How to Use the ACR Recommendations for Incidental Findings

Lincoln L. Berland, M.D., F.A.C.R.
 Consultant to Nuance Communications, Inc.
• Nature of problem
• Severity and breadth of problem
• Incidental findings white papers
• Thyroid and ovarian IF recommendations
• Clinical Decision Support
  • Value of and methods to apply guidance
  • Computerizing guidance
• Evolution of CDS
Acknowledgements

- Keith Dreyer, DO, PhD
- Pari Pandharipande, MD
- Tarik Alkasab, MD
- Ben Harvey, MD
- Jonathan Berlin, MD
- Mark Baker, MD
- Many others….
Nature of Problem
The Problem

Radiologist 1
Indeterminate 3.5 cm adrenal nodule.
Adrenal-mass protocol CT advised.

Radiologist 2
Indeterminate 3.5 cm adrenal nodule.
Consider surgical consultation.

PCP 1
Requests adrenal-mass protocol CT.

PCP 2
Requests surgical consult.

PCP 3
No further work-up.

Courtesy Pari Pandharipande, MD
Dr. Smith and Dr. Jones

- Dr. Smith: Fast, confident, but may miss subtle findings
- Dr. Jones: Slow, misses less, but less definitive
- For every 10K chest x-rays Dr. Smith reads, she only misses one lung cancer.
- Dr. Jones’ misses ½ as many as Dr. Smith but recommends 200 chest CT’s/10K exams more than Dr. Smith for “possible nodules.”
- Who is the higher quality radiologist?
Dr. Smith and Dr. Jones

- Dr. Smith is admired until she misses a subtle cancer on a chest x-ray.....then risk management is all over her case.
- Dr. Jones is insidiously despised and ridiculed by everyone as being a product of a zero-risk culture.
- Attending physicians prefer Dr. Smith for her more definitive reads.

Severity and Breadth of problem
Increased Frequency, Cost and Limited Benefit of Incidental Findings
“Each additional CT machine is associated with 2,224 additional CT scans from 1985-2005” Baker et al. Health Affairs 27(6), 1467-1478, 2008

Courtesy Jonathan Berlin, MD
Incidental Findings at CT for Hematuria

- 1295 patients at UAB: CT for hematuria
- 9% of patients had important incidental findings, but no intervention
- 2% of patients underwent major intervention

Costs : Major Interventions

Costs of just 6 major interventions averaged over all 1295 patients: $353/patient
Inconsistency of Recommendations for Incidental Findings
Increased Recommendations

- 5.9 M studies from 1995-2008
  - Odds of recommendations decreased by 15% per decade of radiologist experience


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Inconsistent Use of Guidelines
Survey – IF Recommendations

- 27 academic radiologists, 3 institutions
- 12 hypothetical incidental findings
- Poor correlation between and even within institutions

Communicating Findings
Role of Radiology Specialization

- Guidelines Adherence: critical-result renal masses on CT:
  - Abdominal specialists: 93%
  - Non-abdominal specialists: 57%

- Adherence to critical-result communication policy:
  - Abdominal specialists: 84%
  - Non-abdominal specialists: 43%

What are the Medicolegal Implications?

- Guidelines used in malpractice suits
- Applying policies consistently is good defense
- All radiologists are held to a common standard-of-care regardless of their specialty orientation
- Nevertheless, malpractice risk currently very limited
Summary – Incidental Findings

- Frequent detection, recommendations and increased cost
- Highly inconsistent detection, recommendations, adherence to guidelines, reporting, follow-up
- This level of performance is not sustainable – too many forces demanding improvement
IF White Papers
Managing Incidental Findings on Abdominal CT: White Paper of the ACR Incidental Findings Committee

Lincoln L. Berland, MD*, Stuart G. Silverman, MD*, Richard M. Gore, MD*,
William W. Mayo-Smith, MD*, Alec J. Megibow, MD, MPH†, Judy Yee, MD†,
James A. Brink, MD*, Mark E. Baker, MD*, Michael P. Federle, MD†,
W. Dennis Foley, MD†, Isaac R. Francis, MD†, Brian R. Herts, MD†,
Gary M. Israel, MD†, Glenn Krinsky, MD†, Joel F. Platt, MD†,
William P. Shuman, MD**, Andrew J. Taylor, MD†

