HPE002-b

Ethical Issues in Radiology Publication and Peer Review

Education Exhibits
Location: NA

Selected for RadioGraphics

Participants
Douglas S. Katz MD (Presenter): Nothing to Disclose
Jason C. Hoffmann MD: Consultant, Merit Medical Systems, Inc
Puneet Bhargava MD: Editor, Reed Elsevier
Mariam Moshiri MD: Consultant, Reed Elsevier Author, Reed Elsevier
Erick Marc Remer MD: Nothing to Disclose
Darienne Segura RT: Nothing to Disclose
Nicole Bielawski: Nothing to Disclose
Michael Nathan Patlas MD, FRCP: Nothing to Disclose

TEACHING POINTS
Radiology researchers, authors, reviewers, and editors have all been under increasing scrutiny in recent years for their academic research, publications, and related activities. Some research and publication practices are clearly unethical, such as academic fraud and duplicate publications. However, other practices fall into a grayer area, such as conflicts of interest, variants of duplicate publication, and unblinding of reviewers and authors during the peer review process. The purpose of this exhibit is therefore to call attention to these topics as they apply to academic radiology, using specific examples from the literature, and quotation of position statements and opinion papers from authorities, particularly past and present journal editors.

TABLE OF CONTENTS/OUTLINE
We will review the following topics: academic fraud and other related scientific misconduct; plagiarism; duplicate publication and its variants; the criteria for authorship; IRB approval and informed consent; HIPAA; conflicts of interest, disclosures, and industry and other relationships; and blinding and unblinding of reviewers and authors, as well as other problems and ethical dilemmas in the peer review process. We will review these issues in some detail, with overviews as well as specific citations of case examples in the imaging literature, and potential solutions.

HPE003-b

Perceived Impact of Radiation Exposure During Radiology Residency on Fertility Among Current Female Radiology Residents

Education Exhibits
Location: NA

Participants
Michelle Elizabeth Naylor MD (Presenter): Nothing to Disclose
Elizabeth M. Johnson MD: Nothing to Disclose
Robert Alan Koenigsberg DO: Nothing to Disclose

TEACHING POINTS
1. Investigate the level of awareness and understanding amongst female radiology residents about the amount of radiation they are exposed to during their training, and the effects it may or may not have on fertility. 2. Assess if and how possible radiation exposure affects any decisions female residents make during their training in regards to pregnancy planning. 3. Discuss female medical student and resident education on the impact of radiation, including effects on fertility.

TABLE OF CONTENTS/OUTLINE
1. Gender disparity in radiology and subspecialty fields with higher potential radiation exposure
2. Recent trends in female resident specialty choices (published ACGME data)
3. Our survey results: 165 female residents of nearly 1300 total female residents from ACGME accredited radiology residency programs completed the survey. 80% reported having some general knowledge about the effects of radiation on fertility, 42% of residents were not concerned about the effects of radiation on fertility, 42% somewhat concerned, and the remainder very concerned. 41% of respondents answered that their decision in regards to subspecialty was or will be influenced by the amount of radiation exposure they receive.
4. Discussion of the current radiation physics education/testing and possible changes in education for medical students and radiology residents

HPE004-b

Video Based Educational Program for Appropriate Utilization of CT Radiation Dose

Education Exhibits
Location: NA

Participants
Atul Padole MD (Presenter): Nothing to Disclose
Ranish Deedar Ali Khawaja MD: Nothing to Disclose
Roberto Lo Gullo MD: Nothing to Disclose
TEACHING POINTS

Teaching points: Appropriate radiation dose utilization is important in CT scanning. Our exhibit will highlight our personal experience and content to teach the audience in a simplified "easy to understand" manner. 1. Importance of appropriate indication for CT scanning 2. Selecting and setting indication appropriate CT protocols 3. Scan parameters that help in appropriate dose utilization in CT 4. Good habits that help in radiation dose optimization 5. Pitfalls and errors in CT scanning that can affect associated radiation doses 6. Checking radiation doses to ensure appropriate use

TABLE OF CONTENTS/OUTLINE

Table of contents/outline We will create and use our short video/animation clips to help audience understand the following 1. Effect of scan parameters on CT radiation dose 2. Effect of radiation dose on image quality and certain lesions 3. Iterative image reconstruction: How to set them up 4. Important "Always Do" prior to CT scanning 5. Critical "Never Do" in CT scanning 6. Dose checks and alerts: rational response

HPE005-b

Practical and Interactive Approach to ACGME Health Economics Requirements: A Resident Primer

Education Exhibits
Location: NA
Cum Laude

Participants
Nii O. Koney MD, MBA (Presenter): Nothing to Disclose
Mustafa Syed DO: Nothing to Disclose
Munir Ghesani MD: Nothing to Disclose
Nolan J. Kagetsu MD: Spouse, Employee, Pfizer Inc

TEACHING POINTS

Using the new ACGME milestone model, we have designed an interactive and practical case-based approach to educating residents and fellows about health economics requirements 1. Attendees will have a better understanding of the alphabet soup involved in the reimbursement process such as ICD, MPFS, RVRVU, CMS, CPT, RCU and how they all relate to one another. We will pay particular attention to the looming transition to ICD-10 and ways it can affect the bottom line of radiology departments 2. Attendees will be introduced to the basic radiology revenue cycle model and practical steps that need to be taken in the current system to ensure a bright future for radiology

TABLE OF CONTENTS/OUTLINE

* Case Study introduction * Overview of ACGME Diagnostic Radiology Health Economics Requirements: - Level 1: Types of payors and the reimbursement mechanism - Level 2: Relative costs of common procedures - Level 3: Technical and professional components of imaging costs - Level 4: Productivity measurements - Level 5: The radiology revenue cycle * Emerging payment models * Take Home points

HPE007-b

Diagnostic Intensity in End of Life Patients

Education Exhibits
Location: NA

Participants
Myriam Irislimane (Presenter): Nothing to Disclose
Francois Lamontagne: Nothing to Disclose
Lucie Brazeau-Lamontagne MD: Nothing to Disclose

TEACHING POINTS

Explore end of life (EOL) diagnostic intensity with the aim of improving quality of care. Explore the need for a patient-centered approach from the communication angle between physicians.

TABLE OF CONTENTS/OUTLINE

Advance care planning is relevant at the EOL. Lack of diagnostic advance care planning carries the risk of unwanted and unnecessary tests from the perspective of the patients. Unwanted and unnecessary diagnostic tests, in turn, would overstress limited resources and financial constraints on the health care system. To our knowledge, this is one of the first studies addressing diagnostic intensity in EOL. Patients with known metastatic cancer seemed a representative and traceable group. Given the high risk of thromboembolic events associated with cancer, pulmonary angiograms (PAS) are frequently prescribed to rule out pulmonary embolism. We aimed to explore the informed consent in a cohort of patients with documented metastatic cancer who underwent PAS while hospitalized. We conducted a single-center retrospective study from 01-01-2012 to 31-12-2012. Forty-five patients met the criteria. Seven were hospitalized in the palliative care unit and 38 on the acute care wards. None of the explicit documentations of the desired levels of care specifically addressed diagnostic procedures as care. More detailed data will be presented on the poster.

HPE008-b

Contrast Enhanced Ultrasound as a 24/7 Service. How to Set It Up

Education Exhibits
Certificate of Merit

Participants

Demosthenes D. Cokkinos MD (Presenter): Nothing to Disclose
Eleni Antypa: Nothing to Disclose
Christina Sierrou MD: Nothing to Disclose
Stylianos V. Benakis MD: Nothing to Disclose
Anna Skoula: Nothing to Disclose
Ploutarhos A Piperopoulos MD, PhD: Nothing to Disclose

TEACHING POINTS

Tips for setting up a round-the-clock service for Contrast Enhanced Ultrasound (CEUS).

TABLE OF CONTENTS/OUTLINE

Basic knowledge of physics and explanation of haemodynamic behaviour of US contrast agents, as well as machine settings. Introductory steps for performing a CEUS examination. How to present the technique to clinicians, who are usually unaware of its indications. Tips to facilitate learning the technique by Radiologists in training: initial scanning of patients with simple diagnostic questions, scheduling CEUS examinations at beginning or end of session, placing IV catheters in advance, minimising clip storing to avoid memory load, transferring clips-images to PCs, reviewing scans on workstations, etc. Description of CEUS examination protocols for various emergency indications in the abdomen, neck and extremity vessels, scrotum etc. Review of contraindications, limitations and safety matters.

HPE009-b


Education Exhibits
Location: NA

Participants

Rounak R. Bafana MD (Presenter): Nothing to Disclose
Shehbaz Shaikh MD: Nothing to Disclose
Safwan Halabi MD: Nothing to Disclose

TEACHING POINTS

1. To describe the concept of concierge and second opinion radiology services. 2. To describe the services offered by concierge and second opinion radiology services. 3. To describe the business and cost models in concierge and second opinion services. 4. To discuss the current and future applications into the delivery of health care.

TABLE OF CONTENTS/OUTLINE

I. Concierge and Second Opinion Radiology
   a. Emphasize patient centered radiology
   b. Second opinion radiology services: literature review of effects on clinical outcomes
   II. Review of services offered by Concierge Radiologists a. Explanation of the variety and availability of consultation services. b. Methods of delivery of personalized radiology services. III. Business models of Concierge and Second Opinion Radiology a. Fee for service model (quality vs. quantity) b. Operational costs and costs to the patient c. Medical legal implications and HIPAA compliance IV. Future direction of Concierge Radiology a. Applications in academics and private practice

HPE100

Do Radiologist Get $? DRGs and the Federal Reimbursement System

Education Exhibits
Location: NA

Selected for RadioGraphics

Participants

Simcha B. Rimler MD (Presenter): Nothing to Disclose
Deborah L. Reede MD: Nothing to Disclose
Brian David Gale MD: Board Member, SaferMD, LLC

TEACHING POINTS

Teaching Points After viewing this exhibit you will understand the: 1. Historical context of federal payments for healthcare 2. Relevance of DRG to patient care and physician/ hospital reimbursement 3. Potential future of the federal reimbursement system

TABLE OF CONTENTS/OUTLINE

Changes in the Federal government's 2014 Final Rule will have an important impact on Medicare reimbursement for imaging studies, particularly CT and MR. Radiologists are responsible for the education of clinicians and patients about diagnostic imaging services. This encompasses both the clinical and economic impact of their imaging decisions. Therefore, radiologists must be familiar with diagnostic related groups (DRGs) to understand their impact on patient care and service reimbursements for in-patient procedures. This exhibit begins with a pre-test of open ended questions about DRG's and the prospective payments system. Using a sample patient we demonstrate the new payment methodology and how different decisions (i.e. choice of hospital, co-morbidities, complications, length of stay and unnecessary studies) affect hospital and professional financial results. A post-test is included to reinforce the salient teaching points.
Participants
Ajay Dilip Wadgaonkar MD (Presenter): Nothing to Disclose
David M. Yousem MD: Royalties, Oakstone Publishing, LLC Author with royalties, Reed Elsevier Research Grant, Bayer AG

TEACHING POINTS
Few newly practicing radiologists and even fewer radiology trainees receive adequate exposure to the business of radiology, much less the details of radiology reimbursement. However, to remain competitive in a rapidly changing healthcare environment, the modern radiologist must have at least a basic knowledge of the reimbursement process. The aim of this exhibit is to: 1. Discuss ICD-9-CM and CPT coding 2. Describe the resource-based relative value scale and its elements, including the technical and professional components of payment 3. Introduce the revenue cycle and accounts receivable 4. Describe current and future challenges shaping radiology reimbursement, including the Affordable Care Act and capitation

TABLE OF CONTENTS/OUTLINE

HPE102
The Physician Quality Reporting System: Measures Relevant to Radiology - What You Don't Know Will Cost You

Education Exhibits
Location: NA

Participants
Christopher John Moran MD (Presenter): Nothing to Disclose
Munir Ghesani MD: Nothing to Disclose
Nolan J. Kagetsu MD: Spouse, Employee, Pfizer Inc
Mustafa Syed DO: Nothing to Disclose
Andrew John Evans MD: Nothing to Disclose

TEACHING POINTS
- To provide an up-to-date listing of PQRS measures relevant to radiology.
- To present rationale for these metrics while highlighting the relationship to appropriate use guidelines.
- To review the legislative history of PQRS metrics and discuss future applications.
- To demonstrate the economic implications of PQRS reporting bonus and readjustment payments.
- To discuss the use of PQRS metrics on Physician Compare, a CMS website presenting physician demographic and quality metric information.
- To list PQRS reporting and participation methods.

TABLE OF CONTENTS/OUTLINE
I. PQRS Background
a. Legislative
b. Economic Implications
c. Reporting and Participation
II. PQRS Measures Relevant to Radiology
a. Diagnostic
b. Interventional
c. Nuclear Medicine
d. Radiation Oncology
e. Optimizing Patient Exposure to Ionizing Radiation
f. Tips for Compliance with PQRS Measures
III. PQRS Metric Publication
a. Physician Compare
IV. Discussion

HPE103
"A Cut Above": New Techniques For Residents To Learn Interventional and Angiographic Procedures Utilizing Simple Balloon Models: A Pictorial Review

Education Exhibits
Location: NA

Participants
Perry S. Gerard MD (Presenter): Nothing to Disclose
Amrita Kaur Ameja MD: Nothing to Disclose
Christopher Michael Harnain MD: Nothing to Disclose
Sam J. McCabe MD: Nothing to Disclose

TEACHING POINTS
We discuss the conventional methods of learning the concepts of angiographic and interventional procedures. We review various methods used to train radiology residents in the performance and interpretation of angiographic and interventional procedures utilizing simple balloon models. We further discuss the use of balloon models to assist in educating the referring physician about the various procedures and assist in patient education and obtaining consents.
TABLE OF CONTENTS/OUTLINE

- Background on resident training for performance and interpretation of angiographic and interventional procedures, and need for innovative teaching methods. 
- Conventional methods of learning angiographic and interventional procedures. 
- Demonstrate a unique method of teaching various procedures utilizing simple balloon models, which includes: Balloon angioplasty, Stent and IVC filter placement, Angiographic diagnostic procedures and intervention, Abscess drainage, dialysis graft intervention Catheter and line placement, TIPS, biliary and GU intervention, and foreign body retrieval. 
- Discussion of using these methods for resident teaching, educating referring physician, patient education and obtaining consent. 
- Conclusion with summary and various applications.

HPE105

Contrast Extravasation: Management Guidelines for the Radiologist

Education Exhibits
Location: NA
Certificate of Merit

Participants
Khalid Walid Shaqdan MD (Presenter): Nothing to Disclose
Shima Aran MD: Nothing to Disclose
Ajay K. Singh MD: Nothing to Disclose
Elmira Hassanzadeh MD: Nothing to Disclose
Hani H. Abujuudeh MD, MBA: Research Grant, Bracco Group Consultant, RCG HealthCare Consulting Author, Oxford University Press

TEACHING POINTS

• Contrast extravasation (CE) is not an infrequent event. • Intravenous contrast agents are commonly used for both computed tomography (CT) and magnetic resonance (MR) imaging to aid in the detection, characterization, and staging of disease • While extravasation injuries are usually minor and resolve spontaneously, some cases result in serious complications • The aim of this exhibit is to provide a literature review of risk factors that increase the possibility of a patient developing CE, and discuss the most recent guidelines for extravasation management.

TABLE OF CONTENTS/OUTLINE

- Defining Contrast Extravasation 
- Risk factors o Mechanical o Physiologic o Pharmacologic 
- Clinical manifestation of Contrast Extravasation 
- Contrast Media and administration methods 
- Vascular Access for administration of contrast guideline o Mechanical injections o Power injections o Central lines 
- Management of contrast extravasations guideline o Safety reporting o Inpatients o Outpatients o Emergency

HPE106

Dose Optimization for Personnel during Interventional Procedures

Education Exhibits
Location: NA
Certificate of Merit

Participants
Sanne Slegers MSc (Presenter): Nothing to Disclose
Esther Leung PhD: Nothing to Disclose

TEACHING POINTS

The increased number of interventional procedures leads to higher radiation exposure for personnel. We give physicians useful tips for dose optimization and how to increase awareness of scatter radiation.

TABLE OF CONTENTS/OUTLINE

Firstly, it is important to optimize the patient dose, as this directly affects the operator dose. Besides minimizing acquisition protocol and fluoroscopy time, other factors that decrease patient dose are using low dose fluoroscopy (fig 1), optimizing patient and detector position (fig 2), optimizing zoom and collimation, using tube filtration, and avoiding steep angulations (fig 3). To further protect the operator, lead shielding can be employed. The effect of lead shielding is evaluated by measuring scatter dose profiles in the x-ray room (fig 4). In circumstances where shielding is not possible, it is advised to increase the distance to the patient. In particular, when using lateral fluoroscopy, the dose can be reduced by standing at the detector side instead of the tube side (fig 5). The visualization of scatter radiation leads in practice to more awareness for, and a reduction of, scatter radiation.

Above mentioned points should be instructed to new residents. By actively coaching the physician and monitoring scatter dose during the interventional procedure, considerable dose reduction can be achieved.

HPE107

Give 'Em What They Want: Matching Resident Reviews with Resident Expectations

Education Exhibits
Location: NA

Participants
Judah Burns MD (Presenter): Nothing to Disclose
Daniel Ariel Krieger MD: Nothing to Disclose
Mordecai Koenigsberg MD: Nothing to Disclose
**TEACHING POINTS**

1. Resident evaluation and feedback should provide a comprehensive picture of resident performance, incorporating both objective and subjective measures.
2. ACGME milestones are an incomplete measure of resident achievement.
3. Resident evaluation forms query data from varied sources to create a holistic assessment of progress and deficiencies.

**TABLE OF CONTENTS/OUTLINE**

The ACGME Milestones project and NAS create an opportunity to revise traditional methods of resident evaluation. Clinical Competency Committees (CCC) derived Milestones standards do not fully reflect resident participation and accomplishment. The semi-annual evaluation affords an opportunity for more meaningful and resident-focused interval measurement of learning and academic involvement, which is assessed using an evaluation form that serves as a tool for CCC review.

This exhibit outlines the components of a thorough semi-annual evaluation form, and provides guidance as to how the information is collated. Specific components may include:

- Objective exam scores
- Longitudinal summary of milestones achievement
- Graphical representation of resident performance
- Resident learning portfolio
- Case logs
- Scholarly activity
- Teaching activities
- Departmental/hospital service
- Awards
- Faculty comments from rotations
- CCC summary

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**HPE110**

**Imaging Safety Considerations in the Pregnant Patient: Management Principles Based Upon New ACR Practice Guidelines**

*Education Exhibits*

*Location: NA*

**Participants**

- David Pinter MD (Presenter): Nothing to Disclose
- Justin McCloskey BA: Nothing to Disclose
- Matthew Scott Hartman MD: Nothing to Disclose
- Margaret Eddy Blackwood MS: Nothing to Disclose
- Xi Xue: Nothing to Disclose

**TEACHING POINTS**

1. Educate clinicians on principles of radiation and imaging safety, with a focus on the pregnant patient and fetus.
2. Discuss diagnostic imaging considerations, including potential risks and pregnancy screening, in females of reproductive age in accordance with new ACR guidelines.

**TABLE OF CONTENTS/OUTLINE**

- Radiation basics
- Ionizing radiation
- Stochastic versus deterministic effects
- Dosimetry
- Diagnostic imaging safety considerations in the pregnant patient
- Identification and screening
- Radiation risks and adverse outcomes
- MRI - V/Q scan - Use of contrast media
- Imaging management principles
- Interactive clinical cases to reinforce teaching points
- Summary and pearls

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**HPE112**

**MRI: Mapping Radiology Information**

*Education Exhibits*

*Location: NA*

**Participants**

- Fadi Toonsi MBBS,FRCPC (Presenter): Nothing to Disclose
- Wid Kattan MBBS, MA: Nothing to Disclose
- Jeffrey Chankowsky MD: Nothing to Disclose

**TEACHING POINTS**

This exhibit discusses: 1- The concept of mind mapping including benefits of their use as an educational tool. Mind mapping involves arranging the details of a subject under general headings, which provides learners with a clear view of the "big picture" as well as a way to see links, compare similarities, and recognize relationships within large bodies of information. Collectively these features help organize knowledge in a way that enhances retrieval and promotes clinical reasoning. 2- How to create a mind map, including various software applications that help create digital mind maps. To maximize their effectiveness, mind maps are built using the following structure: central topic, main topic, subtopics, floating topics, relationship arrows, boundaries, markers and notes. 3- Example mind maps in radiology. Mind maps can be used effectively in the field of radiology. Example topics include creating differential diagnosis lists, outlining disease summaries, reading studies by using a mind map checklists. Other example topics are discussed.

**TABLE OF CONTENTS/OUTLINE**

1- Background on mind maps as an educational tool. 2- How to create a mind map: - Structure of a mind map. - Software applications to design digital mind maps. 3- Radiology mind maps examples

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**HPE113**
Teaching and Learning Image Interpretation Skills (A Guide for Teachers and Learners)

Participants
Ibrahim Ali Alorainy MD (Presenter): Nothing to Disclose

TEACHING POINTS
1. Learn about skills that help in correct imaging interpretation and reduce errors
2. Learn how different skills interact to better outline diseases and refine differential diagnoses
3. Learn how to simplify image interpretation and build logical interpretation system for radiology residents

TABLE OF CONTENTS/OUTLINE
These skills will help radiology residents to correctly interpret images and reduce errors, and help radiology teachers in teaching logical system for interpretation. Each skill will be illustrated by cases that will also show how different skills interact at the same time to reach better diagnosis. 1. Identify your patient 2. Identify exam attributes 3. Judge exam adequacy 4. Recognize normal anatomy 5. Think real estate (location, size, shape, content, neighborhood) 6. Lesion pattern 7. Lesion behavior 8. Cut and paste / cover test 9. Cause and Effect relation 10. Compare paired organs/ sides 11. If you see one, look for another 12. Organ counting 13. Hidden areas/slices/series 14. Look at the previous exams and reports 15. 2nd look for normal exam 16. The answer is always on the image 17. On follow up, there is a change until proven otherwise 18. Have a system for interpretation 19. Put things in context 20. Know your expected role

That's not Appropriate! Educating the Radiology Resident about ACR Appropriateness Criteria in Neuroimaging

Participants
Dana Lin MD : Nothing to Disclose
Daniel S. Chow MD (Presenter): Nothing to Disclose
Randy Yeh MD : Nothing to Disclose
Angela Lignelli-Dipple MD : Nothing to Disclose

TEACHING POINTS
Widespread emphasis on ordering the most appropriate imaging study for patients has been advocated by the American College of Radiology (ACR). As we enter a new era of healthcare insurance, cost-effective care will undoubtedly include avoiding wasteful imaging. The responsibility to provide such care is shared by both radiologists and ordering physicians. Radiology residents need to be trained in gaining specific knowledge that can guide clinical colleagues in ordering the most appropriate imaging study for a specific clinical indication. The purpose of this exhibit is to provide A selected review of common indications that lead to inappropriate neuroimaging studies Alternative imaging options if the most appropriate imaging study in each of the clinical scenarios cannot be obtained, Quiz questions to interactively test the learner’s knowledge. All recommendations in this exhibit follow the American College of Radiology Appropriateness Criteria.

TABLE OF CONTENTS/OUTLINE
1. Background of ACR Appropriateness Criteria
2. Presentation of ACR Neurologic Imaging Criteria, with emphasis on:
   a. Cerebrovascular Disease
   b. Focal Neurologic Deficit
   c. Head Trauma
   d. Headache
   e. Hearing loss and/or Vertigo
   f. Seizures and Epilepsy
3. Case-based Self-Assessment questions using clinical vignettes
4. Summary

The Basics for Interpretation: A Radiologist’s Guide for Evaluating and Comparing Imaging Modalities

Participants
Kevin Psoter (Presenter): Nothing to Disclose
Bahman Sayyar Roudsari MD, PhD : Nothing to Disclose
Michael L. Richardson MD : Nothing to Disclose

TEACHING POINTS
The purpose of this educational exhibit is: 1. To review the fundamental concepts for evaluating and comparing imaging modalities, with particular emphasis on binary and continuous outcome measures 2. To describe the diagnostic utility of combined radiologic and laboratory studies 3. To describe intra and inter-observer variability in imaging studies

TABLE OF CONTENTS/OUTLINE
HPE116

Billing Compliance for Radiologists

Education Exhibits

Location: NA

Certificate of Merit

Participants

Brian David Gale MD (Presenter): Board Member, SaferMD, LLC
Stephen Anthony Waite MD: Nothing to Disclose
Deborah L. Reed MD: Nothing to Disclose

TEACHING POINTS

1. Major billing compliance regulations that affect radiology practices
2. New mechanisms of compliance enforcement
3. Potential areas where noncompliance may occur

TABLE OF CONTENTS/OUTLINE

This educational exhibit will be presented as a review followed by quiz questions.

They key topics will include:

- Increasing risk of CMS compliance enforcement penalties
- Major billing compliance regulations that affect radiology practices
- New mechanisms of compliance enforcement

HPE118

Decisions Involved in Equipment Acquisition: What Radiologists Need to Consider

Education Exhibits

Location: NA

Participants

Kushal Parikh MD (Presenter): Nothing to Disclose
Richard K.J. Brown MD: Investor, RadExchange, LLC
Michael Kasotakis MD: Nothing to Disclose
Shane A. Wells MD: Nothing to Disclose
Ruth C. Carlos MD, MS: Nothing to Disclose
Nishant Patel MD: Nothing to Disclose
Geri Will: Nothing to Disclose

TEACHING POINTS

1. Learn the elements that hospital administrators consider so that you will be able to more effectively communicate the need for new equipment acquisitions
2. Learn why understanding the underlying business plan may increase your influence in the decision making process
3. Learn how to increase the likelihood of acquiring new equipment for radiology versus competing interests in the institution

TABLE OF CONTENTS/OUTLINE

Items to consider in the analysis of equipment acquisition.

Why:
- Why do we need/want new equipment?

What:
- What is the status of the expected market for our services?
- What are our options and their respective costs/benefits?
- What will it cost, financially and non-financially?
- What are the different financial options (i.e. leasing vs. outright purchasing)?
- What are the regulatory ramifications?

How:
- How will the equipment be acquired and implemented into the workflow?

When:
- When will the implementation occur?
- When can we expect to see the benefits?

Who:
- Who is needed to make the project work?

HPE119

Helping Others “Choose Wisely”: A Case-based Approach to Avoiding Unnecessary Imaging

Education Exhibits
TEACHING POINTS

The Choosing Wisely initiative started by the American Board of Internal Medicine aims to improve quality of care for patients by reducing unnecessary tests and procedures. These initiatives include evidence-based recommendations from 52 specialty societies, many of which are imaging focused. Therefore, it is important for the radiologist to be familiar with these guidelines in order to help referrers choose the most appropriate exam and avoid unnecessary tests. The purpose of this exhibit is to 1) describe the radiologists' role in the Choosing Wisely campaign and 2) provide an organized series of clinical vignettes highlighting important imaging "don'ts" of Choosing Wisely.

TABLE OF CONTENTS/OUTLINE

A. Background of Choosing Wisely
B. The radiologists' role in Choosing Wisely
C. Case-based review of Choosing Wisely imaging "don'ts" will be presented in a clinical vignette quiz format with a discussion of evidence supporting each answer following each case. Cases will be organized by imaging subspecialty: Cardiothoracic, Gastrointestinal, Genitourinary, Musculoskeletal, Neuroimaging, Nuclear medicine, Pediatric, Ultrasound.
HPE122

Latest Technology in CT Mechanical Power Injectors: What you Need to Know

Education Exhibits

Location: NA

Participants
Atilla Arslanoglu MD (Presenter): Grant, Siemens AG
Adeel Rahim Seyal MD: Grant, Siemens AG
Lee Goodwin: Nothing to Disclose
Vahid Yaghmai MD: Nothing to Disclose

TEACHING POINTS

Mechanical power injectors are important in optimizing contrast enhancement in MDCT. This exhibit will review the essential concepts in design and utility of modern power injectors in order to enable radiologists optimize the CT protocols. The role of new mechanical injectors in optimizing images, workflow and contrast use will be discussed.

TABLE OF CONTENTS/OUTLINE

• Design of modern injectors: single versus double syringe • Challenges with optimizing the rate of injection: what type of intravenous access is acceptable and what does the pressure gauge tell you? • Common and uncommon causes of injector failure • Controlling iodine flux • Incorporation into scanner control • Clinical examples of how images can be optimized • Data mining for contrast utilization

HPE123

Radiologic Eloquence: Incorporating Strunk and White's "The Elements of Style" into Reporting

Education Exhibits

Location: NA

Participants
Corey K. Ho MD (Presenter): Nothing to Disclose
Sandor Abraham Joffe MD: Nothing to Disclose
Robert Daniel Irish MD: Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is: 1. Review the ACR Practice Guidelines for Communication of Diagnostic Imaging Findings 2. Emphasize the importance of being clear and concise in reports. 3. Incorporate literary guidelines outlined in 'The Elements of Style' to improve clarity and style within radiologic reports.

TABLE OF CONTENTS/OUTLINE

ACR Practice Guideline for Communication of Diagnostic Imaging Findings
The Elements of Style
Elementary Rules of Usage
Elementary Principles of Composition
A Few Matters of Form
Words and Expressions Commonly Misused
An Approach to Style

HPE125

Focused Professional Practice Evaluation (FPPE) of Radiologists - A CMS and Joint Commission Requirement

Education Exhibits

Location: NA

Participants
Jonathan B. Kruskal MD, PhD (Presenter): Author, UpToDate, Inc

TEACHING POINTS

By viewing this exhibit, the learner will be able to:
1. Explain the different types of FPPE evaluations that apply to radiologists
2. Describe clinical examples of what generates a radiologist FPPE
3. Describe data sources that are used to evaluate performance
4. Describe a suggested ad hoc committee composition for performing a review
5. Describe the FPPE process and possible outcomes and actions
**HPE126**

Health Failure Mode and Effects Analysis: Enhancing the Radiologists Understanding

*Education Exhibits*

*Location: NA*

**Participants**

- Khalid Walid Shaqdan MD (Presenter): Nothing to Disclose
- Shima Aran MD: Nothing to Disclose
- Elmira Hassanzadeh MD: Nothing to Disclose
- Hani H. Abujudeh MD, MBA: Research Grant, Bracco Group Consultant, RCG HealthCare Consulting Author, Oxford University Press

**TEACHING POINTS**

- Health Failure Modes and Effects Analysis (HFMEA) is a prospective risk assessment tool originally developed in the manufacturing industry, and is now being used in healthcare to proactively recognize risks to patient safety and lessen medical/healthcare errors. • In the radiology department, HFMEA can be a useful approach for a number of common sources of error, including patient identification, preparation, and consent; radiation exposure, monitoring during an examination, and maintenance of a safe working environment. • The purpose of this exhibit is to understand this quality assessment technique so that the reader can understand and perform the process on their own.

**TABLE OF CONTENTS/OUTLINE**

- Definition of Health Failure mode and Effects Analysis (HFMEA)
- Joint commission on Accreditation of Healthcare Organization standards (JCAHO) requirements when to use Health Failure mode and Effects Analysis
- Common sources of error in radiology
- How to perform Health Failure mode and Effects Analysis:
  - Step 1- Define the Topic
  - Step 2 - Assemble the Team
  - Step 3 - Graphically Describe the Process
  - Step 4 - Conduct a Hazard analysis
  - Step 5 - Define Actions and Outcome Measures
- Examples of Health Failure mode and Effects Analysis used in Radiology
- Limitations and difficulties of Health Failure mode and Effects Analysis

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**HPE127**

Improving Patient Flow in Seven Radiology Modalities within 6 Months

*Education Exhibits*

*Location: NA*

*Selected for RadioGraphics*

**Participants**

- Laura Tibor MBA, BEng (Presenter): Nothing to Disclose
- Stacy R. Schultz BA: Nothing to Disclose
- Julie Cravath: Nothing to Disclose
- Russell Rein: Nothing to Disclose
- Karl N. Krecke MD: Nothing to Disclose

**TEACHING POINTS**

a. Demonstrate how Value Stream Mapping and associated Lean tools can lead to improved patient flow in multiple Radiology workflows b. Demonstrate the level of impact teams can have within a short timeframe c. Share our most impactful improvements d. Articulate lessons learned

**TABLE OF CONTENTS/OUTLINE**

- Launching the Initiative
- Active and Supportive Leadership
- Basic Process Improvement Education
- Clear Expectations and Alignment
- Change Management
- Structure and Support for the Projects
- Engaged Modality Teams
- Self-appointment
- Project Managers Process Improvement
- Coaches
- Collaborative Learning Sessions
- Standardized Process Improvement Tool Set
- Post Project Accountability and Sustainment
- Transition Plan
- Post Project Updates to Quality Committee
- Case Study Examples
- Overall Collective Impact Lessons Learned

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**HPE128**

Key Performance Indicators in Radiology

*Education Exhibits*

*Location: NA*

**Participants**

- Elmira Hassanzadeh MD (Presenter): Nothing to Disclose
- Khalid Walid Shaqdan MD: Nothing to Disclose
- Shima Aran MD: Nothing to Disclose
- Hani H. Abujudeh MD, MBA: Research Grant, Bracco Group Consultant, RCG HealthCare Consulting Author, Oxford University Press

**TEACHING POINTS**
The purpose of this exhibit is: 1. To define performance indicators (PIs) and to introduce Donabedian's model for quality assessment. 2. To demonstrate the 7 steps of developing PIs. 3. To learn how stakeholders influence the process of choosing performance indicators. 4. To discuss the strategic area in radiology practice, that should be evaluated in priority by using performance indicators. 5. To review the main characteristics of key performance indicators (KPIs) and their usefulness in health care improvement. 6. To give examples of potential radiology specific KPIs. 7. To discuss the optimal quantity and ratio of PIs and KPIs for radiology practice. 8. To describe best ways of implementation and interpretation of KPIs in radiology department.

### TABLE OF CONTENTS/OUTLINE
- Performance indicators: definition and types
- Seven steps to develop performance indicators
- Key performance indicators in radiology
- Potential pitfalls in utilization and implementation of indicators

### HPE129
#### Meeting the Quality Mandate: Radiology Quality and Safety Informatics Tools

*Education Exhibits*

*Location: NA*

### Participants
- Christopher Geordie Roth MD (Presenter): Author, Reed Elsevier
- Huan Dong MD: Nothing to Disclose
- Parasa Lakhan MD: Nothing to Disclose
- Caryn Karff MS, ARRT: Nothing to Disclose
- Richard Joseph Thomas: Gornick MD: Speaker, Koninklijke Philips NV
- Adam Eugene Flanders MD: Nothing to Disclose
- Vijay Madan Rao MD: Nothing to Disclose

### TEACHING POINTS
1. This exhibit will demonstrate the spectrum of informatics tools and how they can help to improve quality and safety in various aspects of radiology practice. 2. Relevant regulatory and legislative actions addressing healthcare quality and safety that affect the practice of radiology will be reviewed. 3. How radiology informatics tools can help meet regulatory requirements will be discussed.

