Best Medical Practices: Maximizing Skills, Minimizing Risk”
‘Lung Cancer’

Optimal Management of Incidental Pulmonary Nodule

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Overview

• Use case examples to illustrate issues and risks associated with suboptimal management of incidental pulmonary nodules
• Review imaging criteria for interpretation of pulmonary nodules
• Describe published guidelines for management of incidental pulmonary nodules
• Demonstrate next generation IT tools designed to help improve management of incidental pulmonary nodules
Patient #1
November 2006: 64 F Cardiac CT
December 2007: History: Confusion, Brain mass
Patient #2
May 2005: History: Fever
December 2006: History: SOB
Patient 3

LLQ pain? Diverticulitis form ED
What are the performance gaps?

- Optimum care of these patients requires:
  - [Address the urgent clinical need and relevant imaging findings which led to imaging, as routine screening with CXR, CT not recommended based on current evidence]
  - *Must improve detection, diagnosis, communication, appropriate follow up and management* of incidental pulmonary nodules
Ann Louise Puopolo, BSN, RN
Director, Loss Prevention & Patient Safety
Top CRICO Cancer-related Cases with a diagnosis-related allegation

N = 160 CRICO PL cases asserted 1/1/98–10/1/08 with a diagnosis-related major allegation and final diagnosis of breast, colorectal, lung or prostate cancer. Total incurred losses = $109 million.
N=17 outpatient PL cases asserted 1/1/03-10/1/08 with a final diagnosis of lung cancer and a diagnosis-related major allegation. Total Incurred = aggregate of expenses, reserves, and payments on open and closed cases.
CRICO Lung Cancer Outpatient Cases

By Assert Year

By Loss Year

N=17 outpatient PL cases asserted 1/1/03-10/1/08 with a final diagnosis of lung cancer and a diagnosis-related major allegation.

Severity Scale:  
High= Death, Permanent Grave, Permanent Major or Permanent Significant
Medium= Permanent Minor, Temporary Major or Temporary Minor
Low= Temporary Insignificant, Emotional Only or Legal Issue Only

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### CRICO Lung Cancer Outpatient Cases

#### diagnosis-related process of care

<table>
<thead>
<tr>
<th>Step</th>
<th># cases</th>
<th>% of cases</th>
<th>Total incurred</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Patient notes problem and seeks care</td>
<td>1</td>
<td>6%</td>
<td>$12,416</td>
</tr>
<tr>
<td>2. History/physical and evaluation of symptoms</td>
<td>8</td>
<td>47%</td>
<td>$7,082,698</td>
</tr>
<tr>
<td>3. Order of diagnostic/lab tests</td>
<td>14</td>
<td>82%</td>
<td>$14,433,646</td>
</tr>
<tr>
<td>4. Performance of tests</td>
<td>1</td>
<td>6%</td>
<td>$1,040,000</td>
</tr>
<tr>
<td>5. Interpretation of tests</td>
<td>9</td>
<td>53%</td>
<td>$9,490,766</td>
</tr>
<tr>
<td>6. Receipt/transmittal of test results</td>
<td>5</td>
<td>29%</td>
<td>$5,217,968</td>
</tr>
<tr>
<td>7. Physician follow up with patient</td>
<td>4</td>
<td>24%</td>
<td>$5,745,182</td>
</tr>
<tr>
<td>8. Referral management</td>
<td>0</td>
<td>0%</td>
<td>$0</td>
</tr>
<tr>
<td>9. Patient compliance with follow-up plan</td>
<td>0</td>
<td>0%</td>
<td>$0</td>
</tr>
</tbody>
</table>

N=24 outpatient PL cases asserted 1/1/03-10/1/08 with a final diagnosis of lung cancer and a diagnosis-related major allegation.

Total Incurred=aggregate of expenses, reserves, and payments on open and closed cases.