As multidetector CT has come to play a more central role in medical care and as CT image quality has improved, there has been an increase in the frequency of detecting “incidental findings,” defined as findings that are unrelated to the clinical indication for the imaging examination performed. These “incidentalomas,” as they are also called, often confound physicians and patients with how to manage them. Although it is known that most incidental findings are likely benign and often have little or no clinical significance, the inclination to evaluate them is often driven by physician and patient unwillingness to accept uncertainty, even given the rare possibility of an important diagnosis. The evaluation and surveillance of incidental findings have also been cited as among the causes for the increased utilization of cross-sectional imaging. Indeed, incidental findings may be serious, and hence, when and how to evaluate them are unclear. The workup of incidentalomas has varied widely by physician and region, and some standardization is desirable in light of the current need to limit costs and reduce risk to patients. Subjecting a patient with an incidentaloma to unnecessary testing and treatment can result in a potentially injurious and expensive cascade of tests and procedures. With the participation of other radiologic organizations listed herein, the ACR formed the Incidental Findings Committee to derive a practical and medically appropriate approach to managing incidental findings on CT scans of the abdomen and pelvis. The committee has used a consensus method based on repeated reviews and revisions of this document and a collective review and interpretation of relevant literature. This white paper provides guidance developed by this committee for addressing incidental findings in the kidneys, liver, adrenal glands, and pancreas.

Key Words: Incidental findings, incidentaloma, pancreatic cyst, renal cyst, liver lesion, adrenal nodule

Overview of White Papers of the ACR Incidental Findings Committee II on Adnexal, Vascular, Splenic, Nodal, Gallbladder, and Biliary Findings

Lincoln L. Berland, MD

Managing Incidental Findings on Abdominal and Pelvic CT and MRI, Part 1: White Paper of the ACR Incidental Findings Committee II on Adnexal Findings

Maitray D. Patel, MD², Susan M. Ascher, MD², Raj Mohan Paspulati, MD³, Alampady K. Shanbhogue, MD³, Evan S. Siegelman, MD³, Marjorie W. Stein, MD³, Lincoln L. Berland, MD³

Managing Incidental Findings on Abdominal and Pelvic CT and MRI, Part 2: White Paper of the ACR Incidental Findings Committee II on Vascular Findings

Faisal Khosa, MD⁴, Glenn Krinsky, MD⁴, Michael Macari, MD⁵, E. Kent Yucel, MD⁶, Lincoln L. Berland, MD⁶

Managing Incidental Findings on Abdominal and Pelvic CT and MRI, Part 3: White Paper of the ACR Incidental Findings Committee II on Splenic and Nodal Findings

Matthew T. Heller, MD⁷, Mukesh Harisinghani, MD⁷, Jeffrey D. Nettlich, MD⁷, Paula Yeghiayan, MD⁷, Lincoln L. Berland, MD⁷

Managing Incidental Findings on Abdominal and Pelvic CT and MRI, Part 4: White Paper of the ACR Incidental Findings Committee II on Gallbladder and Biliary Findings

Sunit Sebastian, MD⁸, Cyrillo Araujo, MD⁸, Jeffrey D. Nettlich, MD⁸, Lincoln L. Berland, MD⁸

Managing Incidental Thyroid Nodules Detected on Imaging: White Paper of the ACR Incidental Thyroid Findings Committee

Jenny K. Hoang, MBBS⁹, Jill E. Langer, MD⁹, William D. Middleton, MD⁹, Carol C. Wu, MD⁹, Lynwood W. Hammers, DO⁹, John J. Cronan, MD⁹, Franklin N. Tessler, MD, CM³, Edward G. Grant, MD³, Lincoln L. Berland, MD³
Thyroid IF Recommendations
Incidental Thyroid Nodule Detected on CT or MRI

Suspicious CT or MRI findings

- Limited life expectancy and comorbidities
  - Age <35 years
    - <1 cm: Evaluate with thyroid ultrasound
    - ≥1 cm: No further evaluation
  - Age ≥35 years
    - <1.5 cm: Evaluate with thyroid ultrasound
    - ≥1.5 cm: No further evaluation

No suspicious CT or MRI findings

- General population
  - Age <35 years
    - <1 cm: Evaluate with thyroid ultrasound
    - ≥1 cm: No further evaluation
  - Age ≥35 years
    - <1.5 cm: Evaluate with thyroid ultrasound
    - ≥1.5 cm: No further evaluation
Suspicious CT/MRI features include: abnormal lymph nodes and/or invasion of local tissues by the thyroid nodule. Abnormal lymph node features include: calcifications, cystic components, and/or increased enhancement. Nodal enlargement is less specific for thyroid cancer metastases, but further evaluation could be considered if an ITN has ipsilateral nodes >1.5 cm in short axis for jugulodigastric lymph nodes, and >1 cm for other lymph nodes.