### TABLE OF CONTENTS/OUTLINE
1. Introduction to Radiology Informatics and Informatics Tools
2. Discussion of Quality and Safety
3. Regulations and Legislative Actions Addressing Healthcare Quality and Safety
4. How Informatics Tools Help Promote Quality and Safety (i.e., workflow, patient safety, appropriateness, etc.)
5. Meeting Regulatory Requirements with the Aid of Informatics Tools
6. Ongoing Innovations and Future Work (Natural Language Processing, Radiology Decision Support)

### HPE130
#### Peer Review in Radiology: Current Status, Review of Literature

*Education Exhibits*

*Location: NA*

### Participants
- Elmira Hassanzadeh MD (Presenter): Nothing to Disclose
- Khalid Walid Shanaqdan MD: Nothing to Disclose
- Shima Aran MD: Nothing to Disclose
- Hani H. Abujaudeh MD, MBA: Research Grant, Bracco Group Consultant, RCG HealthCare Consulting Author, Oxford University Press

### TEACHING POINTS
The purpose of this exhibit is: 1. To overview the peer review as a performance measure. 2. To discuss selection of cases in peer review process (reactive/proactive). 3. To gain awareness of the methods of reviewing the selected cases and the scoring systems. 4. To discuss the management of discrepancies observed as a result of the peer review process (committee/single reviewer). 5. To discuss the guidelines to be applied regarding the results (educational, self-improvement goals/sanctions/focused peer review). 6. To describe obstacles in the process of peer review (confidentiality issues/just culture/high work load). 7. To overview of available IT tools for peer review process. 8. To overview the RAPPEER™.

### TABLE OF CONTENTS/OUTLINE
- Why and how to measure performance
- Steps in radiology peer review
  1. Case selection
  2. Review process
  3. Guidelines
- Methods for reducing bias in peer review process
- Obstacles and limitation of peer review implementation
- Current status of peer review in radiology/efficient systems: review

### HPE131
#### Quality and Safety: Basic Concepts for the Radiologist

*Education Exhibits*

*Location: NA*

### Participants
- Khalid Walid Shanaqdan MD (Presenter): Nothing to Disclose
- Shima Aran MD: Nothing to Disclose
- Elmira Hassanzadeh MD: Nothing to Disclose
- Hani H. Abujaudeh MD, MBA: Research Grant, Bracco Group Consultant, RCG HealthCare Consulting Author, Oxford University Press

### TEACHING POINTS
- Enhancing value of patient care in radiology requires proficient management of key safety, quality, and cost metrics.
Enhancing value of patient care in radiology requires proficient management of key safety, quality, and cost metrics. Continuously assessing clinical outcomes with the aid of quality improvement tools allows us to identify problems, and direct our efforts to areas that need the most improvement to maintain high standards of patient care. Knowledge of basic quality concepts must be understood in order to incorporate effective quality and safety processes in everyday care.

**TABLE OF CONTENTS/OUTLINE**

- Quality and safety of care
- Swiss cheese model
- Structural elements and techniques
- Indicators or metrics
- Quality control
- Quality assurance
- Continuous quality improvement
- Root cause analysis
- Health failure mode effect analysis
- Radiology quality map

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**HPE132**

**Root Cause Analysis: Basic Understanding for the Radiologist**

**Education Exhibits**

**Location:** NA

**Participants**

- Khalid Walid Shaqdan MD (Presenter): Nothing to Disclose
- Shima Aran MD: Nothing to Disclose
- Elmira Hassanzadeh MD: Nothing to Disclose
- Hani H. Abujudeh MD, MBA: Research Grant, Bracco Group Consultant, RCG HealthCare Consulting Author, Oxford University Press

**TEACHING POINTS**

- Medical errors are usually the result of several combined factors, and these factors can be grouped into several categories: Institutional, organizational, work environment, staffing, task-related, and patient characteristics.
- Root Cause Analysis is a retrospective approach used to get to the “Root Cause” of the problem, which when identified and resolved, prevents recurrence of the problem. RCA is designed to help identify not only what and how an event occurred, but more importantly why it happened.
- This exhibit will explain root cause analysis so that the reader can understand and perform the processes on their own.

**TABLE OF CONTENTS/OUTLINE**

- Definition of Root Cause Analysis
- Joint commission on Accreditation of Healthcare Organization standards (JCAHO) requirements when to use Root Cause analysis
- How to perform Root Cause Analysis
- Tools and techniques
  - Five rules of causation
  - Six thinking hats
  - Charts and graphical tools
- Key roles in RCA
- Examples of Root Cause analysis in Radiology
- Limitations and difficulties of Root Cause Analysis

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**HPE133**

**Six Sigma and Lean Concepts in Radiology**

**Education Exhibits**

**Location:** NA

**Participants**

- Elmira Hassanzadeh MD (Presenter): Nothing to Disclose
- Khalid Walid Shaqdan MD: Nothing to Disclose
- Shima Aran MD: Nothing to Disclose
- Hani H. Abujudeh MD, MBA: Research Grant, Bracco Group Consultant, RCG HealthCare Consulting Author, Oxford University Press

**TEACHING POINTS**

- The purpose of this exhibit is: 1. To introduce the concepts of six sigma and lean 2. To explain the goals of lean manufacturing 3. To demonstrate 7 types of waste, aimed to be eliminated using a lean thinking system 4. To review the five steps of problem solving methodology in six sigma process (DMAIC) 5. Introducing the main goal of six sigma: to reach over 99.99966% error-free practice 6. To review the implementation of 6 sigma and lean in healthcare

**TABLE OF CONTENTS/OUTLINE**

- Lean: an overview
- Six sigma: an overview
- Lean and six sigma in healthcare

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**HPE134**

**The Anatomy and Essential Components for a Successful Practice Quality Improvement Project**

**Education Exhibits**

**Location:** NA

**Selected for RadioGraphics**

**Participants**

- Jonathan B. Kruskal MD, PhD (Presenter): Author, UpToDate, Inc
- David B. Larson MD, MBA: Nothing to Disclose

**TEACHING POINTS**

- After viewing this exhibit, the viewer will be able to:
  1. Describe the required elements of a PQI project
  2. Compare requirements for individual and group projects
  3. Discuss the spectrum of available options for identifying a PQI project
4. Describe the essential steps in initiating, managing, completing and disseminating a PQI project

**TABLE OF CONTENTS/OUTLINE**

What is PQI, and what is the PQI project?

What are the required elements to meet step IV of the MOC requirements?

Group versus individual projects.

Using Peer Review as your PQI project.

Improvement domains: patient safety, process improvement, professional improvement, customer feedback.

Specific analytical tools, references and project examples from each domain.

What projects does the RSNA currently facilitate?

How can I access and use the RSNA PQI templates?

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**HPE135**

**The Ins and Outs of Imaging Potentially Retained Surgical Items**

*Education Exhibits*

*Location: NA*

Certificate of Merit

**Participants**

William Walter, MD (Presenter): Nothing to Disclose

Seymour Sprayregen, MD: Nothing to Disclose

Jeffrey Michael Levsky, MD, PhD: Nothing to Disclose

E. Stephen Amis, MD: Nothing to Disclose

Linda Broyde Haramati, MD, MS: Investor, OrthoSpace Ltd Investor, Kryon Systems Ltd Spouse, Board Member, Bio Protect Ltd Spouse, Board Member, OrthoSpace Ltd Spouse, Board Member, Kryon Systems Ltd

**TEACHING POINTS**

1. Understand the role of imaging for perioperative evaluation of surgical item miscounts

2. Review the radiographic appearance of many different surgical items and their mimics

3. Understand the limitations of intraoperative radiography

**TABLE OF CONTENTS/OUTLINE**

1. Review of guidelines for managing surgical item miscounts
   a. Current clinical practice in operative imaging for retained surgical items
   b. Dedicated imaging of miscounted items

2. Review of imaging appearance of surgical items
   a. Dedicated radiographs of miscounted items: retractors, clamps, scissors, trocars, forceps, suction cannula, marking pen, surgical sponge, gauze pad, cottonoid, laparoscopic pads with radiofrequency tags, microclip, suture needles of various size, and broken instruments
   b. Examples of retained surgical items on radiography, CT, MRI, and fluoroscopy
   c. Complications of various retained items: gossypiboma, abscess, and bowel perforation
   d. Mimics of retained surgical items: bony mimics, vascular or other calcifications, clips, wires, expected and migrated retained surgical material

3. Limitations of intraoperative radiography
   a. Artifacts: multiple overlying clips, wires, and instruments
   b. Small size of items sought (suture needles)
   c. Role of clinical history for image interpretation

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**SSA05**

**Emergency Radiology (Practice and Protocols)**

*Scientific Papers*

*AMA PRA Category 1 Credits ™: 1.50*

*ARRT Category A+ Credits: 1.50*

*Sun, Nov 30 10:45 AM - 12:15 PM Location: N228*

**Participants**

Moderator

Aaron D. Sodickson, MD, PhD: Research Grant, Siemens AG

Moderator

Ferco H. Berger, MD: Nothing to Disclose

**Sub-Events**

**SSA05-01**

**Emergency Department Imaging Utilization: What Factors are Associated with High Imaging Volume?**

Meir Hillel Scheinfeld, MD, PhD: Nothing to Disclose, Kevin Burns, MD (Presenter): Nothing to Disclose, Victoria Chernyak, MD: Nothing to Disclose

**PURPOSE**
Predicting ED imaging volume would be helpful in scheduling radiologists and technologists. Our goal was to determine the relationship of triage volume, season, weather and day of the week on imaging volume.

**METHOD AND MATERIALS**

IRB approval was obtained. The hospital database was queried for daily ED triage volume and imaging studies performed from 2011 through 2013 at a large tertiary care urban medical center. Daily weather conditions (temperature, amount and type of precipitation) were obtained from National Oceanic and Atmospheric Administration records. 'Extreme weather' was defined as temperature <32ºF or >90ºF. Day of the week and season were recorded. Pearson correlations were first used to compare daily triage volume to imaging volume by modality. Logistic regression was used to arrive at parsimonious models with dichotomous outcomes of having high imaging volume, defined as days above the 90th percentile for a given modality. All models were adjusted for day of the week.

**RESULTS**

There were 485,295 ED triages and 305,493 imaging studies performed during the study period. Pearson correlations between triage volume and imaging modality yielded r=0.73 (p=0.0017 XR, >37 US or >73 CT exams. For every additional 50 triaged patients, the odds of having high XR volume increased by 4.3 times (95% CI 2.9-6.3, p

**CONCLUSION**

Higher ED triage volume is strongly associated with high XR volume and, to a lesser extent, with high CT and US volume. Extreme weather is associated with increased odds of having high CT volume but not US or XR. Amount or type of precipitation were not associated with high imaging volume.

**CLINICAL RELEVANCE/APPLICATION**

ED triage volume is the primary association of imaging volume, most prominently for radiography; therefore, factors which influence ED triages should be considered when determining radiology and technologist staffing.

**SSA05-02**

**Imaging Utilization Trends in Emergency Departments in the Medicare Population**

Santosh Kumar Selvarajan MD (Presenter): Nothing to Disclose
David C. Levin MD : Consultant, HealthHelp, LLC Board of Directors, Outpatient Imaging Affiliates, LLC, Laurence Parker PhD : Nothing to Disclose, Vijay Madan Rao MD : Nothing to Disclose

**PURPOSE**

Policymakers and payers have been concerned with the rapid growth in imaging utilization. But recent studies have shown that outpatient advanced imaging use has leveled off and begun to drop. Our purpose was to see if this trend has manifested itself in Emergency Departments (EDs).

**METHOD AND MATERIALS**

The nationwide Medicare Part B Physician/Supplier Procedure Summary Master Files for 2002-2012 were the data source. CPT codes for plain radiography (XR), noncardiac ultrasound (US), CT, MRI, and nuclear medicine (NM) were aggregated by modality. Medicare's place-of-service codes were used to identify those exams done during ED visits, and its specialty codes were used to determine which specialties did the interpretations. Utilization rates per 1000 Medicare beneficiaries were calculated. Trends from 2002 to 2012 were assessed.

**RESULTS**

Between 2002 and 2012, the ED utilization rate per 1000 of XR increased from 248.8 to 320.0 (+29%). Noncardiac US increased from 9.5 to 21.0 (+121%). CT increased from 57.2 to 147.9 (+159%). MRI increased from 1.4 to 5.1 (+264%). Only NM showed a slight numerical decline, from 2.8 to 2.1 (-25%), but this was largely due to code bundling that occurred in myocardial perfusion imaging in 2010. In each of the first 4 modalities, growth was steady and progressive with no evidence of slowing. Raw numbers per 1000 beneficiaries of accrued new exams between 2002 and 2012 were: XR 71.3, US 11.5, CT 90.7, MRI 3.7, NM -0.7. Radiologists' share of the interpretations in 2012 were: XR 97%, US 89%, CT 99%, MRI 99%, NM 93%.

**CONCLUSION**

In contradistinction to the trends among outpatients, utilization rates of imaging in EDs grew continuously and substantially from 2002 to 2012. The largest numerical increases were seen in CT and XR. Radiologists strongly predominate in interpreting in all modalities. The degree of growth is of some concern and suggests that more attention needs to be directed to imaging appropriateness criteria in EDs.

**CLINICAL RELEVANCE/APPLICATION**

n/a

**SSA05-03**

**ED CT of the Abdomen and Pelvis Utilization has Continued to Increase, Despite what Appears to Be a Reduction in Procedures caused by Code Bundling**

Santosh Kumar Selvarajan MD (Presenter): Nothing to Disclose
David C. Levin MD : Consultant, HealthHelp, LLC Board of Directors, Outpatient Imaging Affiliates, LLC, Laurence Parker PhD : Nothing to Disclose

**PURPOSE**

n/a
Previous studies have shown that the all imaging utilization rates have been stable since 2006 except CT which has continued to grow (overall annual growth of 3.4% from 2007-2009). From 2011, CPT codes for CT scans of the abdomen and pelvis were bundled into a single new code. Our purpose was to determine what effect this policy had on recent trends in CT utilization in ED.

METHOD AND MATERIALS

The nationwide Medicare Part B databases for 2000-2012 were used. The codes for CT of the abdomen and CT of the pelvis were selected for all years of the study, and the bundled codes for CT abdomen/pelvis were selected for 2011 and 2012. Procedure volumes in ED and non-ED (inpatient, office, and outpatient) settings were calculated. To understand the trends through the bundling years (2011 and 2012), we doubled the number of bundled codes, since these would have counted as 2 exams in 2010 and before.

RESULTS

The nationwide Medicare utilization rates of both CT abdomen and CT pelvis grew from 2000 to 2007 (4.8 M. to 9.7 M.) Thereafter, from 2008 to 2010, growth had stabilized except in ED (Non-ED, 8.1 M. to 7.7 M.; ED, 1.7 M. to 2.0 M).

There is a dramatic drop off in 2011 due to bundling: non-ED, 7.7 M. 4.2 M., Ed, 2.0 to 1.2 M When the bundled exams are doubled, 2011 non-ED is stable at 7.8 M. exams; ED increases substantially from 2010, to 2.3 M. exams. In 2012, again counting the bundled code as 2 exams, non-ED volume is stable, at 7.8 M., while ED volume again increases substantially, to 2.6 M.

CONCLUSION

Medicare volumes of CT of the abdomen and CT pelvis show an apparent decline, but this is an artifact of code bundling. While procedure volume is stable in non-ED settings, volume of CT of the abdomen and pelvis continue to grow strongly in the ED.

CLINICAL RELEVANCE/APPLICATION

New guidelines are probably required to reduce the CT utilization rates in Emergency.

SSA05-04

In-person Communication with a Radiologist in the Emergency Department Results in Improved Two-way Communication of Information, and May Improve Patient Care

Mariam Sofia Aboian MD, PhD (Presenter): Nothing to Disclose, Marcel Brus-Ramer MD, PhD: Nothing to Disclose, Allison Anne Tillack PhD: Nothing to Disclose, Mark Daniel Mamlouk MD: Nothing to Disclose, Peter Andrew Marcovici MD: Nothing to Disclose

PURPOSE

We hypothesized that the physical proximity of a radiologist to the treating providers in the ED would improve communication between radiologists and treating providers, and thus possibly improve care.

METHOD AND MATERIALS

The radiology resident on-call reading room at our university hospital was recently moved to the ED. Approximately 6 months later, the impact of this move was assessed via an IRB approved, HIPPA compliant survey [Figure 1] among ED faculty and residents (“providers”) after each in-person encounter with the on-call radiology resident.

RESULTS

27 surveys were completed during the study period. Direct in-person communication with radiology residents on-call was reported as “very important” (14/27) or “important” (11/27) for managing patients in the ED. 48% of providers stated they preferred to consult with a radiologist in-person for only their most difficult patients.

In-person interaction was presumed to affect patient care, with 20/27 of the responders reporting that key information was communicated to the radiologist about the patient’s clinical history that would otherwise not have been communicated. In addition, 22/27 of the responders felt that they understood the imaging results better after the discussion as opposed to reading a "wet read" written report. Improved patient care due to direct communication was reported by 21/27 of the ED provider responders.

CONCLUSION

In-person communication between radiologists and ED providers was reported to be "important" or "very important" in 92% of cases, and was most often sought out by ED providers in perceived difficult cases. Critical history was provided to the radiologist that would not otherwise be communicated in 74% of surveyed encounters. Imaging findings were better understood by the ED providers in 81% of the encounters and there was improvement in patient care from the perspective of the majority of ED providers.

CLINICAL RELEVANCE/APPLICATION

In-person communication between ED providers and radiologists facilitates information sharing and thus may improve patient care in settings that require rapid communication.
**Effect of Patient Primary Spoken Language on CT Utilization in the Emergency Department**

Bruce E. Lehnert MD (Presenter): Nothing to Disclose, Daniel S. Hippe MS: Research Grant, Koninklijke Philips NV Research Grant, General Electric Company, E. Sally Lee PhD: Nothing to Disclose, Lauren K. Whiteside MD: Nothing to Disclose, Ken Floris Linnau MD, MS: Speaker, Siemens AG Royalties, Cambridge University Press

**PURPOSE**

To determine if patient spoken language is associated with utilization of CT and time to CT imaging in the ED for patients who present without a trauma-related complaint.

**METHOD AND MATERIALS**

In this IRB approved, HIPAA compliant study, we retrospectively reviewed all adult ED visits from 10/1/2012 to 5/30/2013. Patient demographics, reported primary spoken language (PSL), Emergency Severity Index (ESI) score, time of ED admission and discharge, and CT (if performed) order time were recorded. Trauma and psychiatric patients, those with ESI scores 1 and 2, those with missing demographics, PSL or discharge time were excluded. The remaining patients were classified as moderate acuity (ESI=3) and low acuity (ESI=4, 5). Cox regression was used to evaluate the relationship between PSL and rate of CT while adjusting for other confounders. The association between PSL and time to CT order was assessed using generalized estimating equations (GEEs) while adjusting for other factors.

**RESULTS**

There were 17,651 ED visits by 12,124 patients which met the inclusion/exclusion criteria. 1,907 (16%) reported a non-English as their PSL. Before adjustments, a CT was ordered for 10.2% of patients with English PSL and 15.2% of patients with non-English PSL. In those for whom a CT was ordered, the average time to order was 124 +/- 93 min (English PSL) and 141 +/- 88 min (non-English PSL). After adjusting for sex, age, number of visits and time of admission, moderately acute patients with a non-English PSL had a 44% (CI: 23-68%; p<0.001) higher chance of getting a CT ordered when in the ED >1.5 hrs and had a 13.6 min longer mean time to CT order (CI: 3.0-24.3; p=0.011). Non acute patients with non-English PSL had an 88% (CI: 26-181%; p=0.002) higher chance of getting a CT ordered when in the ED >1.5 hrs and had a 41.6min longer mean time to CT order (CI: 11.2-72.0; p=0.007). CT ordering rates were comparable when done < 1.5 hrs after admission.

**CONCLUSION**

Patients who report a non-English PSL have a significantly increased likelihood of undergoing CT in the ED and there is a significantly longer time to CT order placement.

**CLINICAL RELEVANCE/APPLICATION**

Patient primary spoken language association with CT use in the Emergency Departments represents a potential source for disparity in health care between English and non-English speaking patients.

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**Dual Energy Post-processing of Incidental Renal Lesions Encountered in the Emergency Department: Reducing the Need for Follow-up Imaging**

Jeremy Robert Wortman MD (Presenter): Nothing to Disclose, Urvi Pravin Fulwadhva MD: Nothing to Disclose, Jeffrey Y. Shyu MD: Nothing to Disclose, Aaron D. Sodickson MD, PhD: Research Grant, Siemens AG

**PURPOSE**

To quantify the incidence of indeterminate renal lesions during routine dual energy CT (DECT) in an Emergency Department (ED) setting, and to assess the potential of DECT post-processing to characterize lesions and eliminate the need for further follow-up evaluation.

**METHOD AND MATERIALS**

1400 consecutive contrast enhanced abdominal CT scans were included in the study cohort, obtained in the ED using a DE CT protocol (Siemens SOMATOM Definition Flash). All scans were reviewed by a radiologist to assess for the presence of an indeterminate renal lesion defined for potentially solid lesions as size > 5 mm, attenuation > 20 HU, and lack of macroscopic fat, or for a cystic lesion as presence of thick septations or calcifications, thickened wall, or mural nodules. DE post-processing was performed on all lesions, which were subsequently re-classified as benign or indeterminate.

**RESULTS**

At least one indeterminate renal lesion was identified in 57 (4.1%) patients, with mean lesion size of 1.7 cm. 36/57 (63%) were classified as benign (non-enhancing) after review of the iodine overlay images (36/36 Bosniak II cysts). The remaining 21 lesions (37%) could not be classified as benign (14 enhancing masses; 12/14 < 20 mm, 2/14 > 20 mm; 8 Bosniak III cyst). Of the 57 indeterminate lesions, 9 had correlative imaging obtained with MR, CT, or US, with concordant results in all cases (1 enhancing mass, 8 Bosniak II/IIF cysts).

**CONCLUSION**
4.1% of ED patients undergoing abdominal CT had an incidentally detected indeterminate renal lesion. DE CT exonerated 63% of these lesions as benign, potentially averting the need for further workup in 2.6% of ER patients imaged by abdominal CT.

**CLINICAL RELEVANCE/APPLICATION**

If performed routinely, dual energy CT has the potential to substantially reduce the need for follow-up imaging to further characterize indeterminate renal lesions incidentally detected on Emergency Department abdominal CT scans.

**SSA05-07 Non-trauma-associated Incidental Findings in Whole-body CT Examinations in Patients with Suspected Multiple Trauma**

Martin Helmut Maurer MD (Presenter): Nothing to Disclose, Eduard Kroczek: Nothing to Disclose

**PURPOSE**

In patients with suspected multiple trauma whole-body computed tomography (wbCT) is the gold standard in the initial diagnostic work-up. As wbCT gives not only a rapid and precise overview on traumatic lesions it may also reveal associated non-traumatic findings of variable clinical importance. The aim of this study was to evaluate the number and quality of such incidental findings in patients that underwent whole-body CT examination due to suspected multiple trauma in a Level I trauma center.

**METHOD AND MATERIALS**

In a retrospective study between 2009 and 2013 a total of 2,909 patients (1,909 male, 800 female) with suspected multiple trauma were retrospectively analyzed with regard to non-trauma-associated incidental findings obtained in whole-body CT examination at initial admission. Findings were categorized by two readers in consensus according to the body region (head, neck, thorax, abdomen/pelvis, musculoskeletal system) and their clinical importance (category 1= further diagnostic work-up or therapeutic intervention urgently needed within initial hospitalization; 2= further work-up needed within less than 3 months; 3= findings that may result in health problems in the future; 4= benign incidental finding, no further work-up needed, variants).

**RESULTS**

Overall, 5,997 incidental findings were documented in 2,074 patients, thereof 1,135 in the head, 262 at the neck, 1,280 in the thorax, 2,541 in the abdomen and 779 findings of the musculoskeletal system. There were 294 patients (9.9%) with a category 1 finding where further work-up or therapy was urgently needed, 673 patients (24.8%) with a category 2 finding, 775 patients (28.6%) with a category 3 finding and 332 patients (12.2%) with a category 4 finding.

**CONCLUSION**

Whole-body CT scans of patients with a suspected multiple trauma show a considerable number of non-trauma-associated incidental findings. There was at least one incidental finding in one out of two patients and a finding requiring urgent follow-up or therapy in one out of ten patients.

**CLINICAL RELEVANCE/APPLICATION**

In patients initially imaged with wbCT for suspected multiple trauma, radiologists and trauma surgeons must be aware of a high number of non-traumatic incidental findings with clinical relevance.

**SSA05-08 Incidence of Acute Myocardial Infarction in Patients with Suspected Acute Pulmonary Embolism: Rationale for Low Dose Triple Rule out CT in the Acute Setting**

Shamir Rai BSC: Nothing to Disclose, David Tso MD (Presenter): Nothing to Disclose, Patrick McLaughlin FFR(RCSI): Nothing to Disclose, Savvas Nicolaou MD: Nothing to Disclose

**PURPOSE**

The purpose of our study was to retrospectively determine the incidence of acute myocardial infarction (MI) in emergency patients with suspected pulmonary embolism (PE) who underwent chest computed tomography pulmonary angiography (CTPE). Given the advent of low dose Triple-Rule-Out (TRO) CT examination with advanced detector and reconstruction technology, reduced contrast medium volumes and improved image quality at low tube kilovoltage, and the continued morbidity, mortality, costs, and catastrophic consequences associated with missed acute MIs it would seem feasible to perform TRO CT examinations over CT chest (CTPE) when looking for a suspected PE in the acute setting in high-risk patient populations.

**METHOD AND MATERIALS**

The reports of 4596 consecutive patients who underwent CTPE between January 2011 and March 2014 at a single institution were retrospectively reviewed. The total number of patients that displayed CT signs of an acute MI were recorded and compared to the total number of CTPE that were conducted in the given time period.

**RESULTS**

Seventeen patients, of which 12 were male and 5 were female, ranging in age from 47 to 90, (mean age, 68.82 +/- 13.87 [SD] years) were identified as having an acute MI when being worked up for a PE via CTPE out of a
CONCLUSION

This investigation establishes a baseline of 0.37% for the incidence of MI in patients being worked up for PE via chest CTPE protocol. Determination of the number of patients with aortic dissection, valvular, myocardial and other coronary artery disease (CAD) has not been explored in this study, but would further support a TRO CT over a chest CT (CTPE). As it stands TRO CT examination techniques, especially in patients over the age of 60, have the potential to reduce the number of hospitalized patients and reduce total health care costs.

CLINICAL RELEVANCE/APPLICATION

Full TRO CT protocol should be considered over chest CT (CTPE) protocol for suspected acute PE in patients over the age of 60. This reduces the chances of missing significant findings such as MI in a high-risk population.

SSA05-09 Maximizing the Golden Hour: Assessing the Novel Prototype Polytrauma Viewer in the Setting of Unstable Acute Polytrauma Patients

Shamir Rai BSc : Nothing to Disclose, David Tso MD (Presenter): Nothing to Disclose, Patrick McLaughlin FR(RCR) : Nothing to Disclose, Chesnal Arepalli MD : Nothing to Disclose, Luck Jan-Luck Louis MD : Nothing to Disclose, Savvas Nicolaou MD : Nothing to Disclose

PURPOSE

The purpose of this study is to evaluate the clinical utility of the novel prototype Polytrauma Viewer (Siemens Healthcare, Forchheim, Germany) in the setting of unstable acute polytrauma patients.

METHOD AND MATERIALS

32 unstable blunt acute trauma patients, between Nov. 2009 and Mar. 2014, meeting the criteria of SBP = 160, at a level 1 trauma center who underwent a whole-body CT (WBCT) scan were identified. Time to conduct the WBCT and time to final reconstruction was recorded. Two trauma radiologists (combined experience of 24 years) were blinded and interpreted the scans for life-threatening injuries [defined as non-contained vascular injury, unstable fractures, aortic dissection, tension pneumothorax, and intra/extra axial hemorrhage with significant mass effect] using the PACS workstation as the gold standard and the novel Polytrauma Viewer. Qualitative and quantitative measurements were used for image assessment. Time to load and process images, time to interpret and reach a final diagnosis, confidence of exclusion of life-threatening injuries (on a scale of 1-10, with 1 representing no confidence and 10 representing high confidence) and missed diagnosis were recorded when compared to the final report.

RESULTS

The mean total time to scan, perform the WBCT and complete the last reconstruction was 458s±258, 18.47s±11.89 and 3454s±1610 respectively. A significant reduction (p

CONCLUSION

The novel Polytrauma Viewer (Siemens Healthcare, Forchheim, Germany) is a promising prototype that can reduce the time to identification of life-threatening injuries in the acute traumatic setting through automatic reconstruction techniques and autosplitting the WBCT.

CLINICAL RELEVANCE/APPLICATION

The novel Polytrauma Viewer can reduce the time to identification of life-threatening injuries in the acute traumatic setting without diagnostic compromise, thereby potentially improving patient outcome and increasing the likelihood of patient survival.
To determine if second-opinion interpretations of outside neuroimaging studies by neuroradiologists at a tertiary care cancer center provided a significant benefit to cancer patients.

**METHOD AND MATERIALS**

This study was performed after local Institutional Review Board approval and in compliance with Health Insurance Portability and Accountability Act regulations. We retrospectively reviewed 300 second opinion interpretations performed by 3 subspecialty trained neuroradiologists from November 2012 through April 2013 and compared these reports to the outside reports submitted with the outside images. There were 15 excluded cases because the outside reader did not have the benefit of prior studies and/or histopathology available to the in-house neuroradiologists at the time of their second-opinion interpretations. The reports were categorized by using a previously described five-point scale: 1, no difference in interpretation; 2, clinically unimportant difference in detection; 3, clinically unimportant difference in interpretation; 4, clinically important difference in detection; and 5, clinically important difference in interpretation. Clinically important differences were defined as those that resulted in a change of diagnosis that affected prognosis (patient counseling), treatment approach, and/or patient referral.

**RESULTS**

The rate of clinically important discrepancies between the outside reports and the second opinion consultations was 21% (61/285). The discrepancies in detection (31) were similar in number to the discrepancies in interpretation (30). When histopathology, imaging follow-up and/or clinical assessment was available to establish the final diagnosis, the second-opinion consultation was more accurate 93% (40/43) of the time.

**CONCLUSION**

Second-opinion interpretations of outside neuroimaging studies of cancer patients by subspecialty radiologists at a tertiary care cancer center have a significant impact on patient care.

**CLINICAL RELEVANCE/APPLICATION**

Second-opinion interpretations of outside neuroimaging studies of cancer patients by subspecialty radiologists at a tertiary care cancer center benefit patient care.

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**HPS137**

The Effects of Self-Editing on Radiologist Productivity, Fatigue and Quality (Station #2)

Sanjeev Katyal MD (Presenter): Nothing to Disclose, Shaina Robinson: Nothing to Disclose, Brian Scott Kuszyk MD: Nothing to Disclose, Susanj S. Patel MD: Nothing to Disclose, Eric Richter MD: Nothing to Disclose, Mark Brown MD: Nothing to Disclose, Suzanne Shullman MD: Nothing to Disclose, James Wilbert Backstrom MD: Nothing to Disclose

**PURPOSE**

The purpose of this prospective study is to investigate the effects of self-editing on radiologist productivity, report quality, fatigue levels, and overall cost effectiveness of care.

**METHOD AND MATERIALS**

Approximately 10,000 CT chest and CT abdomen and pelvis interpreted by four body imagers will be assessed over a 6 month period. Outpatient, inpatient and emergency exams will be included in the scope of this study. For each working week, one of two predetermined reading methods will be used by each radiologist: utilizing a medical transcriptionist with findings only dictation style or self-editing with templates. Effects on fatigue levels with and without the use of a medical transcriptionist will be monitored. Each radiologist will complete daily fatigue surveys on a scale ranging from 1 (little) to 4 (significant fatigue). All final reports will be reviewed for reporting errors to determine overall quality outcomes with and without the use of a medical transcriptionist.

**RESULTS**

A 1,400 representative sampling of our self-editing study data population was preliminarily reviewed. On average, the overall time/case was decreased by approximately two minutes when utilizing a medical transcriptionist than with self-editing. Overall, the four radiologists in our study were approximately 47% more efficient when transferring editing to a lower cost FTE. More importantly, they achieved this increased efficiency with lower fatigue levels. The average fatigue score for the sent to editor workflow was 2.1 and the average score for the self-edited workflow was 3.4. Through the preliminary analysis, there have been no differences in clinically significant accuracy rates between the two reading methods. The entire data set of 10,000 CT scans will be reviewed for both typographical and quality errors.

**CONCLUSION**

By sending to an editor instead of self-editing CT reports, our radiologists have decreased the overall time/report by an average of 47% with associated lower fatigue levels. These gains in clinical efficiency can be traded for reading more cases, performing imaging appropriateness and physician outreach, and spending more time viewing each case.

**CLINICAL RELEVANCE/APPLICATION**

The use of voice recognition (VR) has decreased costs by eliminating medical transcriptionists but for most practicing radiologists, VR may have the unforeseen consequence of decreasing overall productivity and report quality.

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**HPS138**

Real Time Radiology Consultative Service for a Resource Poor African Nation (Station #3)
PURPOSE
Radiology in Rwanda is markedly underserved with 6 radiologists serving 12 million. The health system of Rwanda is decentralized comprised of 430+ health centers, 39 district hospitals (inpatient and outpatient) and 4 national referral hospitals. The University Central Hospital in Kigali (CHUK) is the single point of final referral in the country. As a result the pathology seen is that of the entire population of 12,000,000. An American Radiologist living in Rwanda served in CHUK and frequently encountered cases that require subspecialty expertise for ideal interpretation. We sought to create a real time subspecialty consultation service given the low resource availability.

METHOD AND MATERIALS
CHUK is equipped with a 64-slice Siemens’ scanner. Using an IPhone, the local radiologist would photograph key images, include history and then triage. An internet connection with speeds less than 100kb/sec was used. Those which did not need prompt response were emailed to colleagues at the home institution which had a time difference of 6-7 hours. Those that needed prompt attention were emailed to a Belgium (usually the same time zone). A phone call was placed but not answered from Rwanda to Belgium (zero cost). Seeing the call, the Belgian Radiologist would look at the case and triage to the appropriate subspecialty radiologist and email a reply.

RESULTS
Over 20 cases were sent to Belgium predominately over a 3-month period. Diagnoses included: pleiomorphous adenoma, agenesis corpus callosum with fat; CLIPPPERS (chronic lymphocytic inflammation with pontine perivascular enhancement responsive to steroids); 13 day old with Rhabdomyosarcoma; parapharyngeal Lymphangioleiomyomata; Megalencephalic leukoencephalopathy with subcortical cysts, metachromatic leukodystrophy; HIV associated emphysema. Klippel-Trenaunay-Weber; and many others. Urgency was indicated in the text of the email and when so indicated results have been returned as quickly as 17 minutes. Cases on average were answered in under 24 hours.

CONCLUSION
Using only the camera and internet capabilities of an iPhone in urban Rwanda, near real time subspecialty consultation is achievable in low resource settings at nearly zero cost allowing for remarkably improved diagnosis

CLINICAL RELEVANCE/APPLICATION
With a worldwide shortage of radiologists, marked in impoverished nations, the need for teleradiology is obvious - we present a way to achieve that with an iPhone and slow internet.
PURPOSE

To determine the effectiveness of intraoperative (OR) radiography (x-ray) for evaluating surgical item miscounts and evaluate adherence to our institutional protocol to image the miscounted item.

METHOD AND MATERIALS

We retrospectively reviewed 183 sequential OR x-rays in 180 patients (97 male, mean age 52 yrs, mean BMI 29) for surgical item miscounts 1/1/2011-4/1/2013. X-rays were reviewed in consensus by 3 board-certified radiologists including follow-ups in 78% (142/183). Adherence to our institutional policy of x-raying the miscounted item was tracked.

RESULTS

OR miscounts requiring x-ray occurred in 0.9% (183/20,820) of surgeries. The most commonly miscounted items were needles (118) and sponges (17). Only 9% (17/183) were resolved; 8 items were outside the patient (4 needles, 3 sponges, 1 clamp). 5% (9/183) were ultimately resolved by x-ray, 5 immediately (2 needles, 3 sponges), 2 incidentally on follow-up (2 needles) and 2 during this study (1 needle, 1 microclip) for a false negative rate of 2% (4/183, all very small items). Miscounts were numerically most common with open heart surgery 45/1382 (3%), but occurred in higher proportions of esophagectomies 4/12 (33%), liver transplant 12/66 (18%) and Whipple 7/44 (16%). Item miscount x-ray protocol adherence was 91% (167/183). Items were detected and removed at the time of surgery in 3% (5/183) of cases. Delayed detection occurred in 2% (4/183) of cases and the items were not removed.

