Essential Elements of Effective Lung Cancer Screening Programs: Best Practices

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Cardiothoracic Radiology
Associate Chair for Clinical Affairs
University of Michigan

Chair. ACR Committee on Lung Cancer Screening
Lung Cancer

early stage

late stage
ACR Lung Cancer Screening Goals

- From research to practice, *efficacy to effectiveness*
- Safe, high quality and effective lung cancer screening in practice
- Provide parameters, program framework, data collection on including patient outcomes for facility and practitioner QA/QI
- Data to inform the national dialogue moving forward
- To perform at least as well if not better than NLST
ACR: Lung Cancer Screening Activities

- Practice parameter for the performance and interpretation CT for lung cancer screening April ‘14
- LungRADS™ structured reporting and management tool April ’14
- ACR Designated Lung Cancer Screening Centers under the CT accreditation program May ‘14
- ACR Lung Cancer Screening Registry September ‘15
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ACR LungRADS 1.0 Released at April 2014

- Structured reporting and management tool for lung cancer screening CT interpretation; it will iterate with the evidence
  - *Definition of (+) screen, management recommendations*
  - *How nodules are measured (diameter vs. volume)*

- Modeled after the ACR’s 20 year experience with BI-RADS, now it’s fifth edition

http://www.acr.org/Quality-Safety/Resources/LungRADS
Why LungRADS for Lung Cancer CT Screening?

- High false positive rate & lack of clarity about how to manage positive screens
- Concerns about over testing, radiation exposure, patient anxiety, invasive procedures & cost
- Overdiagnosis: cancer you can live with vs. die of
- Provide standardized reporting & management; facilitate outcomes tracking
Fundamental question:
What is a positive screen?
NLST: Positive CT Screen Definition

- Nodule $\geq 4$ mm
- Independent of nodule consistency (solid vs ground glass)
- Positive screen rates:
  - 27.3% baseline
  - 27.9% T1 screen
  - 16.8% T2 screen
Size Threshold for a Positive Lung Cancer Screening CT

Definition of a Positive Test Result in Computed Tomography Screening for Lung Cancer
A Cohort Study
Claudia L. Henschke, PhD, MD; Rowena Yip, MPH; David F. Yankelevitz, MD; and James P. Smith, MD, for the International Early Lung Cancer Action Program Investigators*


effect of alternative thresholds for defining a positive result on the rates of positive results and cancer diagnoses
## Size Threshold for a Positive Lung Cancer Screening CT

- 21,136 individuals with baseline CT performed between 2006 and 2010

<table>
<thead>
<tr>
<th>Size</th>
<th>(+) Screen Rate</th>
<th>Work Up Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 5 mm</td>
<td>16.0%</td>
<td></td>
</tr>
<tr>
<td>≥ 6 mm</td>
<td>10.2%</td>
<td>36%</td>
</tr>
<tr>
<td>≥ 7 mm</td>
<td>7.1%</td>
<td>56%</td>
</tr>
<tr>
<td>≥ 8 mm</td>
<td>5.1%</td>
<td>68%</td>
</tr>
<tr>
<td>≥ 9 mm</td>
<td>4.0%</td>
<td>75%</td>
</tr>
</tbody>
</table>

9 month delay in cancer dx 0%, 5%, 5.9%, 6.7%
NLST: Size Threshold for a Positive Lung Cancer Screening CT

- Examined impact of nodule size > 4 mm NLST (+) screen
- 64% of (+) screens (11,598/18141) were ≤ 7 mm nodules
- Going from 5 to 8 mm...
  - missed or delayed cancer increased from 1.0% to 15.8%
  - false positives reduced from 65.8% to 10.5%
- “Raising the nodule size threshold for a (+) screen would substantially reduce false-positive CT screenings and medical resource utilization with a variable impact on screening outcomes.”