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## Top Contributing Factors

<table>
<thead>
<tr>
<th>Issue</th>
<th>% of cases*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Misinterpretation of diagnostic studies</td>
<td>44%</td>
</tr>
<tr>
<td>Communication among providers—patient condition</td>
<td>20%</td>
</tr>
<tr>
<td>Failure/delay in ordering diagnostic test</td>
<td>12%</td>
</tr>
<tr>
<td>Test result management</td>
<td>11%</td>
</tr>
<tr>
<td>- Patient did not receive result</td>
<td></td>
</tr>
<tr>
<td>- Result not received by clinician—other</td>
<td></td>
</tr>
<tr>
<td>Insufficient/lack of documentation—adverse event</td>
<td>8%</td>
</tr>
<tr>
<td>Reliance on negative finding w/ continued symptoms</td>
<td>8%</td>
</tr>
<tr>
<td>Failure to establish differential diagnosis</td>
<td>7%</td>
</tr>
<tr>
<td>Failure to respond to patient’s concerns</td>
<td>7%</td>
</tr>
<tr>
<td>Possible technical problem</td>
<td>7%</td>
</tr>
</tbody>
</table>

*A case may have multiple factors identified.

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CRICO Lung Cancer Outpatient Cases

physician specialty

- General Medicine
- Radiology/Imaging
- Hematology/Oncology
- General Surgery
- Rheumatology/Immunology
- Neurosurgery
- Ent

31 physician defendants named in 17 outpatient PL cases asserted 1/1/03-10/1/08 with a final diagnosis of lung cancer and a diagnosis-related major allegation.
## Summary

<table>
<thead>
<tr>
<th></th>
<th>CRICO</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lung cancer outpatient cases asserted 1/1/03–10/1/08</strong></td>
<td></td>
</tr>
<tr>
<td># cases asserted</td>
<td>17</td>
</tr>
<tr>
<td>Average indemnity incurred</td>
<td>$1,067,694</td>
</tr>
<tr>
<td><strong>Lung cancer outpatient cases closed 1/1/03–10/1/08</strong></td>
<td></td>
</tr>
<tr>
<td># cases closed</td>
<td>18</td>
</tr>
<tr>
<td>% cases closed with payment</td>
<td>44%</td>
</tr>
<tr>
<td>Average indemnity payment</td>
<td>$969,989</td>
</tr>
<tr>
<td># cases closed with payment &gt;=$1 million</td>
<td>2</td>
</tr>
</tbody>
</table>
Lung Cancer

• It is estimated that 219,440 men and women (116,090 men and 103,350 women) will be diagnosed with and 159,390 men and women will die of cancer of the lung and bronchus in 2009*

• More men die from lung cancer than colorectal, prostate and pancreatic cancers combined

• More women die from lung cancer than breast, uterine and ovarian cancers combined

Stage Distribution (SEER Summary Stage 2000)
By Cancer Site
All Ages, All Races, Both Sexes
2000-2006

Percent

Lung and Bronchus

Localized
Regional
Distant
Unstaged

Cancer sites include invasive cases only unless otherwise noted.
Incidence source: SEER 17 areas (San Francisco, Connecticut, Detroit, Hawaii, Iowa, New Mexico, Seattle, Utah, Atlanta, San Jose-Monterey, Los Angeles, Alaska Native Registry, Rural Georgia, California excluding SF/SJM/LA, Kentucky, Louisiana and New Jersey).

Reference: National Cancer Institute
5 year Relative Survival Rate for Non-Small Cell Lung Cancer

<table>
<thead>
<tr>
<th>Stage</th>
<th>5-year Relative Survival Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>56%</td>
</tr>
<tr>
<td>II</td>
<td>34%</td>
</tr>
<tr>
<td>III</td>
<td>10%</td>
</tr>
<tr>
<td>IV</td>
<td>2%</td>
</tr>
</tbody>
</table>

These survival rates aren't broken down by substages, but the rates would likely be slightly higher than those above for the A subgroups and slightly lower for the B subgroups.

Reference: American Cancer Society
Detection
Imaging as a screening tool

- CXR screening has not been shown to reduce disease specific mortality
- Several Low dose CT (LDCT) trials already completed
  - Routine use as a screening tool not supported by current evidence
  - No reduction in disease specific mortality
  - High false positive rate
- National Lung Screening Trial ongoing, reporting by mid-2010
National Lung Screening Trial NLST

• Compares CT vs Chest X-Ray for reducing lung cancer specific mortality
• Smokers aged 55-74 years
• 53,000 participants at 30 sites
• Reporting in 2010
National Lung Screening Trial (NLST)