CONCLUSION

OR x-rays can effectively identify retained items, although small needles were difficult to detect. Despite a high level of adherence to imagining the miscounted item, positive OR x-rays are rare and miscounted items may be occult due to small size. Surgical needles were not routinely removed when found post-operatively.

CLINICAL RELEVANCE/APPLICATION

Miscounted surgical needles are not routinely removed when found post-operatively, suggesting that x-rays for miscounted small needles may be unnecessary.

HPS140

Probable Benign Hepatic and Renal Extracolonic findings Drive Variability in Recommendations for Follow-up of between the National CT Colonography Screening Trial and a Consensus Panel (Station #2)

Hanna Maryam Zafar MD (Presenter): Nothing to Disclose, Ilana F. Gareen PhD: Nothing to Disclose, Jorean Sicks MS: Nothing to Disclose, Amy Kiyohara MD: Nothing to Disclose, Bettina Siewert MD: Nothing to Disclose, William Black MD: Nothing to Disclose, Judy Yee MD: Research Grant, EchoPixel, Inc

PURPOSE

To compare American College of Radiology Imaging Network National CT Colonography Trial (NCTCT) radiologist recommendations for additional follow-up testing of extra colonic findings (ECFs) with those of an expert panel of radiologists.

METHOD AND MATERIALS

Radiologists in the NCTCT recorded follow-up recommendations for ECFs using standard forms. Using the Delphi method to obtain consensus, a panel of five radiologists classified follow-up for each of the 182 types of ECF recorded in the NCTCT as benign (no further evaluation), further evaluation recommended, and cannot categorize without additional information. Panel classification was based on the standard ECF categories from the NCTCT rather than on images or reports. All patients were presumed asymptomatic. For each type of ECF, we compared the recommendations of the NCTCT radiologist with those of the expert panel. Reports, but not images, were reviewed for disagreement cases.

RESULTS

Among 2,662 ECFs in 1,488 patients, both the NCTCT radiologists and the panel agreed follow-up was not recommended for 85% of ECFs (2,257/2,662) and was recommended for 8% of ECFs (215/2,662); most commonly lung nodules > 4 mm in size (32%, 70/215) and indeterminate masses in the kidney > 1 cm (15%, 33/215) and in the liver > 0.5 cm (11%, 23/215). Disagreement on management recommendations was found in 7% of cases (190/2,662). The majority of disagreement cases were located in the kidneys (22%, 41/190) and liver (14%, 27/190) involving two diagnostic categories: indeterminate masses > 0.5 cm (12%, 23/190) and simple cysts (11%, 21/190). Manual review of these reports revealed that both diagnostic categories described probable benign lesions (e.g., cysts) for which NCTCT radiologists recommended follow-up due to lesion size and low dose technique.

CONCLUSION
Both the NCTCT radiologists and the panel agreed no further follow-up was advised for 85% of ECFs.

Disagreement in 7% of cases was mainly due to divergent categorization of similar hepatic and renal lesions, most of which were favored by Trial readers to be benign. Standardized definitions of hepatic and renal ECFs on CT Colongraphy and evidence based outcomes of these findings may help reduce variability in ECF follow-up recommendations.

**CLINICAL RELEVANCE/APPLICATION**

Standardized definitions of probable benign hepatic and renal ECFs and evidence based outcomes of these findings may help reduce variability in CTC follow-up recommendations.

**TEACHING POINTS**

1. To define what the new International Classification of Diseases, 10th revision (ICD-10) coding system is and its impact on radiologists.
2. To review how ICD-10 codes are constructed.
3. To challenge the reader with cases and a quiz that reviews practical applications of ICD-10 for radiology and patient care.

**TABLE OF CONTENTS/OUTLINE**

1. Define the new International Classification of Diseases, 10th revision (ICD-10) and how it is different from ICD-9 and Current Procedural Terminology (CPT) coding.
2. Outline what the numerical system means and how codes are assigned.
3. Give examples of different codes and their impact on radiology practice.
4. Give 2 cases/vignettes where ICD-10 will be used.
5. Review potential hurdles of implementing ICD-10.
6. Quiz to test the reader's knowledge of ICD-10.

**Breast Imaging: State of Union**

**Refresher/Informatics**

**AMA PRA Category 1 Credits ™**: 1.50
**ARRT Category A+ Credits**: 1.50

Sun, Nov 30 2:00 PM - 3:30 PM Location: E451B

**LEARNING OBJECTIVES**

1) The data that support mammography screening beginning at the age of 40. 2) The history of efforts to reduce access to screening mammography and the scientific errors in those efforts. 3) The details of the poor quality mammography and the allocation errors that compromised the Canadian National Breast Screening Study1. 4) Errors in analysis from a major review that incorrectly suggested that screening leads to massive overdiagnosis of breast cancer.

**ABSTRACT**

Mammography screening is one of the major medical advances of the last half century. Prior to the onset of screening in the U.S., the death rate from breast cancer had been unchanged since 1940. Screening began in the mid 1980's and soon after, in 1990, the death rate began to fall. Each year there are now more than 30% fewer women who die from breast cancer each year than would have had screening not been available. Therapy has improved, but therapy saves lives when cancers are treated earlieir. Nevertheless, controversy continues to be raised about the efficacy of screening. For more than 30 years, specious arguments have been made in an effort to limit access to screening. These will be described, and shown to be based on faulty methodology.

**Supplemental Screening Beyond Mammography**

**LEARNING OBJECTIVES**

1) To learn when supplemental screening beyond mammography may be useful. 2) To understand the strengths and weaknesses of various supplemental screening modalities. 3) To identify which modality is most
appropriate in which clinical setting.

**RC115C**

**Current Economic Challenges**

Geraldine B. McGinty MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) To review the current economic issues in breast imaging. 2) Understand the recent cuts to breast interventional procedures.

**RC127**

**Changing the Culture of Radiology: How to Thrive in Turbulent Times**

*Refresher/Informatics*

PR HP

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Sun, Nov 30 2:00 PM - 3:30 PM  Location: E353B

**Participants**

*Moderator*

David C. Levin MD: Consultant, HealthHelp, LLC Board of Directors, Outpatient Imaging Affiliates, LLC

Vijay Madan Rao MD (Presenter): Nothing to Disclose

William T. Thorwarth MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Understand the threats facing radiology. 2) Be aware of ways to counter the trend toward commoditization of the specialty. 3) Learn how to improve relationships with hospital administrations. 4) Understand how radiologists can add more value to patients and referring physicians. 5) Be aware of some ACR initiatives that will help radiology practices alter their culture in a positive way.

**MSAS21**

**Regulations and Legislation That Effect Health Care Access and Practice (Sponsored by the Associated Sciences Consortium) (An Interactive Session)**

*Multisession Courses*

HP

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Mon, Dec 1 8:30 AM - 10:00 AM  Location: S105AB

**Participants**

*Moderator*

Lynne Roy MBA, MS: Nothing to Disclose

**Sub-Events**

**MSAS21A**

**ICD-10 for Imaging: Now What**

Denise A. Merlino MBA (Presenter): Consultant, IBA Molecular Imaging Consultant, United Pharmacy Partners, Inc Consultant, Bracco Group Spouse, Employee, Pharmaluce, Inc

**LEARNING OBJECTIVES**

1) At the end of the session the participant will understand the important aspects of successful ICD 10 implementation and training tips important for Imaging. 2) The participant will know where to locate important references and resources regarding ICD-10 as it relates to Imaging.

**URL’s**

www.merlinohccc.com

**Active Handout**

MSAS21B  Health Care Reform: Implications for Health Care Providers
Erika  Johnson (Presenter):  Nothing to Disclose

LEARNING OBJECTIVES

1) Describe a new perspective on population health and efforts to contain health care spending. 2) Describe a new population health taxonomy. 3) Describe different management approaches for each population cohort to improve efficiencies.

RC202  Milestone Implementation: Practical Lessons Learned at 3 Academic Institutions

Refresher/Informatics

ED HP ED HP
AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 0
Mon, Dec 1 8:30 AM - 10:00 AM  Location: S504AB

Participants

Moderator
Angelisa Marie  Paladin MD : Nothing to Disclose

LEARNING OBJECTIVES

1) Identify resources that will help Program Directors implement the Milestones. 2) Identify potential obstacles and solutions for efficient implementation of the Milestones. 3) Identify ineffective and effective tactics in implementing the Milestones.

Sub-Events

RC202A  University of Maryland Experience
Charles S.  Resnik MD (Presenter):  Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

RC202B  The University of Washington Experience
Angelisa Marie  Paladin MD (Presenter):  Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

RC202C  The Stanford Experience
Terry S.  Desser MD (Presenter):  Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

RC227  The Future of Radiology Payments: Can Analytics Help Radiologists Regain Control?

Refresher/Informatics

HP HP HP
AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50
Mon, Dec 1 8:30 AM - 10:00 AM  Location: S102D

Participants

Moderator

LEARNING OBJECTIVES

1) Understand how analytics can help radiologists provide value over volume and get compensated for it. 2) Understand how big data and analytics can be made accessible to the practicing radiologist. 3) Better understand radiology's place in the economic puzzle of bundles. 4) Understand how analytics can make the radiologists report more accurate and easier to produce. 5) Understand how a department powered by analytics can enhance quality and payment.

ABSTRACT

As healthcare delivery models evolve into ones that reward value over volume, the mechanisms by which physicians and facilities will be compensated will change. To date, there is little consensus on how radiologists and radiology departments will be addressed under new payment models. This program is intended for radiologists at all stages of their careers and in various leadership and management roles, and is intended to demonstrate the power of historical analytic data in forming the baseline for innovative local and national payment models that will align stakeholder interests. It is also aimed at the more day to day practical side of analytics explaining how they can help create more consistent and accurate reports while simultaneously enhancing payment. Increasingly, practice leaders will be required to establish contracts based on risk and value. Given the seeming lack of information regarding new payment models and how they are actually implemented, it is easy for radiologists to feel hopeless or powerless against the oncoming tide of change. This program will show that, using data and analytics, radiology and radiologists can regain control of their financial stake in the patient encounter. Although "Big Data" and "Analytics" may sound like something that cannot affect your day to day practice as a radiologist, it turns out that having powerful tools work in the background can allow for better, more consistent reports, better communication of critical results and follow-up and can allow for a more proactive rather than reactive radiology practice.

MSAS22

Think Inside the Box: Combining Strategy and Design to Re-invent Radiology Master Planning (Sponsored by the Associated Sciences Consortium) (An Interactive Session)

MULTISESSION COURSES

AMERICAN MEDICAL ASSOCIATION PATHWAY TO LEADERSHIP CATEGORY 1 CREDITS: 1.50
ARRT CATEGORY A+ CREDITS: 1.50
MON, DEC 1 10:30 AM - 12:00 PM Location: S105AB

Participants

Moderator
Morris A. Stein BArch : Nothing to Disclose
Carlos L. Amato (Presenter): Nothing to Disclose
Katherine Margaret Richman MD (Presenter): Spouse, Employee, Agfa-Gevaert Group
John T. McGarry (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Identify strategic master planning initiatives to address ACA impacts as well as innovative future delivery of care models. 2) Describe how technology trends such as mobile health, cloud computing, big data, intelligent patient models, intelligent infrastructure and patient empowerment will affect future physical radiology department designs. 3) Demonstrate the benefits of parametric master planning and why it will radically change the traditional design process commonly used today. 4) Understand parametric planning and simulation modeling to objectively evaluate and compare department functional organizations, staffing models, efficiency and patient throughput.

ABSTRACT

Every hospital and outpatient center faces several common and overlapping challenges: limited space, growing demands for efficiency, finite resources and increased patient volume. Master planning for Radiology is more than simply technology change or squeezing more inside existing space. This refresher course will describe how using strategic planning, physical design and functional organization all best contribute for a modern reinvention of master planning. The same clues that large institutions are using globally are valuable for radiology specific planning.

SSC06

ISP: Health Service, Policy & Research (Quality)

Scientific Papers

AMERICAN MEDICAL ASSOCIATION PATHWAY TO LEADERSHIP CATEGORY 1 CREDITS: 1.50
ARRT CATEGORY A+ CREDITS: 1.50
MON, DEC 1 10:30 AM - 12:00 PM Location: S102D

Participants

Moderator
Christopher Paul Hess MD, PhD : Research Grant, General Electric Research Consultant, Imaging Endpoints Research Consultant, Cerebrotech Medical Systems
Pari Pandharipande MD, MPH : Nothing to Disclose

Sub-Events

SSC06-01 Health Service, Policy & Research Keynote Speaker: Defining Quality in Radiology
Christopher Paul Hess MD, PhD (Presenter): Research Grant, General Electric Research Consultant, Imaging
SSC06-02  High Fidelity Contrast Reaction Simulation Training: A Single Department’s Comparison of Performance and Comfort Level Amongst Faculty, Fellows, and Residents

Kyle Elmer Pfeifer MD (Presenter): Nothing to Disclose, Jay Kumar Pahade MD: Nothing to Disclose, Jonathan D. Kirsch MD: Nothing to Disclose, Melih Arici MD: Nothing to Disclose, Jennifer Arango: Nothing to Disclose, Lawrence H. Staib PhD: Nothing to Disclose

PURPOSE
Reactions to contrast material are uncommon in diagnostic radiology, and vary in presentation from urticaria to life threatening anaphylaxis. It is the responsibility of the radiologist to provide appropriate care. Prior work has shown a high error rate in contrast reaction management, with smaller studies using simulation showing variable data on effectiveness. Using the largest study population to date, (>150 radiologists) we sought to assess the effectiveness of high fidelity simulation in managing contrast reactions.

METHOD AND MATERIALS
A 20 question multiple-choice test and Likert scale questions assessing subjective comfort levels and knowledge of management of contrast reactions was created. Three simulation scenarios (moderate reaction, severe reaction, and reaction mimic) were designed to provide simulation training. Each course was completed in one hour in groups of 8-10 with 2-3 “responders” per simulation. All participants completed a pre-test, post simulation debriefing, and post-test to assess effectiveness on test scores and subjective Likert ratings of comfort in managing reactions.

RESULTS
151 radiologists participated (residents=53, fellows=24, faculty=74). There was a statistically significant increase in the post-test scores after the simulation (p=0.03). Post simulation Likert scores regarding comfort in managing contrast reactions showed a significant increase across mild, moderate, and severe reactions (P<0.05). No statistical difference in test scores was noted when comparing residents to fellows to faculty.

CONCLUSION
High fidelity simulation is an effective learning tool, allowing practice of “high acuity” situations in a non-threatening setting. Our study revealed a statistically significant improvement in test scores, and subjective comfort in management of reactions. The study supports the use of high fidelity simulation as an effective teaching tool for contrast reaction management.

CLINICAL RELEVANCE/APPLICATION
Our study illustrates the successful implementation of a high fidelity contrast reaction simulation program across an entire radiology department and is the largest to date. It further supports the implementation of simulation as an effective teaching tool in contrast reaction management training with the goal of improving patient outcomes.

SSC06-03  Appropriateness of Use of Computed Tomography Pulmonary Angiography by Emergency Department by Use of Decision Rules

Jadranka Stojanovska MD, MS (Presenter): Nothing to Disclose, Ruth C. Carlos MD, MS: Nothing to Disclose, Aamer Rasheed Chughtai MBBS: Nothing to Disclose, Aine Marie Kelly MD: Nothing to Disclose, Ella A. Kazerooni MD: Nothing to Disclose

PURPOSE
To apply the appropriateness of computed tomography pulmonary angiography (CTPA) utilization using existing clinical decision rules in emergency department (ED) and to assess CTPA diagnostic yield by applying decision rules.

METHOD AND MATERIALS
Institutional Review Board approval was obtained for this HIPPA-compliant prospective cohort study. A total of 602 consecutive adult ED patients undergoing CTPA for suspected pulmonary embolism (PE) formed the study population. Primary outcome was positive or negative for PE. PE rule-out criteria (PERC) and modified Wells (mWells) score were retrospectively calculated. Positive PERC (+PERC) was defined as having ≥1 of the criteria met. Positive mWells (+mWells) was defined if the score was > 4. PE prevalence, percentage of CTPA examinations that could have been avoided, the diagnostic yield of CTPA among patients with -PERC compared to -mWells were calculated.

RESULTS
Of 602 patients in total, 61 (10%) were diagnosed with PE. By applying PERC and mWells, 17.6% (106/602) and 45 (261/602) of all CTPA examinations could have been avoided. The overall diagnostic yield of PERC was higher at 10% (59/602) compared to diagnostic yield of mWells of 8% (49/602) p<0.0001. Among patients with -PERC, the diagnostic yield for PE was 1.9% (2/106) compared to a diagnostic yield of positive PE of 4% (12/273) among patients with -mWells (p=0.004).

CONCLUSION
PERC is safer triaging decision tool than mWells that reduces the probability of PE to below 2% and should be applied in ED setting to avoid overutilization of CTPA.
The diagnostic yield of PE among negative cases by PERC (1.9%) is lower than diagnostic yield of PE among negative cases by mWells (4%). PERC is safer clinical decision rule than mWells that reduces PE posterior probability to below 2% and it should be applied in ED setting to avoid overutilization of CTPA.

**Frequency of Acute Kidney Injury Following Intravenous and Intra-arterial Iodinated Contrast Material Administration in a Paired Cohort**

Jennifer S. McDonald PhD (Presenter): Research Grant, General Electric Company, Robert J. McDonald MD, PhD: Nothing to Disclose, Caleb Brandon Leake BS: Nothing to Disclose, Rickey Carter PhD: Nothing to Disclose, Rajiv Gulati MD, PhD: Nothing to Disclose, Richard W. Katzberg, MD: Research Grant, Siemens AG Research Grant, Bayer AG Investigator, Siemens AG Investigator, Bayer AG, Eric E. Williamson MD: Research Grant, General Electric Company, David F. Kallmes MD: Research support, Terumo Corporation Research support, Covidien AG Research support, Sequent Medical, Inc Research support, Benvenue Medical, Inc Consultant, General Electric Company Consultant, Covidien AG Consultant, Johnson & Johnston

**PURPOSE**

Prior uncontrolled studies of contrast-induced nephropathy suggested that intra-arterial contrast administration is associated with a higher risk of acute kidney injury (AKI) compared to intravenous administration. We compared the risk of AKI following intravenous and intra-arterial contrast exposure in a cohort of patients that received both routes of contrast administration.

**METHOD AND MATERIALS**

Materials and Methods: This retrospective study was HIPAA compliant and approved by our IRB. All patients who received both a contrast-enhanced CT or CT angiography scan and a diagnostic or interventional cardiac catheterization between 2000-2011 were identified. Patients who lacked sufficient pre- and post-procedure serum creatinine (Scr) results, who were on pre-existing renal dialysis, who underwent additional contrast-enhanced procedures within 14 days of either procedure, or whose baseline Scr changed more than 0.3 mg/dL between procedures were excluded. The incidence of AKI, defined as Scr >= 0.5 mg/dL above baseline, was compared following CT scan and cardiac catheterization using McNemar’s test.

**RESULTS**

Results: A total of 1073 patients met all study inclusion criteria. The incidence of AKI following CT scan was similar to the incidence following catheterization when examining all patients (4.9% CT vs. 6.0% catheterization, p=.27). This similar AKI incidence was observed regardless of order of procedure (CT or catheterization) or type of cardiac catheterization performed (diagnostic or interventional).
CONCLUSION
Conclusion: In this paired cohort, the frequency of AKI following intra-arterial administration of iodinated contrast material is similar to the rate observed following intravenous contrast administration. These findings suggest that prior reports of excess incidence of AKI following intra-arterial contrast administration compared to intravenous administration may reflect differences in clinical status and baseline risk for AKI rather than differences in the nephrotoxic potential in these two routes of contrast administration.

CLINICAL RELEVANCE/APPLICATION
Clinical Relevance: The nephrotoxic risk of intra-arterial contrast administration has been overstated in prior studies lacking a suitable control group.

Quality Measurements in Radiology: A Systematic Review of the Literature

PURPOSE
As the US healthcare delivery system transitions from volume to value, numerous public, private and non-profit entities have developed quality metrics to evaluate health care providers. Radiology quality metrics currently in use by CMS programs (e.g., Physician Quality Reporting System) do not focus on true diagnostic outcomes. We present here an exhaustive inventory of all published radiology quality metrics and classify them according to the hierarchical framework of Donabedian et al., which is used widely throughout the broader healthcare quality metric literature.

METHOD AND MATERIALS
A systematic review was performed in which eligibility criteria included published primary research articles, commentaries, and review articles from 2000 onward. Multiple databases were searched (7/1/2013) as well as the reference lists of identified articles. Studies were double-read with discrepancies resolved by consensus. Outcome measures were organized based on standard Donabedian categories (structure, process, outcome). Results were reported according to PRISMA study guidelines for reporting systematic reviews.

RESULTS
Our initial search yielded 1816 unique citations (Figure 1). Our double-blind abstract screen identified 110 papers for detailed review, of which 16 were included in the final analysis. A total of 75 unique metrics were reported, which were further classified as follows: 28 (37%) structure metrics, 24 (32%) outcome metrics and 23 (31%) process metrics. The most commonly cited outcome metric was the ACR RADPEER score (50% of papers). The most commonly cited structural metric was whether or not a facility was accredited by the ACR (31% of papers). The most commonly cited process metric was whether ACR appropriateness criteria were followed (25%).

CONCLUSION
Numerous radiology quality metrics have been described, which are evenly divided between structure, process and outcomes metrics. Additional research is needed to determine why there has been low uptake of radiology outcome metrics into existing value-based contracting (e.g., CMS PQRS).

CLINICAL RELEVANCE/APPLICATION
Radiologists must work to develop quality metrics that evaluate patient centered outcomes of radiologic studies.

Intravenous Contrast Extravasation: Trends in Rate, Complications, and Demographics
Martin Lee David Gunn MBChB (Presenter): Medical Advisor, TransformativMed, Inc Spouse, Consultant, Wolters Kluwer nv Grant, Koninklijke Philips NV, Bruce E. Lehnert MD: Nothing to Disclose

PURPOSE
The primary purpose of this study was to examine the contrast extravasation (CE) rate and complications from power-injected intravenous low-osmolality iodinated contrast media. The secondary purpose was to determine the impact of real-time pressure monitoring and saline test injections on the CE rate.

METHOD AND MATERIALS
Retrospective, single-center review of adult patients (18 years and older) maintained in a dedicated CE database from 2006 to 2013 inclusive, encompassing approximately 80,000 contrast injections. Demographic information, iv line location (peripheral or central), scan protocol used, flow rate, contrast type, volume of contrast extravasation, and complications were examined. Statistical analysis included chi-squared tests for contingency tables, and t-test for continuous variables.

RESULTS
From 2006-2013 inclusive, there were 290 CE's from 80,045 contrast injections, yielding an overall CE rate of...
0.362%. All injections were non-ionic low-osmolality contrast media (iomeprol 300, iohexol 350, iodixanol 320). CE occurred in older patients than those without CE (52.04 vs 46.9 years, p<0.0001). There was a significant gender difference, with males slightly less likely to have extravasations than females (relative risk 0.74; 95%CI 0.59-0.94; p=0.014). Volume of extravasation ranged from 20 cc to 200 cc (mean 72.8 cc, sd 41.14 cc).

Following implementation of a power-injected saline test flush and real-time technologist pressure monitoring in 2008, there was no reduction in the extravasation rate (pre: 0.40%, post: 0.33% to (p<=0.17), or volume (69.8 cc vs 75 cc 95CI = -6.1-16.35 cc, p=0.36) CE line type were: 238 (82%) peripheral, 22 (8%) central, and 30 unknown (10%) respectively. There were two serious complications - forearm compartment syndrome requiring a fasciotomy, and central line extravasation requiring chest tube placement.

CONCLUSION

We report a low rate of CE following iv power injection. Age is correlated with risk. 2/259 serious complications occurred, confirming the safety of LOCM CE power-injections. The implementation of saline test power-injections and real-time pressure monitoring was not associated with a lower rate or volume of extravasations.

CLINICAL RELEVANCE/APPLICATION

The risk of a complication requiring intervention due to CE is extremely low, approx 2 / 80,000 in our series. Using a saline test bolus, and real-time infusion pressure monitoring do not reduce, or volume of CE.

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**SSC06-08**

Is Computerized Tomography Sufficient without Bone Scan for Routine, Asymptomatic Breast Cancer Staging?

Jill Tichy MD (Presenter): Nothing to Disclose, Mark Raymond Waddle BS: Nothing to Disclose, Allison Deal MS: Nothing to Disclose, Lisa A. Carey: Nothing to Disclose, Hyman Muss: Nothing to Disclose, Nisha Mehta MD: Grant, Siemens AG

PURPOSE

Redundant use of imaging modalities for staging is not cost effective, and can result in unnecessary additional workup. This study aims to assess the added utility of routine bone scan (BS) above staging CT chest/abdomen/pelvis (CT) in detection of asymptomatic breast cancer bone metastasis (BM).

METHOD AND MATERIALS

Eligible patients had stage I-III asymptomatic breast cancer diagnosed between 2010-2013 and underwent staging BS and CT

RESULTS

Among 124 patients, the median age was 53, median tumor size 3.45 cm, and 82 had >= 1 positive lymph node. Varying receptor subsets were included. Median follow-up was 2.18 years, 102 (82.3%) were radiologically concordant for BM evaluation with 93 (75.0%) negative and 9 (7.3%) raising suspicion for metastatic disease. There were 22 (17.7%) radiologically discordant cases per initial reports, of which 9 were deemed truly discordant on review. 13 of the discordant patients underwent further workup with 1 biopsy confirmation. Of the 11 CT+/BS- patients, 9 are alive without disease, 1 died with BM, and 1 was lost to follow-up. Of the 11 BS+/CT- patients, 8 are alive without disease, 1 died with visceral-only metastases, 1 died with visceral+BM, and 1 was lost to follow up with confirmed BM. Skull-only metastases were suspected by BS in 2 cases; 1 died with visceral+BM. There was no association of any patient or tumor characteristic with measured discordance (p-values >= 0.07).

CONCLUSION

Of the cases demonstrating discordance between CT and BS, the vast majority had negative follow-up imaging for metastasis, and there was only 1 case out of 124 of isolated clinically significant BM identified by BS without associated abnormal CT findings. Therefore, bone scan routinely coupled with CT staging may be unnecessary in asymptomatic breast cancer.

CLINICAL RELEVANCE/APPLICATION

Recommendations for asymptomatic breast cancer staging may merit reconsideration; BS may only be necessary in those with findings suspicious for osseous or visceral metastatic disease on CT staging.

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**SSC06-09**

Health Service, Policy & Research Keynote Speaker: Practicing Quality in Radiology

Annette Jean Johnson MD, MS (Presenter): Nothing to Disclose

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HPS-MOA

Health Services Monday Poster Discussions

Scientific Posters

AMA PRA Category 1 Credits™: .50

Mon, Dec 1 12:15 PM - 12:45 PM  Location: HS Community, Learning Center

Participants

Moderator
Dare to Compare! Analysis of Recommendations for Additional Imaging in Abdominopelvic Studies that can be Avoided by a Thorough Comparison with Prior Examinations (Station #1)

Ankur Doshi MD (Presenter): Nothing to Disclose, Michael Kiritsy: Nothing to Disclose, Andrew B. Rosenkrantz MD: Nothing to Disclose

PURPOSE

Abdomen and pelvic CT and MRI reports frequently contain recommendations for additional imaging (RAI) to evaluate an indeterminate finding, generating increased utilization and cost. The purpose of this study was to determine the frequency and characteristics of RAI that could be avoided by thoroughly reviewing all available prior studies.

METHOD AND MATERIALS

This IRB-approved, retrospective evaluation of abdominopelvic CT and MRI reports included 1,015 RAI. An abdominal imaging fellow comprehensively reviewed the reports and images from each patient’s prior imaging studies, including all relevant body parts and modalities. The RAI was considered avoidable if the prior imaging demonstrated ≥2 years of stability of the finding, complete characterization of the finding, or if the recommended study was already recently performed. The fraction and characteristics of such “avoidable” RAI were computed/assessed using summary statistics.

RESULTS

Of the 1,015 RAI, 41 were avoidable (4%). The involved organs were as follows: 22% kidney, 15% adrenal, 15% uterus, 12% liver, 7% bone, 7% biliary, 5% chest, 5% adnexa, 4% spleen, 2% peritoneum, 2% pancreas, 2% bowel, 2% abdominal wall. The RAI was considered avoidable on the basis of prior full characterization in 61%, ≥2 year stability in 29% and recent completion of the recommended study in 10%. The key prior study was a different modality from the study containing the RAI in 54% and was not mentioned as a comparison study in 83%. The key prior study modality comprised CT (44%), MRI (32%), ultrasound (17%), PET-CT (2%) and radiographs/fluoroscopy (5%). The key prior body imaging area included the abdomen/pelvis (59%), spine (10%) and chest (32%). The key finding was noted in the impression of the prior study in 22%, noted only in the report body in 17%, present on the prior images but not described in the report in 54%, and present in an outside study uploaded to our system in 7%.

CONCLUSION

A small fraction of RAI (4%) can be avoided by a thorough evaluation of all prior imaging studies, including studies of other body parts and modalities. More than half (54%) of the key prior studies did not report the finding, highlighting the importance of directly reviewing all relevant prior images.

CLINICAL RELEVANCE/APPLICATION

Direct review of all prior relevant imaging, including different body parts and modalities, can help avoid recommendations for additional imaging.
Knowledge of the risk factors associated with contrast extravasation for CT can be used to identify vulnerable groups, and help create or strengthen CE risk modification programs.

**Near-Misadministration Events for Imaging Studies: A Detailed Analysis of Major Sources and Types of Errors (Station #3)**

Resmi Charalel MD (Presenter): Nothing to Disclose, Ian Ross Drexler MD, MBA: Nothing to Disclose, Pina Christine Sanelli MD: Nothing to Disclose, Michael Lyon Loftus MD, MBA: Nothing to Disclose, Keith David Hentel MD, MS: Nothing to Disclose, Robert J. Min MD: Medical Advisory Board, Sapheon, Inc

**PURPOSE**

To identify most common types and sources of imaging study near-misadministration in order to develop tailored solutions for prevention and improvement in quality and patient safety.

**METHOD AND MATERIALS**

Detailed analysis of near-misadministration events in imaging studies was performed over a five-month period as part of departmental quality improvement efforts. Multi-modality technologists were educated regarding the risks associated with misadministration and instructed to record data, such as ordering provider, modality, and source of error for all near-misses encountered each day. Statistical analyses were performed to identify the most common errors and their sources.

**RESULTS**

Over this five-month period, in 150,604 total imaging exams performed, 148 near miss-errors were identified in 145 imaging exams (0.1% of total exams), with 98% (148/145) ordering errors and 2% (3/148) protocol errors. 74% (107/145) of near-miss errors occurred in modalities utilizing ionizing radiation (CT or XR), 53% (77/145) of errors occurred on inpatients, 39% (56/145) on emergency room patients and 8% (12/145) on outpatients. The housestaff were responsible for 60% (87/145) of ordering errors, while 12% (18/145) originated from attendings and 28% (40/145) originated from physician extenders (nurse practitioners and physician assistants). Multiple services contributed to ordering errors, with the most from Internal Medicine (33%, 48/145) and Emergency Medicine (23%, 33/145). The ordering errors consisted of most frequently wrong body part (38%, 56/148), wrong side (17%, 25/148) and wrong contrast (14%, 21/148), but also included wrong patient (5%, 8/148) and duplicate (11%, 10/148). All errors were discovered and corrected before reaching the patient.

**CONCLUSION**

At our academic medical center, the majority of ordering errors occurred in modalities involving ionizing radiation and originated from housestaff providers in departments ordering high volume imaging. By identifying these major sources of error, we are better able to target information technology, educational and workflow-related solutions towards subsets of ordering providers to reduce the number of near-miss ordering errors and ultimately true miss-errors in the future.

**CLINICAL RELEVANCE/APPLICATION**

Near-misadministration event analysis for imaging studies is important for reducing the number of true misadministration events leading to unnecessary radiation exposure and wasted resources.

**Six Years of Radiology Sentinel Events: Rates and Opportunities (Station #4)**

Carrie Phillips (Presenter): Nothing to Disclose, Karl N. Krecke MD: Nothing to Disclose, Anil Nicholas Kurup MD: Nothing to Disclose, Laura Tibor MBA, BEng: Nothing to Disclose, Sherrie L. Prescott RN: Nothing to Disclose, Robert E. Watson MD, PhD: Nothing to Disclose

**PURPOSE**

We present our experience with and rates of occurrence of sentinel events in a large multispecialty group practice. The use of denominators is important for benchmarking high-reliability radiology practice.

**METHOD AND MATERIALS**

We reviewed our institutional database for sentinel events assigned to the Department of Radiology by the institution's quality management team from 2008-2013. Denominators were selected to reflect the total number of patient exams performed and unique patient visits in each year. Annual rates were computed for events per radiology exam performed and events per 10,000 unique patients. Events were stratified into inpatient vs outpatient, harm vs risk, and grouped by error type.

**RESULTS**

Seventy-nine sentinel events were ascribed to the department over the six year period. Annually, a mean of 210,512 patients were examined in Radiology and an average of 937,214 examinations performed. Annual rate of sentinel event occurrence averaged 13.2 events (range: 8-19). Events occurred at a rate of 0.0014% for exam volumes (range: 0.0008 - 0.0020%) and 0.625 events per 10,000 unique patients (range: 0.40 - 0.91).
These defects in care represent an average sigma level of 5.7 (range: 5.61 - 5.81). Of the 79 events, 43% were associated with patient harm and 57% with increased risk of harm. Fifty-four percent of events occurred in the outpatient setting, 41% inpatient, and 5% in the emergency department. We had one patient death due to equipment failure during an interventional procedure. Our areas of opportunity are in defects related to incorrect procedure or exam, medication misadministration, specimen mishandling, and delay in treatment.

CONCLUSION
Rates of significant care defects are low in our practice compared to manufacturing standards. Yet, opportunities to improve patient care and safety remain.

CLINICAL RELEVANCE/APPLICATION
Patient safety is a preeminent priority in Radiology. While we work toward a goal of error-free practice, ‘never’ is a stretch goal. Benchmarking current rates among enlightened, self-reflective practices will help guide learning and support discovery of best practices. Adopting standard definitions and measures of defect rates is a valuable step toward benchmarking and process improvement.

Sample Size Selection to Evaluate Emerging Imaging Technologies: A Reader’s Guide (Station #6)
Anand Narayan MD, PhD (Presenter): Nothing to Disclose

TEACHING POINTS
How many patients should be studied? This is one of the most commonly asked questions in designing a research study. New imaging modalities are being developed to provide answers to clinical questions with lower radiation doses and decreased scanner time. Although there are many articles and textbooks written about sample size selection and statistical power, few of these articles describe sample size selection to evaluate safer, faster imaging technologies with equivalent accuracy. The purpose of this exhibit is to review the basic principles underlying sample size selection and use those principles to describe the process of sample size selection for common study designs that evaluate new imaging technologies.