Limited life expectancy and comorbidities that increase the risk of treatment or are more likely to cause morbidity and mortality than the thyroid cancer itself, given the nodule size; see text for details. Patients with comorbidities or limited life expectancy should not have further evaluation of the ITN, unless it is warranted clinically, or specifically requested by the patient or referring physician.

Further management of the ITN after thyroid ultrasound, including fine needle aspiration, should be based on ultrasound findings.
Incidental Thyroid Nodule Detected on $^{18}$FDG-PET and Other Nuclear Medicine Scans

- Focal activity
  - Limited life expectancy and comorbidities
    - No further evaluation
  - General population
    - Evaluate with thyroid ultrasound

- ITN on accompanying PET/CT or PET/MRI without metabolic activity
  - Refer to Recommendations for ITN on CT and MRI
Legend for Flowchart

- Flowchart for incidental thyroid nodules (ITNs) detected on 18FDG-PET and other nuclear medicine studies.

- Focal uptake may include one or more sites. Diffuse uptake in the thyroid without a corresponding mass is not considered to be focal.

- Limited life expectancy and comorbidities that increase the risk of treatment or are more likely to cause morbidity and mortality than the thyroid cancer itself, given the nodule size; see text for details. Patients with comorbidities or limited life expectancy should not have further evaluation of the ITN, unless it is warranted clinically, or specifically requested by the patient or referring physician.

- Further management of the ITN after thyroid ultrasound should include fine-needle aspiration for PET-avid ITN regardless of the ultrasound findings; see text for details. Avid nodules on other nuclear medicine scans can have ultrasound with the decision to perform FNA based on findings seen on the dedicated thyroid ultrasound.
Ovarian IF Recommendations
Management of Asymptomatic Ovarian and Other Adnexal Cysts Imaged at US: Society of Radiologists in Ultrasound Consensus Conference Statement

The Society of Radiologists in Ultrasound convened a panel of specialists from gynecology, radiology, and pathology to arrive at a consensus regarding the management of ovarian and other adnexal cysts imaged sonographically in asymptomatic women. The panel met in Chicago, Ill, on October 27–28, 2009, and drafted this consensus statement. The recommendations in this statement are based on analysis of current literature and common practice strategies, and are thought to represent a reasonable approach to asymptomatic ovarian and other adnexal cysts imaged at ultrasonography.

© RSNA, 2010
<table>
<thead>
<tr>
<th>Simple cysts (includes ovarian and extraovarian cysts)</th>
<th><img src="image1.png" alt="Image" /></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Round or oval</td>
<td></td>
</tr>
<tr>
<td>- Anechoic</td>
<td></td>
</tr>
<tr>
<td>- Smooth, thin walls</td>
<td></td>
</tr>
<tr>
<td>- No solid component or septation</td>
<td></td>
</tr>
<tr>
<td>- Posterior acoustic enhancement</td>
<td></td>
</tr>
<tr>
<td>- No internal flow</td>
<td></td>
</tr>
</tbody>
</table>

- These may appear similar on CT

<table>
<thead>
<tr>
<th>Hemorrhagic cyst</th>
<th><img src="image2.png" alt="Image" /></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Reticular pattern of internal echoes</td>
<td></td>
</tr>
<tr>
<td>- +/- Solid appearing area with concave margins</td>
<td></td>
</tr>
<tr>
<td>- No internal flow</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Endometrioma</th>
<th><img src="image3.png" alt="Image" /></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Homogeneous low level internal echoes</td>
<td></td>
</tr>
<tr>
<td>- No solid component</td>
<td></td>
</tr>
<tr>
<td>- +/- Tiny echogenic foci in wall</td>
<td></td>
</tr>
</tbody>
</table>

Levine D et al. Radiology 2010;256:943-954
©2010 by Radiological Society of North America
Incidental Adnexal Cystic Mass (≤ 1 cm)
Post-Menarcheal, Non-Pregnant