• Nodule < 4 mm in diameter
  – no follow-up between annual screens

• Nodule > 4 mm minimum
  – f/u 6 mo in addition to annual screens

• Nodules that grow, are spiculated or large go on to biopsy or resection
## CT Screening Trials

<table>
<thead>
<tr>
<th>Study</th>
<th>No. Screened</th>
<th>% Nodules</th>
<th>Lung Ca</th>
<th>Stage I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kaneko (1996)</td>
<td>1369</td>
<td>1%</td>
<td>93</td>
<td></td>
</tr>
<tr>
<td>Sone (1998)</td>
<td>5483</td>
<td>0.5%</td>
<td>84</td>
<td></td>
</tr>
<tr>
<td>Henschke (1999)</td>
<td>1000</td>
<td>23%</td>
<td>2.7%</td>
<td>85</td>
</tr>
<tr>
<td>Swensen (2000)</td>
<td>1520</td>
<td>51%</td>
<td>1.3%</td>
<td>71</td>
</tr>
<tr>
<td>Dederick (2002)</td>
<td>817</td>
<td>43%</td>
<td>1.3%</td>
<td>58</td>
</tr>
<tr>
<td>Nawa (2002)</td>
<td>7956</td>
<td>26%</td>
<td>0.4%</td>
<td>86%</td>
</tr>
</tbody>
</table>
LDCT Missed Lung Cancer

- 1443 individuals (5,418 CT’s)
- 7/22 retrospectively found
- Size - 6 mm (range 4-13 mm)
- 6 Stage 1; 1 Stage 2
MISSED CANCERS

• General population-32 of 83 missed initially

• 88% stage 1A

• Sizes — detection error (9.8 mm) — interpretation error (15.9 mm)

• Detection errors — 91% GGO

• Interpretation errors – TB, fibrosis

Li. Radiology 2002; 225
MISSED NODULES

• Missed nodules many < 4mm

• Factors - location, partial volume, parenchymal disease

• Most proven “missed cancers” are early stage lesions at diagnosis
NODULE SIZE AS RISK FACTOR FOR CA: Results of Baseline Study (N = 233)

<table>
<thead>
<tr>
<th>Size (mm)</th>
<th>2-5</th>
<th>6-10</th>
<th>11-20</th>
<th>20-45</th>
</tr>
</thead>
<tbody>
<tr>
<td>#</td>
<td>99</td>
<td>46</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>%</td>
<td>1</td>
<td>24</td>
<td>33</td>
<td>80</td>
</tr>
</tbody>
</table>

Tiny nodules—very low incidence of cancer

Henschke C. Lancet 1999; 354
40 year old female

Adenocarcinoma
Diagnosis and Management
### Recommendations for Follow-up and Management of Nodules Smaller than 8 mm Detected Incidentally at Nonscreening CT

<table>
<thead>
<tr>
<th>Nodule Size (mm)</th>
<th>Low-Risk Patient†</th>
<th>High-Risk Patient‡</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \leq 4 )</td>
<td>No follow-up needed§</td>
<td>Follow-up CT at 12 mo; if unchanged, no further follow-up‖</td>
</tr>
<tr>
<td>( &gt;4–6 )</td>
<td>Follow-up CT at 12 mo; if unchanged, no further follow-up‖</td>
<td>Initial follow-up CT at 6–12 mo then at 18–24 mo if no change‖</td>
</tr>
<tr>
<td>( &gt;6–8 )</td>
<td>Initial follow-up CT at 6–12 mo then at 18–24 mo if no change</td>
<td>Initial follow-up CT at 3–6 mo then at 9–12 and 24 mo if no change</td>
</tr>
<tr>
<td>( &gt;8 )</td>
<td>Follow-up CT at around 3, 9, and 24 mo, dynamic contrast-enhanced CT, PET, and/or biopsy</td>
<td>Same as for low-risk patient</td>
</tr>
</tbody>
</table>

**Note.**—Newly detected indeterminate nodule in persons 35 years of age or older.  
* Average of length and width.  
† Minimal or absent history of smoking and of other known risk factors.  
‡ History of smoking or of other known risk factors.  
§ The risk of malignancy in this category (<1%) is substantially less than that in a baseline CT scan of an asymptomatic smoker.  
‖ Nonsolid (ground-glass) or partly solid nodules may require longer follow-up to exclude indolent adenocarcinoma.
Radiologic Interpretation: NODULE FEATURES

- **Size**
- **Growth rate**
  - Stable in 2 years: benign
  - Malignant: doubling time 30 days to 180 days
- **Internal characteristics**
  - Ca++: benign
  - Ground glass opacities
- **Shape, margins and contour**
  - **Benign features**: Smooth, round
  - **Malignant features**: Spiculated
  - **Satellite lesions**: (granulomatous process)
CALCIFIED GRANULOMA

Narrow collimation advantage

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Inflammatory nodule - 12 month resolution

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INDETERMINATE NODULE 4-7 mm

Thin-section CT at 6 m.