TABLE OF CONTENTS/OUTLINE
1. Basic Principles of Sample Size Calculation Type I Error Type II Error Statistical Power Types of Variables
2. Case Studies Non-inferiority of Diagnostic Tests (Is my new imaging test/protocol at least as good as the old one?) Diagnostic Accuracy Studies (Is my new imaging test better than the old one?) Imaging Biomarkers as Disease Predictors (Does my imaging test predict disease outcomes?)
3. Resources Web based Articles
Myths Busted—Debunking Common Fallacies Surrounding Exposure to Ionizing Radiation from Medical Imaging (custom application computer demonstration)

Mindy Licurse MD (Presenter): Nothing to Disclose, Tessa S. Cook MD, PhD: Nothing to Disclose

TEACHING POINTS

The purpose of this educational exhibit is to demonstrate the use of an online quiz module to debunk a variety of myths regarding exposure to ionizing radiation from medical imaging. Upon completing the module, the participant will:

- Understand the different types of radiation effects
- Differentiate between theoretical risk model data and lack of real epidemiologic data
- Explain the relative risks of radiation for common radiologic exams
- Define the appropriate application of radiation protection strategies
- Understand the principles of ALARA, ImageWisely and ImageGently

TABLE OF CONTENTS/OUTLINE

Radiation Effects
- Stochastic
- Non-stochastic
- Hereditary

Risk of cancer
- Most common cancers related to radiation exposure
- Theoretical risk models
- Effective dose

Relative radiation risk for common radiologic exams
- Non-ionizing radiation modalities
- Ionizing radiation modalities
- Interventional radiology & fluoroscopy

Radiation protection strategies
- Shields
- Lead aprons
- “Low-dose” protocols
- ALARA
- ImageGently
- ImageWisely

Common myths about radiation exposure
- “Radiation is universally dangerous”
- “Radiation exposure makes you radioactive”
- “Radiation causes sterility”

HPS-MOB

Health Services Monday Poster Discussions

Scientific Posters

AMA PRA Category 1 Credits™: .50
Mon, Dec 1 12:45 PM - 1:15 PM Location: HS Community, Learning Center

Sub-Events

HPS147 The Effect of Obesity on Radiological Cost and Utilization at a Community-based Hospital (Station #1)

Jose Morey MD (Presenter): Nothing to Disclose, Nora Marie Haney BS: Nothing to Disclose, Penny B. Cooper: Nothing to Disclose

Background

Obesity is recognized as having a significant impact on healthcare. Given the increased cost of patient care associated with elevated BMI, it was our hypothesis that obesity would be associated with increased imaging utilization and radiology costs when compared to normal BMI patients with all other factors equal. To our knowledge no other study has attempted to analyze obesity’s impact on utilization and imaging costs.

Evaluation

The study was conducted from 2008 through 2012. Patients with pneumonia, chronic obstructive pulmonary disease, acute myocardial infarction, gastrointestinal bleed, sepsis, congestive heart failure (CHF), stroke, lung cancer, lymphoma, pulmonary embolism, and renal stone were analyzed. Patients were grouped by condition and BMI, but normalized based on age, sex, and Charlson Comorbidity Index. Every condition, except renal
Rural Hospital to Tertiary Medical Center: Role of Imaging in Triggering Patient Transfers by Air and Sea (Station #2)

Anand M. Prabhakar MD, Nothing to Disclose, Shehab Ahmed Al-Ansari MD, Nothing to Disclose, H. Benjamin Harvey MD, JD, Nothing to Disclose, James A. Brink MD, Nothing to Disclose, Alexander Seiji Misono MD, MBA, Consultant, BIND Therapeutics, Inc, James Kelly, Nothing to Disclose, Sanjay Saini MD, Nothing to Disclose, Rahmi Oklu MD, PhD, Nothing to Disclose

PURPOSE

One-fourth of the US population lives in a rural area, yet only 10% of physicians practice in these areas, highlighting limited access to care for these patients. Since rural hospitals are often ill equipped to handle all medical emergencies, patients are transferred to other institutions for higher level of care. These transfers are estimated to cost up to $25,000. Since imaging has been shown to be critical in the emergency setting, the goal of this study is to investigate the role of imaging in transfers to a tertiary care center from an integrated rural hospital located on an island 30 miles at sea.

METHOD AND MATERIALS

In this IRB-approved, HIPAA compliant study, medical records were reviewed to identify all patients who were transferred to our institution from 2012-2013. Medical history and type of imaging that was performed at the rural hospital prior to transfer was reviewed. Medical records at the tertiary care center and any additional or repeat imaging studies that were performed at the tertiary care center were also evaluated.

RESULTS

22,075 ER visits were made to the rural hospital from 2012-2013. Of these patients, 696 (3%) patients were transferred from the rural hospital. 78% (545) of the transfers were by air and 12% (86) were by boat. The most common reasons for transfer were cardiac (121; 29%), trauma (77; 18%), GI tract (64; 15%), and neurological (54, 13%) in etiology. 92% of patients had imaging prior to transfer (47% radiograph, 41% CT, 4% MRI, 6% US). Only 1 patient (0.002%) had imaging repeated at the tertiary center due to quality concerns, the rest were deemed satisfactory. 46% of total and 69% of non-cardiac patients had positive imaging findings related to the transfer-diagnosis.

CONCLUSION

Only 3% of rural hospital ER visits required a transfer to the tertiary care center. The integrated PACS system between the hospitals streamlined diagnosis and led to rapid identification of patients for emergent transfer. Additionally, this integration nearly eliminated the need for repeat imaging, reducing healthcare costs and radiation dose to the patient.

CLINICAL RELEVANCE/APPLICATION

Imaging is critical in identifying patients that require a higher level of care not possible at a rural hospital. Having experienced technicians at rural hospitals, adequate imaging equipment and an integrated PACS system can greatly assist this vulnerable population and reduce unnecessary transfers to tertiary care centers.

Predictors of Accrual Success in Oncologic Imaging Trials (Station #3)

Lori Henderson (Presenter): Nothing to Disclose, Eric Huang PhD, Nothing to Disclose, Frank I. Lin MD, Nothing to Disclose, Lalitha K. Shankar MD, PhD, Nothing to Disclose

PURPOSE

Patient accrual in imaging clinical trials has historically been problematic. To address this, factors that can potentially indicate good or poor ultimate accrual are explored qualitatively and analyzed by statistical methods for associations. The results of this study provide insight into factors that can predict accrual issues and aid in the design of successful studies.

METHOD AND MATERIALS

An analysis, including a qualitative description of the portfolio, was performed on R01-funded research grants which supported Phase 0, I, or II clinical trials that investigated novel or novel uses of imaging agents, modalities, interventions, or methodologies. The data included accrual information and trial characteristics of...
109 grants which had 3 or 5 years of open enrollment from 2005 to 2010. Patient accrual was tabulated annually, most recently in 2014. Studied factors included clinical indication (e.g. screening, diagnostic, therapeutic assessment), trial design features (e.g. numbers of required scans), study objectives, imaging agent/modality, treatment regimens, and primary disease location. Univariate associations of accrual at the time of project completion with trial features and percent of target accrued (PTA) at 2 years were explored. The 2 year PTA association was derived from likelihood ratio tests based on Cox regression models whereas accrual performance vs. trial features associations were evaluated using log-rank tests.

RESULTS

Accrual performance demonstrated strong positive association with 2 year PTA (p<0.0001) and negative associations with two trial characteristics: primary liver disease site (p=0.0034) and use of X-rays (p=0.0073). Accrual performance demonstrated weaker positive association with use of computed tomography (CT) (p=0.093). There was no evidence of association of accrual performance with a study's primary objective.

CONCLUSION

Higher 2 year PTA and use of CT are associated with greater likelihood of accrual success, while lower likelihoods are associated with X-ray use and primary liver disease site. No association between accrual and the primary objective was found.

CLINICAL RELEVANCE/APPLICATION

Evidence-based medicine depends on data from clinical trials. This study identifies factors which improve the successful completion rate of clinical trials with imaging components.

HPS150

Contrast-Induced Nephropathy in Outpatients with Pre-existing Renal Disease: A Randomized Comparison between Iohexol (Omnipaque) and Iodixanol (Visipaque) (Station #4)

Maria A. Jepperson MD (Presenter): Nothing to Disclose, Douglas Adolphson MD: Nothing to Disclose, William E. Haley MD: Nothing to Disclose, Julia Crook PhD: Nothing to Disclose, Alexander Parker PhD: Nothing to Disclose, Joseph George Cernigliaro MD: Nothing to Disclose

PURPOSE

The primary purpose of this prospective, randomized, double blinded study was to compare iohexol to iodixanol with respect to subsequent incidence of contrast induced nephropathy (CIN) in an outpatient population with pre-existing renal disease.

METHOD AND MATERIALS

Following IRB approval, 124 outpatients with a glomerular filtration rate (GFR) of 45.0-59.9 mL/min obtained within 48 hours of the CT examination were prospectively enrolled and 102 met inclusion criteria for the study and had a return visit. Exclusion criteria included: age < 18 years, CT with IV contrast in the previous 10 days, end stage kidney or liver disease (defined by being currently considered for renal or liver transplant), acute illness, inpatient/emergency room visit. Patients were randomly assigned to receive 100 mL of either iohexol (47 patients) or iodixanol (55 patients); GFR and creatinine was again obtained 48-96 hours after CT examination. CIN was defined as having a decrease in GFR ≥ 20% or an increase in creatinine ≥ 25%. Statistical analysis consisted of estimation of proportions and odds ratios along with confidence intervals. A priori we had considered that the study would provide preliminary evidence of non-inferiority for iohexol if the 90% confidence interval (CI) for the odds ratio (ioxol vs. iodixanol) was found to have upper limit less than 1.5.

RESULTS

The overall rate of CIN in the study population was 5.9% (6/102, 95% CI: ), including one patient (2.1%) in the iohexol arm (95% CI: 0.4-11.1%) and five patients (9.1%) in the iodixanol arm (95% CI: 4.0-19.6%). These results met our goal of providing evidence of non-inferiority of iohexol (OR=0.22, 90% CI: 0.04-1.36). All 6 patients who developed CIN had additional risk factors for acute kidney injury (history of cancer, chemotherapy, prior nephrectomy, surgery between the CT and follow-up lab work).

CONCLUSION

This study suggests that, in outpatients with mild preexisting renal disease, iohexol is likely not associated with a higher risk of CIN than iodixanol. The overall rate of CIN seen in our specific outpatient population of ~6% is lower than previously reported rates (based largely off of inpatient cohorts with variable comorbidities, risk factors and greater background fluctuation).

CLINICAL RELEVANCE/APPLICATION

Iodixanol is much more expensive than iohexol; a change in protocol will have a significant impact on overall health care delivery cost savings.

HPS151

Contrast Induced Nephropathy Prevention Regimens for Patients Undergoing Intravenous Contrast Enhanced Computed Tomography: A Meta-analysis (Station #5)

Shira I. Moos MD, MMedSc (Presenter): Nothing to Disclose, Roderick S. de Weijert: Nothing to Disclose, Jaap Stoker MD, PhD: Research Consultant, Robarts Clinical Trials, Shandra Bipat MS: Nothing to Disclose
PURPOSE

To summarize difference in CIN incidence between prevention regimens (i.e. prophylactic intravenous hydration) with addition of anti-oxidants in patients undergoing intravenous CECT.

METHOD AND MATERIALS

We performed a review and meta-analysis according to the preferred reporting in systematic reviews, meta-analysis (PRISMA) guidelines. We searched MEDLINE, EMBASE and Cochrane (2002 till November 2013). Randomised controlled trials (RCTs) studying CIN prevention in CECT were selected. Data were pooled (intervention versus control) and analysed by a fixed- or random-effects models depending on heterogeneity.

RESULTS

We included eight RCTs. The intervention group comprised 655 patients receiving N-acetylcysteine, Vitamin E or alprostadil combined with saline. The control group comprised 667 patients receiving saline. The risk-difference in CIN incidence between intervention and the control groups was -0.08(95%CI:-0.11--0.04), p<0.0001). Subgroup analysis for N-acetylcysteine only as intervention compared to the control group showed a difference in CIN incidence; risk difference: -0.09(95%CI:-0.16--0.01), p=0.03). Patients with kidney disease showed a risk-difference in CIN of -0.10(95%CI:-0.16--0.04), p=0.001, for N-acetylcysteine only this was: -0.10(95%CI:-0.16--0.04), p=0.001 as well. The risk difference in patients undergoing emergency CECT was -0.04(95%CI:-0.16-0.08), p=0.49).

CONCLUSION

Hydration with prevention agents, or more specifically N-acetylcysteine, seems to decrease CIN incidence when compared to hydration only. RCTs with controls not receiving any prevention are lacking.

CLINICAL RELEVANCE/APPLICATION

Addition of anti-oxidant to contrast induced nephropathy (CIN) prevention regimens has become part of daily clinical practice. However evidence for the addition of these agents in patients undergoing contrast enhanced computed tomography (CECT) is ambiguous. The results of our meta-analysis indicate if addition of anti-oxidants for CIN prevention is effective.

MSAS23

Unsolved Dilemmas in a Digital World: Improving Radiologist and Technologist Communication (Sponsored by the Associated Sciences Consortium) (An Interactive Session)

Multisession Courses

HP BR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Mon, Dec 1 1:30 PM - 3:00 PM  Location: S105AB

Participants

Moderator
Dana Aragon RT : Nothing to Disclose

Sub-Events

MSAS23A

The Team Approach to Breast Imaging: A Model for All of Radiology

Michael N. Linver MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the new clinical role of each member of the breast cancer imaging team in providing total patient care. 2) Discern the importance of appropriate interactions with the other members of the imaging team. 3) Apply the changing paradigm of patient care within the breast imaging model to other areas of diagnostic and interventional radiology.

ABSTRACT

Over the past 15 years, breast imaging as a subspecialty has been transformed from a purely imaging-based modality to a true clinical specialty, requiring a specialized team of individuals sensitized not only to the imaging aspects, but also to the clinical, pathology and treatment aspects of breast cancer care. The role of each team member and the important interactions with other members will be expanded upon, with emphasis on the need to include the patient in all such interactions. Further emphasis will be placed on the changing face of all of radiology toward more direct interactions with patients, and how the breast imaging model can be modified and adapted to the rest of diagnostic and interventional radiology to better serve patient needs, thereby improving patient outcomes.

MSAS23B

Speak To Me! Unsaid Is Risky and Expensive
LEARNING OBJECTIVES

1) Understand the financial and compliance implications of substandard documentation. 2) Identify opportunities to improve communications and documentation. 3) Apply suggestions and/or recommendations given in the presentation.

Handout: Patricia Kroken

http://media.rsna.org/media/abstract/2014/14000886/Speak to Me! RSNA 2014 with ARS Questions.pot

SSE12

ISP: Health Service, Policy & Research (Evidence-based Radiology)

Scientific Papers

AMAPRA Category 1 Credits™: 1.00
ARRT Category A+ Credit: .50

Mon, Dec 1 3:00 PM - 4:00 PM  Location: S102D

Participants

Moderator

Paul P. Cronin MD, MS : Nothing to Disclose

Moderator

Pia Maly Sundgren MD, PhD : Nothing to Disclose

Sub-Events

SSE12-01

Health Service, Policy & Research Keynote Speaker: Meta-analysis of Diagnostic/Imaging Test Accuracy

Paul P. Cronin MD, MS (Presenter): Nothing to Disclose

SSE12-02

A Systematic Review and Meta-Analysis of Air versus Liquid Enema Stratified by Technique for Intussusception Reduction in Children

Gelareh Sadigh MD (Presenter): Nothing to Disclose, Kelly H. Zou PhD : Director, Pfizer Inc Stockholder, Pfizer Inc, Seyed Amirhossein Razavi MD : Nothing to Disclose, Ramsha Khan : Nothing to Disclose, Kimberly E. Applegate MD, MS : Co-editor, Springer Science+Business Media Deutschland GmbH Advisory Board, WellPoint, Inc

PURPOSE

To assess the effectiveness of air vs. liquid enema reduction for treating intussusception in children stratified by reduction guidance.

METHOD AND MATERIALS

Literature search of PubMed, EMBASE, and the Cochrane Library Databases was conducted (1/1/1966-5/31/2013). Studies reporting reduction success rate, using air/liquid enema in children with confirmed diagnosis of intussusception, and reporting enema guidance, fluoroscopy (FL) or ultrasonography (US), air pressure or liquid bag height, were included. Studies in non-English language and with number of air/liquid enemas<50 were excluded. Three reviewers independently assessed the quality and abstracted the eligible studies, with disagreements resolved by consensus. Systematic review and meta-analysis were conducted to combine the enema success and perforation rate by guidance method. Five studies with mixed guidance were not included for comparisons. 95% confidence intervals (CI) were constructed.

RESULTS

A total of 12,277 children (66% male, 26%-79%/study) were included. Children aged 1day-22 years. Under FL, the combined success rates from 23 studies (6,038 children) undergoing air enema was 84%(CI 82-86%;12=82%) and 68%(CI 62-74%;12=94%) in 26 studies (3,534 children) undergoing liquid enema (P=0.001). Perforation rate from 21 studies (5,766 children) undergoing air enema was 0.4%(CI 0.2-0.6%;12=33%) and 0.6%(CI 0.2-0.9%;12=0%) in 18 studies (2,124 children) undergoing liquid enema (P=0.36). Under US, the combined success rates were 89% (CI 79->99%;12=94%) from 4 studies (454 children) undergoing air enema and 86% (CI 81-91%;12=81%) from 7 studies (994 children) undergoing liquid enema (P=0.10). Perforation rate from 3 studies (255 children) undergoing air enema was 3%(CI 0-6%;12=65%) and from 2 studies (250 children) undergoing liquid enema was 0.3%(CI 0-1%;12=0%) (P=0.08). Reduction success rate had a small correlation with maximum reported pressure used for air enema in 32 studies (Spearman r=4.2%) and a large correlation with maximum height of bag for liquid enema in 31 studies (Spearman r=51%).

CONCLUSION

Air was superior to liquid enema for intussusception reduction without higher perforation rate. Limitations included high heterogeneity and publication bias.
**SSE12-03**

**Contrast Induced Nephropathy and Adverse Events in the Long Term after Intravenous Contrast Enhanced Computed Tomography. A Meta-analysis**

Shira I. Moos MD, MMedSc (Presenter): Nothing to Disclose, David N.H. van Vemde: Nothing to Disclose, Jaap Stoker MD, PhD: Research Consultant, Roberts Clinical Trials, Shandra Bipat MS: Nothing to Disclose

**PURPOSE**

To assess incidence and relation between contrast induced nephropathy (CIN) and long term adverse events in intravenous contrast enhanced computed tomography (CECT) patients.

**METHOD AND MATERIALS**

A systematic review and meta-analysis according to the Preferred Reporting Items in Systematic reviews and Meta-Analysis guidelines was performed. We searched MEDLINE, EMBASE and Cochrane from 2002 till November 2013. Two reviewers selected relevant papers en extracted data. Data were pooled with a fixed or random effect model depending on variation in data (Akaike information criterion, I2).

**RESULTS**

We included 15 studies, containing 4,455 patients. We found a mean incidence of: 51.52% chronic kidney disease, 22.60% diabetes mellitus, 25.55% cardiovascular disease, and 9.12% use of nephrotoxic medication. Mean incidence of CIN was: 8.20%(95%CI:4.98-13.21). Incidence of the adverse events permanent renal failure, renal replacement therapy and death was: 13.28%(95%CI:5.57-28.45), 0.50%(95%CI:0.13-1.98), and 13.46%(95%CI:6.55-25.65). The risk difference for permanent renal failure between CIN patients and patients without CIN was: 0.07(95%CI:-0.05-0.20), I2=53%, p=0.25, for renal replacement therapy: 0.05(95%CI:-0.07-0.16), I2=91%, p=0.41 and for death: 0.19(95%CI:0.02-0.29), I2=0%, p=0.03.

**CONCLUSION**

CIN is not related with increased risk for permanent renal failure and renal replacement therapy after intravenous CECT. Despite the statistical association it is questionable if death is a manifestation of CIN rather than a manifestation of pre-existing co-morbidity.

**CLINICAL RELEVANCE/APPLICATION**

We describe a meta-analysis in which we assess relation between contrast induced nephropathy (CIN) and adverse events, i.e. permanent renal failure, renal replacement therapy and death, after intravenous contrast enhanced computed tomography (CECT). It has become clear that CIN incidence after intravenous contrast enhanced computed tomography is low. Previous literature assessments show that adverse events rarely occur after CIN in this particular group of patients and it is questionable if these events can be attributed to CIN or more specific intravenous CECT. To our knowledge this is the first systematic review and meta-analysis on this topic. We therefore believe that the results of our meta-analysis could lead to re-evaluation of prevention measures in patients undergoing intravenous contrast enhanced computed tomography.

**SSE12-04**

**Provider Adherence to the American College of Radiology’s Appropriateness Criteria for Post-treatment Follow-up of Prostate Cancer Patients**

Jennifer S. McDonald PhD (Presenter): Research Grant, General Electric Company, R. Jeffrey Karnes MD: Nothing to Disclose, Rickey Carter PhD: Nothing to Disclose, Paul R. Julsrud MD: Nothing to Disclose, John DeWitt Port MD, PhD: Nothing to Disclose, Claire E. Bender MD: Nothing to Disclose

**PURPOSE**

The American College of Radiology (ACR) Appropriateness Criteria panel has recommended that post-treatment prostate cancer patients only receive imaging following suspicion of cancer recurrence, with radionuclide bone scan the recommended first modality. We examined whether local physicians followed these recommendations in a cohort of prostate cancer patients.

**METHOD AND MATERIALS**

The [redacted for blinding purposes], a collection of the records of all medical centers in [redacted], was used to capture the complete medical history of local prostate cancer patients from 2000–2011. Clinical information, imaging exams performed, exam indication, and ordering physician specialty were retrieved by chart review. Only exams performed in relation to prostate cancer were included in the analysis. Treatment-specific PSA elevations, bone pain, or abnormal DRE were suggestive of cancer recurrence.

**RESULTS**

Out of the 670 patients that were included in the final analysis, 131 (20%) had suggested cancer recurrence. 129 patients (19%) received imaging following treatment. After excluding imaging performed in relation to retreatment or another cancer, 13 patients (10% of imaged patients) underwent imaging prior to or in the absence of cancer recurrence. A total of 90 patients (70% of imaged patients) underwent imaging following suspicion of cancer recurrence. Of these patients, 62 (68%) received a bone scan as their first imaging
modality and 28 (31%) received another modality prior to a bone scan or did not receive a bone scan. Endorectal coil MRI, spinal X-ray, and transrectal ultrasound were performed most often prior to or in lieu of a bone scan. Patient age, Gleason score, and treatment type did not affect the likelihood of receiving a bone scan first. Radiation oncology, medical oncology, and internal medicine physicians were more likely to order a bone scan first, while urology and family practice physicians were less likely.

CONCLUSION

The majority of patients in this study did not receive imaging in the absence of prostate cancer recurrence. However, one third of patients with potential cancer recurrence did not receive a bone scan first as recommended.

CLINICAL RELEVANCE/APPLICATION

Providers frequently order alternative imaging modalities for post-treatment prostate cancer patients with suspected cancer recurrence.

**SSE12-05**


Soon Ho Yoon MD (Presenter): Nothing to Disclose, Kyung Won Kim MD: Nothing to Disclose, Jin Mo Goo MD, PhD: Research Grant, Guerbet SA, Dong Wan Kim MD, PhD: Nothing to Disclose, Seokyoung Hahn PhD: Nothing to Disclose

**PURPOSE**

Figuring out intra- and inter-observer reproducibility in manual measurement of tumor burden on CT is essential for the interpreting treatment response in clinical practice as well as in clinical trials. We aimed to systematically review and meta-analyze intra- and inter-observer reproducibility in manual measurement of tumor burden according to the response evaluation criteria in solid tumors (RECIST) guideline on computed tomography (CT).

**METHOD AND MATERIALS**

Two authors independently performed a literature search of the MEDLINE and EMBASE databases by using the search terms tumor, measurement, reproducibility and CT. We included studies in which observer reproducibility in manual measurement of target lesion was evaluated by experienced radiologists on CT in oncologic patients, with extractable outcomes including summary statistics on the percentage of relative difference between the measurements, intra-class correlation coefficient, and concordance correlation coefficient. The primary outcome was 95% limits of agreement (LOA) of relative measurement difference in unidimensional measurement of target lesion within observer and between observers derived from the Bland-Altman plot. Outcomes were pooled using a random-effect model.

**RESULTS**

Pooled 95% LOA for unidimensional measurement of single target lesion were (-18.0%, 16.2%) within observer and (-22.4%, 25.7%) between observers. Pooled 95% LOA for unidimensional measurements of the sum of multiple target lesions were (-9.8%, 13.1%) within observer and (-19.3, 19.5%) between observers. The reported intra-class correlation coefficients for the measurement of single lesion ranged from 0.94 to 0.99 within observer and from 0.79 to 0.99 between observers. The reported concordance correlation coefficients for single lesion ranged from 0.97 to 0.99 both within observer and between observers. There was a paucity of researches on observer reproducibility in measuring the interval change of tumor burden.

**CONCLUSION**

Pooled 95% LOA in measurement of single target lesion were over 20% between observers. Measurement reproducibility increased when single observer measured tumor burden and when tumor burden was assessed by the sum of multiple lesions.

**CLINICAL RELEVANCE/APPLICATION**

Caution should be taken in measuring tumor burden on CT at specific time point, especially when different observers assess tumor burden on previous or follow-up CT scan.

**SSE12-06**

**18F-fluoride PET/CT in the Detection of Bone Metastases: A Critically Appraised Topic**

Jennifer Murphy MBBCh, MRCPI (Presenter): Nothing to Disclose, Patrick Nicholson MBBCh : Nothing to Disclose, Karl James MBBCh, MRCS : Nothing to Disclose, Kevin Noel O Regan MD : Nothing to Disclose, Marie Staunton MBBCh : Nothing to Disclose

**PURPOSE**

Initial results from the National Oncologic PET registry have demonstrated that 18F-fluoride PET/CT altered management in patients with prostate cancer in at least 44-52% of cases. We aim to critically appraise the literature to evaluate the use of 18F-fluoride PET/CT in the detection of bone metastases in patients with known malignancy.

**METHOD AND MATERIALS**

A focused clinical question was constructed and the literature was searched using the patient, intervention, comparison, and outcome (PICO) methodology.
A focused clinical question was constructed and the literature was searched using the patient, intervention, comparison, outcome (PICO) method. Our search strategy utilized a "top-down" approach of the evidence pyramid hierarchy. Information systems, synopses, syntheses and primary studies were reviewed. A search of Medline using PubMed "Clinical Queries" retrieved 2 meta-analyses. A PubMed PICO search retrieved 76 abstracts. Expert Consensus Guidelines, review articles, abstracts, editorials and case reports were excluded. Retrieved articles were appraised and assigned a level of evidence based on the Oxford University Centre for Evidence-Based Medicine hierarchy of validity for diagnostic studies.

RESULTS

The results corresponding to the highest level of evidence retrieved were two meta-analyses of cohort studies (level 1a). The retrieved diagnostic performance for 18F-fluoride PET or PET/CT showed sensitivity and specificity values of 96.2% (95% confidence interval [CI] 93.5-98.9%) and 98.5% (95% CI 97.0-100%), respectively, on a patient-based analysis and 96.9% (95% CI 95.9-98.0%) and 98.0% (95% CI 97.1-98.9%), respectively, on a lesion-based analysis. This compares with sensitivity and specificity values of 56.9% (95% CI 51.0-62.7%) and 98.0% (95% CI 96.4-99.6%), respectively, on a patient-based analysis and 55.7% (95% CI 50.7-60.7%) and 95.6% (95% CI 93.2-98.1%), respectively, on a lesion-based analysis for planar bone scintigraphy (BS) or planar BS plus SPECT. Dose and cost-effectiveness ratio were considerably higher for 18F-fluoride PET/CT than for BS.

CONCLUSION

18F-fluoride PET/CT has better sensitivity and similar specificity for the detection of bone metastases than planar BS or planar BS plus SPECT. However, radiation dose and cost-effectiveness must be considered.

CLINICAL RELEVANCE/APPLICATION

A critical appraisal of the literature demonstrates that 18F-fluoride PET/CT has better sensitivity than planar BS or planar BS plus SPECT in the detection of bone metastases.
LEARNING OBJECTIVES
1) Understand the current thinking regarding risk of contrast-induced acute kidney injury from intravenously administered iodinated contrast media. 2) Learn the recent updates to the American College of Radiology’s Manual on Contrast Media. 3) Remember the correct dose of epinephrine for the treatment of anaphylaxis.

ABSTRACT
Recent changes to the ACR Manual on Contrast Media will be reviewed, with an emphasis on contrast-induced acute kidney injury. Other topics, including gadolinium-based contrast media-related complications, external warming of iodinated contrast media, and management of acute contrast reactions will be reviewed.

LEARNING OBJECTIVES
1) Understand the basic definition of quality and how it is applied in practice. 2) Understand how quality improvement principles developed in service and manufacturing are relevant to radiology. 3) Be familiar with basic improvement strategies that can be applied in a local radiology practice.

LEARNING OBJECTIVES
1) The learner should be able to explain the elements of professionalism as they apply to the practice of radiology. 2) Attendees should be able to use available resources to comply with the requirements of professionalism. 3) Attendees will be able to choose appropriate courses of action that apply to solving issues related to lapses in professional behavior. 4) The learner will gain ability to articulate how professionalism can impact the quality of patient care. 5) The learner will be able to devise appropriate goals for professionalism within their practice.

LEARNING OBJECTIVES
1) Understand the frequency and economic impact of radiology litigation. 2) Consider the role of communication of radiologic results in certain types of radiology litigation. 3) Describe common perceptual and cognitive errors in body imaging and their role in potential radiology litigation.

ABSTRACT
Allegations of medical negligence are not infrequent in radiologic practice. This course will cover the demographics of radiology malpractice from the perspective of a medical director at a major malpractice insurance carrier, with an emphasis on the frequency and economic impact of radiology litigation, and a description of how cases are evaluated by a major malpractice carrier. Additional topics covered by the remaining two lecturers will be the importance of communication between radiologists and other health care providers, emphasizing examples of how communication breakdowns between healthcare providers can
occasionally result in allegations of negligence. Finally, the topics of radiologic interpretive errors and their potential role in radiology litigation will be explored, focusing on body imaging.

**SSG06**

**ISP: Health Service, Policy & Research (Economic Analyses)**

**Scientific Papers**

AMERICAN MEDICAL ASSOCIATION CREDITS™: 1.50
ARRT Category A+ Credits: 1.50

*Tue, Dec 2 10:30 AM - 12:00 PM  Location: S102D*

**Participants**

**Moderator**
Janie M. Lee MD : Nothing to Disclose
Moderator
Marta Elise Heilbrun MD : Nothing to Disclose

**Sub-Events**

**SSG06-01**

Health Service, Policy & Research Keynote Speaker: Value in Diagnostic Imaging
Janie M. Lee MD (Presenter): Nothing to Disclose

**SSG06-02**

Incorporating the Effects of Radiation Exposure from CT-Angiography and Perfusion in Cost-Effectiveness Analyses in Subarachnoid Hemorrhage
Jana Ivanidze MD, PhD (Presenter): Nothing to Disclose, Resmi Charalel MD: Nothing to Disclose, Omar Nabil Kallas: Nothing to Disclose, Matthew Spector Simon MD, MSc: Nothing to Disclose, Ajay Gupta MD: Nothing to Disclose, Pina Christine Sanelli MD: Nothing to Disclose

**PURPOSE**

Establishing the value of imaging through cost-effectiveness analyses has become a major focus in our changing healthcare environment. Despite concerns regarding the effects of radiation exposure from CT, there have been no cost-effectiveness analyses incorporating these risks. The purpose of this study was to determine the benefits and harms of radiation exposure from CT angiography and perfusion (CTAP) in aneurysmal subarachnoid hemorrhage (SAH).

**METHOD AND MATERIALS**

We modified our previous decision model comparing CTAP and transcranial Doppler ultrasound (TCD) by incorporating the long-term risk of developing brain cancer from CTAP. The clinical pathways were developed according to published guidelines. The input probabilities were based on literature data as well as a cohort at our institution. Outcome health states reflect functional SAH outcomes, combined with the delayed outcome of developing brain cancer. Cancer risk was calculated using National Cancer Institute (NCI) methodology. Radiation doses for CTAP and latency of onset of brain cancer after radiation exposure were taken from published literature. Expected health benefits and costs were calculated for each imaging strategy. Univariable and multivariable sensitivity analyses were performed.

**RESULTS**

The CTAP strategy was dominant over the TCD strategy when incorporating brain cancer risk, calculated as 0.000274 (95% CI: 0.000053; 0.000802). Our results remained robust in a two-way sensitivity analysis when varying the brain cancer risk within the CI limits and the latency of cancer onset from 0.1 to 30 years. Even assuming higher risk (up to 50 times higher than calculated), the CTAP strategy (NEW strategy) remained dominant over the TCD strategy (STANDARD strategy) for the published brain cancer latency of 10 years (Figure 1).

**CONCLUSION**

While the development of brain cancer from radiation exposure in patients undergoing CTAP is an important consideration, it does not alter the fact that CTAP is the preferred imaging strategy compared to TCD, with overall improved clinical outcomes and lower healthcare costs. This is true even when modeling a significantly higher risk and shorter latency period than what is known from published literature.

**CLINICAL RELEVANCE/APPLICATION**

While accounting for the risk of developing radiation-induced brain cancer, CTAP remains the superior imaging modality in SAH, resulting in improved clinical outcomes and lower healthcare costs.

**SSG06-03**

Have Incentives to Improve Quality of Care Led to Unnecessary CT Scanning in Major Trauma?

**PURPOSE**

In 2008, the UK Department of Health designed funding mechanisms in trauma management to incentivize and improve clinical practice. Payments are linked to a 1-hour scan time target, whereby any major trauma patient...
should have a CT within one hour of being admitted to the Emergency room. Linking reimbursement mechanisms to targets can result in unintended consequences and outcomes. The aim of this study is to assess the impact of this national policy on scanning practices and whether these policies have resulted in unnecessary CT scanning in certain patients.

METHOD AND MATERIALS

Data from four discrete 3-month time periods in 2011 and 2012 was retrospectively collated at our institution. Workflow pattern was assessed by analyzing the total number of major trauma CTs (n = 1004) in relation to the number of major trauma referrals (n = 1483). These CTs were then categorized into the type of scan performed (whole body CT versus non-whole body CT) and scan findings; namely positive (trauma related findings), negative (no significant findings) and incidental (findings unrelated to trauma). Bivariate analysis (Chi-Squared Test for Variables) was used to assess for statistically significant changes in these groups.

RESULTS

There was a statistically significant increase in the percentage of major trauma CTs across three of the time intervals from 2011 and 2012 (p<0.05). This was accompanied by a significant increase in the percentage of negative CTs (p<0.05) for the same intervals. There was also a significant increase in the percentage of whole body CTs immediately after the introduction of these payment incentives (p< 0.01) although the percentage of whole body CTs did not increase beyond the immediate time interval.

CONCLUSION

There was a significant increase in both the percentage of major trauma CTs in 2011 and 2012 as well as the percentage of these studies that had negative findings. The increased percentage of negative CTs is a particular area of concern as it could indicate some patients are being unnecessarily scanned.

CLINICAL RELEVANCE/APPLICATION

The 1-hour to scan target may lower the threshold for scanning patients at low risk in order to avoid possible financial loss. This could result in patients having a CT when they may have otherwise been managed without imaging. This could be a potentially unintended consequence of designing policy incentives whereby reimbursement is linked to rapid access to imaging.

Different Imaging Strategies in Patients with Suspected Basilar Artery Occlusion: A Cost-effectiveness Analysis

Sebastian Ekkehard Beyer (Presenter): Nothing to Disclose, Birgit Betina Ertl-Wagner MD : Nothing to Disclose, M.G. Myriam Hunink MD, PhD : Nothing to Disclose, Maximilian F. Reiser MD : Nothing to Disclose, Wieland H. Sommer MD : Nothing to Disclose

PURPOSE

To evaluate the cost-effectiveness of different non-invasive imaging strategies in patients with suspected basilar artery occlusion.