Benign-appearing cyst

- Pre-menopausal
  - ≤ 5 cm: Benign, no follow-up
  - > 5 cm: US follow-up at 6-12 wk

- Early post-menopausal
  - ≤ 3 cm: Benign, no follow-up
  - > 3 cm, ≤ 5 cm: US follow-up at 6-12 mo
  - > 5 cm: Ultrasound

- Late post-menopausal
  - ≤ 3 cm: Benign, no follow-up
  - > 3 cm: Ultrasound

Probably benign cyst

- Pre-menopausal
  - ≤ 3 cm: Benign, no follow-up
  - > 3 cm, ≤ 5 cm: US follow-up at 6-12 wk
  - > 5 cm: Ultrasound

- Early post-menopausal
  - ≤ 3 cm: Benign, no follow-up
  - > 3 cm: Ultrasound

- Late post-menopausal
  - ≤ 1 cm: Benign, no follow-up
  - > 1 cm: Ultrasound

Other imaging features

- Probable diagnostic features
  - Manage as appropriate for diagnosis

- Features not specific
  - Ultrasound
ACR Adnexal Algorithm – Three Factors

- All incidental, post-menarchal and non-pregnant
- Appearance-features:
  - Benign-appearing, probably benign, other
- Timing relative to menopause:
  - Pre-, early-post, late-post
- Size:
  - 1, 3, 5 cm thresholds
SRU Consensus (Simplified)

- Pre-menopausal:
  - <3 cm: Ignore
  - 3-5 cm: Describe, but benign, no FU
  - 5-7 cm: Yearly FU
  - >7 cm: MRI or surgical evaluation

- Post-menopausal:
  - <1 cm: Ignore
  - May choose up to 3 cm to ignore
  - 1-7 or 3-7 cm: US FU yearly, depending on change
  - >7 cm: MRI or surgical evaluation
SRU Consensus Criteria (Simplified)

- Remaining cystic lesion management based on US findings not seen on CT or MRI

- Pre-menopausal hemorrhagic cysts:
  - Up to 5 cm: no FU
  - >5 cm: FU in 6-12 weeks

- Early post-menopausal hemorrhagic cysts:
  - US FU in 6-12 weeks

- Late post-menopausal:
  - Surgical evaluation
Pre-Menopausal 3.7 cm Cyst

- Benign-appearing. No follow-up.
Pre-Menopausal 3.8 cm Cyst with Artifact

- Artifact, but no suspicious features. No FU
Early Post-Menopausal 4.7 cm Cyst

- Resolved on follow-up ultrasound
Clinical Decision Support
Importance and Value of Using Guidelines and Recommendations
Consistent processes are most important determinant of quality

Already beginning to be rewarded in $ for good quality and penalized for “poor” quality

New payment models (MIPS/APM) incentivizing limitations on imaging
I would like to have evidence-based guidelines integrated into my reporting workflow. (April, 2015, n = 2,586)
- Radiology reports and recommendations need to be more standardized. (April, 2015, n = 2,586)
Each radiology report should be individually dictated in free text vs. a standard template. (April, 2015, n = 2,586)

Courtesy Keith Dreyer, DO, PhD
Effect of BI-RADS on Report IQ

- Creates a quality threshold by structuring essential information.

![Graph showing the effect of BI-RADS on report IQ.](image)

Courtesy Keith Dreyer, DO, PhD
Then, Why Don’t Radiologists Want to Use Guidance when Reporting?
Complaints about IF Recommendations

- The recommendations are:
  - Sometimes/often wrong, outdated
  - Not clinically relevant, built without clinical input
- Flowcharts are confusing
- Not risk-stratified
  - Age, gender, co-morbid conditions
- Based on consensus, weak or non-existent data (not evidence-based)
Conformity to Other Specialty Guidelines

- ACR Adrenal IF recommendations do not conform to:
  - American Association of Clinical Endocrinologists (AACE) guidelines
  - American Association of Endocrine Surgeons (AAES) guidelines
  - Endocrine Practice 15 (Suppl 1) Aug, 2009

- ACR Pancreatic cysts recommendations do not conform to:
  - ACG, ACS guidelines
Other Psychosocial Obstacles

- Too busy to look up
- Out of sight, out of mind
- Not my problem
- It’s not the way we do it or way we were trained
- I won’t get sued anyway
- Low- vs. high-risk tolerance personality