Ca+

Benign

Indeterminate

CT at 12 mo

CT at 24 mo

↑size > 8mm PET or Biopsy

↑size – Biopsy or PET

↑size – Biopsy or PET
6 m follow up: No Change
Inflammatory opacity 6 m
Increase in size –
Adenocarcinoma, papillary type
NODULE GROWTH

DOUBLING TIME

- Stable in 2 years: benign

- Malignant: doubling time 30 days to 18 months
DETECTING VOLUME CHANGE: SMALL NODULES

- 4 mm volume doubling
- 5 mm volume doubling
- 6.2 mm volume doubling

- 3 cm
- 3.75 cm
- 4.70 cm
Inter-observer Variation
VARIABLES IN NODULE SIZING

• Scan technique—collimation, reconstruction interval, F.O.V.

• Observer variables, cursor location
Adenocarcinoma

Initial scan

At 10 months
SHAPE, MARGINS, & CONTOUR

- Smooth, round - benign
- Spiculated (corona radiata) - malignant
- Satellite lesions - granulomatous process
Baseline

MAI GRANULOMA

6 m.
Adenocarcinoma  Squamous cell carcinoma
Bronchoalveolar carcinoma
GROUND GLASS OPACITIES (GGO)
Screen
Bronchoalveolar Carcinoma
6 m
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CAUSES OF GGO

• Slow growing bronchoalveolar carcinoma
• Atypical adenomatous hyperplasia
• Organizing pneumonia
• Inflammatory pseudotumor
• Lymphoma
GGO: CT / PATHOLOGY

- 43 GGO`s < 2 cm resected

- BAC 23; Adenocarcinoma 11; AAH 9

- GGO and solid component 93% malignant

Nakata Chest 2002
INDETERMINATE NODULE (8-20 mm)

PET-FDG SCAN

(-) 3+12 mo F/U CT

(+ ) FDG

Biopsy/VATS/Lobectomy

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THORACIC NEEDLE BIOPSY

• Sensitivity - 90% overall

• Nodules < 15mm PPV-100%, NPV-88%

• Benign diagnoses > 80% with small cutting needles

• Pneumothorax & hemorrhage 5-30%
CT Fluoroscopic biopsy

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FDG IMAGING (PET)

- Overnight fasting: scan 45-60 mins post injection
- 1 mg Ativan — muscle relaxant
- Attenuation correction allows calculation of absolute FDG uptake rates
ADENOCARCINOMA 1 YEAR GROWTH - PET+
PET and Indeterminate SPN (< 3 cm)

- **METANALYSIS-Gould (JAMA 2001)**
  - 40 studies with 1474 focal pulmonary lesions where PET performed
  - Sensitivity of 96.8 % and a specificity of 77.8%

- PET improves characterization of SPN with very high negative predictive value

- PET use for pulmonary nodules
  - Watch and wait is a safe strategy in PET-negative nodules
  - Malignancy must be excluded in PET-positive nodules

- **LIMITATIONS:**
  - Small nodules (< 6-7 mm) have higher false negative rate
  - False positives associated with inflammation, granulomatous disease, fungal infections
LUL 1 cm Adenocarcinoma
Emphysema
8mm nodule Unchanged at 6 months - Negative PET scan
Organizing Pneumonia
Mild PET Activity
FALSE NEGATIVES

- Bronchoalveolar cell carcinomas
- Carcinoid
- Small slow growing adenocarcinoma
- Acellular tumor
PET/CT ADVANTAGES

• Distinguish physiologic uptake from tumor

• Precise localization of uptake

• Localize uptake to specific nodes

• Single examination - staging
Summary: PET and SPN

• Negative PET most likely benign but can be “followed” rather than biopsied

• Positive PET should be considered potentially malignant- consider biopsy or resection
Communication Among Caregivers
National Patient Safety Goal
Joint Commission
Goal 2: Improve the effectiveness of communication among caregivers

• 2A. For verbal or telephone orders or for telephonic reporting of critical test results, verify the complete order or test result by having the person receiving the information record and "read-back" the complete order or test result.