METHOD AND MATERIALS

A Markov decision analytic model was used to evaluate long-term outcomes resulting from strategies employing non-enhanced CT, CT angiography, or magnetic resonance (MR) angiography. The analysis was performed from the societal perspective using USA recommendations for such analyses. Input parameters were derived from the literature. Costs were obtained from US costing sources and published literature. Outcomes were lifetime costs, quality-adjusted life-years (QALYs), incremental cost-effectiveness ratios, and net monetary benefits (NMB), with willingness-to-pay (WTP) thresholds of $50,000 and $80,000 per QALY. The strategy with the highest net monetary benefit was considered the most cost effective. Extensive deterministic and probabilistic sensitivity analyses were performed to explore the effect of varying parameter values.

RESULTS

In the reference case analysis, both CTA and MRI resulted in a similar increase in QALYs (0.31 and 0.33, respectively) compared to non-enhanced CT. MRI yielded 0.02 QALYs more than CTA at a cost of $44,668 per QALY gained. At WTP thresholds of $50,000 and $80,000 per QALY, MRI yielded the highest NMB. The probability that MRI is cost-effective was 51% at a WTP threshold of $50,000/QALY and 63% at $80,000/QALY (figure).

CONCLUSION

Our results suggest that MRI in patients with suspected basilar artery occlusion is cost-effective in the American setting.

CLINICAL RELEVANCE/APPLICATION

In diagnosing basilar artery occlusion, MRI should be the initial test.
Stage I Renal Cell Carcinoma: A Surveillance, Epidemiology and End Results (SEER) Population Study

Nima Kokabi MD (Presenter): Nothing to Disclose, Minzhi Xing MD: Nothing to Disclose, Richard Duszak MD: Nothing to Disclose, Kimberly E. Applegate MD, MS: Co-editor, Springer Science+Business Media Deutschland GmbH Advisory Board, WellPoint, Inc, Juan Camilo Camacho: Nothing to Disclose, David H. Howard PhD: Nothing to Disclose, Hyun Sik Kim MD: Nothing to Disclose

PURPOSE
To investigate contemporary national practice trends in the utilization of percutaneous thermal ablation (TA) (radio frequency ablation (RFA) and cryoablation (CRA)) for treating stage I renal cell carcinoma (RCC) and identify possible sociodemographic factors that determine receipt of surgical vs. TA therapy.

METHOD AND MATERIALS
Using the most update SEER database, we identified all patients with stage T1N0M0 RCC who were diagnosed between years 2004 to 2010 and underwent either TA or surgical resection (partial nephrectomy (PN) or radical nephrectomy (RN)). Sociodemographic, geographic, and clinical determinants of trends in use of surgery vs. TA were evaluated using chi-square and logistic regression models. Sub-analysis of differences in utilization of TA between 2004-2007 vs. 2008-2010 was also performed.

RESULTS
Overall, 39,307 patients were diagnosed with T1N0M0 RCC. Of those, 37,739 (96%) underwent surgical resection (13,442 PN and 24,297 RN). Of the remaining 1568 patients who were treated with thermal ablation, 921 received CRA and 647 underwent RFA. There was no significant difference in the proportion of TA's performed between 2004-2007 vs. 2008-2010 (3.8% vs. 4.1%, p=0.43). The proportion of cryoblation performed between 2008-2010 was significantly higher compared to the prior 3 years (23% vs. 65%, p<0.001). Patients with older age, smaller tumor size (<4cm), lower histologic grade of tumor (I and II), residing in urban settings, with higher education levels, and higher median income were more likely to receive TA according to both uni- and multivariate analyses.

CONCLUSION
Only a small proportion of organ-confined stage 1 RCC appear to be treated by TA with potential underutilization of less invasive percutaneous therapies compared to surgery. Older age, smaller tumor size, and more favorable sociodemographics status are significant determinants of receipts of TA vs. surgery.

CLINICAL RELEVANCE/APPLICATION
There appears to be significant underutilization of less invasive percutaneous thermal ablation therapies for treatment of stage 1 RCC, which are also less costly with lower associated complication rates compared to surgery.

Neuroimaging Utilization and Hospitalization Cost for Patients Admitted with Stroke and Transient Ischemic Attack

Lukasz Babiarz MD, MBA (Presenter): Nothing to Disclose, Stella Liang: Nothing to Disclose, Paul Intihar MS: Nothing to Disclose, David M. Yousem MD: Royalties, Oakstone Publishing, LLC Author with royalties, Reed Elsevier Research Grant, Bayer AG

PURPOSE
We set out to assess the changes in neuroimaging utilization and its effect on hospitalization cost of patients admitted with stroke and transient ischemic attack (TIA) between 2004 and 2013 at a major urban academic medical center.

METHOD AND MATERIALS
Hospital billing and administrative data were used to identify inpatients discharged with stroke and TIA diagnoses during 2004-2013. Basic demographics, hospital length of stay (HLOS), number of neuro-CT and MR exams performed, case complexity, intensive care unit (ICU) stay, surgical intervention, and neuroimaging, ICU, surgical, and total hospitalization cost were collected. Summary statistics and compound annual growth rates (CAGRs) for cost components were calculated.

RESULTS
3,582 patients (mean age: 62.1 years; 1,818 Female) were admitted with stroke and TIA during 2004-2013. Mean HLOS was 4.62 days (annual range: 4.12-4.95 days). Mean case complexity was 1.004 (annual range: 0.928-1.132). Comparing 2004 to 2013: the proportion of patients having neuro-CTs increased from 84% to 86%; having neuro-MRs from 77% to 91%; and requiring ICU care from 15% to 24%. The average number of CTs and MRs per admission increased from 1.4 to 2.3 and from 1.1 to 2.6, respectively. As a percent of total hospitalization cost, CT grew from 2.0% to 4.7% and MR from 8.2% to 14.9%. During 2004-2013, 3.2% patients required ICU/surgical care, 13.2% ICU care, 4.7% surgical care, and 78.8% required neither. ICU care comprised ~32% of total cost. The number of neuro-scans for ICU/surgical patients grew from 3.1 to 9.1 (CAGR=12.7%), for ICU patients from 3.6 to 5.6 (CAGR=5.1%), for surgical patients from 3.3 to 4.8 (CAGR=4.5%), and for the remaining patients from 2.3 to 4.4 (CAGR=7.2%). The total and non-neuroimaging cost grew at CAGR of 4.5% and 3.0%, respectively.

CONCLUSION
Neuroimaging utilization for patients admitted for stroke and TIA has increased with a greater percentage of
patients being imaged and a greater number of studies being performed per patient. Neuroimaging cost has gone up and it was responsible for 1/3 of all interval hospitalization cost increases. ICU and surgical patients undergo more neuroimaging.

**CLINICAL RELEVANCE/APPLICATION**

Neuroimaging utilization for patients with stroke and TIA has been increasing. This has contributed to the interval increase in hospitalization cost.

**SSG06-07**

The Effect of Demographics and Socio-Economic Factors on Survival in Unresectable Hepatocellular Carcinoma: a Surveillance, Epidemiology and End Results (SEER) Population Study

Minzhi Xing MD (Presenter): Nothing to Disclose, Nima Kokabi MD: Nothing to Disclose, Richard Duszak MD: Nothing to Disclose, Kimberly E. Applegate MD, MS: Co-editor, Springer Science+Business Media Deutschland GmbH Advisory Board, WellPoint, Inc, Juan Camilo Camacho: Nothing to Disclose, Hyun Sik Kim MD: Nothing to Disclose

**PURPOSE**

To investigate long-term survival in patients with chemorefractory, unresectable hepatocellular carcinoma (HCC) based on demographics and socio-economic factors in a large-scale population study.

**METHOD AND MATERIALS**

Eighteen registries of the U.S. Surveillance, Epidemiology, and End Results (SEER) database were queried for patients with HCC not amenable to cancer-directed surgery/radiation diagnosed between 2000 and 2010. Mean overall survival was stratified according to patient characteristics including gender, age at diagnosis, ethnicity, geographic location, income level, education, and urbanization. Survival analysis and 95% confidence intervals (CI) were calculated using Kaplan-Meier estimation and compared using the log-rank test. Multivariate Cox proportional hazard models were used to assess independent prognostic factors for overall survival.

**RESULTS**

Of 63,434 newly diagnosed primary liver cancer patients in the US between 2000 and 2010, 52,944 patients had HCC. The median age of all HCC patients was 63 years, 74% (39,201) male. Overall survival was significantly correlated with age at diagnosis (<70 vs. ≥70 years, 8.9 vs. 6.9 months), ethnicity (white, black, American Indian, Asian/Pacific Islander; 7.9, 7.1, 8.3, 10.5 months, respectively), geographic location (East, Northern Plains, Southwest, Pacific Coast, Alaska; 7.6, 6.4, 7.1, 8.6, 7.6 months, respectively), income level (median household income ≥$45k vs. <$45k/year, 6.8 vs. 8.5 months), education (% with bachelor degree or above, ≥15% vs. <15%, 6.6 vs. 8.4 months), and degree of urbanization (county population ≥50,000 vs. <50,000, 8.4 vs. 6.6 months), p<0.001 for all.

**CONCLUSION**

Socio-demographic factors including age <70 years, Asian/Pacific Islanders, those from the Pacific coast, urban settings, higher income and education level were significantly correlated with prolonged survival in a large-scale population-based study.

**CLINICAL RELEVANCE/APPLICATION**

The differences in survival in patients with HCC not amenable to cancer-directed surgery/radiation may be due to disparity in access to effective palliative therapy based on patient demographics and socio-economic factors.

**SSG06-08**

Bundled Inpatient Radiologist Imaging Professional Services: An Empiric Episode Frequency Focused Approach to Bundled Payment Modeling

Richard Duszak MD (Presenter): Nothing to Disclose, Nadia Bilal: Nothing to Disclose, Danny Hughes PhD: Nothing to Disclose, David Andrew Rosman MD: Nothing to Disclose

**PURPOSE**

As healthcare payment systems evolve from fee-for-service to value-based episodic bundles, much interest has focused on inpatient payments to hospitals, particularly as they relate to length of stay and readmissions. Physician services, including those of radiologists, have been largely ignored. In anticipation of inpatient bundled physician professional payments, we aimed to develop an evidence-based episode frequency focused strategic framework for identifying encounters where initial bundled payment modeling might be most impactful.

**METHOD AND MATERIALS**

Using a 5% random sample of all approximately 32 million Medicare beneficiaries from 2011, we first used Part A (hospital) claims data to categorize all inpatient admissions using Medicare Severity Diagnosis Related Groups (DRGs). Imaging professional services (defined by Berenson-Eggers Types of Service) rendered by radiologists associated with each episode were then identified separately using Part B (physician services) claims data. Inpatient admission DRGs involving radiologist professional services were frequency ranked by to identify those disproportionately associated with total inpatient encounters.

**RESULTS**
Of 618,906 identified inpatient admission episodes, imaging professional services were rendered in 430,707 (69.6%), attributable to nearly all (739/742; 99.6%) uniquely identifiable DRGs. Just 4 DRGs, however, accounted for 11.3% of all hospital encounters involving radiologist imaging professional services (470, 871, 292, 194). The top 9 accounted for 20.1%, top 17 for 30.3%, and top 41 for 50.3%. All other 701 combined accounted for 48.5% (1.2% were non-categorizable). The bottom 506 (68.2%) DRG codes together accounted for only 10% of episodes where radiologists rendered imaging professional services.

**CONCLUSION**

Efforts to model radiologist inpatient professional services have been hampered by the nearly ubiquitous involvement of imaging in the inpatient setting. A very small number of DRGs, however, account for a disproportionately large share of all admissions involving imaging. These would ideally serve as the basis for initial inpatient imaging bundled payment initiatives.

**CLINICAL RELEVANCE/APPLICATION**

In the inpatient setting, just 4 DRGs account for 10% of all admissions where radiologists typically render services. Initial bundled payment initiatives should be evidence-based and targeted.

**SSG06-09 Health Service, Policy & Research Keynote Speaker: Cost-effective Analyses**

Marta Elise Heilbrun MD (Presenter): Nothing to Disclose

**HPS-TUA Health Services Tuesday Poster Discussions**

**Scientific Posters**

**HPS152 Hospital Level Factors Associated with High Utilization of In-hospital CT in Japan (Station #1)**

Kanako Kunishima Kumamaru MD, PhD (Presenter): Nothing to Disclose, Hiraku Kumamaru: Nothing to Disclose, Hideo Yasunaga: Nothing to Disclose, Shigeki Aoki MD, PhD: Nothing to Disclose, Kunio Ohtomo MD: Research Grant, Bayer AG Research Grant, DAIICHI SANKYO Group, Frank John Rybicki MD, PhD: Research Grant, Toshiba Corporation, Ruth M. Dunne MBBCh: Nothing to Disclose, Amir Imanzadeh MD: Nothing to Disclose

**PURPOSE**

In Japan, CT scanners are readily available and individual imaging costs are low. Thus, CT is an "easy to perform" test that can be overutilized. The purpose of this study is to evaluate the hospital level factors associated with higher CT utilization using a nationwide Japanese administrative database.

**METHOD AND MATERIALS**

This retrospective (04/2012-03/2013) study used data from the Japanese nationwide administrative database of 1108 hospitals. The target population was patients who received total knee or hip replacement surgeries at hospitals meeting an inclusion criteria based on 30 or more procedures annually. We fitted logistic regression models with generalized estimating equations to identify hospital level factors associated with patient’s probability of undergoing CTs, while adjusting for patient level factors including age, sex, BMI, smoking status, pre-existent comorbidities, history of deep vein thrombosis, operative type (knee or hip), surgical time, transfusion during surgery, postoperative events, and length of stay.

**RESULTS**

A total of 448 hospitals met the inclusion criteria, and in these institutions, 37,110 patients underwent the procedure. During the median length of stay of 25 days (IQR:20-33), 7307 (19.7%) patients underwent post procedure CT. CT utilization was not homogeneous among hospitals. At majority (57.2%) of hospitals, less than 10% of patients had post procedure CT. However, more than 50% of patients had a CT at the 46 (10.3%) high utilization hospitals. Multivariable analysis identified academic status of the hospitals (99/448 hospitals) to be strongly associated with an increased probability of undergoing post procedure in-hospital CTs (adjusted odds ratio:4.22 (95%CI:1.91-9.32), p=0.003), while other hospital characteristics (number of beds, availability of radiologists, number of surgeons and total number of procedures during the year) were not.

**CONCLUSION**
We observed great variability in the utilization of post procedure CT in this Japanese cohort. Patients treated at academic facilities were more likely to have in-hospital CT after total knee or hip replacement compared to those treated at non-academic hospitals, even after adjusting for patient and hospital level factors.

**CLINICAL RELEVANCE/APPLICATION**

This Japanese database study showed an association between higher CT utilization after total knee or hip replacement surgery and academic status of the hospitals, which may need further investigation.

**Using Software based Solution for Quality Assurance in a Sub Specialized, Multivendor CT Practice (Station #2)**

Yasir Andrabi MD, MPH (Presenter): Nothing to Disclose, Jorge Mario Fuentes MD: Nothing to Disclose, Mukta Dilipkumar Agrawal MBBS, MD: Nothing to Disclose, Manuel Patino MD: Nothing to Disclose, Dushyant V. Sahani MD: Research Grant, General Electric Company

**PURPOSE**

To evaluate the effectiveness of an automated dose monitoring (ADM) in assuring success to adhere with dose optimization protocols using kidney stone CT exams (KSCT) as a model.

**METHOD AND MATERIALS**

In this IRB approved study, all Kidney stone exams performed between January 2013-January 2014 on 17 of 21 scanners (GE=12, Philips=2 and Siemens=3) were retrieved using an ADM software (eXposure TM, Bayer). Out of total 136,254 exams, 1935 exams (M:F=1031:904, Age=56.7 Years, BW=81 Kgs) were performed for kidney stone indications. Mean radiation doses (SSDE, DLP) were tracked for different scanners, vendors, reconstruction techniques, technicians, time of scan and radiation dose outliers (>2 SD above mean) were identified using a box plot. Doses were compared with DIR National averages.

**RESULTS**

Mean Radiation doses (SSDE=9.8±3.9 mGy, DLP=420.1 ±240mGy-cm) were 38% lower than national averages (DIR feedback report 2013). In 75 patients DLP greater than 2SD (> 900mGy-cm) was noted, of these 70 patients had excessive body weight (mean=112.4 Kgs). In 3 patients higher doses were due to increase in scan area while in 2 patients, incorrect protocols was applied. The exam protocols were reviewed with 3 technicians involved in these 5 exams and proper education was provided. The time of scan acquisition i.e. 8 AM to 6 PM or after 6 PM had no impact on radiation dose outliers.

**CONCLUSION**

ADM software enabled us to identify 5 patients who received radiation doses higher than expected due to protocol violations, necessitating need for continuous dose tracking and continued education and training of technologists and radiologists.

**CLINICAL RELEVANCE/APPLICATION**

Close monitoring of radiation doses is essential to adhere to ALARA principle and improve patient care. ADM software is effective way of tracking dose outliers and any protocol deviations and paves path for quality assurance in CT and provides opportunity for education and continuous protocol optimizations.

**Echocardiography Manifests Substitutability with Other Cardiac Imaging Modalities in the Ordering Patterns of Referring Providers (Station #3)**

Mark D. Hiatt MD, MBA (Presenter): Medical Director, Regence BlueCross BlueShield Board Member, RadSite Former Chief Medical Officer, HealthHelp, LLC, Mark S. Holdaway BS : Nothing to Disclose

**PURPOSE**

To observe the degree to which cardiac MRI, CT, SPECT, and PET (non-echo procedures) may substitute for echocardiography (echo) by examining the ordering patterns of providers before and after the recent implementation of a program to manage the utilization of echo, with the resulting need to seek prior authorization considered an additional ‘cost’ of ordering echo under demand theory in economic science.

**METHOD AND MATERIALS**

The ordering of echo and non-echo procedures, as defined by Current Procedural Terminology code and discerned through claims data, by providers in 4 states in the United States caring for approximately 1.5 million commercial and Medicare members of a health insurance plan was tracked from the beginning of November 2010 to the end of October 2013. A program to manage outpatient echo utilization, administered by a radiology benefit manager, was instituted in December 2012. (A similar program to manage non-echo utilization had been in place at the time of this implementation, beginning in June 2009 and phased in during subsequent months.)

**RESULTS**

During the 3-year study period, 265,704 echo and non-echo procedures were performed in the population under review. With the implementation of echo utilization management (UM), the relative ordering of echo and non-echo procedures changed as anticipated, declining by 4.1% for echo (from 48.4 to 46.4 units per 1,000
members), but increasing for non-echo procedures by 3.8% after echo UM implementation, compared to a decrease of 3.7% before implementation (yielding an overall decline from 12.3 to 11.5 units per 1,000 members).

CONCLUSION

The cross elasticity of demand between echo and cardiac MRI, CT, SPECT, and PET is positive, as apparent substitution was observed as a result of the recent program implementation. Other confounding factors may have been at play during the study period, including rising concern about excessive medical radiation (except, of course, for MRI) and campaigns to address inappropriate ordering such as the Choosing Wisely initiative; however, these influences would have tended to reduce, not increase, non-echo utilization as a whole, thus supporting the hypothesis of substitutability.

CLINICAL RELEVANCE/APPLICATION

These results suggest that ordering patterns for diagnostic imaging may be less entrenched than expected, with such other considerations as changes in relative ordering convenience overcoming ingrained preferences for modality.

Liver and Kidney Biopsies: Changing Roles of Radiologists and Other Specialists from 1991 – 2012 (Station #4)

Wesley A. Angel MD (Presenter): Nothing to Disclose, C. Matthew Hawkins MD: Nothing to Disclose, Jennifer M. Wang PhD: Nothing to Disclose, Danny Hughes PhD: Nothing to Disclose, Richard Duszak MD: Nothing to Disclose

PURPOSE

To evaluate national specialty trends in hepatic and renal biopsies over two decades.

METHOD AND MATERIALS

Medicare Physician Supplier Procedure Summary (PSPS) master files were analyzed from 1991 to 2012 for hepatic and renal biopsies (CPT codes 47000, 50200). Procedure volumes were collected for radiologists, various specialist groups, primary care physicians, surgeons, and advanced practice providers (nurse practitioners and physician assistants). All other providers were combined. Changes and trends over time were analyzed.

RESULTS

Between 1991 and 2012, the frequency of liver biopsies in Medicare Part B beneficiaries increased from 25,318 to 53,055 (+110% increase) and kidney biopsies increased from 11,599 to 32,762 (+182% increase). The number of liver and kidney biopsies performed by radiologists increased from 4,277 to 46,181 (+980%) and 1,325 to 23,003 (+1636%) respectively. For most other specialties, procedure volumes declined, with the exception of nephrologists, who experienced a modest 52% increase from 1991 to 2012. Overall, the proportion of liver and kidney biopsies performed nationally by radiologists increased from 17% to 87% and from 11% to 70% respectively. Prior to 2002, advanced practice providers performed few biopsies. Since 2002, the number of liver and kidney biopsies performed by advanced practice providers has increased by 274% and 1,267% respectively.

CONCLUSION

Since 1991, the number of liver and kidney biopsies has increased and the proportion of those procedures performed by radiologists has increased dramatically. This may be due at least in part to the safety-driven movement towards image-guidance for procedures, but the economics related to declining procedural reimbursement may be contributing. Over that time, the acceptance of procedures performed by advanced practice practitioners has increased substantially.

CLINICAL RELEVANCE/APPLICATION

Radiologists are now by far the largest providers of hepatic and renal biopsies on Medicare beneficiaries.
HPS158

Hypothesis Testing and Power for Partially-Paired, Fully-Paired, and Unpaired Screening Trials

John Brinton : Nothing to Disclose, R. Edward Hendrick PhD : Consultant, General Electric Company Advisory Board, Bracco Group Medical Advisory Board, Koning Corporation, Deborah Glueck (Presenter):

PURPOSE

The purpose of this research is to provide novel methods for data, power and sample size analysis for unpaired, partially-paired, and fully-paired screening trials which use the full area under the ROC curve as the outcome.

METHOD AND MATERIALS

The partially-paired design is constructed by randomly assigning participants to one of three groups: participants who receive a single screening test, participants who receive the alternative screening test and a third arm of participants who receive both tests. In a fully paired design all participants receive both tests. When running screening

HPS157

Antenatal Care in Low- and Middle-income Countries (LMIC) Delivered through a Public-private Partnership (PPP) (Station #1)

Meera Gopalakrishnan PhD : Director, Koninklijke Philips NV, Kristen K. DeStigter MD (Presenter):
Research Grant, Koninklijke Philips NV Consultant, Koninklijke Philips NV Medical Advisory Board, McKesson Corporation, Eric Z. Silfen MD : Officer, Koninklijke Philips NV

PURPOSE

Over 80% of maternal and neonatal mortality occurs in areas of high birthrate with limited access to healthcare, such as sub-Saharan Africa [WHO 2010]. Infant and maternal mortality continue to be a major health concern in Uganda. It is estimated that ~6,000 Ugandan women die each year due to pregnancy-related complications and for each 1 who dies, 6 survive with chronic and debilitating health conditions such as fistula. Ultrasound examination is well-recognized as an instrument for early detection of life-threatening complications, allowing for timely referral for appropriate life-saving obstetrical care. Improving access to ultrasound technology has the potential to significantly reduce maternal and neonatal deaths and help countries achieve Millennium Development Goals (MDG) 4 and 5 targets. However, access to affordable ultrasound technology at point-of-care coupled with high-quality care delivery is challenging in highly resource-constrained environments. Addressing the complexity and magnitude of these challenges requires domain knowledge, infrastructure capacity and skill-sets housed in both the public and private sectors. Recognizing this need for public-private sector collaboration, we established an NGO-Commercial-Ugandan government public-private partnership (PPP), which combined volunteer doctors, camera-equipped ultrasound machines, low-risk government engagement, and a variety of financial models. As a result, we are evaluating a combination of point-of-care ultrasound technology; an inventive care delivery model; and, strong community engagement for improving the clinical outcomes of antenatal medical care in the LMIC setting.

RESULTS

The clinical program was established at ten, church-affiliated, private rural health clinics. Forty-five midwives were trained to perform ultrasound scans and 15,000 scans were performed over the course of three years. Unexpected or urgent clinical findings were identified in 23% of patients, resulting in successful change in clinical management. High-risk conditions diagnosed late in pregnancy using ultrasound included 18% breech or transverse, 4% multiples (twins/triplets), 2.9% abnormal amniotic fluid volume, 2% low lying placenta, 1% placenta previa. This knowledge led to follow-up ultrasound, better-planned deliveries, and/or referrals for C-sections. Additionally observed were "magnet" effects associated with use of the ultrasound. These included a sustained increase in antenatal care visits (ANCs) and skilled deliveries, first time attendance of husbands at the ANCs, and a commensurate 70% increase in testing and treatment of co-morbidities. Finally, once church-affiliated, private clinics were established, clinic services remained fiscally viable when the current level of government funding was subsidized by an affordable patient co-payment of ~5,000 UGX (~$2 US) for the course of the pregnancy. Based upon these clinical and financial results, the Ugandan Ministry of Health has approved, for the first time, a similar co-payment model for patients receiving ANC through this program at public clinics and hospitals, thereby significantly expanding affordable access to antenatal care throughout the country.

CONCLUSION

Public-private partnerships can create value for all partners (Table 1) by synergizing business objectives with social value creation. For ANCs such a clinical program can drive progress in global health by increasing access to life-saving obstetrical care in LMIC and improving community health outcomes, thereby making progress towards MDG 4 and 5 targets. Furthermore, in addition to creating value through the public-private partnership, the clinical program uncovered and began to address new roadblocks such as the need for tools that facilitate collaboration and communication, ways of working in a resource-constrained country, acceptable funding to scale local clinics and the need for sustainable business models for large scale deployment.

METHODS

A PPP collaboration agreement was signed to prospectively evaluate pregnant women cared for at level III rural health clinics. The agreement outlined expectations as well as deliverables. Onsite visits were conducted twice a year to gain insights directly from the patients. Working groups comprised of individuals with complementary skill-sets were established. The working groups met weekly to establish and implement program deliverables. The working groups also served as a forum for disseminating lessons learned and best practices as well as agents for the creation of affiliations with local clinical networks. In addition, the PPP framework allowed autonomy for the program team to make necessary programmatic changes based upon local dynamics in the field. Finally, program metrics included both clinical outcomes and cost of care.
studies in a busy clinic, the fully-paired design may not be feasible. Conducting two examinations on all participants can slow clinic flow. A partially-paired design strikes a balance between efficient study design and clinical acceptability. We propose a novel F test that allows for the analysis of unpaired, partially-paired, and fully-paired designs. Power is calculated using an approximate F distribution. Sample size is estimated by numerically inverting the power function. We use a Monte Carlo simulation to evaluate the Type I error rate and power of the test statistic. We compare our proposed power and sample size estimation to that of a commonly used SAS macro, ROCPOWER. The novel method is applied to estimate sample size for a proposed partially paired breast cancer screening trial.

RESULTS

The novel F statistic has accurate Type I error and power. The power approximations are within 0.045 of empirical estimates for all three trial designs (unpaired, partially-paired, and fully paired). Compared to results from ROCPOWER, the proposed F statistic resulted in smaller sample sizes. The sample sizes for the partially-paired designs fell between the sample sizes for the unpaired and fully-paired designs, with increasing efficiency as the ratio of participants with paired data to total participants increased.

CONCLUSION

Our approach provides an accurate approach for data, power and sample size analysis for partially-paired, fully-paired, and unpaired screening trials.

CLINICAL RELEVANCE/APPLICATION

The method lets clinicians consider a range of partial-pairing ratios while designing screening trials, yielding studies that maintain power and minimize impact on clinic flow.

The Weber Effect; A Multi-Year Experience with Gadopentetate Dimeglumine Administration (Station #3)

Shima Aran MD (Presenter): Nothing to Disclose, Khalid Walid Shaqdan MD : Nothing to Disclose, Hani H. Abujudeh MD, MBA : Research Grant, Bracco Group Consultant, RCG HealthCare Consulting Author, Oxford University Press

PURPOSE

The Weber effect states that adverse event reporting tends to increase in the first two years after introduction of a new agent or a new indication, and then declines. We aim to present our experience with adverse reaction reporting pattern of Gadopentetate Dimeglumine.

METHOD AND MATERIALS

IRB approved the retrospective study. Data in the electronic incident reporting system was searched between Jan-01-2007 to Jan-14-2014. Gadopentetate Dimeglumine (Mag) and Gadobenate Dimeglumine (Mul) were studied. Our institution developed new guidelines for the use of gadolinium based contrast agents (GBCAs) due to the risk of developing NSF as a result of Mag administration in May-07. In Oct-07 Mag was replaced with Mul for patients with an eGFR <60 mL/min/m2. We continued to use Mag for Other patients. We discontinued the use of Mul in Dec-08 due to concerns about acute allergic reactions. As a result the clinical indications for Mag use were changed again and it was used for all clinical indications based on a newly defined guideline. Table shows the time frame of events.

RESULTS

Of 184,218 injections, 174(0.09%) patients (mean age: 45.6±15.1) showed allergic reaction, consisted of 48 (27.6%) males and 126 (72.4%) females. The highest rates of reactions were observed in the first year (Period-3; 0.167%) after the change in clinical indications followed by the second year (Period-4; 0.109%). Period-3 was statistically significantly different from all other periods except period-4.

CONCLUSION

A Weber pattern was observed in our study following a change in clinical indications for the use of Mag. As institutions consider changing the type of GBCA they use for their general patient population, they should be aware that the overall risk of adverse events could increase. Considering the influence of Weber effect, the increase in adverse events could be attributed to epidemiologic reporting bias and may not represent a true difference in adverse events based on the pharmacologic structure of the GBCA.

CLINICAL RELEVANCE/APPLICATION

Our investigation showed that the weber effect does happen with GBCAs and that Radiology departments should be aware of this effect when substituting the GBCAs or their clinical indications.

Have CT and MR Angiography Replaced Catheter Angiography in Diagnosing Peripheral Arterial Disease? (Station #4)

Manisha Chandrakrant Patel MD (Presenter): Nothing to Disclose, David C. Levin MD : Consultant, HealthHelp, LLC Board of Directors, Outpatient Imaging Affiliates, LLC, Laurence Parker PhD : Nothing to Disclose, Vijay Madan Rao MD : Nothing to Disclose
PURPOSE
Diagnostic catheter angiography (DCA) has been considered the gold standard for diagnosing peripheral arterial disease (PAD), but it has been challenged by CTA and MRA, which are noninvasive and less expensive. Our purpose was to determine whether DCA has been replaced by extremity CTA and MRA in diagnosing PAD.

METHOD AND MATERIALS
Nationwide Medicare Part B databases for 2002-2012 were reviewed. CPT codes for extremity MRA and CTA and supervision and interpretation of extremity DCA were selected. Physician specialty codes were used to classify providers as radiologists, cardiologists, and surgeons. Utilization rates per 100,000 Medicare beneficiaries were calculated.

RESULTS
Among all specialties, the combined utilization rate of all 3 types of angiography increased from 917 per 100,000 in 2002 to 1261 in 2006 (+38%), after which it remained stable until 2010, then declined to 1035 in 2012. The overall rate of MRA and CTA together rapidly increased from 89 in 2002 to 440 in 2006 (+394%), after which it leveled off, then gradually decreased to 331 in 2012. In 2012, 32% of the total procedures were MRA and CTA, up from 10% in 2002. Greater than 85% of MRA and CTA examinations were performed by radiologists. The overall rate of DCA remained stable over the course of the study. However, among radiologists, the DCA utilization rate decreased from 433 in 2002 to 120 in 2012 per 100,000 (-72%), whereas among cardiologists and surgeons together, the overall DCA utilization rate increased from 353 in 2002 to a peak of 578 in 2010 (+64%) before dropping somewhat in 2011.

CONCLUSION
Among radiologists, MRA and CTA have gradually replaced DCA, with 71% of procedures among radiologists in 2012 being MRA/CTA (29% DCA), up from 16% in 2002. While overall utilization of DCA has remained steady, it has risen sharply among cardiologists and surgeons, while dropping sharply among radiologists. The increase among cardiologists and surgeons has occurred despite availability of noninvasive alternatives. The lack of growth of MRA/CTA utilization after 2006 is likely related to multiple factors, including radiology benefits management and copay increases, and the drop in DCA among cardiologists and surgeons in 2011 is likely an apparent decrease related to bundling of invasive procedure codes.

CLINICAL RELEVANCE/APPLICATION
Not applicable

HPS161
30-day Readmission Rate following Transjugular Intrahepatic Portosystemic Shunt (TIPS) Placement: A Single Center Experience (Station #5)

Ammar Sarwar MD (Presenter): Nothing to Disclose, Elliot Tapper: Nothing to Disclose, Douglas Grunwald: Nothing to Disclose, Salomao Faintuch MD: Nothing to Disclose, Raza Malik: Nothing to Disclose, Muneeb Ahmed MD: Nothing to Disclose

PURPOSE
Readmission of patients within 30 days of discharge is a quality metric used by the Center for Medicare and Medicaid Services, which is linked to financial penalties. We examined 30 day re-admissions and outcomes after inpatient transjugular intrahepatic portosystemic shunt (TIPS) procedures at our institution to identify the most common causes for re-admission.

METHOD AND MATERIALS
We searched for all TIPS placed at our institution from May 2003 to May 2013 using CPT codes and review of our interventional radiology database. In total, there were 168 primary TIPS procedures performed with 94 covered stents and 74 uncovered stents. We reviewed electronic medical records, radiology reports, administrative databases and discharge summaries. Of these patients, we evaluated the type of TIPS stent used (covered vs. uncovered), length of stay, readmission rates, 30 day re-admissions and overall mortality.

RESULTS
Between May 2003 to May 2013, 168 primary TIPS were placed in 168 patients (55±11 yrs, 71% male). 83/168 were for refractory ascites and 85/168 were for variceal bleeding. 17/168 procedures required only overnight admission whereas 151 required extended hospitalization (12±12 days). Readmission was required in 31/168 (18%) patients within 30 days of discharge after the TIPS procedure. Causes for readmission included encephalopathy (8/31, 25%), clinical symptoms requiring TIPS revisions (6/31, 19%), ascites or hydrothorax causing shortness of breath (6/31, 19%), acute renal failure (3/31, 9%), fluid/electrolyte imbalance (3/31, 9%), sepsis (2/31, 6%) and others (3/31, 9%). Only 1/8 patients with encephalopathy required TIPS reduction. Overall, 7 day mortality was 6/168, 30 day mortality was 19/168 and overall mortality was 64/168 occurring 1-2343 days (431±571 days after TIPS).

CONCLUSION
We report single center results for 30 day readmissions following TIPS placement. The most common reason for readmission is hepatic encephalopathy, which can be medically managed in a majority of patients. Assigning more resources post-discharge to high-risk patients may reduce readmission rates.

CLINICAL RELEVANCE/APPLICATION
30 day readmission rates are a CMS metric with potential financial penalties. There is limited current data on 30 day readmission rates following TIPS placement.
Treating for Two? How to Manage Contrast Reactions in Pregnant Patients (hardcopy backboard)

Jaspreet Kaur Bisla MD (Presenter): Nothing to Disclose, Jeanne Miriam Horowitz MD: Nothing to Disclose, Frank H. Miller MD: Nothing to Disclose, Carla Branco Harmath MD: Nothing to Disclose, Nancy A. Hammond MD: Nothing to Disclose, Vahid Yaghmai MD: Nothing to Disclose

TEACHING POINTS

1. Review the types of contrast reactions (allergic-like and physiologic reactions to intravascular iodinated contrast). 2. Describe the symptoms of contrast reactions unique to pregnant patients. 3. Review management guidelines for contrast reactions in pregnant patients, with attention to medications administered and what to do in case of anaphylaxis.