Courtesy Mark Baker, MD
Methods to Apply Medical Evidence to Radiology Reporting
Traditional Ways Towards Quality

- Original journal articles
  - Our white papers are among these traditional methods
- Review, pictorial articles
- Books
- Educational digests
- Online resources – Google, Journals, etc.
Survey of ACR about White Paper
<table>
<thead>
<tr>
<th>Response</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, I have read the white paper</td>
<td>37.9%</td>
</tr>
<tr>
<td>Yes, I am aware of the white paper but have not read it</td>
<td>30.4%</td>
</tr>
<tr>
<td>No, I am not aware of the white paper</td>
<td>31.6%</td>
</tr>
</tbody>
</table>

## Changing Recommendations (Read Paper)

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>I recommend additional tests more often</td>
<td>3.1%</td>
</tr>
<tr>
<td>I recommend additional tests less often</td>
<td>50.6%</td>
</tr>
<tr>
<td>I have not changed how often I recommend additional tests</td>
<td>37.6%</td>
</tr>
<tr>
<td>Not sure</td>
<td>8.7%</td>
</tr>
</tbody>
</table>
When you encounter a 1 cm low attenuating lesion… with no history of malignancy and no prior studies, …how you would report it?

<table>
<thead>
<tr>
<th>Option</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>I would not report such a finding</td>
<td>0.8%</td>
</tr>
<tr>
<td>“Lesion too small to characterize”</td>
<td>22.3%</td>
</tr>
<tr>
<td>“1 cm lesion, likely benign”</td>
<td>34.8%</td>
</tr>
<tr>
<td>“Recommend characterization [with another imaging modality]”</td>
<td>30.4%</td>
</tr>
<tr>
<td>“Recommend follow-up in 6-12 months”</td>
<td>11.7%</td>
</tr>
</tbody>
</table>
When you encounter a 1 cm low attenuating lesion… with no history of malignancy and no prior studies, …how you would report it?

<table>
<thead>
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<th>Option</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>I would not report such a finding</td>
<td>0.8%</td>
</tr>
<tr>
<td>“Lesion too small to characterize”</td>
<td>20.7%</td>
</tr>
<tr>
<td>“1 cm lesion, likely benign”</td>
<td>58.5%</td>
</tr>
<tr>
<td>“Recommend characterization [with another imaging modality]”</td>
<td>9.5%</td>
</tr>
<tr>
<td>“Recommend follow-up in 6-12 months”</td>
<td>10.4%</td>
</tr>
</tbody>
</table>
Consistently Applying Guidelines

- Educational programs within your practice
- Print copies of algorithms and papers and place in folder at workstations
- Place online in secure intranet site
- Google, Bing, etc. and download
- Write macros for common recommendations
Education Programs

- Quality initiative to decrease physiologic/benign adnexal lesions referred for follow-up

- Formal education, charts and guidelines placed electronically on workstation desktop

- Recommendations decreased 58%, increase in the proportion called physiologic/benign

Hui JS, Kramer DJ, Blackmore CC, Hashimoto BE, Coy DL. A Quality Improvement Initiative to Reduce Unnecessary Follow-up Imaging for Adnexal Lesions. JACR 2014; 11:373-377
48 radiology residents provided decision-support (DS) tool from web or through direct PACS access

- Integrated access group: 3X higher use
- Use of the integrated DS jumped by an order of magnitude after second month

Computerized CDS
RadsBest: Fast Decision Support for Radiologists

Medocratic, LLC

iPhone Screenshots

- Renal Cyst
- Asymptomatic Pancreatic Cyst
- Incidental Adrenal Mass
- Contrast Reaction
- Thyroid Nodules
- Solitary Pulmonary Nodule
- Renal Mass
- Liver Mass
- Asymptomatic Ovarian Cyst

- Nasopharyngeal Cancer
- Lung Cancer
- Pancreatic Cancer
- Colorectal Cancer
- Prostate Cancer
- Oropharyngeal Cancer

TUMOR

- Size
  - < 2 cm
  - ≤3 cm
  - ≤5 cm
  - ≤7 cm
  - >7 cm

- Airway Involvement?
  - No
  - Yes but ≥2 cm from carina
  - Within 2 cm of carina

Lung Cancer

T2b

Average

- Greater than 40 years old
- No known malignancy
- No known hepatic dysfunction
- No abnormal liver function tests
- No risk factors for hepatic malignancy
- No symptoms attributable to the liver

OK
Asx Panc Cystic Mass

Choose the appropriate option that is lowest down on the list for each question. Options that don’t affect outcome will become disabled. You can just skip those and move on to the next applicable option. To change a selection, just unselect your previous selection first.