Ref: http://www.jointcommission.org/PatientSafety/NationalPatientSafetyGoals/07
National Patient Safety Goal
Joint Commission
Goal 2: Improve the effectiveness of communication among caregivers

• 2C. Measure, assess and, if appropriate, take action to improve the timeliness of reporting, and the timeliness of receipt by the responsible licensed caregiver, of critical test results and values.

Ref: http://www.jointcommission.org/PatientSafety/NationalPatientSafetyGoals/07
BWH Policies and procedures:

[Definitions & Functional Requirements for Enabling IT tools]
## Notification of Critical/Discrepant Results

**Description:** This measure is obtained by reviewing all radiology reports from one work day to manually assess whether results were critical and if so whether communication was within our policy parameters.

**Data Source:** BWH IDX/Rad

**Last Update:** Jul-09

**Comments:** Policy for critical results communication is attached

**Contact:** Maria Damiano

<table>
<thead>
<tr>
<th>Month</th>
<th>Total # of Cases Reviewed</th>
<th># (%) with Critical or Discrepant Finding</th>
<th># (%) of Critical/Discrepant Meeting Notification Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>February-07</td>
<td>623</td>
<td>42 (6.7%)</td>
<td>12 (28.6%)</td>
</tr>
<tr>
<td>March-07</td>
<td>840</td>
<td>51 (6.1%)</td>
<td>30 (58.8%)</td>
</tr>
<tr>
<td>May-07</td>
<td>511</td>
<td>32 (6.3%)</td>
<td>22 (68.8%)</td>
</tr>
<tr>
<td>July-07</td>
<td>645</td>
<td>46 (7.1%)</td>
<td>31 (67.4%)</td>
</tr>
<tr>
<td>October-07</td>
<td>692</td>
<td>59 (8.5%)</td>
<td>37 (62.7%)</td>
</tr>
<tr>
<td>November-07</td>
<td>384</td>
<td>16 (4.2%)</td>
<td>14 (87.5%)</td>
</tr>
<tr>
<td>January-07</td>
<td>249</td>
<td>16 (6.4%)</td>
<td>11 (68.8%)</td>
</tr>
<tr>
<td>July-07</td>
<td>603</td>
<td>45 (7.5%)</td>
<td>41 (91.1%)</td>
</tr>
<tr>
<td>June-08</td>
<td>310</td>
<td>30 (9.7%)</td>
<td>29 (96.7%)</td>
</tr>
<tr>
<td>August-08</td>
<td>536</td>
<td>72 (13.4%)</td>
<td>61 (84.7%)</td>
</tr>
<tr>
<td>November-08</td>
<td>1187</td>
<td>120 (10.1%)</td>
<td>108 (90.0%)</td>
</tr>
<tr>
<td>January-09</td>
<td>1025</td>
<td>109 (10.6%)</td>
<td>99 (96.6%)</td>
</tr>
<tr>
<td>March-09</td>
<td>1540</td>
<td>158 (10.26%)</td>
<td>134 (84.8%)</td>
</tr>
<tr>
<td>May-09</td>
<td>1383</td>
<td>152 (11.6%)</td>
<td>125 (96.4%)</td>
</tr>
<tr>
<td>July-09</td>
<td>1147</td>
<td><strong>128 (11.6%)</strong></td>
<td><strong>122 (95.3%)</strong></td>
</tr>
</tbody>
</table>
Examples of Next Generation IT tools for improved management of incidental pulmonary nodules
Computer Aided Tools