TABLE OF CONTENTS/OUTLINE


PS30

Tuesday Plenary Session

Plenary Sessions

AMA PRA Category 1 Credits™: 1.25
ARRT Category A+ Credit: 1.00
Tue, Dec 2 1:30 PM - 2:45 PM Location: Arie Crown Theater

Participants

Presiding
N. Reed Dunnick MD Nothing to Disclose President, Radiological Society of North America

Sub-Events

PS30A

Presentation of the Gold Medal of the Radiological Society of North America


PS30C

Annual Oration in Diagnostic Radiology: Transitioning from Volume-Based to Value-Based Practice: A Meaningful Goal for All Radiologists or a Meaningless Platitude?

David C. Levin MD (Presenter): Consultant, HealthHelp, LLC Board of Directors, Outpatient Imaging Affiliates, LLC, N. Reed Dunnick MD Nothing to Disclose

This centennial year of the RSNA meeting is a good time to reflect on past successes, but also to recognize that radiology is at a crossroads. We face many threats, ranging from commoditization, to declining reimbursements, to the perception that much imaging is unnecessary, to termination of groups by hospitals, etc. One of our biggest challenges - and a way to counter some of these threats - is to effectively move from our current volume-based practice model to one which is more value-oriented. This oration will present concrete ideas on steps that need to be taken to accomplish that goal. Radiologists must refute the notion that we are simply purveyors of a commodity by starting to act like true consulting physicians. True consulting physicians would take a more active role in activities like assessing the appropriateness of requests for imaging, supervising the performance of the studies, communicating the results to patients, and being more available to consult with referring doctors. Of course, doing these things takes time away from reading cases, and that will lead to lower incomes. I will make the case that this is a worthwhile and necessary tradeoff. Primary care physicians and specialists in clinical disciplines spend hours each day providing uncompensated services to patients, and we have to start doing some of that as well. While it may not be feasible to try to evaluate the appropriateness of every imaging request or to directly supervise every study being done, there are things we can do to add value to these processes of care. A side benefit of taking the time to act like true consultants is that it will create more jobs for young radiologists, who are having trouble finding them now. We owe them that. Radiologists will also provide greater value if they make themselves available around the clock to help their patients and referring doctors, rather than outsourcing night and weekend work to others outside their practice. Greater focus on quality is another way to provide value. Programs like the Physician Quality Reporting System have imposed quality measures upon radiology practices, but some of them are neither useful nor easily measurable, and fail to provide any true indication of the quality of a practice. Radiology groups could provide better value by creating and tracking their own internal quality metrics, as some have already done. Still another way for...
radiologists to provide value is to develop closer ties to primary care physicians, who are often overburdened and need our help, and who are going to become increasingly influential players in an era of ACOs and bundled payments. One way we can do this is to propose what might be termed "the 90% rule." If all these suggestions are followed, I believe that within 5 years radiology will be considered a high-value specialty that is more helpful to our patients and referring physicians than at present, and one that is no longer viewed as a commodity by others in the rest of the medical world.

SSJ12

ISP: Health Service, Policy & Research (Guidelines/Outcomes)

Scientific Papers

AMA PRA Category 1 Credits™: 1.00
ARRT Category A+ Credit: 1.00
Tue, Dec 2 3:00 PM - 4:00 PM Location: S102D

Participants

Moderator
James Vincent Rawson MD: Nothing to Disclose
Kirsteen Rennie Burton MD, MBA: Nothing to Disclose

Sub-Events

SSJ12-01 Health Service, Policy & Research Keynote Speaker: Standardization and Guidelines in Radiology
James Vincent Rawson MD (Presenter): Nothing to Disclose

SSJ12-02 Prevalence and Significance of Incidentally Noted Dilation of the Thoracic Aorta on Screening Chest CT
Nancy J. Benedetti MD (Presenter): Nothing to Disclose, Michael D. Hope MD: Nothing to Disclose

PURPOSE

With the commencement of lung cancer screening in the United States, the discovery of incidental thoracic findings, such as ascending aortic dilation, will become more common. Current guidelines recommend yearly CT follow-up for ascending aortas measuring 4.0-5.0 cm. However, little is known about patient outcomes in this population. We conducted a study to determine the incidence of incidental ascending aortic dilation and to determine the rate of change in aortic diameter over time in 55-80 year olds (lung cancer screening population). The objective of this study is to inform guidelines on follow-up of incidental ascending aortic dilation.

METHOD AND MATERIALS

We searched 88,171 chest CT scans done on 31,963 patients aged 55-80 years old at our institution over a 14 year period (2000-2013) and determined the incidence of incidental ascending aortic dilation (4.0-5.0 cm). Patients were excluded if they had a known/repaired aortic aneurysm or dissection, mycotic aneurysm or history of connective tissue disease. For patients with at least 2 CT scans ≥6 months apart, we determined the growth rate of the aorta. We also conducted a chart review to assess for complications or vascular surgery interventions.

RESULTS

In our study sample of 25,039 patients after exclusions, we found a 2.7% incidence (n=678) of incidental ascending aortic dilation. Of the 678 patients with aortic dilation, 333 patients had follow-up studies with 3.3 years average length of follow-up between chest CT examinations. In the population of patients with follow-up studies, only 2.7% (n=9) demonstrated interval growth of 3 to 7 mm over a time period of 1.5 to 7.5 years (average growth of 1.1 mm/year). None of these patients had complications (e.g.- dissection, rupture) or surgical intervention.

CONCLUSION

Current guidelines recommend yearly follow-up of patients with incidental ascending aortic dilation in the 4.0-5.0 cm range. However, we found aortic growth in only 2.7% of patients, a slow growth rate of 1.1 mm/year and no complications.

CLINICAL RELEVANCE/APPLICATION

Current guidelines could be revised to:

1.) Increase the interval between follow-up studies
2.) Incorporate risk stratification to determine which patients would benefit most from yearly follow-up and which could safely be followed at longer time intervals.
Patient-Centered Treatment Selection for Small Renal Masses Using Nephrometry Score and Renal Function: A Comparative Effectiveness Study

Stella Kang MD: Nothing to Disclose, Pari Pandharipande MD, MPH (Presenter): Nothing to Disclose

PURPOSE

The current standard of care for small renal masses is partial nephrectomy (PN), but concern has been raised over consequent renal functional decline. In patients with chronic kidney disease (CKD), we compared life expectancy (LE) after PN to that after a treatment strategy in which patients were triaged to percutaneous ablation vs. PN based on renal function and Nephrometry Score (NS), a tumor anatomy scoring system.

METHOD AND MATERIALS

We developed a decision-analytic Markov model to project LE in hypothetical patients with mild or moderate CKD undergoing treatment of small renal masses. Our model incorporated NS, which correlated with tumor anatomy predictive of post-surgical renal functional loss. Tested strategies were: 1) nonselective PN; and 2) selective PN, with triage to percutaneous ablation for moderate CKD and any NS, or for mild CKD and high NS, and otherwise PN. The model accounted for benign and malignant lesions, renal functional decline after each treatment type, mortality rates by CKD stage, Charlson comorbidity index, tumor NS distribution, and local recurrence and metastatic disease rates for each treatment. Patients were susceptible to all-cause mortality, surgical mortality, and cancer-specific mortality. Our primary model outcome was LE. We used sensitivity analysis to determine the stability of results when varying key parameters.

RESULTS

Nonselective treatment with PN of 65-year-old men (mean age of renal cell cancer diagnosis) resulted in an average decrease in LE of 0.46 years (11.0 to 10.54 years) relative to selective PN, due to worsening CKD and associated cardiovascular mortality. 65-year-old women experienced an average LE loss of 0.56 years (12.7 to 12.14 years). Among all parameters, model results were most sensitive to variability in the rate of renal function decline and CKD-related mortality.

CONCLUSION

Renal mass ablation is likely to be the most effective strategy for treatment of small renal masses in patients with baseline moderate CKD, or with mild CKD and complex tumor anatomy.

CLINICAL RELEVANCE/APPLICATION

Renal mass ablation may be a more effective treatment option for small renal masses than partial nephrectomy in patients with moderate CKD or with mild CKD and complex tumor anatomy.

Agreement Studies in Radiology Research

Behzad Farzin MD (Presenter): Nothing to Disclose, Jean-Christophe Gentric: Nothing to Disclose, Olivier Naggara MD: Nothing to Disclose, Jean Raymond MD: Nothing to Disclose

PURPOSE

Guidelines to improve reporting of reliability and agreement studies in health care were proposed by Kottner et al., in 2011 (GRRAS). We hypothesized that rater agreement studies reported in the radiology literature were suboptimal. Our purpose was to assess how agreement studies were designed and reported in our field, and identify areas for improvement.

METHOD AND MATERIALS

We conducted a retrospective assessment of all articles published in 4 selected journals (Radiology, AJNR, CARJ, Journal de Radiologie; from January 2011 to December 2012). Editorials, commentaries, review articles and references to published studies were excluded. Four trained adjudicators independently evaluated pertinent articles using a 23-item form that included the 15 GRRAS criteria. One senior author reviewed all report forms.

RESULTS

Of 2229 source articles, 951 titles were identified, and after manual exclusion, 280 articles (12.6% of total) were found that reported agreement or reliability studies. The mean number of subjects per study was 81 ± 99. Justification for the sample size was found in 9 studies (3.2%). The number of raters was = 20 patients, and v) mention of agreement in the discussion section was present in 4 studies (1.4%). Radiology articles dedicated to agreement were few in number (20 or 0.9%).

CONCLUSION

In spite of their importance, agreement studies are few, incompletely reported and commonly offer a cursory assessment of reliability. There are many potential research opportunities for studies of this type, which should be promoted at all levels.

CLINICAL RELEVANCE/APPLICATION

The demonstration of robust intra- and inter-observer agreement or reliability in well-designed studies is essential, before dissemination of diagnostic technologies or the widespread use of diagnostic criteria, to prevent
SSJ12-05

Utilization of Pre-operative Imaging for Muscle Invasive Bladder Cancer: A Population-based Study

Matthew Donald Fernand McInnes MD, FRCP(C) (Presenter): Nothing to Disclose, David Robert Siemens: Nothing to Disclose, William Mackillop MD: Nothing to Disclose, Yingwei Peng PhD: Nothing to Disclose, Shelly Wei: Nothing to Disclose, Nicola Schieda MD: Nothing to Disclose, Christopher M. Booth MD, FRCP(C): Nothing to Disclose

PURPOSE

To describe the use of pre-operative imaging for muscle-invasive bladder cancer and to evaluate the association between imaging and patient outcome in routine clinical practice.

METHOD AND MATERIALS

In this IRB-approved, population-based cohort study, electronic records of treatment were linked to the Ontario Cancer Registry to identify all patients with bladder cancer treated with cystectomy in Ontario from 1994-2008. Utilization of various chest, abdomen, pelvis and bone imaging strategies was evaluated over time. Temporal trends were evaluated over 3 study periods (1994-1998, 1999-2003, and 2004-2008). Logistic regression was used to analyze factors associated with imaging utilization. Cox model analyses were used to explore associations between imaging and survival.

RESULTS

2802 patients with MIBC underwent cystectomy during 1994-2008. Utilization increased over the 3 study periods: chest x-ray (CXR) (55%, 64%, 63%, p<0.001), CT chest (10%, 10%, 21%, p<0.001), bone scan (30%, 34%, 36%, p=0.04) and CT, US or MR of the abdomen and pelvis (85%, 90%, 92%, p<0.001). Use of chest and bone imaging was independently associated with age, N-stage, surgeon cystectomy volume, and geographic region. In adjusted analyses we found inferior outcomes among patients who did not have pre-operative chest imaging (CXR or CT): Overall survival (OS) hazard ratio (HR) 1.12 (95%CI 1.01-1.25), cancer specific survival (CSS) HR 1.09 (0.97-1.22); or bone scan OS HR 1.11 (1.01-1.22), CSS HR 1.09 (95%CI 1.01-1.25). No benefit for CT chest over CXR was identified.

CONCLUSION

In routine clinical practice, there is considerable variation in use of pre-operative chest, body, and bone imaging. Pre-operative chest and bone imaging is associated with improved outcomes. No survival benefit for CT chest over CXR was identified. This association likely reflects better patient selection for cystectomy.

CLINICAL RELEVANCE/APPLICATION

Pre-operative chest and bone imaging to stage muscle-invasive bladder cancer is associated with improved outcomes. This association likely reflects better patient selection for cystectomy.

SSJ12-06

Projected Effects of Radiation-induced Cancers on Life Expectancy in Patients Undergoing CT Surveillance for Limited-stage Hodgkin’s Lymphoma: A Markov Model

Kathryn Lowry MD (Presenter): Nothing to Disclose, Ekin Turan: Nothing to Disclose, Jonathan David Eisenberg BA: Nothing to Disclose, Jeffrey Barnes: Nothing to Disclose, Pari Pandharipande MD, MPH: Nothing to Disclose

PURPOSE

To compare risks of death and life expectancy losses from recurrent lymphoma to those due to radiation exposure from surveillance CT scans in patients with limited-stage Hodgkin’s lymphoma.

METHOD AND MATERIALS

We adapted a previously developed Markov model to project lifetime mortality risks and life expectancy losses due to lymphoma versus radiation-induced cancers from surveillance CT in hypothetical patients with limited-stage Hodgkin’s lymphoma. In the base case, we modeled 35-year-old men and women undergoing seven surveillance CT scans of the chest, abdomen, and pelvis over 5 years. Radiation-induced cancer risks and mortality for 17 organ systems were modeled using an organ-specific approach that accounted for specific anatomy exposed at CT. Cohorts of 20-, 50-, and 65-year-old men and women were evaluated in secondary analyses. Markov Chain Monte Carlo methods were used to estimate the uncertainty (95% confidence intervals) of radiation risk projections.

RESULTS

In 35-year-old men and women, respectively, we projected 3,324/100,000 and 3,345/100,000 deaths due to recurrent lymphoma, and 245±126/100,000 and 317±118/100,000 radiation-induced cancer deaths. Discrepancies in projected life expectancy losses from lymphoma (428 days in men, 482 days in women) and radiation-induced cancers (11.6±6.0 days in men, 15.6±5.8 days in women) were proportionately higher, due in part to the delayed timing of deaths from radiation-induced cancers over the cohorts’ lifetimes. Attributable deaths and life expectancy losses from radiation-induced cancers were highest in the youngest cohorts, and discrepancies in life expectancy losses from lymphoma versus radiation-induced cancers were more pronounced at younger ages.

CONCLUSION
Given the low rate of radiation-induced cancer deaths due to CT surveillance of limited-stage Hodgkin's lymphoma, modest benefits would justify its use. Life expectancy losses from recurrent lymphoma are substantially higher than those from radiation-induced cancers due in part to the differential timing of these events.

CLINICAL RELEVANCE/APPLICATION
In patients with limited-stage Hodgkin's lymphoma undergoing CT surveillance, from a health outcomes perspective, modest benefits would justify its use.

RC427
Critical Issues Facing the Practice of Radiology in 2015 and Beyond: A Roundtable with ACR Leaders (In Conjunction with the American College of Radiology)

Refresher/Informatics

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50
Tue, Dec 2 4:30 PM - 6:00 PM Location: S403B

Participants
Moderator
Bibb Allen MD : Nothing to Disclose
Geraldine B. McGinty MD (Presenter): Nothing to Disclose
James A. Brink MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
1) Recognize the major economic, political and practice issues facing the specialty of radiology. 2) Analyze the federal policy, private payer, health system and consumer initiatives that are signaling the shift away from volume driven transactional medical care toward value driven care and reimbursement models. 3) Describe point-of-care patient centric tools radiologists can use to bring value based radiological care into routine clinical practice. 4) Formulate strategies to position their community based or academic practices in a position to adapt and succeed in evolving value based reimbursement models. 5) Explain how aligning incentives between all stake holders is required to achieve the goals of health reform and how to be vocal supporters of our profession.

ABSTRACT
Because of changing federal policy and reimbursement models, the next five years may be the most tumultuous for medicine and our specialty since the adoption of Medicare. Leaders in organized radiology are working to place our specialty in the best possible position, but we face complex issues requiring complex and potentially counterintuitive solutions. Strategic decisions made by our organizations need to be informed by and have buy-in from those in the trenches of clinical practice. The imperatives of health reform and the dynamic shift from volume based transactional care to value based population care are creating the critical issues facing our specialty. In this roundtable session, we discuss a number of the critical issues facing our practices and discuss proactive strategic initiatives that can empower radiologists to transition from volume based to value based care and position their practices to succeed in the new paradigm. While integral to providing optimal radiological care, the value of the interpretations we provide will ultimately be taken for granted by our systems and policy makers. In order to provide additional value we must look beyond just the value of our interpretations. By engaging in the care prior to and following image interpretation, radiologists can improve individual patients' safety, outcomes and engagement as well as improve population health. This measurable role for radiology in providing cost effective care will increase our relevance to the healthcare system beyond image interpretation. Participants can share their ideas and concerns with leaders in organized radiology as well as take away a number of tools they can use in their practices to begin or enhance the shift to value based care. Using these strategies, radiologists can leverage the value they create to enhance their position in their health systems and your professional organizations can leverage that same value with policy makers to impact federal health policy.

SPSC41
Controversy Session: DTI in Head Injury: Crossing Borders, Clinical Applications, and Legal Ramifications

Special Courses

AMA PRA Category 1 Credits ™: 1.00
ARRT Category A+ Credit: 1.00
Wed, Dec 3 7:15 AM - 8:15 AM Location: N228

Participants
Moderator
Gordon K. Sze MD : Investigator, Remedy Pharmaceuticals, Inc

Sub-Events
SPSC41A DTI in the Courtroom: Pro
Michael L. Lipton MD, PhD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
This presentation will discuss dMRI assessment the legal context, to illustrate the potential and limitations of dMRI, as well as other imaging approaches. The basis and limitation of dMRI will be discussed in the context of the legal standard of evidence.
DTI in the Courtroom: Con

Pratik Mukherjee, MD, PhD (Presenter): Research Grant, General Electric Company Medical Advisory Board, General Electric Company

LEARNING OBJECTIVES

1) Identify the diffusion tensor imaging (DTI) correlates of traumatic brain injury (TBI). 2) Explain the challenges of applying DTI to the diagnosis of TBI. 3) Summarize the current state of clinical research in DTI of TBI, including the advent of large multi-center trials.

Controversy Session: Overreading Outside Examinations: Controversies, Benefits and Pitfalls

LEARNING OBJECTIVES

1) Consider and minimize the potential the medicolegal risks of agreeing to review outside imaging studies, or failing to agree to review outside imaging studies, when asked to do so by attending physicians. 2) Approach requests to interpret outside examinations as an opportunity to add value to radiologists' professional services and to patient care. 3) Define the role of imaging consultant as an example of tertiary care. 4) Benefit from the experience of other imaging centers to successfully receive reimbursement for radiologic second opinion consultations.

ABSTRACT

Although our professional workflow has developed to conduct imaging examinations and issue reports of their interpretation, we are increasingly asked to interpret examinations performed at other institutions (outside examinations). This session will address common uncertainties regarding potential medicolegal risks inherent in how we respond to these requests. We will review the financial and ethical implications of providing this added service, emphasizing a trend away from 'piece work' as defining our professional responsibilities. We will define the meaning of value added, to management, early diagnosis and prevention of disease. We will review the finite resource model of health dollars and the future role of each of us in using these efficiently. Finally, two specific experiences at different academic centers will be reviewed to reinforce these concepts.

Sub-Events

SPSC42A What Are the Medicolegal Risks?

Leonard Berlin, MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

SPSC42B It's the Right Thing to Do, and It's Not About the Money

Mark E. Schweitzer, MD (Presenter): Consultant, MMI Munich Medical International GmbH Data Safety Monitoring Board, Histogenics Corporation

LEARNING OBJECTIVES

1) Review changes in reimbursements for outside readings. 2) Stress concept of value added. 3) Define tertiary care as being an imaging consultant.

ABSTRACT

We will review the current and anticipated changes in funding for imaging. The importance of this trend away from "piece work" will be emphasized. We will define what value added will mean in the future and how we should work to make ourselves needed in the care and more importantly early diagnosis and prevention of disease. We will review the finite resource model of health dollars and the future role of each of us in using these efficiently.

SPSC42C Financial Performance—A Tale of Two Cities

James A. Brink, MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
**RC527**

**The Affordable Care Act: What Does it Mean for Radiology and Radiologists?**

*Refresher/Informatics*

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*Wed, Dec 3 8:30 AM - 10:00 AM  Location: N227AB*

**Participants**

Moderator  
Ezequiel Silva MD : Nothing to Disclose  
Cynthia Moran (Presenter): Nothing to Disclose  
Thomas W. Greason JD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Gain from perspectives on Obamacare’s impact on payment policy, the health insurance marketplace, the individual and employer mandates, the Sunshine Act and the Cadillac Tax. 2) Up to date knowledge will be gained of the future of the legislation based on recent political changes such as the 2014 mid-term elections.

**ABSTRACT**

The Patient Protection and Affordable Care Act, also knows as Obamacare represents the most significant change in health care policy in the last 25 years. The laws implementation affects radiologists on a number of fronts and knowledge of these changes is imperative to the continued success of our profession. Important aspects of the legislation include changes in payment policy, the individual and employer insurance mandates, the new health insurance marketplace, the Sunshine Act and the upcoming Cadillac plans tax. The changing political landscape, including the 2014 mid-term Congressional elections will impact the manner in which Obamacare becomes reality.

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**RC532**

**What Is Driving Health Care Reform and How It Is Changing Your Radiology Practice**

*Refresher/Informatics*

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*Wed, Dec 3 8:30 AM - 10:00 AM  Location: S103AB*

**Sub-Events**

**RC532A**  
A Brief History of Health Care Reform

Bernard F. King MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Understand the historical drivers of healthcare reform. 2) Understand the important milestones in healthcare Reform over the last 100 years. 3) Understand the major goals of the Affordable Care Act (ACA). (This course is part of the Leadership Track)

**ABSTRACT**

This refresher course will review three major aspects of Healthcare Reform: 1) Historical drivers and milestones of healthcare Reform over the last 100 years, 2) The major implications of the Affordable Care Act (ACA) on Radiology and 3) Contemporary examples of how this is being carried out in the state of Massachusetts. The historical drivers and milestones in healthcare reform over the last 100 years is important to understand current changes and vehicles involved in payment schemes that exist today. The major implications of the Affordable Care Act on radiology are key in understanding current and future healthcare reforms will reshape medicine and radiology. Finally, current practices occuring in Massachusetts are the most revealing and telling picture of how all these healthcare reforms will affect the practice of medicine and radiology in the United States for many years to come.

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**RC532B**  
Impact of Health Care Reform on Radiology: Intended and Unintended

Lawrence R. Muroff MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Discuss the key elements of health reform as they impact radiology. 2) Develop strategies to deal with the intended and unintended consequences of health care reform. 3) Describe some of the alternative payment mechanisms that will be competing with fee-for-service, and discuss how radiologists will fit into these new
compensation dynamics. (This course is part of the Leadership Track)

ABSTRACT

This presentation will review the trends impacting our specialty. Declining reimbursement, non-traditional competition, and more aggressive turf incursion will be examined, and strategies will be offered to enable radiologists the opportunity to survive and thrive in a time of change. The talk will cover alternative payment proposals and possible new practice models. Future opportunities will be discussed.

Attendees of this session should have a better understanding of how our specialty will look in the new health care dynamic and what their role will be in this changed environment.

RC532C

Health Care Reform in Massachusetts

Alexander M. Norbash MD (Presenter): Stockholder, Boston Imaging Core Laboratories, LLC Co-founder, Boston Imaging Core Laboratories, LLC

LEARNING OBJECTIVES

1) Recognize the contributory elements promoting the implementation of significant healthcare reform in Massachusetts. 2) Review both the systemic shortfalls and benefits delivered to the citizens of Massachusetts during that state’s implementation of universal health care. 3) Understand broad similarities and differences between the Massachusetts and National models of their respective Affordable Care Acts. (This course is part of the Leadership Track)

RC554

The Future of Federal Health Information Technology Incentive Programs and Policies: Expert Panel

Refresher/Informatics

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Wed, Dec 3 8:30 AM - 10:00 AM   Location: S104A

Participants

Moderator
Curtis P. Langlotz MD, PhD : Shareholder, Montage Healthcare Solutions, Inc Advisory Board, Reed Elsevier Advisory Board, Activate Networks, Inc Spouse, Consultant, Johnson & Johnson
John D. Halamka (Presenter): Board Member, Imprivata, Inc
Paul C. Tang MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Understand federal health information technology incentive programs and how they can affect practice revenue and operations. 2) Hear the views of experts involved in the regulatory process to understand the intent and context for these programs. 3) Gain insight into recent and upcoming regulatory changes. 4) Decide how your practice should respond to these programs, including Meaningful Use and PQRS.

SSK11

ISP: Health Service, Policy & Research (Medical and Practice Management)

Scientific Papers

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: .50

Wed, Dec 3 10:30 AM - 12:00 PM   Location: S102D

Participants

Moderator
David C. Levin MD : Consultant, HealthHelp, LLC Board of Directors, Outpatient Imaging Affiliates, LLC
Moderator
Aine Marie Kelly MD : Nothing to Disclose

Sub-Events

SSK11-01 Health Service, Policy & Research Keynote Speaker: Practice Management
Aine Marie Kelly MD (Presenter): Nothing to Disclose

SSK11-02 Opportunistic Osteoporosis Screening: Addition of QCT BMD Measurement to CT Colonography Fits a
Clinical Need


PURPOSE

For patients undergoing CT colonography, an opportunity exists for concurrent osteoporosis screening without additional radiation exposure or patient time using proximal femur quantitative CT (QCT) "CTXA". Previous studies demonstrated equivalence between CTXA and DXA for femoral neck BMD evaluation. This study aims to evaluate the addition of CTXA reporting to a CT colonography program.

METHOD AND MATERIALS

This cohort included 77 female and 59 male adults (mean age, 60.3±7.7 years; range, 50-85 years) who underwent routine CT colonography at 120kVp (GE Healthcare, Waukesha, WI) between March 2013 and March 2014 with calibration phantom on the table at the time of the scan. Areal BMD in g/cm2 of the femoral neck was measured on the CT series using QCT Pro Version 5.1 (Mindways Software, Austin, TX) with synchronous phantom calibration. QCT T-scores were derived using manufacturer's female reference data. Chart review was performed to evaluate if the patient was eligible for screening according to the USPSTF recommendations, had undergone prior BMD testing, and to determine if results of QCT changed patient management.

RESULTS

Overall, 67.6% (92/136) of patients from the cohort had not previously undergone BMD screening and 23.9% (22/92) of these patients were eligible for screening according to the USPSTF recommendations. T-scores within the osteopenic and osteoporotic were detected in 30.9% (42/136) and 4.4% (6/136) of patients respectively. Of these patients with low bone mineral density, 77.1% (37/48) had not previously undergone screening or were due for follow-up BMD testing. The reported T-score altered management in 6 patients with low bone mineral density.

CONCLUSION

In this cohort, adding BMD evaluation of the femoral neck to CT colonography allowed osteoporosis screening in patients who were eligible and had not previously undergone screening. A large proportion of patients with low bone mineral density identified had not previously undergone screening. This add-on, which does not change workflow, stands to add value to CT colonography examinations for both patients and referring providers.

CLINICAL RELEVANCE/APPLICATION

Maximizing value from the imaging currently being performed is crucial in the current era of healthcare reform. We demonstrate the ability to combine screening for both colon cancer/polyps and osteoporosis.

SSK11-03

Allergic Adverse Reactions to Gadolinium-based Contrast Agents: Experience with 194,400 Injections

Shima Aran MD (Presenter): Nothing to Disclose, Khalid Walid Shaqdan MD: Nothing to Disclose, Hani H. Abujudeh MD, MBA: Research Grant, Bracco Group Consultant, RCG HealthCare Consulting Author, Oxford University Press

PURPOSE

The use of MRI gadolinium-based contrast agents (GBCAs) is associated with the risk of allergic adverse reactions. There is high variation in the reported allergic reactions between different institutions (0.07% to 2.4%). We investigated the incidence, severity and risk factors of allergic reaction to four GBCAs at a single large academic medical center.

METHOD AND MATERIALS

IRB approved the retrospective study. Data in the electronic incident reporting system was searched between Jan-01-2007 to Jan-14-2014. These GBCAs were used: Gadopentetate Dimeglumine (Mag), Gadofosveset Trisodium (Abl), Gadoxetate Disodium (Eov) and Gadobenate Dimeglumine (Mul). The severity of the hypersensitivity reactions was classified into 3 categories of mild, moderate, and severe.

RESULTS

Of 194,400 injections, 204(0.1%) patients (mean age: 45.7±14.9) showed allergic reaction, consisted of 6/746 (0.80%), 10/3200 (0.31%), 14/6236 (0.22%) and 174/184218 (0.09%), for Abl, Eov, Mul and Mag, respectively (graph). A significant difference was found between different GBCAs regarding the total number of reactions (P<0.0001). When comparing the GBCAs, we found significant differences for Abl vs. Mag (p<.0001), Abl vs. Mul (p=0.0051), Eov vs. Mag (p<.0001) and Mag vs. Mul (p=0.0013). There was no significant difference between ages of patients receiving different GBCAs (p= 0.815). Rate of reaction was higher in females with significant difference for all GBCAs (table, p<0.0001). Significant differences were found when GBCAs were compared for emergency, inpatient, and outpatient groups (table, p<0.0001). Mild reactions were most common. There was a significant difference between GBCAs regarding the severity of reaction (p=0.0297). Significant differences were found regarding the patients outcome (table, p<0.0001), history of allergy (table, p<0.05) and different types of examinations (table, p<0.0001).

CONCLUSION

The overall rate of allergic adverse reaction in our study was 0.1%. The rates of allergic reaction to GBCAs in
SSK11-04

Contrast-induced Nephropathy in Intensive Care Units: Incidence, Outcomes, Risk Factors, and Implications for Clinical Practice

Joseph Papanikitas MBBS (Presenter): Nothing to Disclose, Mark William Little MBBS, MSc: Nothing to Disclose, Suresh Pillai: Nothing to Disclose, Steven Alderson: Nothing to Disclose, Aliki Manoras: Nothing to Disclose, David A. Lewis: Nothing to Disclose, Stuart McKechnie: Nothing to Disclose, Raman Uberoi MBChB, FRCR: Nothing to Disclose

PURPOSE

Acute Kidney Injury (AKI) is commonly seen in patients cared for in intensive care units (ICUs) and is associated with significantly increased morbidity and mortality. Moreover, patients receiving iodinated contrast agents whilst undergoing radiological investigations are at increased risk of developing AKI, which is referred to as Contrast-Induced Nephropathy (CIN). CIN has previously been investigated in patients undergoing coronary angiography. These studies have suggested that risk factors for AKI (including pre-existing renal impairment, diabetes, age, and haemodynamic instability) may also increase the risk of patients developing CIN. Despite such risk factors commonly being observed in ICU patients and these patients frequently undergoing radiological investigations using iodinated contrast, CIN has not previously been investigated in large numbers of ICU patients. We therefore undertook a single-centre retrospective observational study of CIN in ICU patients, seeking to define the incidence, risk factors, and outcomes of CIN within this cohort.

RESULTS

Our analysis included 479 scans, involving 331 patients. Univariate analyses demonstrated that male gender was associated with the development of CIN (p=0.01 for any CIN vs no CIN; X2 for trend across grades of CIN p=0.02). Lower pre-scan eGFR was associated with the development of higher grades of CIN (trend X2 p

CONCLUSION

AKI and CIN are common amongst adult ICU patients undergoing radiological procedures or investigations involving iodinated contrast. It is clear that male gender, lower pre-scan eGFR, and pre-scan oliguria are independent risk factors for renal impairment or injury post-scan. The association with male gender is a novel finding and requires confirmation in a separate cohort. Shorter time from admission to scan is also associated with the development of both CIN and AKI, and pre-scan shock is associated with the development of AKI alone. These associations may reflect inadequate patient optimisation prior to contrast administration. It is notable, that over half of the patients within this study were shocked or oliguric, or received nephrotoxic medications, prior to their scans. In addition to this, only 22% of patients received any form of CIN/AKI prophylaxis and no patients received a reduced dose of contrast. Increased efforts to prepare patients adequately, prior to investigations with iodinated contrast may result in a reduction in morbidity and mortality rates resulting from AKI and CIN.

METHODS

We completed a search of an electronic radiology database in a tertiary centre, seeking to identify radiological investigations or procedures undertaken using iodinated contrast, over a three year period (2009-2011). We manually collected data on patient demographics, ICU admission characteristics, radiological investigation/procedure (‘scan’) characteristics, together with post-scan outcome data on AKI/CIN, use of renal replacement therapy (RRT), ICU length of stay, and ICU mortality. We investigated univariate and multivariate associations with CIN and AKI.

SSK11-05

The Association between Cardiovascular Risk and CMR Measures of Fibrosis: The Multi-Ethnic Study of Atherosclerosis (MESA)


PURPOSE

Risk scores for cardiovascular disease (CVD) integrate multiple CVD risk factors in order to identify individuals likely to experience a CVD outcome, such as myocardial infarction or death. Risk score models such as Framingham incorporate factors that may also increase myocardial fibrosis, such as age, smoking, diabetes and blood pressure. We hypothesized that individuals at higher risk for CVD may also have greater indices of myocardial fibrosis as measured by cardiac magnetic resonance (CMR).

METHOD AND MATERIALS

Study subjects in the Multiethnic Study of Atherosclerosis (MESA) free from clinical cardiovascular disease at enrollment underwent CMR imaging at 1.5T at six centers. T1 times were determined a) before (native T1), b) 12 min and c) 25 min after gadolinium administration (0.15 mmol/kg) using a modified Look-Locker pulse
sequence. The correlations between the different CMR measures and extracellular volume fraction (ECV) and 14 established different cardiovascular risk scores were determined. The Generalized Additive Model (GAM) was employed to evaluate the adequacy of the linear relationships.

RESULTS

1208 subjects (men, 50.8%) ages 55-94 years old were evaluated. CVD risk scores were significantly different for men and women (p < 0.001). Of 14 cardiovascular risk scores, 10 (71%) were significantly associated with 25 minute post-contrast T1 time among men (p < 0.05). In addition, 7/14 (50%) of risk scores were significantly associated with native T1 time among men. As for women, only ECV showed significant correlations with 2/14 (14%) risk scores. Reynolds and MESA risk scores showed the most consistent agreement with CMR measures. The new AHA/ASCVD risk score showed no relationship to CMR indices of myocardial fibrosis.

CONCLUSION

Asymptomatic men with greater CVD risk by contemporary risk scores had greater CMR indices of myocardial fibrosis. These results support the use of post-gadolinium T1 time as an index of myocardial fibrosis.

CLINICAL RELEVANCE/APPLICATION

Future studies relating T1 time or ECV measurements to cardiovascular events will help to further refine the role of T1 mapping by CMR in asymptomatic individuals.

SSK11-06

Using Decision Analysis to Explore Potential Overtreatment of ARVD with ICD in Low Prevalence Population

Saurabh Jha MD (Presenter): Speaker, Toshiba Corporation, Stefan L. Zimmerman MD: Nothing to Disclose, Tessa S. Cook MD, PhD: Nothing to Disclose

PURPOSE

Arrhythmogenic Right Ventricular Dysplasia (ARVD) is uncommon, but can be fatal if undetected and the management, placement of an Implantable Cardioverter Defibrillator (ICD), is not trivial. The major and minor diagnostic criteria for ARVD include findings on cardiac MRI (CMR). The potential for overtreatment in low prevalence populations is explored.