Size
- <2 cm
- 2-3 cm
- >3 cm

Character
- No characterizable study available.
- Uncharacterizable Cystic Mass or any OTHER cystic neoplasm
- BD-IPMn
- Serous Cystadenoma

Change Over Time
- No Prior
- Stable
- Growth

Aspirate cyst and consider resection depending on comorbidities and risk

DONE

DONE
Computerizing CDS: ACR Common, ACR Assist
ACR COMMON

ACR SELECT

ACR ASSIST

ACR CONNECT

Courtesy Keith Dreyer, DO, PhD
The ACR radiological terminology of common:

- Procedures, indications, findings, recommendations
- Provides integration to EHR and ACR services

Current Contents:

- +1,000 Imaging procedures
- +1,200 Clinical indications
- +100 Clinical Findings (Actionable findings, BI-RADS, Incidental findings)

Courtesy Keith Dreyer, DO, PhD
ACR Common – EHR Messaging

Courtesy Keith Dreyer, DO, PhD
ACR Assist – Report Information Quality

- With what would a system that improves Report IQ assist the radiologist?
  - Detection of Findings
  - Interpretation/Classification of Disease
  - Recommendation of Actions
  - Communication of all the Above

- Think BI-RADS for the rest of radiology reporting

- Point-of-care

Courtesy Keith Dreyer, DO, PhD
### Content Sources for ACR Assist

**ACR incidental findings white papers**

X-RADS (e.g. LI-RADS, PI-RADS, TI-RADS, etc.)

**ACR actionable findings white paper**

**Others: e.g. organ injury classification**

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Maitreyi D. Patel, MD, Susan M. Ascher, MD, Raj Mohan Raspauliai, MD, Alampady K. Shanbhogue, MD, Evan S. Singelman, MD, Marjorie W. Stein, MD, Lincoln L. Bertland, MD

<table>
<thead>
<tr>
<th>Category 1 - Communicate within Minutes</th>
<th>Category 2 - Communicate within Hours</th>
<th>Category 3 - Communicate within Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Suspected non-accidental trauma</td>
<td>• Clinically significant mass, tumor, or infection</td>
<td></td>
</tr>
<tr>
<td>• Malpositioned line or tube of immediate clinical concern (e.g. ET tube or enteric tube in bronchus)</td>
<td>• Finding highs suggestive of malignancy</td>
<td></td>
</tr>
<tr>
<td>• Allergic reaction or adverse event resulting in a code</td>
<td>• Intravascular lines in suboptimal location, moderate-risk (e.g., unintended central line in subclavian or innominate vein, right atrium, etc.)</td>
<td></td>
</tr>
<tr>
<td>• Foreign body with potential immediate and/or severe consequences</td>
<td>• Retained surgical instruments, sponges, devices</td>
<td></td>
</tr>
<tr>
<td>• Any finding that the interpreting radiologist determines requires immediate physician notification</td>
<td>• Malignant or uncertain surgical or other implanted devices (e.g., pacemaker, surgical, pacemaker wires, etc.)</td>
<td></td>
</tr>
<tr>
<td>• Arterial event from diagnostic imaging or interventional procedure</td>
<td>• Adverse event from diagnostic imaging or interventional procedure</td>
<td></td>
</tr>
<tr>
<td>• Significant congenital anomaly</td>
<td>• Significant congenital anomaly</td>
<td></td>
</tr>
</tbody>
</table>

**Neuroradiology**

| General                                |                                      |                                    |
|----------------------------------------|                                      |                                    |
| • Intracranial or spinal hemorrhage (parenchymal, subarachnoid, subdural, epidural) | • Small intracranial mass, likely benign, no mass effect |
| • Non-hereditary stroke or suspected stroke, thromboembolic candidate | • Neurologically significant arterial stenosis (pontine or vertebral), not associated with acute symptoms or otherwise immediately threatening |
| • Intracranial mass with significant mass effect (midline shift, herniation, hydrocephalus) | • Suspected brain metastases, established cancer diagnosis |
| • Brain herniation                      | • Small intracranial mass, likely benign, no mass effect |