• Improved nodule detection in large data sets
• Reduce reading times
• Quantification – volume measurements
• Characterization
<table>
<thead>
<tr>
<th>Patient Name: OETEST, BRIDGET M.</th>
<th>BWH MRN 11489986</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth Date: February 13, 1934</td>
<td>Age: 75 years</td>
</tr>
<tr>
<td>Gender: Female</td>
<td>Phone Number: 6175551212</td>
</tr>
<tr>
<td>Ordering Provider: Khorasani, Ramin, MD MPH</td>
<td>Payor: BWH - BCBS of MA / HMO Blue/Blue Choice</td>
</tr>
<tr>
<td>Exam: CT Chest Pulmonary Nodule follow up</td>
<td>Order ID: 13526022</td>
</tr>
<tr>
<td>Created By: N/A</td>
<td>Ordering Site: TEST PRACTICE</td>
</tr>
</tbody>
</table>

* Required indication

### Signs and Symptoms: (Select one or more)

- No symptoms relevant to incidental pulmonary nodule(s)
- Asymptomatic

### Relevant History: (Select one or more)

- Incidental pulmonary nodule(s) (Specify)
- Smoking history (Specify)
- Asbestos exposure (Specify)
- Occupational exposure to Uranium and/or Radon (Specify)
- History of lung cancer in first degree relative (Specify)
- Abnormal Prior Imaging Specify
- Known Active Malignancy (under/planning for treatment) (Specify)
- Known Metastasis (Specify)
- History of Malignancy (no evidence of disease) (Specify)
- Recurrent pneumonia
- Emphysema
- Sarcoid
The recommendations below reflect nationally published guidelines based on nodule size and assessment of patient risk. According to the information you have provided, this patient is considered low risk for primary lung malignancy. Final determination of your patient’s risk should include your clinical judgment.

The decision to pursue further evaluation for an individual patient should also include consideration of the patient’s co-morbid conditions, long-term prognosis, and preference.

Fleischner Society recommendations for Follow-up and Management of Pulmonary Nodules Detected Incidentally at Nonscreening CT

1. Nodule Size (mm): <=4
   o Low-Risk Patient**: No follow-up needed*
   o High-Risk Patient~: Follow-up CT at 12 mo; if unchanged, no further follow-up**

2. Nodule Size (mm): >4-6
   o Low-Risk Patient**: Follow-up CT at 12 mo; if unchanged, no further follow-up**
   o High-Risk Patient~: Initial follow-up CT at 6-12 mo then at 18-24 mo if no change

3. Nodule Size (mm): >6-8
   o Low-Risk Patient**: Initial follow-up CT at 6-12 mo then at 18-24 mo if no change
   o High-Risk Patient~: Initial follow-up CT at 3-6 mo then at 9-12 and 24 mo if no change

4. Nodule Size (mm): >8
   o Low-Risk Patient**: Follow-up CT at around 3, 9, and 24 mo; dynamic contrast-enhanced CT, PET, and/or biopsy
   o High-Risk Patient~: Same as for low-risk patient

Note: Newly detected indeterminate nodule in persons 55 years of age or older.

* Average of length and width.
** Minimal or absent history of smoking and of other known risk factors.
~ History of smoking or of other known risk factors.
* The risk of malignancy in this category (<1%) is substantially less than that in a baseline CT scan of an asymptomatic smoker.
** Nonsolid (ground-glass) or partly solid nodules may require longer follow-up to exclude indolent adenocarcinoma.
*** Nodule size measured as average of length and width. Adoption of this policy applies only to fully solid nodules. Ground glass and partly solid nodules are excluded from the Fleischner criteria. These may require longer follow-up to exclude indolent adenocarcinoma.
Powerscribe
Radiology Screen
## Alert Notification of Critical Radiology Results

<table>
<thead>
<tr>
<th>Alert Level</th>
<th>Count</th>
<th>Next Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Alert</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Orange Alert</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Yellow Alert</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Gray Alert</td>
<td>0</td>
<td>-</td>
</tr>
</tbody>
</table>


Change Password
Create New Alert

<table>
<thead>
<tr>
<th>Level</th>
<th>Status</th>
<th>Context</th>
<th>Message</th>
<th>Users</th>
<th>Time</th>
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</tbody>
</table>

Last updated at: Wed Sep 30 13:55:45 EDT 2009

Ramin Khorasani, MD, 2009
Critical Results :: Result Detail

<table>
<thead>
<tr>
<th>Level</th>
<th>Contact</th>
<th>Result</th>
<th>Communication Options</th>
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<tbody>
<tr>
<td>Red Alert</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orange Alert</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yellow Alert</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gray Alert</td>
<td>○</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Red Alert**: Findings that are **potentially immediately life-threatening**. Requires "face-to-face" or "telephone" contact.
- **Orange Alert**: Findings that could result in mortality or significant morbidity if not appropriately treated immediately. Requires "face-to-face" or "telephone" contact.
- **Yellow Alert**: Findings that could result in mortality or significant morbidity if not appropriately treated, but are not immediately life-threatening or urgent. Requires "face-to-face", "telephone", or other verifiable contact.