METHOD AND MATERIALS

Bayes’ inversion tree was constructed to explore the burden of unnecessary ICDs in a hypothetical cohort of males with electrophysiological abnormalities suspected to have ARVD. Test characteristics of CMR for diagnosis of ARVD were abstracted from literature. Positive CMR was assumed to trigger placement of ICD; the assumption relaxed during sensitivity analysis. The prevalence of ARVD was varied between 0.5 % and 20 %. Trade-off between the incremental cases of ARVD detected and unnecessary ICDs placed when using minor over major criteria, was explored.

RESULTS

Sensitivity and specificity of CMR findings, for the detection of ARVD in males, representing major and minor criteria are 76 % and 90 % and 79 % and 85 %, respectively. The model postulates overtreatment when diagnosis is based on CMR findings. At prevalence of 5 %, use of major criteria results in five inappropriate ICD placements for two appropriate ICDs. In a cohort of 10,000 males suspected of ARVD use of minor instead of major criteria detects more cases of ARVD at a cost: at prior probability of one percent, 3 more cases of ARVD are diagnosed at the expense of 495 additional patients receiving unnecessary ICDs; at five percent, an additional 15 cases are detected and 475 additional ICDs unnecessarily placed; even at prior probability of twenty percent, the incremental detection of 60 cases of ARVD comes at the price of unnecessary ICD placement in an additional 400 patients.

CONCLUSION

The specter of sudden death may lead clinicians to lower their threshold for suspicion of ARVD and request CMR for exclusion of ARVD in patients at low probability of ARVD. Imagers must be aware of the potential for overtreatment when using taskforce guidelines to rule out rather than rule in ARVD.

CLINICAL RELEVANCE/APPLICATION

Overtreatment is a recognized problem in modern medicine particularly when attempting to diagnose uncommon but dangerous conditions with imperfect tests.

SSK11-07

Universal CT Dose Reduction: Should a Policy of Providing Patient Shielding Be Required?


PURPOSE

Estimates of potential cancer deaths in the United States from Computed Tomography (CT) are 1.5-2%. The effectiveness of using CT personal radiation protection is well known, however, such a policy has not yet been established. This study was designed to (1) evaluate the need for a policy to ensure lower radiation exposures to patients undergoing CT examinations and (2) evaluate the effectiveness of novel personal patient shielding as a method to reduce radiation exposure during CT procedures.
A policy was developed whereby all patients undergoing CT examinations over a 5-year time period (2008-13) were offered a novel, comfortable, reusable protective lead-free radiation shielding (RADPAD, Kansas City, KS) to protect parts of the body not included in the CT examination. Radiation monitoring of 125 patients during their CT examinations was performed under IRB approval (UNFORS, Birddal, Sweden).

RESULTS
A total of 28,715 (9,331 head, 19,384 body) CT examinations were performed during the 5-year time period. The training and expense of implementing the radiation protection material policy was minimal. Patient acceptance of the policy has been universal with no patients refusing the use of radiation protection to date. Successful radiation recordings were obtained in 112 patients (39 females and 73 males) ranging in age from 24 to 93 years. Average patient dose reductions were Brain/Sinus (60%), Abdomen (46%), Abdomen/Pelvis (45%), Chest/Cardiac (51%), CTA (43%), and extremities (77%). Thyroid shielding for abdomen and pelvis studies was of limited effectiveness because of high levels of internal scatter. Scout imaging provided relatively negligible (0.001-1.0 millirem) patient radiation exposure.

CONCLUSION
A policy of providing as much personal radiation protection as possible during CT scanning effectively reduces the overall radiation exposure to the patient. In accordance with the principle of "As Low As Reasonable Achievable" (ALARA) it appears reasonable for facilities performing CT examinations to consider a policy of providing personal radiation protection to patients undergoing CT examinations.

CLINICAL RELEVANCE/APPLICATION
A policy of offering radiation protection material to patients undergoing CT examinations has been well accepted in our study and resulted in a significant reduction in patient radiation dose.

Impact of Subspecialized Radiologic Reporting on Report Turnaround Time
Christoph Stern BA, MD (Presenter): Nothing to Disclose, Nadine Kawel-Boehm MD: Nothing to Disclose, Klemens Wittig: Employee, Euronet Worldwide, Inc, Thomas Boehm MD: Nothing to Disclose

PURPOSE
Short turnaround times of radiologic reports are essential for an optimized patient workflow and contribute to the economic success of a hospital. Subspecialized radiology aims at increasing the quality of radiologic reports but is not performed routinely in Europe. The purpose of our study was to evaluate the impact of subspecialized radiology on turnaround times of radiologic reports in our institution compared to the conventional modality based reporting approach (CT, MRI, x-ray).

METHOD AND MATERIALS
We defined the total turnaround time (tTAT) of a radiologic report as the time from confirmation of an exam till its approval. Turnaround times were extracted and calculated from the Radiology Information System (RIS) by a self-developed calculation tool within the Software RadCentre Analyzer (Transact GmbH, Hamburg, Germany). Subspecialized Radiology - musculoskeletal-, cardiac- and thoracic-, abdominal-, breast-, pediatric-, neurological imaging and interventional radiology - was introduced on January 1st 2014. Only reports were included, that were generated and approved by subspecialized senior consultants. The average tTAT over all radiologic exams and separately for the main modalities (CT, MRI, x-ray) were compared over a period of 3 months, prior to (October-December 2013; modality based reporting) and after introduction of subspecialized reporting (January-March 2014).

RESULTS
The average tTAT over all radiologic exams of subspecialized senior consultants was 10:35:44 (hh:mm:ss) from January till March 2014, compared to 12:27:54 from October till December 2013. The decrease of tTAT by an average of 1:52:10 (-15%) after introduction of subspecialized radiology was statistically significant (p

CONCLUSION
Introduction of subspecialized radiology is an effective method to reduce the turnaround time of radiologic reports for the majority of modalities. A longer follow up period is necessary to evaluate the long-term effectiveness of subspecialized reporting.

CLINICAL RELEVANCE/APPLICATION
By reducing turnaround time of radiologic reports, important clinical information will be available earlier to clinicians, facilitating immediate initiation of treatment.
Incidence and Etiology of Ionizing Radiation Misadministrations at a Tertiary Care Academic Medical Center: A Retrospective Five Year Review (Station #1)

Amichai Joshua Erdfarb MD (Presenter): Nothing to Disclose, Richard Zampolin MD: Nothing to Disclose, Judah Burns MD: Nothing to Disclose, E. Stephen Amis MD: Nothing to Disclose

PURPOSE

Considerable attention has been given to the issue of misadministrations in diagnostic imaging, however no benchmarks for monitoring such events are routinely used. Although patient identification errors have been demonstrated to contribute to such events, there is a paucity of information regarding other error sources. The purpose of this study is to determine the incidence and etiology of ionizing radiation misadministrations at a tertiary-care academic medical center in order to develop benchmarks for comparison and to identify specific factors that contribute to such events in an effort to develop appropriate remediations.

METHOD AND MATERIALS

All misadministrations of ionizing radiation from 2008-2012 were reviewed and categorized by event type (repeat examination, patient, procedure, site, and laterality errors), by whether the exam was performed in the Department of Radiology or on an inpatient unit, and by the proximate cause, for example, patient misidentification or incorrect order placement.

RESULTS

From 2008-2012, 1,819,445 exams were performed with 141 associated misadministrations, resulting in an incidence of 1:12904. Plain radiographs accounted for 70% (1:13544) of these, and CT imaging for 30% (1:11342). Patient misidentification and exam verification errors resulted in 120 (85%) of the events, however multiple less common errors, including registration errors, order errors by the referring clinician, and wristband errors, were identified and associated with certain event types. For example, of the 19 repeat exams, 8 (42%) resulted from referrer error. Additionally, certain situations seemed to predispose to error. For example, portable exams accounted for 35 (56%) of the wrong-patient events.

CONCLUSION

Multiple factors contribute to misadministrations, underscoring the need to address multiple etiologies when designing a robust quality assurance program designed to eliminate such events. Some of these errors originate outside the Department of Radiology, at the point of referral, requiring the engagement of our clinical colleagues to correct. Similarly, certain external factors, such as the location of the exam, increase the likelihood of an error occurring, highlighting the need to improve site-specific procedures in such settings.

CLINICAL RELEVANCE/APPLICATION

Multiple factors must be addressed when developing a robust quality assurance program designed to eliminate misadministrations of ionizing radiation.

The Shift in Outpatient Advanced Imaging from Private Offices to Hospital Facilities (Station #2)

Bhavik Patel MD (Presenter): Nothing to Disclose, David C. Levin MD: Consultant, HealthHelp, LLC Board of Directors, Outpatient Imaging Affiliates, LLC, Laurence Parker PhD: Nothing to Disclose, Vijay Madan Rao MD: Nothing to Disclose

PURPOSE

To study recent outpatient imaging trends in private offices and hospital outpatient departments (HOPDs) to determine if any shifting has occurred between the two. Concern has been expressed that reduced reimbursements and other factors might lead to closure of offices and a shift to higher cost HOPDs.

METHOD AND MATERIALS

The nationwide Medicare Physician/Supplier Procedure Summary Master Files for 2000-2012 were studied. All CPT codes for MRI, echocardiography, nuclear medicine, ultrasound, and CT were selected and procedure utilization rates per 1,000 Medicare beneficiaries were determined for each year. Medicare location codes identified the settings where the scans were performed.

RESULTS
Total utilization rates per 1,000 of all these exams in private offices grew rapidly from 415 in 2000 to 874 in the peak year of 2008 (+111%). The rate then declined sharply to 503 in 2011 (-42%), primarily as a result of code bundling in echocardiography in 2009, nuclear cardiac exams in 2010, and CT abdomen/pelvis in 2011. No further bundling occurred in 2012 but there was continued decline from 503 to 475 that year. In HOPDs, the total rate rose from 391 in 2000 to 523 in 2008 (+34%), followed by a bundling-related decline to 418 (-20%) in 2011. But in 2012, in contrast to what happened in offices, the HOPD rate increased from 418 to 426. The ratio of private office to HOPD advanced imaging was 1.67 in 2008, declining to 1.11 in 2012. Similar shifts away from offices and into HOPDs were quite apparent in MRI, echocardiography, and nuclear medicine, and present but less apparent in ultrasound and CT. The office-to-HOPD ratio in 2008 and 2012 were as follows in the different modalities: MRI 1.12 and 0.93; echocardiography 3.62 and 1.71; nuclear medicine 2.59 and 1.00; ultrasound 1.82 and 1.74; and CT 0.54 and 0.47.

CONCLUSION

In recent years, there has been a shift in utilization from private offices into HOPDs in MRI, echocardiography, nuclear medicine, and to a lesser extent, ultrasound and CT. This could portend a loss of access for patients to advanced imaging, and an increase in costs due to the higher reimbursements paid to HOPDs.

CLINICAL RELEVANCE/APPLICATION

Not applicable.

HPS164

Traditional Text vs. Image and Interactive Data Embedded Multimedia Enhanced Radiology Reporting: Referring Physicians’ Perceptions about Value (Station #3)

Gelareh Sadigh MD (Presenter): Nothing to Disclose, Timothy Hertweck: Vice President, IDR Medical GmbH, Cristine Kao: Employee, Carestream Health, Inc, Paul Wood BA: Director, IDR Medical GmbH, Danny Hughes PhD: Nothing to Disclose, Richard Duszak MD: Nothing to Disclose

PURPOSE

To evaluate referring physicians’ perceptions of multimedia enhanced radiology reporting (MERR) as an alternative to traditional text-based radiology reporting. MERR supplements text-based reports by embedding interactive hyperlinks to key images described in a radiology report and graphically plotting target lesion size and other changing objective findings longitudinally over time.

METHOD AND MATERIALS

Over a 2-week period in 2014, medical oncologists, radiation oncologists, neurosurgeons and pulmonologists practicing in the United States were contacted via email and asked to complete a 22-question online survey with embedded images describing and illustrating MERR. The survey included questions about physician satisfaction with current text-based radiology reporting, and their perceptions about the value of enhanced reporting.

RESULTS

194 responding physicians met inclusion criteria (84% male, mean age 47 with mean 16 years post training, and 48% from academic medical centers). Although 78% were satisfied with the current format of received radiology reports, 79% believed MERR would represent an improvement. The most commonly reported advantages of MERR were “improved understanding of radiology findings by correlating images to text reports” (68%) and “easier access to images while monitoring progression of a disease/condition” (60%). 28% of physicians had concerns regarding MERR implementation, with the most common being “too time intensive” (15%) and “the clinic workflow does not allow itself to view reports in such a fashion” (11%). 79% of physicians indicated an increased likelihood of referring patients to and recommending peers use facilities that offer MERR.

CONCLUSION

Most specialist referring physicians believe that MERR represents an improvement over current text-based radiology reporting. Most would preferentially refer patients and peers to facilities offering enhanced reporting.

CLINICAL RELEVANCE/APPLICATION

Referring physicians indicate increased value in multimedia enhanced radiology reporting (over text only) and would preferentially refer patients to facilities offering enhanced radiologist communication.

HPS165

Pre-Approval Process for Radiology Services in a Tertiary Medical Center (Station #4)

Arnon Makori MD (Presenter): Medical Advisory Board, Carestream Health, Inc, Roman Tsirkin BA: Nothing to Disclose, Ilan Shelef MD: Nothing to Disclose

PURPOSE

Escalating medical costs and ever-increasing imaging workloads require the modern day radiology department to implement a Pre-Approval Process (PAP). The principal goal of PAP is to prevent unnecessary requests for imaging studies, a process in which the radiologist plays an important role as ‘gate keeper’. The major advantages of PAP are the efficient use of imaging resources, reducing workload, curtailing expenses and improving patient care. Our medical center is a 1,100 beds academic tertiary care hospital. Our radiology department performs more than 300,000 studies a year. PAP was implemented in our radiology department in
To understand its full impact we evaluated its overall performance metrics, and how they affect the departmental workflow.

**METHOD AND MATERIALS**

Our PAP workflow is fully integrated into our state-of-the-art RIS. Radiology Orders (RO) are computerized and are sent using an ordered entry module. Our departmental policy mandates PAP for RO requesting predefined studies: US, CT and MR. RO are manually added to a special PAP worklist, reviewed by our radiologist and are either Approved, Denied or Suspended pending further information. Our evaluation is Institutional Review Board exempt. Using our RIS database we collected and analyzed the RO that required Pre-Approval during 2013 for inpatients and the Emergency Department (ED). The ratio of Pre-Approved Radiology Orders (PARO) was calculated as the number of PARO divided by the number studies. Similarly, Denied Radiology Orders ratio (DRO) was calculated.

**RESULTS**

During 2013 the total number of Pre-Approved Radiology Orders (PARO) was 21,409. The total number of studies (US, CT and MR for inpatients and ED) was 40,622. Overall PARO ratio was 56%. Overall Denied ratio was 2%. MR was the modality with the highest PARO ratio of 116% and a Denied ratio of 10%. US had a PARO of 91% and a Denied ratio of 4%. CT had the lowest PARO and Denied ratios of 43% and 2% respectively.

**CONCLUSION**

The Pre-Approval Process is successfully integrated into our departmental workflow and plays an important role in the efficient management of our imaging resources.

**CLINICAL RELEVANCE/APPLICATION**

Pre-Approval Process (PAP) will become a key task and an integral part of the modern radiology department. Radiology and Healthcare policy makers should be aware of the advantages of PAP and understand its potential for improving the efficiency of the departmental workflow.

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**HPS166**

Development of Radiological Expertise—A Visual Tracking Experiment do the Radiologists’ Eyes See what their Brains Ought to See? (Station #5)

Padmini Gopalan MBBS (Presenter): Nothing to Disclose, Amaka Offiah MBBS, PhD : Nothing to Disclose

**PURPOSE**

Visual tracking, by demonstrating 1) how visual knowledge is acquired over time and 2) which visual information is useful for decision-making will allow a dramatic reduction in the time taken to train novice analysts and increase the efficiency of practicing experts. Track development of expertise during training and identify critical interventions. Modify the training programme as indicated.

**METHOD AND MATERIALS**

Radiologists of different years of experience, speciality radiologists will be assessed. Phase 1 study consisted of a computerised experimental task to confirm that abnormalities can be identified from images in a manner consistent with clinical practice. 150 paediatric musculoskeletal radiographs (133 abnormal, 17 normal) were selected and classified into easy, medium and difficult. Participants were given six options as to how confident they felt about the presence/absence of an abnormality. If there were abnormalities they were asked to click the position(s) on the image. Distance from the centre of the identified abnormality was used to score performance

**RESULTS**

So far, accuracy was higher and location error lower amongst consultants than trainees. On average the consultants were faster than the novices to make their initial decision about the presence of an abnormality (14.1 sec Vs 18.9 Sec), made fewer incorrect abnormality identifications (0.2 Vs 0.5) and were more accurate at locating an abnormality (average distance to centre of reference location 23.6 pixels Vs 55.9).

**CONCLUSION**

The consultants showed a quicker decision time but longer location time, suggesting that having identified an abnormality, they double check the review areas. This is something that Phase 2 of the study will reveal.

**CLINICAL RELEVANCE/APPLICATION**

Radiologists must detect subtle fractures that indicate the abuse has taken place. A previous ROC study states that in suspected abuse, diagnostic accuracy of fracture detection was generally low and appeared to be affected more by observer related factors. 2005 UK consultant radiologists’ survey showed significant dissatisfaction with the training and service provided at that time. There is potential to increase numbers of radiology child abuse experts by 27% if given improved training and support. How expert levels of performance manifest in different eye movement patterns and decision times can be studied in view of implementing in teaching.

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**HPE010-b**

Biostatistics for Radiologists: Top Ten Concepts That We Want to Know but Are Afraid To Ask (hardcopy backboard)

Michael Hayden Rosenthal MD, PhD (Presenter): Nothing to Disclose, Atul Bhanudas Shinagare MD : Nothing to Disclose, Fiona Mary Fennessy MD, PhD : Nothing to Disclose, Katherine Margaret Krajejski MD : Research Grant, General Electric Company Spouse, Employee, Ironwood Pharmaceuticals, Inc, Nikhil H. Ramaiya MD : Nothing to Disclose

**TEACHING POINTS**
1. Basic biostatistics can be understandable and accessible when a few fundamental concepts are kept in mind. 2. Awareness of these basic concepts is critical to understanding the literature and publishing research, as illustrated through case examples. 3. A structured approach to describing the research question, characterizing the nature of the data, and performing a few preliminary tests can provide a clear understanding of which test to use in most situations.

TABLE OF CONTENTS/OUTLINE
1. Overview of basic biostatistical concepts, including data types (binary, categorical, ordinal, and interval variables), normality, and basic statistical tests. 2. How to choose a statistical test - review of the key concepts (e.g. dependent and independent variables, parametric vs. nonparametric tests) that are seen on statistical testing guides. 3. Case examples of common statistical tests, including chi-squared tests for categorical variables, t-tests and Wilcoxon rank sum tests for grouped interval data, and Kappa for interreader agreement. 4. Case examples from our biostatistics curriculum demonstrating common pitfalls in choosing or interpreting statistical tests. 5. Knowing when and how to consult a biostatistician - key issues such as data transforms, repeated measures, interactions, and nonlinear effects that often warrant expert advice.

HPS-WEB

Health Services Wednesday Poster Discussions

Scientific Posters

Assessing the Gap in Female Authorship in Radiology: Trends Over the Past Two Decades (Station #1)

Teresa I-Han Liang MD (Presenter): Nothing to Disclose, Cathy Zhang: Nothing to Disclose, Rohan Khara: Nothing to Disclose, Alison Clare Harris MBChB: Nothing to Disclose

PURPOSE

In the past twenty years, the number of women entering and working in the medical profession has been increasing. However, a question has been raised whether this is reflected in the representation and growth of female radiologists. The purpose of this study is to quantify the presence of female authorship within prominent radiology literature, and to determine if the proportions have changed over the last two decades.

METHOD AND MATERIALS

A comprehensive search was conducted for all articles in 1993, 2003 and 2013 from two prominent radiology journals: Radiology and American Journal of Roentgenology (AJR). Research studies, case reports, review articles and pictorial essays were included in this study. The gender of first and last authors and the continent where the paper was written were collected. Names with only initials or gender that remained uncertain after an Internet search were excluded. Chi squared tests were used for statistical analysis and p<0.05 was considered significant.

RESULTS

Between 1993 and 2013, the representation of female authorship in both journals increased in a total of 2341 articles. In Radiology, a significant increase from 16.5% to 30.4% in first authorship, and 12.1% to 19.2% in last authorship was determined (p<0.0001, p=0.004, respectively). Similarly, in AJR, a growing trend of women in first and last authorship was demonstrated, with growths from 20.7% to 27.2% and 17.5% to 23.5% respectively (p=0.045, p=0.051). 13.9% (326/2341) and 12.1% (285/2341) of authors' genders were indeterminate after an Internet search and were excluded. The majority of articles were written in North America.

CONCLUSION

Although there has been an increase in female authorship in radiology literature, women continue to remain a minority within academic journals.

CLINICAL RELEVANCE/APPLICATION

While women are becoming more prominent within radiology literature, they continue to remain a minority in relation to their counterparts. This is an opportunity to identify barriers impeding female radiologists globally from pursuing academic radiology, and to initiate a campaign to increase female presence in radiology literature in the future.

Radiology Resident Usage of the American College of Radiology Appropriateness Criteria (Station #2)

James Ryan Hogan MD (Presenter): Nothing to Disclose, Mina L. Labib MD: Nothing to Disclose, Justin Alpert MD: Nothing to Disclose, Judith Korek Amorosa MD: Nothing to Disclose
PURPOSE
The purpose of this study is to investigate the extent to which radiology residents use the American College of Radiology Appropriateness Criteria (ACR AC) to research proper imaging choices during training.

METHOD AND MATERIALS
An online survey was created to assess the resources that radiology residents use to research appropriate imaging studies. After gathering demographic information, the survey asks how often respondents disagree with the imaging test ordered and recommend a better imaging test, the resources that respondents most frequently use to research optimal imaging modalities, whether respondents are aware of the ACR AC, how frequently respondents refer to the ACR AC, how respondents first learned of the ACR AC, and whether respondents use the ACR AC in preparing for journal club and conference.

RESULTS
31.8% of respondents disagree with the imaging test ordered at least 25% of the time, and 37.5% of respondents recommend a better test “most of the time” when disagreement occurs. Nearly all respondents are aware of the ACR AC. 40.7% of those surveyed report using the ACR AC a few times per month, with 37.2% using it a few times per year. 8.3% of junior respondents ranked the ACR AC among their most frequently used resources, compared to 30.4% of senior respondents. 41.2% of respondents first learned of the ACR AC through an attending physician, 16.5% learned of it from another resident, and 5.9% learned of the resource from their program director. 16.7% of respondents use the resource in preparing for journal club, and 28.9% use it in preparing for conference.

CONCLUSION
Disagreement with ordered imaging tests and the recommendation of better tests is common among respondents. Moreover, nearly all respondents are aware of the ACR AC. However, they access the ACR AC infrequently. Moreover, junior respondents are less likely to utilize the resource than are senior respondents. Finally, only a small minority of respondents learned of the ACR AC from their program director, and relatively few respondents utilize the resource in preparation for journal club and conference. These findings suggest that greater efforts are required to encourage use of the ACR AC early in residency, especially by program directors.

CLINICAL RELEVANCE/APPLICATION
The American College of Radiology Appropriateness Criteria is an evidence-based resource that can enhance radiology resident education and reduce the number of suboptimal imaging tests ordered.

Developing a Heuristic Score for Resident Selection (Station #3)

Lawrence Cabusora MD (Presenter): Nothing to Disclose, Judah Burns MD: Nothing to Disclose, Mordecai Koenigsberg MD: Nothing to Disclose

PURPOSE
The NRMP Match program requires each residency program to rank candidates in the program’s order of preference. Established methods of ranking residents are time- and effort-intensive, operate by an irreproducible process, and are subject to bias at multiple levels, often by design. A heuristic scoring model is introduced, offering an adjunct to decision-making, that streamlines and objectifies the process of resident ranking.

METHOD AND MATERIALS
Candidates were rated on a 0-5 scale on each of seven components: USMLE score, medical school attended, medical school grades, research, professionalism, initiative, and sociability. Component rating was performed on the day of interview, but, to minimize cross-list bias, the ratings were not converted to a score at that time. After completion of the Match rank list via the classical method, the candidate ratings were summed into a score. The candidates were sorted by score, and the resulting order was compared with the classical rank list via rank correlation coefficient analysis.

RESULTS
78 candidates were evaluated. In the comparison of the classical rank list vs. the score ordering, the Kendall tau-b equaled 0.74, an indication of strong positive rank-correlation. The distribution of individual absolute deviations between the classical rank list ordering vs. the score ordering was as follows: 0-5=42%, 5-10=28%, 10-15=19%, 15-20=6%, >20=4%.

CONCLUSION
Scores generated by a parsimonious model framework using easily-apprehended individual ratings (more reproducible than classical evaluations) are well-rank-correlated with results obtained via the laborious classical method. Further model refinement is desirable and possible, although caution is advised to avoid overfitting the extant data at the cost of predictive validity.

CLINICAL RELEVANCE/APPLICATION
A heuristic scoring model for the evaluation of residency candidates offers an efficient, objective adjunct to a radiology program’s ranking process for the NRMP Match.

Initiating the Critical Findings Pathway: The Need for Inclusive Radiology Reporting (Station #4)

HPS169

HPS170
Differences in Knowledge and Skills used for Interpretation of Radiologic Volume Datasets Compared to 2D Images (Station #5)

Anouk Van Der Gijp MD, PhD (Presenter): Nothing to Disclose, Cecile Ravesloot MD: Nothing to Disclose, Josephine Huige: Nothing to Disclose, Irene van der Schaaf: Nothing to Disclose, Koen L. Vincken PhD: Nothing to Disclose, Jan P.J. van Schaik MD, PhD: Nothing to Disclose, Marieke Van Der Schaaf: Nothing to Disclose, Olie Ten Cate: Nothing to Disclose

PURPOSE

In current practice radiologists interpret digital images, including a substantial amount of volume datasets. We hypothesize that interpretation of volume datasets demands different cognitive skills than the interpretation of two-dimensional (2D) cross-sectional images. This study aims to investigate and compare the cognitive processes occurring during interpretation of volume datasets versus 2D images.

METHOD AND MATERIALS

Twenty radiology clerks of a Dutch university medical center were asked to think aloud while reading four to five volume CT datasets and 2D CT images (a selection of cross sectional slices). Cases were presented using a digital program, that allows for volume dataset viewing in different planes and contrast settings. Participants were asked to formulate a (differential) diagnosis. Thoughts verbalised by the subjects were registered and coded by a previously constructed framework of sixteen knowledge and skill elements, arranged in three main components: perception, analysis and synthesis (the latter includes generating a differential diagnosis and giving advice). A within-subject analysis with Friedman and Wilcoxon Signed Rank tests was performed to compare knowledge and skills used during volume dataset readings versus 2D readings.
RESULTS

In general, most of the utterances concerned perceptual knowledge and skills (46%). A smaller part involved synthesis (31%) and analysis (23%). During the interpretation of volume datasets, the largest part of utterances was perceptual (50%), which was significantly larger than in 2D image interpretation (37%), χ²=16.2, p<.001, T=1, p<.001. In contrast, during 2D image interpretation, synthesis represented the largest part of utterances (41%), significantly larger than in volume dataset interpretation (26%), χ²=16.2, p<.001, T=1, p<.001. No significant differences were found in the proportion of analysis during volume dataset and 2D image interpretation (22% and 23% respectively).

CONCLUSION

Volume dataset interpretation draws predominantly on perceptual processes while 2D image interpretation is mainly characterised by synthesis.

CLINICAL RELEVANCE/APPLICATION

The results encourage the use of volume datasets for teaching and testing perceptual skills, while 2D images of cross sectional studies could be sufficient for educational purposes concerning the ability to generate a differential diagnosis or give advice.

SPHA41

Hospital Administrators Symposium

Special Courses

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AMA PRA Category 1 Credits ™: 3.25
ARRT Category A+ Credits: 3.50
Wed, Dec 3 1:30 PM - 4:45 PM   Location: S103AB

Participants

Moderator
Jonathan W. Berlin MD: Stockholder, Nuance Communications, Inc Radiology Advisory Board, Nuance Communications, Inc

LEARNING OBJECTIVES

1) Understand ongoing key changes to the Resource Based Relative Value System (RBRVS) as they pertain to radiology. 2) Explore the concept of radiology co-management from the perspective of a radiologist and a hospital CEO. 3) Consider one method for value based incentive compensation of radiologists using quality metrics. 4) Learn new ways to approach specialty management companies. 5) Examine changing radiology employment models.

ABSTRACT

As the health care economic environment evolves, collaboration between radiology departments and hospitals will continue to increase in importance. The Wednesday afternoon Hospital Administrators' Seminar is designed to explore new ways to increase radiology department and hospital teamwork. Six speakers will cover a broad range of topics including an update on the RBRVS system, radiology and hospital co-management, dealing with specialty management companies, changing radiology employment models, and moving radiology into the world of value based compensation. Both healthcare administrators and healthcare providers at all levels of training and seniority and encouraged to attend.

Sub-Events

SPHA41A  Introduction
Jonathan W. Berlin MD (Presenter): Stockholder, Nuance Communications, Inc Radiology Advisory Board, Nuance Communications, Inc

LEARNING OBJECTIVES

View learning objectives under main course title.

SPHA41B  Medicare RBRVS Update: Where Do We Go From Here?
Ezequiel Silva MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

SPHA41C  Radiologists Are from Mars, Radiology Benefit Managers Are from Venus: Secrets of Dealing with Radiology Benefit Management Companies
Mark D. Hiatt MD, MBA (Presenter): Medical Director, Regence BlueCross BlueShield Board Member, RadSite Former Chief Medical Officer, HealthHelp, LLC
LEARNING OBJECTIVES

1) Define the terms related to managing radiology benefits. 2) Delineate the relationships related to this management. 3) Discuss the interventions radiologists may pursue to improve their relationships with benefit managers.

SPHA41D  Changing Relationships in Radiology
David J. Seidenwurm MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

SPHA41E  Question and Answer 1
Jonathan W. Berlin MD (Presenter): Stockholder, Nuance Communications, Inc Radiology Advisory Board, Nuance Communications, Inc, Mark D. Hiatt MD, MBA (Presenter): Medical Director, Regence BlueCross BlueShield Board Member, RadSite Former Chief Medical Officer, HealthHelp, LLC

LEARNING OBJECTIVES

View learning objectives under main course title.

SPHA41F  Radiology and Hospital Co-Management: A Roadmap for the Future
Syed Furqan Zaidi MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

SPHA41G  Radiology Co-Management: The Hospital CEO Perspective
Christopher E. Remark (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

SPHA41H  Moving Radiology Toward Value Based Compensation
Kenneth A. Buckwalter MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the transition from fee for service to value based purchasing. 2) Define "value". 3) Learn how to differentiate process from quality metrics. 4) Describe how to create a "value matrix".

SPHA41I  Question and Answer 2

LEARNING OBJECTIVES

View learning objectives under main course title.

SSM12

ISP: Health Service, Policy & Research (Education)

Scientific Papers

AMA PRA Category 1 Credits™: 1.00
ARRT Category A+ Credit: 0

Wed, Dec 3 3:00 PM - 4:00 PM  Location: S102D
The Effects of Spacing in Radiology Instruction: Are Orderly Lectures Really Better than Messy Case Conferences?

Anna Rozenshtein MD (Presenter): Nothing to Disclose, Gregory D. N. Pearson MD, PhD: Nothing to Disclose, Sherry Yan: Nothing to Disclose, Andrew Zhangyanchu Liu BS: Nothing to Disclose

PURPOSE
Radiology curricula are based on lectures, typically with uninterrupted repetition (massing) of similar cases. Educational research reveals that spacing intellectual activity by mixing (interleaving) items-to-be-learned leads to better recollection of items already seen as well as better induction (pattern recognition). We compare the effectiveness of massed vs. interleaved methods of teaching chest x-ray interpretation.

METHOD AND MATERIALS
After IRB approval, we recruited 40 medical students (average age 23, 33% women, 60% in the first and 40% in the second year of training) without formal radiology training, and randomized them into two groups matched in age, gender, and year of training. Each group was shown a recorded presentation with six examples each of normal radiograph, bronchiectasis, miliary disease, pneumothorax, lung mass, emphysema, pleural effusion, pneumonia, atelectasis, congestive heart failure, pulmonary fibrosis, and mediastinal mass, each with an independent voiceover imbedded with the slide. At the start both groups saw six consecutive normal chest radiographs. The "massed" group saw the remaining 66 images in 11 consecutive blocks, each consisting of six images of the same disease entity. The "interleaved" group saw the same images in three blocks of 22 randomized images (two images of each pattern per block) to avoid repeating diseases by chance. After a distracting activity and a snack, a multiple choice test with 24 chest x-rays, two in each pattern, was administered. One of these images was previously shown, testing recollection. The other was new, testing induction. Statistical analysis was performed using Student's t-test of proportion.

RESULTS
The average test score was 47.4% ± 21.8% for women and 51.4% ± 18.6% for men (p = 0.58), 39.1% ± 14.4% for the first year and 66.7% ± 13.3% for the second year students (p = 0.000000592). The interleaved group scored overall 57.1% ± 17.1%, compared to the massed group 43.1% ± 19.7% (p = 0.03). Comparing the interleaved and the massed groups, average scores on recall were 61±17.5% vs 46.7± 18.8% (p = 0.03) and on induction 53.3±20.8% vs. 40.4±23.4% (p=0.1).

CONCLUSION
Interleaving different pathologies in a short medical student training session led to improved image recognition compared to the massed method.

CLINICAL RELEVANCE/APPLICATION
In a short training session mixing, rather than massing teaching cases led to better learning of radiographic patterns of disease.
As first-year residents, the cohort (n=36) interpreted a total of 24,932 radiographs during their MSK subspecialty rotations. While taking second-year call, they interpreted a total of 16,269 MSK radiographs, of which >70% were peripheral extremity (wrist, hand, ankle, foot) and large joint (hip, knee, shoulder, elbow) cases. The highest quartile first-year residents interpreted a mean of 1182 cases each, versus 599 studies for the lowest quartile (p<0.000001). The on-call discrepancy rate for peripheral extremities was 12.2% in the highest quartile and 18.6% in the lowest quartile (p = 0.011). The discrepancy rate for large joints was 10.6% in the highest quartile vs. 17.5% in the lowest quartile (p = 0.002). No statistically significant difference were seen in the other skeletal categories.

CONCLUSION

First year radiology residents who reviewed the most MSK radiographs on rotation have up to one third lower total discrepancy rates than their peers when taking independent call the following year.

CLINICAL RELEVANCE/APPLICATION

Radiology residents may significantly improve their interpretations of on-call MSK radiographs by maximizing volume of interpreted radiographs during their first-year MSK subspecialty rotations.

SSM12-04

Integrating Ultrasound into the Medical School Anatomy Curriculum

Gerald J. Tan MBBS, FRCR (Presenter): Nothing to Disclose, Dinesh Kumar Srinivasan MBBS, PhD: Nothing to Disclose, Cher Heng Tan MBBS, FRCR: Nothing to Disclose, Kum Ying Tham MBBS: Nothing to Disclose

PURPOSE

The teaching of anatomy in medical school has changed little since the days of cadaveric dissection and anatomical pots. Clinical medicine, on the other hand, has rapidly evolved to use advanced imaging techniques such as ultrasound. Nonetheless, ultrasound training remains haphazard or even non-existent outside radiology, particularly at the medical school level.

METHOD AND MATERIALS

We worked with our affiliated medical school to review the established curriculum, and identified key areas where ultrasound would add value to traditional teaching methods. We decided to embed ultrasound into the preclinical years using hands-on practical sessions, with the aim of building a deeper understanding of human structure and function, and providing students with an introduction to clinical ultrasound. The ultrasound curriculum consisted of 8 practical sessions over the 2 pre-clinical years. This consisted of an Introduction to Ultrasound, followed by 7 clinical sessions entitled Cardiac, Bladder, Shoulder, Hepatobiliary, Renal, Neck and Pelvic Ultrasound. A combination of ultrasound phantoms and standardized volunteers was used. Each session lasted 4 hours, with 6 students per machine, to allow for maximum hands-on experience.

