomy classified into three broad categories: examples of normal anatomy, sports-related injuries, and internal derangement. Cases will be presented in an interactive format with explanations of the imaging findings and pathology.

TEACHING POINTS: (1) To review normal MR anatomy of the knee joint, with correlation to common pathology. (2) To depict common sports-related injuries and internal derangements of the knee. (3) To correlate MR findings with radiographic abnormalities.

(E-110)

The Breast Imaging and Intervention Radiologic-Pathologic Conference: A Valuable Tool for Quality Assurance and Staff and Resident Education

Michael P. McNamara, Jr, MD*, *Case Medical School/MetroHealth Campus, Cleveland, OH*; Ignacio Chiong, MD (mmcnamara@metrohealth.org)

Imaging-detected breast abnormalities are most commonly diagnosed with minimally invasive biopsy. Pathology results on the submitted tissue, if adequate for diagnosis, may fall into various malignant and benign categories, but “problem” lesions such as ADH (atypical ductal hyperplasia), lobular neoplasia, and papillary, fibroepithelial, mucocystic-like, columnar cell, and microglandular lesions, as well as radial scars, can be encountered. Often, the referring physician is not a breast surgeon and may not have a background in breast care sufficient to independently interpret and make management decisions. We conduct a weekly multidisciplinary breast imaging and intervention radiologic-pathologic conference. Each image-directed breast procedure is reviewed and discussed in detail with attention to (1) the initial imaging work-up and assessment (and review of relevant earlier films) for “lessons learned”; (2) the procedure itself, reviewed from a technical and image documentation standpoint for quality and completeness; and (3) the pathology findings and whether they are concordant or discordant with the imaging findings and expectations. As a result of the conference, the radiologist generates a final (nonbilled) report for the referring clinician, documenting that the case was reviewed and whether the results are concordant or discordant, and makes a recommendation for the appropriate clinical and imaging follow-up. This exhibit will be a PowerPoint presentation that reviews our radiologic-pathologic conference process in detail, presents seven cases as they would be presented in the actual conference, and provides samples of our “follow-on” report macros that are sent to our referring physicians.

(E-111)

Full-Body-Thickness Multiplanar Reformat of CT Data: A Novel Plain Film Teaching Tool

Asim Choudhri, MD, *University of Virginia, Charlottesville, VA*; Christopher P. Ho, MD; Eric Johnson, MD; Theodore E. Keats, MD

PURPOSE: Increased emphasis on cross-sectional imaging during residency training is thought to be decreasing plain film diagnostic skills; however, plain films remain a valuable tool for evaluation of chest, abdominal, vertebral, and musculoskeletal pathology. We attempted to determine if thick-slice multiplanar reformats (MPRs) of computed tomography (CT) data can be used as an educational tool to improve radiographic diagnostic skills.

METHOD AND MATERIALS: Full-body-thickness MPRs were created from chest, abdomen, and pelvis CT examinations to simulate radiographs of the chest, abdomen, and vertebral column. Data were acquired on a multislice scanner with isotropic voxels, and sagittal and coronal MPRs were computed from the source data. Thick-slice reconstructions were performed on a dedicated workstation. Anatomic and pathologic findings were presented to 15 residents at varying levels of training. After review of the simulated radiograph, thin-slice correlates were provided to assist in understanding of the findings. Teaching points included differentiation between small-bowel and colon gas patterns, finding facet joints on vertebral radiographs, and identification of abdominal organomegaly, pulmonary vasculature, pulmonary nodules, and hilar adenopathy.

RESULTS: 14/15 (93%) of residents felt that they were able to better understand the findings on the simulated radiograph when using the thin-slice images, and 15/15 (100%) felt that inclusion of this technique would benefit their education in interpretations of plain films.

CONCLUSION: Thick-slice MPR-CT data sets can be leveraged as a valuable educational tool, and the use of this technique should be added to the curriculum for junior residents learning to read radiographs.

(E-112)

Retroperitoneal Spaces: An Online Digital Interactive CT Teaching File of Normal Anatomy and Disease in Children

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PURPOSE: The retroperitoneal spaces are a potentially challenging region for radiology residents to master. The purpose of this electronic education exhibit is (1) to review normal CT anatomy of the retroperitoneal spaces by using an online large-data-set interactive format with a display that allows optional color-shading of anatomical structures and has a scroll feature in axial, coronal, and sagittal planes; and (2) to review examples of pathology involving the retroperitoneal spaces in children, by using a format described in aim 1.

CONTENT/ORGANIZATION: 1. We created a CT atlas of the retroperitoneal spaces in a normal child, consisting of a total of approximately 100 axial and reformatted coronal and sagittal Digital Imaging and Communications in Medicine (DICOM)-compliant CT images. 2. We created a teaching file of pathological conditions, including infectious, neoplastic, traumatic, and iatrogenic entities, also composed of a total of approximately 100 axial and reformatted coronal and sagittal images per case. The underlying program to view the atlas was written in C# using the .NET Framework. The program runs on any version of Microsoft Windows with the .NET Framework installed.

SUMMARY: The major goals of this exhibit are (1) to provide residents with an online easy-to-use interactive method to learn imaging anatomy of the retroperitoneal spaces; and (2) to provide an online interactive digital CT teaching file of pathological pediatric conditions involving these spaces in a format that (a) contains a scroll feature in three planes for each, (b) allows for side-by-side comparison with a normal subject, (c) has optional color shading and labelling of anatomical structures, and (d) includes the option to “take cases” as unknowns.

* Faculty financial disclosures are located in the Faculty Index.