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These findings have been placed into three categories of urgency under the assumption that they are known or suspected to be new findings or are known to have significantly worsened since a prior study. A stable finding that was previously known and appropriately communicated may not require additional non-routine communication despite the severity of the disease process.
Computer Assisted Reporting Guidance Objects (CARGO)

Making Guidelines Computer Readable

Courtesy Keith Dreyer, DO, PhD
Radiologist

Reporting Driven by Definition

Definition -> Interface -> Report

Courtesy Keith Dreyer, DO, PhD
Patient: 74F
Exam: CTABPW (untagged)
Completed: 2013-12-02T

Adrenal Nodule

Right, 12 mm

Size

12 mm Se/Im 2 12

Side

• Right

Previously characterized

Adenoma on CT
Adenoma on MRI
Benign on PET
Not previously characterized

Body

In the right adrenal gland (series 2, image 12), a 12 mm lesion does not have specifically benign imaging features.

Impression

Indeterminate 12 mm right adrenal nodule does not have the typical characteristics of a benign adenoma, although most such lesions will ultimately prove to be benign.

Recommendations

• Adrenal mass protocol CT in 6 months.
Adrenal Nodule

Right, 12 mm, Stable 6 mos

Size

12 mm

Body

In the right adrenal gland (series 2, image 12), a 12 mm lesion is unchanged in size for at least six months.

Impression

Stable 12 mm right adrenal nodule. Radiologic findings are most consistent with a benign adrenal adenoma.

Recommendation

COMPARISON: 9/15/2012

FINDINGS:

LOWER THORAX: Lung bases are clear.

HEPATOBIILIARY: No focal hepatic lesions. No biliary ductal dilatation.
SPLEEN: No splenomegaly.
PANCREAS: No focal masses or ductal dilatation.

ADRENALS:
In the right adrenal gland (series 2, image 12), a 12 mm lesion is unchanged in size for at least six months.

KIDNEYS/URETERS: No hydrenephrosis, stones, or solid mass lesions.
PELVIC ORGANS/BLADDER: Unremarkable.

PERITONEUM / RETROPERITONEUM: No free air or fluid.
LYMPH NODES: No lymphadenopathy.
VESSELS: Unremarkable.

GI TRACT: No distention or wall thickening.

BONES AND SOFT TISSUES: Unremarkable.

IMPRESSION:

Stable 12 mm right adrenal nodule. Radiologic findings are most consistent with a benign adrenal adenoma.

RECOMMENDATION:

Improving Report Quality

- Abdominal CT incidental pulmonary nodule

Real-time access to guidelines improves compliance from 45% to 95%

Courtesy Keith Dreyer, DO, PhD
Tarik Alkasab, MD

M T Lu, MD, Boston, MA; D A Rosman, MD; C C Wu, MD; T K Alkasab, MD, PhD; J O Shepard, MD; G W Boland, MD; et al. Impact of a Point-of-Care Electronic Clinical Decision Support (CDS) Tool on Adherence to Departmental Guidelines for Follow-up of Incidental Pulmonary Nodules on Abdominal CT. RSNA 2013
Future Goals: NGC Criteria

- Meet same target criteria for external review as Appropriateness Criteria (AC) panels
  - Merit posting by National Guideline Clearinghouse (NGC) of the AHRQ
    - Documentation of literature searches
    - Evidence linkages and scores
    - Involvement of non-radiology experts
    - Transparent consensus processes
Future Goals: New Themes

- Are some IFs actually normal (e.g. small renal cysts)?
  - Implications for reporting, recommendations
- Can risk thresholds be normalized across findings?
  - Establish risk concepts that can apply to work-up of incidental findings across organ systems and types of findings
  - Broaden these concepts beyond IFs to, e.g. LI-RADS, Lung-RADS, other medical decision making
Clinical decision support methods will evolve and become:

- More accurate, more useful, more efficient
- Essential

Please encourage your IT vendors to develop and improve such systems
Take-Home Messages

- Reaching an inflection point
  - Too much information for us to remember
- Radiology reporting is an open-“book” test
  - Support should be available at the point of interpretation
- Current level of performance is not sustainable
  - Too many forces demanding improvement:
    - Economic, regulatory, medicolegal
“If you don’t like change, you’ll like irrelevance even less”

Eric Shinseki