RESULTS

In order to assess knowledge retention, sonographic images were included in the anatomy practical assessments. Student scores for these questions showed good correlation with final scores and good item discrimination, with point biserial correlation coefficients from 0.37 to 0.61. We also conducted an anonymous course evaluation using a 5-point Likert scale on a range of questions. The results were overwhelmingly positive, with mean scores of 4.45 to 4.86 on a 5-point Likert scale, and more than 88.7% of respondents answering “Agree” or “Strongly Agree” to all questions.

CONCLUSION

The medical students were able to use ultrasound to appreciate living anatomy and real-time physiology, thus increasing the clinical relevance of the basic sciences and improving knowledge retention. This also served as an early introduction to radiologists as the pre-eminent practitioners of imaging, and provided them with foundational skills in ultrasound.

CLINICAL RELEVANCE/APPLICATION

Integrating ultrasound into the medical school curriculum provided students with a deeper understanding of human anatomy and function, as well as an introduction to basic ultrasound technique.

SSM12-05

Evidence Based Development of a High-fidelity Simulation Team Training Program for Contrast Reaction Management


PURPOSE

To develop and implement an evidenced based high-fidelity simulation team training program for contrast reaction management (CRM) and teamwork skills (TS) and compare it to our standard curriculum of computer-based simulation training and didactic lecture for radiology residents, nurses and technologists.

METHOD AND MATERIALS

IRB approved HIPAA compliant study of 12 residents, 13 nurses and 15 technologists who were randomized to hands-on (HO) or computer-based (CB) training. In the HO group a resident, nurse and tech trained together as
a team to manage different contrast reactions using high-fidelity simulation scenarios and practicing specific teamwork skills based on TeamSTEPPS® (Team Strategies and Tools to Enhance Performance and Patient Safety). In the CB group each completed a computer-based simulation program on CRM and watched an online video on team skills. Eighteen HO (6 of each type) and 12 CB (6 residents, 4 nurses and 2 techs) completed the training. Both groups completed written tests on CRM and TS skills before and after the intervention and responses were compared using the Mann-Whitney test. Changes in scores were tested against no change using the Wilcoxon signed-rank test.

RESULTS

No statistical difference existed between the pre-test scores of the CB (65.6 ± 16.5) and HO groups (66.7 ± 19.9) (p=0.73) or the immediate post-test scores (CB=79.0 ± 14.4, HO=79.6 ± 16.7) (p=0.69), although both groups improved after the intervention.

CONCLUSION

Our novel high-fidelity simulation team training program was able to teach both contrast reaction management and teamwork skills and was well accepted by the trainees. HO was comparable to CB at training CRM and may be more effective than CB training for teamwork skills.

CLINICAL RELEVANCE/APPLICATION

Medical teams rarely treat contrast reactions. Suboptimal teamwork threatens patient safety. High-fidelity team simulations teaching CRM and teamwork skills improve patient safety.

Does Quality and Completeness of Reported Systematic Reviews and Meta-analyses Published in High Impact Radiology Journals Correlate with Citation Rates?

Christian Balthasar, Van Der Pol MD (Presenter): Nothing to Disclose, Matthew Donald Fernand McInnes MD, FRCPaC: Nothing to Disclose, William Petrich MSc: Nothing to Disclose, Adam Scranton Tunis MD, MSc: Nothing to Disclose, Ramez Hanna MD: Nothing to Disclose

PURPOSE

The purpose of this study is to determine whether study quality and completeness of reported systematic reviews (SR) and meta-analysis (MA) published in high impact factor (IF) radiology journals correlate with citation rates.

METHOD AND MATERIALS

All SR and MA published in English between Jan 2007 - Dec 2011, in radiology journals with an IF >2.75, were searched on Ovid MEDLINE using the modified Montori method. The full text articles were retrieved and reviewed by two investigators. Following this, the Assessing the Methodologic Quality of Systematic Reviews (AMSTAR) checklist for study quality, and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist for study completeness, was applied to each SR and MA independently by each observer. All discrepancies were resolved by consensus. Inter-observer agreement was calculated using the Kappa coefficient. Each SR and MA was then searched in Google Scholar to yield the number of citations. A citation rate, defined as citations/month post-publication, was calculated for each SR and MA. Pearson correlation coefficients were used to assess the relationship between both AMSTAR and PRISMA results with citation rate, and journal 5-year IF with citation rate.

RESULTS

129 studies from 11 journals were included (50 SR and 79 MA). Average AMSTAR score was 7.2/11 and average PRISMA score was 21.9/27, with moderate-to-significant respective inter-observer agreement; K = 0.69 and 0.57. SR and MA ranged from 0.03-3.8 citation/month post-publication, with a mean of 0.91. There was moderate positive correlation between journal 5-year IF and SR and MA citation rate (R=0.46). Similar correlation was observed with both AMSTAR and PRISMA scores and SR and MA citation rate; R= 0.28 and 0.30 respectively.

CONCLUSION

The results confirm that there is a correlation between the journal 5-year IF and individual article citation rate. Furthermore, there is a positive correlation between the quality of an SR or MA and the completeness of its reporting with citation rate.

CLINICAL RELEVANCE/APPLICATION

Higher quality and more thoroughly reported SR and MA have higher citation rates. This reinforces the importance of complete reporting and following publishing guidelines for authors of SR and MA.
LEARNING OBJECTIVES

1) Identify changes in the relationship between hospitals and radiologists. 2) Learn about different models of radiology practice including employed, academic, private practice and their different relationships with hospitals. 3) Learn about evolving practice models for hospital based radiologists including co-management, pay for performance structures, and hybrid relationships in academic centers. 4) Learn about evolving compensation models away from traditional fee for service, including bundling, ACO's, and at-risk contracts.

ABSTRACT

The healthcare landscape in the US is changing rapidly with the pressures of healthcare reform and rising costs forcing consolidation and changes in relationships between hospitals and radiologists. Hospitals are looking for alignment with both their employed and private practice radiologists. Radiology groups are under additional pressures of competition within radiology between private practice, academic and national corporate radiology groups in a landscape of declining reimbursement and pressures on the traditional fee for service business model. This session aims to address ways that different types of radiology groups are facing the changing landscape. There will be different models presented including employed, academic, and private practice models. There will be examples presented on different contractual relationships evolving from the traditional exclusive radiology services contract including co-management and pay for performance structures. There will also be discussion of compensation models that may evolve within ACOs and other structures that hold providers accountable for the total cost of care.

RC632
Value-Added Initiatives for a Healthcare System

Refresher/Informatics

LM  HP  ML

AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50
Thu, Dec 4 8:30 AM - 10:00 AM   Location: S404AB

Sub-Events

RC632A Understanding Total Value Creation in Radiology
Richard Elliott Heller MD (Presenter): Consultant, Gerson Lehrman Group, Inc

LEARNING OBJECTIVES

1) Understand the difference between interpretive value and non-interpretive value and the concept of the Total Value Equation. 2) Understand how to illustrate where on the Operations Frontier Curve your practice or department wishes to place itself, and where you think you actually are. 3) Based on the above two objectives, be able to identify potential areas of improvement in your staffing model. (This course is part of the Leadership Track)

ABSTRACT

The term ‘value’ is popular in health care, and while universally understood to be critical to success, it is also a concept that is complex and can be challenging to evaluate. This talk analyzes the idea of value and value creation in the radiology department, and uses the Total Value Equation as a framework to deconstruct the activities of the department into interpretive and non-interpretive. By understanding these ideas, the radiology practice leader is better able to manage their resources and maximize their value production.

RC632B Imaging Informatics
Keith J. Dreyer MD,PhD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Develop an understanding of the essential Informatics skills required for a leader to be successful. 2) Develop an understanding of the common Informatics errors made by leaders in academic and private practices. 3) Acquire the skills of Informatics planning needed to ensure that the success of your organization is sustainable over time. (This course is part of the Leadership Track)

RC632C Radiology’s Impact on the Hospital’s Bottom Line
Bernard F. King MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Identify methods to derive meaningful financial and clinical metrics and analytics demonstrating how Radiology contributes to the bottom line (tangible added value). 2) Developing departmental dashboards supporting HealthCare system balanced score cards etc. 3) Identify methods for improving imaging report turn around times to support initiatives to decrease hospital length of stays thus improving bottom line. (This course is part of the Leadership Track)
HPS-THA

Health Services Thursday Poster Discussions

Scientific Posters

AMA PRA Category 1 Credits ™: .50
Thu, Dec 4 12:15 PM - 12:45 PM  Location: HS Community, Learning Center

Participants
Moderator
Aine Marie Kelly MD : Nothing to Disclose
Moderator
James Vincent Rawson MD : Nothing to Disclose

Sub-Events

HPS172 Developing Curricula for Teaching MRI Safety and MRI/CT Contrast Safety To Residents: How Effective Are Live Lectures and Online Modules? (Station #1)

Jordan K. Swensson MD (Presenter): Nothing to Disclose, Benjamin Lloyd Rase MD : Nothing to Disclose, Brian Lane McMahan MD : Nothing to Disclose, Bilal Tahir MD : Nothing to Disclose, Darel Edward Heitkamp MD : Nothing to Disclose

PURPOSE
The advent of the diagnostic radiology Core Exam and the new ACGME Milestone evaluation system for radiology residents places new emphasis on topics in MRI safety and MRI and CT contrast agents. This change gives residency programs the opportunity to develop new curricula to help their residents succeed in this new environment. We evaluated whether lecture-based teaching or online modules would improve baseline resident knowledge in these areas, and assessed which intervention was more effective.

METHOD AND MATERIALS
Prior to didactic intervention, two cohorts were created from 57 radiology residents with equal numbers and matched level of training. The residents were tested on their baseline knowledge of general MRI safety, MRI contrast safety, and CT contrast safety with a multiple-choice examination consisting of 42 questions divided equally among the topics. Additional questions evaluated the residents' subjective comfort in these fields. One group attended a live, one hour lecture on the above topics. The other engaged in three short, online educational modules. After one month, the residents were again tested with the same questions to assess for improvement in their understanding and/or comfort level.

RESULTS
Both the module and lecture cohorts demonstrated a statistically significant increase in questions answered correctly on CT contrast safety (13.1%, p<0.001, and 19.1%, p<0.001 respectively) and on MRI safety/MRI contrast safety (12.9%, p<0.001, and 14.4%, p<0.001). The pre-intervention and post-intervention scores, and degree of improvement post-intervention was similar for the module vs lecture groups without statistical difference (p=0.70). Resident confidence improved in both groups for both modalities.

CONCLUSION
Focused didactic intervention improves resident knowledge on issues of general MRI safety and MRI and CT contrast agents. Live lectures and online modules can be equally effective tools, allowing residency programs flexibility.

CLINICAL RELEVANCE/APPLICATION
Live lectures and online modules are equally effective tools for increasing resident knowledge of MRI safety and MRI and CT contrast safety allowing flexibility for residency program curricula.

HPS173 Patient Perception and Understanding of Radiation in Diagnostic Imaging (Station #2)

Joseph R. Steele MD (Presenter): Consultant, INTIO, Inc Stockholder, INTIO, Inc Stockholder, Intelligic, Inc Stockholder, MedicaSafe, Inc Consultant, Adient Medical Inc Stockholder, Adient Medical Inc Consultant, Edumedics LLC Stockholder, Edumedics LLC, A. Kyle Jones PhD : Nothing to Disclose, Stowe Shoemaker PhD : Nothing to Disclose

PURPOSE
We were interested in developing tools and processes for educating patients about radiation exposure and the risks and benefits of medical imaging. Developing these tools and processes requires an understanding of the knowledge of patients regarding ionizing radiation. We designed a survey to measure patients' knowledge about the use of ionizing radiation in medical imaging.

RESULTS
5462 patients completed the initial survey, having undergone a mean of 6.4 imaging studies in the last year at our institution. Over 2,000 competed the non-responder survey. Reasons provided for visits included to check for disease recurrence (41%) and evaluate treatment response (23%). Only 22% of patients could define ionizing radiation. 27% of patients responded that radiography did not involve exposure to ionizing radiation while 30% responded that MRI did. Only 36% of patients believed that CT exposed them to ionizing radiation, and no more than 36% of those surveyed responded affirmatively to any modality that uses ionizing radiation.
When asked to identify the medical imaging exam that delivered the highest radiation dose from a list of exams (chest x-ray, chest CT, whole body PET, NM bone scan, abdomen MRI, none), only 50% responded but the highest fraction correctly identified whole body PET. 22% of patients reported that they were ‘Not concerned at all’ about radiation exposure, while 13% reported being ‘Very concerned’. Most patients answered that the risks from medical imaging were small. Most agreed with the statement ‘I am willing to accept the risks associated with radiation exposure because I want a less invasive test that provides quick answers,’ and most perceived the studies they received to be valuable in treating their condition (95%). Only 3% of patients were informed of the radiation dose from their most recent imaging study, however, only 55% of patients wanted to be informed. Only 21% of patients reported that a doctor had discussed the risks and benefits of their most recent imaging study, and 40% said they would have the exam regardless of the risk/benefit ratio. Patients did not understand the risks of imaging, believing risks from CT included heritable mutations (12.2%), sterility (23.5%), and acute radiation sickness (12%). When asked how they would behave if another hospital nearby began advertising ‘low dose’ CT scans at the same cost as our institution, only 7% of patients reported that they would have their imaging performed at the outside facility, 57% would continue to have their imaging performed at our institution, and 36% would ask their doctor what they should do.

CONCLUSION

Most patients do not know what ionizing radiation is, and therefore poorly understand radiation risks. Patients believe that the studies they undergo offer a benefit that is large compared to the risk, and as providers we owe it to them to ensure this is the case. We cannot hope to effectively educate patients about radiation without understanding their current knowledge level. Our survey, the largest of its kind, indicates that we currently overestimate the knowledge of our patients about radiation. Using the information learned in this survey, we can target our educational efforts to have the highest impact on patient education. Better education leads to more accurate expectations, which translates into better decisions and a better patient experience.

METHODS

We developed a 25 question survey that was distributed to patients who had recently undergone diagnostic imaging at our institution. Participants were first asked if they could define ionizing radiation, if not, they were provided with the definition. Participants were then questioned about which types of diagnostic imaging use ionizing radiation, the relative associated radiation doses in imaging relative to other activities, risks from radiation exposure, information that had been provided to them about their exam, and their desire for information related to the risks and benefits of medical imaging. A shorter non-responder survey was distributed to patients who did not respond to the original survey.

HPS174

Potential Redundancy in MR Imaging of Brain: Quantification by Studying the Location of Core Diagnostic Information Across Various Sequences (Station #3)

Arindam Rano Chatterjee MD (Presenter): Nothing to Disclose, Seth-Emil T. Bartel MD: Nothing to Disclose, Manu Shri Goyal MD, MSc: Nothing to Disclose, Matthew Shawn Parsons MD: Nothing to Disclose, Aseem Sharma MBBS: Stockholder, General Electric Company

PURPOSE

Time taken to obtain MR scans has direct implications for imaging costs, but has not been studied methodically. We sought to quantify potential redundancy in our MR brain sequence protocol by identifying the location of core diagnostic information within the scan.

METHOD AND MATERIALS

In this retrospective review, we aggregated consecutive 207 individual adult MRI brain studies. The senior author, a board certified neuroradiologist reviewed the medical and imaging records to document the clinical indication, core diagnostic information (CDI) provided by the MR imaging, and its clinical impact. Imaging findings useful for reaching the diagnosis constituted positive CDI while absence of imaging abnormalities constituted negative CDI. The senior author then selected the Core Sequences (CS) felt to allow for comfortable extraction of the CDI. The selection of CS was validated by presenting the CS to four readers who assessed the relative ease of identification of the CDI within the CS. Potential redundancy was calculated by comparing the number of CS to the number of total sequences obtained.

RESULTS

MR imaging had been performed utilizing an average of 9.4 ± 2.8 sequences obtained over an average of 37.3 ± 12.3 minutes. In comparison, CDI was thought to be easily extractable from an average of 2.1 ± 1.1 core sequences, with an assumed corresponding average scan time of 6.6 ± 4.8 minutes, reflecting a potential redundancy of 74.5 ± 19.1 %. Potential redundancy was least in scans obtained for treatment planning (14.9 ± 25.7%) and highest in scans obtained for follow-up of benign disease processes (81.4 ± 12.6). The selection of CS was considered to be valid with the ease of extracting CDI from CS considered by all four reviewers to be either easy or equivalent to that from entire scan in 97.4% cases. With a lack of clinical impact on only one case (0.48%), overutilization of imaging was not thought to contribute potential redundancy.

CONCLUSION

There is high potential redundancy in brain MR imaging protocols that can be targeted for a more efficient utilization of MR scanners.

CLINICAL RELEVANCE/APPLICATION

More indication directed sequence protocling can help improve efficiency of MR scanner utilization with associated potential for reducing imaging related healthcare costs.
CT Imaging Techniques and Strategies for Radiation Dose Optimization: What the Radiologist Should Know (Station #4)


TEACHING POINTS

1) To outline basic principles of CT radiation exposure and its quantities
2) To summarize CT radiation dose optimization based on modification of scanning parameters and application of technologic innovations
3) To demonstrate optimal strategies using current and novel technologies by presenting experimental data and clinical images

TABLE OF CONTENTS/OUTLINE

1) CT radiation dose quantities · CT dose index (CTDI) · dose length product (DLP) · effective dose (ED) · size-specific dose estimates (SSDE) 2) scanning parameters and technologic innovations · CT system optimization: detector/collimators/beam-shaping filter · automatic exposure control · optimal tube potential · noise control in reconstruction and data processing · dual energy CT 3) Optimal strategies for dose reduction · appropriate indications · optimal scan length and phases · use optimal scanning techniques · provide optimal protection

HPS175

Rates and Causes of Radiologist Disagreement during Independent Review of Oncology Clinical Trials (Station #1)

Gregory V. Goldmacher MD, PhD (Presenter): Employee, ICON plc, Ninad Mantri MS: Employment, ICON plc, James J. Conklin MD: Employment, ICON plc, David Raunig PhD: Director, Pfizer Inc Stockholder, Pfizer Inc Employee, ICON plc

PURPOSE

Radiological endpoints in oncology trials are often assessed with multiple readers on each case. Reader variability is of interest to regulators and trial designers, who sometimes regard a disagreement rate (DR) over 40% as indicating unreliable data, regardless of indication or cause. Disagreement on progression and response has not been systematically studied across cancer types.

METHOD AND MATERIALS

We examined disagreement between independent readers in pooled data from Phase 2 or 3 trials in non-small cell lung cancer (NSCLC), breast cancer, colorectal cancer (CRC), and non-Hodgkin's Lymphoma (NHL). Each case was assessed by two readers, using RECIST 1.0 or 1.1 in solid tumors and Cheson 1999 in NHL. We calculated DR on whether the subject progressed, date of progression (DOP), best overall response (BOR), duration of response (DOR), or any visit response. DOR was calculated, for cases where readers agreed on a BOR of partial response (PR) or complete response (CR), as the duration from first PR or CR until progression. Where there was disagreement on DOP, we assessed whether it was based on target lesions (TL), non-target lesions (NTL), or new lesions (NL) for solid tumors.

RESULTS

The data included patients from 4 NSCLC trials, 3 breast cancer trials, 3 CRC trials, and 4 NHL trials. The table shows DR on various parameters and combinations. When readers disagreed on DOP in breast cancer (n=377), DR on NL, TL, and NTL respectively, was 51.5%, 48.8%, and 66.6%. For NSCLC (n=961), it was 45.8%, 76.7%, and 51.3%. For CRC (n=435), it was 43.0%, 8.0%, and 59.1%. For NHL, DR on NL was 24.2%, with TL and NTL data not captured. Causes of disagreement were non-exclusive.

CONCLUSION

Up to 33% of DOP disagreements are by one visit. A DR above 40% is to be expected for some tumors, especially if multiple parameters are compared. Some have advocated new lesions as the sole reliable progression indicator, but there is considerable variability in new lesion perception. Some cancers show less variability that others on perception of TL progression, possibly due to fewer lesions (less variability in lesion selection), lesions being easier to measure (less variability in measurement), or both. This study establishes baseline rates of disagreement, so that interventions to reduce variability can be assessed.
Peer-Review Sampling: Comparison of Two Paradigms Against Double Reading of Gadoxetate-Enhanced MRI (Station #2)

Sheela Agarwal MD, MS (Presenter): Nothing to Disclose, Tarik K. Alkasab MD, PhD: Nothing to Disclose, Peter F. Hahn MD, PhD: Stockholder, Abbott Laboratories Stockholder, Covidien AG Stockholder, CVS Caremark Corporation Stockholder, Kimberly-Clark Corporation Stockholder, Landauer, Inc, Sanjay Saini MD: Nothing to Disclose, Mukesh Gobind Harisinghani MD: Nothing to Disclose, Debra Ann Gervais MD: Research Grant, Covidien AG

PURPOSE

Because hepatobiliary contrast liver MRI offers special challenges, these studies undergo enhanced peer-review. We evaluated the effectiveness of two randomized peer-review methods compared to double reading for detection and characterization of liver lesions and incidental findings.

METHOD AND MATERIALS

A single expert in gadoxetate-enhanced MRI double read the 544 studies performed during a 6 month period. Rates of change in diagnosis served as the historical control. Each study had been read initially by a fellowship trained abdominal radiologist before expert over-reading. During the same 6 month period in the following year, 798 liver MRIs were performed with gadoxetate disodium. These examinations were randomly sampled for a total of 2% of all cases, or 16 cases, which were then over-read (Arm 1). During this same time frame, all gadoxetate MRIs that were randomly selected during the department-wide peer-review system were evaluated, as part of the ACR recommended target rate of 2% of all examinations per radiologist (Arm 2).

RESULTS

Using a double read paradigm, changes in interpretation occurred on 50/544 examinations (9.2%) with 23 (4.2%) leading to a potential change in clinical management. All 28 readers were evenly sampled (100%). Using the 2% paradigm the following year (Arm 1), changes in interpretation occurred on 3 (19%) examinations, with 2 (12.5%) leading to potential change in management. 12 (39%) radiologists were sampled using this method. During the department-wide 2% peer-review process, 53 abdominal MRIs were reviewed, of which 6 (0.75%) were gadoxetate-enhanced liver MRI (Arm 2). One (17%) led to a change in interpretation, which was not clinically significant, and 6 (21%) radiologists were sampled.

CONCLUSION

Department wide peer-review, which randomly selects cases from all abdominal MRIs performed, under-sampled gadoxetate MRI and radiologists, therefore capturing a lower rate of error compared to the double-read paradigm. Instead, specifically sub-selecting two percent of all gadoxetate studies leads to a significantly more accurate reflection of misinterpretation rates.

CLINICAL RELEVANCE/APPLICATION

Double reading of gadoxetate MRI results in clinically significant improvement in read accuracy, though this approach is resource intensive and thus impractical in a busy hospital setting. Accurate methodologies for sampling are essential to capture ongoing interpretive challenges with gadoxetate MRI.

An Ex Post Cost-Benefit Analysis of Kidney Function Screening for all Patients Prior to Iodinated Intra-vascular Contrast Administration during Computed Tomography (Station #3)

John R. Mayo MD: Speaker, Siemens AG, Collette Louise English BMBS, FRCR (Presenter): Nothing to Disclose, Bruce Hartnett MBA,RT: Nothing to Disclose

PURPOSE

We retrospectively assessed the allocation efficiency of universal kidney function testing for all patients receiving contrast media for CT versus risk factor screening as measured from the perspective of both the patient outcome and public funding.

METHOD AND MATERIALS

Contrast Induced Nephropathy (CIN) rates in patients receiving contrast with GFR < 60 in a tertiary acute care using a universal testing policy were calculated. A standard Cost Benefit Analysis was used to assign standing, identify and monetize impact categories, obtain present values of costs and benefits, and perform a sensitivity analysis. Actual testing and patient costs were calculated. Benefits were derived from the number of avoided cases of Nephropathy Requiring Dialysis (NRD) and avoided deaths.

RESULTS

The social benefits of screening all patients for impaired renal function versus testing those with risk factors is centered on finding occult renal impairment. Based on our site’s CIN rate with universal screening (0.34%), the extrapolated risk of missing someone during screening who would then go on to develop NRD was calculated to be 0.0021% (proportion of patients found to have occult kidney function < 60 x proportion of patients that are...
likely to develop NRD). The benefit of a blanket kidney function testing policy then, for a site administering contrast to ~7,800 patients/year, was the prevention of 0.0036 NRD cases/year and, based on literature estimates, the saving of 0.0012 lives/year. The actuarial values calculated for these benefits, including adjustments for Quality Adjusted Life Years, was of the order of magnitude of ~$9,000 versus the ~$165,000 cost estimated to send 7,000 patients for additional blood-work.

**CONCLUSION**

We found the net social benefit of a blanket kidney function screening policy versus risk factor screening, was negative. We note political feasibility costs for health care practitioners were not assessed nor monetized. A risk stratification policy for GFR testing substantially reduces the tested population and the cost while preserving the proportion of patients receiving prophylactic hydration and/or alternative imaging strategies.

**CLINICAL RELEVANCE/APPLICATION**

Risk stratification policy for GFR testing substantially reduces the tested population and the cost while preserving the proportion of patients receiving prophylactic hydration and/or alternative imaging strategies.

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HPE104

**ACR Imaging 3.0 Preparedness: How Good are Your Communication Skills? (Station #4)**

Cindy S. Lee MD (Presenter): Nothing to Disclose, Ryan Woods MD, MPH: Nothing to Disclose, Brian David Gale MD: Board Member, SaferMD, LLC, Paul G. Nagy PhD: Nothing to Disclose

**TEACHING POINTS**

1. To demonstrate the value of radiologists, the ACR Imaging 3.0 campaign has asked us to take on more leadership and consultation responsibilities, and concentrate on value-based practice. Effective communication skills with the referring clinicians and patients are the key to our future success. 2. Viewers will be able to take the Radiology Communication Quiz to find out how effective their communication skills are and receive suggestions on how to improve.

**TABLE OF CONTENTS/OUTLINE**

1. Why is effective communication essential for radiologists in ACR Imaging 3.0? 2. Benefits of Effective Communication • Improved safety. • Improved quality of care and patient outcomes. • Improved patient and family satisfaction. • Enhanced staff morale and job satisfaction 3. Examples to illustrate 5 components of effective communication • Complete • Concise • Concrete • Clear • Accurate 4. Literature review: Pitfalls in Communicating Effectively 5. The Radiology Communication Quiz • How good are your communication skills? • Score interpretation and suggestions for future improvements

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SPSH52

**Hot Topic Session: Lung Cancer Screening: Update on Policies and Procedures**

**Special Courses**

AMA PRA Category 1 Credits ™: 1.00  
ARRT Category A+ Credit: 1.00

**LEARNING OBJECTIVES**

1) Describe the ACR perspective on lung cancer screening in regards to policy and practice guidelines. 2) Appraise governmental decisions and policies on lung cancer screening, and their economic impact. 3) Recognize the patient’s perspective of our lung cancer screening activities, and how it can impact screening.

**ABSTRACT**

The success of the NLST in reducing lung cancer specific mortality has generated great interest in the medical community regarding deployment of CT for lung cancer screening. While guidelines for who should be screened have been developed by many organizations, policies and procedures for performing lung cancer screens have not been fully developed. The radiology community, governmental officials, and patient advocacy groups have been influential in affecting standards, policies and procedures for lung cancer screening. This session will review and update radiologist of these actions.

**Sub-Events**

**SPSH52A Radiologist Perspective: LungRADS - Practice Guidelines, Accreditation and Oversight, Centers of Excellence**

Ella A. Kazerooni MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

View learning objectives under main course title.

**ABSTRACT**
SPSH52B  Government Perspective: Economics of Screening, USPSTF Recommendation Impact, CMS and 3rd Party Coverage, Regulation/Concerns

Geraldine B. McGinty MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

View learning objectives under main course title.

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SPSH52C  Patient Perspectives

Laurie Fenton Ambrose (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

View learning objectives under main course title.

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**RC727**

**From Research to Reimbursement: Lung Cancer Screening and Healthcare Payment Policy (In Conjunction with the American College of Radiology)**

**Refresher/Informatics**

AMA PRA Category 1 Credits™: 1.50  
ARRT Category A+ Credits: 1.50  
Thu, Dec 4 4:30 PM - 6:00 PM  
Location: S403B

**Participants**

- Moderator: Pamela Kassing: Nothing to Disclose  
- Geraldine B. McGinty MD (Presenter): Nothing to Disclose  
- James Vincent Rawson MD (Presenter): Nothing to Disclose  
- Mark Otto Bernardy MD (Presenter): Nothing to Disclose  
- Robert K. Zeman MD (Presenter): Stockholder, General Electric Company

**LEARNING OBJECTIVES**

1) Understand the current process of how reimbursement for new procedures and technology is obtained from CPT code development, valuation and coverage. 2) Using Lung Cancer Screening as an example, the participants will become familiar with the specific processes for obtaining coverage for new screening programs in the public and private sectors and how a myriad of governmental agencies and other policymaking groups are involved in determining which new procedures are covered. 3) Understand how obtaining coverage will bring this new technology to the mainstream. 4) Interactive techniques will be used to engage the audience in the consideration of strategic partnerships between industry, clinical research, governmental agencies and third party payors.

**URL's**

http://www.acr.org/

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**RC732**

**Compensation Plans and Funds Flow**

**Refresher/Informatics**

AMA PRA Category 1 Credits™: 1.50  
ARRT Category A+ Credits: 1.50  
Thu, Dec 4 4:30 PM - 6:00 PM  
Location: S404AB

**Participants**

- Ronald L. Arenson MD (Presenter): Nothing to Disclose  
- Pablo Riera Ros MD, PhD (Presenter): Medical Advisory Board, Koninklijke Philips NV Medical Advisory Board, KLAS Enterprises LLC Medical Advisory Committee, Oakstone Publishing Departmental Research Grant, Siemens AG Departmental Research Grant, Koninklijke Philips NV Departmental Research Grant, Sectra AB Departmental Research Grant, Toshiba Corporation  
- William G. Bradley MD, PhD (Presenter): Stockholder, Time Medical Holdings Company Ltd Advisory Board, Time Medical Holdings Company Ltd
**LEARNING OBJECTIVES**

1) Understand the need to offer incentive compensation (bonus) to faculty in Academic Radiology Departments. 2) To be able to describe the advantages and disadvantages of productivity only incentive plans in Academic Radiology. 3) Understand methods of providing incentives other than clinical productivity. 4) Understand how to insure fairness and a feeling of working as a team with incentive-based compensation plans. 5) Understand how incentive systems used by private practices are different from that of an Academic Radiology Department. 6) Understand how payment mechanisms to Academic Radiology Depts are changing from collections-based to RVU-based ("Funds Flow") with increased cost cutting and reliance on core services. (This course is part of the Leadership Track)

**RC827**

**Value: What Is It, and What Does It Mean for Radiology?**

*Refresher/Informatics*

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**AMA PRA Category 1 Credits ™:** 1.50  
**ARRT Category A+ Credits:** 1.50  
**Fri, Dec 5 8:30 AM - 10:00 AM**  
**Location: SS02AB**

**Participants**

Moderator  
Saurabh Jha MD : Speaker, Toshiba Corporation  
Richard Glenn Abramson MD (Presenter): Consultant, ICON plc Board Member, Partners in the Imaging Enterprise LLC

**LEARNING OBJECTIVES**

1) Understand the difference between uncertainty and risk. 2) Articulate how radiological exams transform uncertainty into risk. 3) Assess the value of converting uncertainty into risk. 4) Apply the techniques discussed to existing and hypothetical radiological exams.

**ABSTRACT**

How can we put price tags on radiological exams? Many radiological exams serve the purpose of converting uncertainty about a patient’s status into defined risk. When something is uncertain, we both do not know what will happen next and do not know the distribution of possible outcomes. In contrast, with risk, we still do not know what will happen next, but do know the distribution of possible outcomes. This presentation discusses how radiological exams convert uncertainty into risk, and how we can assess the value of the conversion. It concludes by demonstrating how the techniques discussed can be applied to put price tags on both radiological exams that exist today and hypothetical exams that could be invented in the future.

**RC829**

**Should I Scan That Patient? A Very Interactive Session on MR Safety and Regulations (An Interactive Session)**

*Refresher/Informatics*

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**AMA PRA Category 1 Credits ™:** 1.50  
**ARRT Category A+ Credits:** 1.50  
**Fri, Dec 5 8:30 AM - 10:00 AM**  
**Location: E353B**

**Participants**

Jeffrey C. Weinreb MD (Presenter): Nothing to Disclose  
Emanuel Kanal MD (Presenter): Consultant, Boston Scientific Corporation Consultant, Medtronic, Inc Consultant, St. Jude Medical, Inc Consultant, Bayer AG Investigator, Bracco Group Royalties, Guerbet SA

**LEARNING OBJECTIVES**

1) Analyze the cause and avoidance of a spectrum of common MR safety issues, including burns. 2) Assess the most current information about the development of NSF (nephrogenic systemic fibrosis) and the possibility of other chronic conditions following GBCA administration. 3) Compare indications and contraindications for MRI on patients with pacemakers, neurostimulators, and other devices with wires or leads. 4) List the factors (including regulation and guidelines) which should be evaluated in order to determine the safety of MRI in patients with implants, devices, or foreign objects.

**ABSTRACT**

The major potential safety considerations in magnetic resonance imaging relate to those stemming from the static magnetic field, the time varying radiofrequency oscillating magnetic fields, the contrast agents often utilized in the MR imaging process, sedation/anesthesia and monitoring-related issues unique to the MR imaging environment, and cryogen related potential safety concerns. These can present confounding situations for MR practitioners faced with questions relating to the safety of exposing particular patients and devices, implants, or foreign bodies to MR imaging examinations. This session will introduce and briefly explain the above safety considerations, and highlight specific issues likely to confront MR practitioners in their daily practice by utilizing real-life examples. The methodology and reasoning process used to approach these clinical examples in determining risk-benefit ratios for accepting or rejecting such patients from MR exposure will be stressed. The emphasis will be on not so much the particular examples used, but rather having the attendee feel more comfortable with the approach to such clinical and research situations in order to better enable them to appropriately address such questions in their own daily practice routines. Audience polling and interaction will be actively utilized throughout this session. This will help enable the attendee to not only hear the opinions of the presenters on the cases being discussed, but also to assess their own responses to the questions being posed relative to that of the other attendees of this session.

**RC832**

**Aligning Incentives Along the Imaging Value Chain**
LEARNING OBJECTIVES

1) To understand value-focused healthcare imperatives in the evolution of healthcare delivery systems and how they impact medical imaging. 2) To implement practice changes aligned with Imaging 3.0 so as to maximize the relevance of radiology and radiologists in ongoing health system changes. 3) To improve the delivery of imaging care by focusing on value chain opportunities. (This course is part of the Leadership Track)

ABSTRACT

Although radiology’s dramatic evolution over the last century has profoundly affected patient care for the better, our current system is fragmented with many providers focusing more on technology and physician needs rather than what really matters to patients: better value and outcomes. This latter dynamic is aligned with current national health care reform initiatives and creates both challenges and opportunities for radiologists to find ways to deliver new value for patients. The American College of Radiology has responded to this challenge with the introduction of Imaging 3.0, which represents a call to action to all radiologists to assume leadership roles in shaping America's future health care system through 5 key pillars: imaging appropriateness, quality, safety, efficiency, and satisfaction. That enhanced value will require modulation of imaging work processes best understood through the concept of the imaging value chain, which will be the focus of this course.