Message

After speaking to provider, please acknowledge your communication in ANCR.

- "To" field is blank.
- No result notes provided.
- Direct contact is required, but no method is selected.

Submit  Cancel

---

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<table>
<thead>
<tr>
<th>Context</th>
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</thead>
<tbody>
<tr>
<td>Patient Name</td>
<td></td>
</tr>
<tr>
<td>Patient DOB</td>
<td></td>
</tr>
<tr>
<td>Patient MRN</td>
<td></td>
</tr>
<tr>
<td>Accession</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>Exam Time</td>
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</tr>
</tbody>
</table>

Enter Critical Findings Description Below *

Diverticulitis

Orange Alert

Email: [redacted]
Phone: [redacted]

Test

Notification
After speaking to provider, please acknowledge your communication in ANCR.

- Direct contact is required, but no method is selected.

Submit  Cancel
Ramin Khorasani, MD, 2009
### Alert Notification of Critical Radiology Results

<table>
<thead>
<tr>
<th>Alert Level</th>
<th>Count</th>
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<tbody>
<tr>
<td>Red Alert</td>
<td>0</td>
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</tr>
<tr>
<td>Orange Alert</td>
<td>1</td>
<td>2 hr 27 min</td>
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<tr>
<td>Yellow Alert</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Gray Alert</td>
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Last update at: Wed Sep 30 14:03:40 EDT 2009

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<table>
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<td></td>
<td></td>
<td>2 hr 27 min pending</td>
<td>Diverticulitis</td>
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<td></td>
</tr>
</tbody>
</table>

- **Sender:**
  - 2009-09-30 14:01:00

- **Receiver:**
  - 2009-09-30 16:31:00

- **Proxy Status:**
  - Acknowledged
Critical Results :: Result Detail

Pulmonary Nodule

Radiology Exam
Patient Name
Patient DOB
Patient MRN
Accession
Description
Exam Time

Last Updated: 9/30/2009 2:09 PM
09-30-2009 02:09 PM
Pager: ********

Acknowledgment

- face-to-face
- phone
- Email
- Personal Text Message
- Other - please specify below

Notes:

Submit  Submit and Close  Cancel and Close

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Summary

• Optimal management of Incidental pulmonary nodules will improve patient safety and quality of care
  – Suboptimal care is a source of patient harm and malpractice risk

• Improvements in detection, diagnosis, appropriate followup and management of these nodules will benefit from next generation IT tools embedded in physician workflow
What you can do today!

• Encourage leaders at your institution to include incidental lung nodules as a key component of optimizing communication of critical results (A Joint Commission mandate)

• Follow Fleishner Society guidelines for management of small indeterminate pulmonary nodules
## Fleischner Society Small Nodule Followup

<table>
<thead>
<tr>
<th>Nodule Size</th>
<th>Low Risk Pt</th>
<th>High Risk Pt</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;=4 mm</td>
<td>None</td>
<td>12 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No Δ - stop</td>
</tr>
<tr>
<td>4 – 6 mm</td>
<td>12 m</td>
<td>6-12 m; No Δ then 18-24 m</td>
</tr>
<tr>
<td></td>
<td>No Δ - stop</td>
<td></td>
</tr>
<tr>
<td>6 – 8 mm</td>
<td>6-12 m</td>
<td>3-6 m</td>
</tr>
<tr>
<td></td>
<td>If no Δ then 18-24 m</td>
<td>If no Δ then 18-24 m</td>
</tr>
<tr>
<td>&gt; 8 mm</td>
<td>CT 3, 9, 24 m or CE CT; PET; or biopsy</td>
<td></td>
</tr>
</tbody>
</table>

Ramin Khorasani, MD, 2009

Radiology Nov, 2005
Thank you

- Special thanks to (for material provided for this workshop):
  - Francine Jacobson, MD,
  - Luciano Prevedello, MD,