Gierada DS, Pinsky P, Nath H, Chiles C, Duan F, Aberle DR. *Journal of the National Cancer Institute* October 2014
AIS

International Multidisciplinary Classification of Lung Adenocarcinoma

AAH

MIA

AIS

INVASIVE
Preinvasive Lesions:

- Atypical adenomatous hyperplasia (AAH)
  - localized small proliferation of atypical Type II pneumocytes and/or Clara cells lining the alveolar walls and respiratory bronchioles

- Adenocarcinoma in situ (AIS)
  - \( \leq 3 \text{ cm} \) solitary adenocarcinoma with pure lepidic growth
  - complete resection achieves 100% disease-specific survival
2011 IASLC/ATS/ERS International Multidisciplinary Classification of Lung Adenocarcinoma

- Minimally invasive adenocarcinoma (MIA)
  - ≤ 3 cm with predominantly lepidic pattern and ≤5 mm invasion at the largest dimension
  - does not invade lymphatics, blood vessels, or pleura
  - contains no necrosis
  - complete resection achieves nearly 100% disease-specific survival

- Invasive adenocarcinoma
Structured reporting and management

Categories 0 – 4

Two Modifiers:

S  Clinically significant or potentially clinically significant findings (non lung cancer)

C  Prior diagnosis of lung cancer who return to screening

Facilitates data collection, facility & radiologist performance, quality assurance and improvement
<table>
<thead>
<tr>
<th>Category Descriptor</th>
<th>Category Descriptor</th>
<th>Primary Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incomplete</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Negative</td>
<td>No nodules &amp; definitely benign nodules</td>
<td>1</td>
</tr>
<tr>
<td>Benign Appearance or Behavior</td>
<td>Nodules with a very low likelihood of becoming a clinically active cancer due to size or lack of growth</td>
<td>2</td>
</tr>
<tr>
<td>Probably Benign</td>
<td>Probably benign finding(s) - short term follow up suggested; includes nodules with a low likelihood of becoming a clinically active cancer</td>
<td>3</td>
</tr>
<tr>
<td>Suspicious</td>
<td>Findings for which additional diagnostic testing and/or tissue sampling is recommended</td>
<td>4A, 4B</td>
</tr>
<tr>
<td>Category Descriptor</td>
<td>Category Descriptor</td>
<td>Primary Category</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>------------------</td>
</tr>
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<td>0</td>
</tr>
<tr>
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<td>1</td>
</tr>
<tr>
<td>Benign Appearance</td>
<td>Nodules with a very low likelihood of becoming a clinically active cancer due to</td>
<td>2</td>
</tr>
<tr>
<td>or Behavior</td>
<td>size or lack of growth</td>
<td></td>
</tr>
<tr>
<td>Probably Benign</td>
<td>Probably benign finding(s) - short term follow up suggested; includes nodules with a</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>low likelihood of becoming a clinically active cancer</td>
<td></td>
</tr>
<tr>
<td>Suspicious</td>
<td>Findings for which additional diagnostic testing and/or tissue sampling is</td>
<td>4A</td>
</tr>
<tr>
<td></td>
<td>recommended</td>
<td>4B</td>
</tr>
<tr>
<td>Category Descriptor</td>
<td>Category Descriptor</td>
<td>Primary Category</td>
</tr>
<tr>
<td>---------------------</td>
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</table>
## ACR LungRADS™

<table>
<thead>
<tr>
<th>Category Descriptor</th>
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<th>Primary Category</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incomplete</td>
<td>-</td>
<td>0</td>
<td>Additional lung cancer screening CT images and/or comparison to prior chest CT examinations is needed</td>
</tr>
<tr>
<td>Negative</td>
<td>No nodules &amp; definitely benign nodules</td>
<td>1</td>
<td>Continue annual screening with LDCT in 12 months</td>
</tr>
<tr>
<td>Benign Appearance or Behavior</td>
<td>Nodules with a very low likelihood of becoming a clinically active cancer due to size or lack of growth</td>
<td>2</td>
<td>6 month LDCT</td>
</tr>
<tr>
<td>Probably Benign</td>
<td>Probably benign finding(s) - short term follow up suggested; includes nodules with a low likelihood of becoming a clinically active cancer</td>
<td>3</td>
<td>3 month LDCT; PET/CT may be used when there is a ≥ 8 mm solid component</td>
</tr>
<tr>
<td>Suspicious</td>
<td>Findings for which additional diagnostic testing and/or tissue sampling is recommended</td>
<td>4A, 4B</td>
<td>Chest CT with or without contrast, PET/CT and/or tissue sampling depending on the *probability of malignancy and comorbidities. PET/CT may be used when there is a ≥ 8 mm solid component.</td>
</tr>
</tbody>
</table>
What nodules or other findings get into what categories?

- Nodule size
  - baseline or new finding
  - growth vs. stability

- Nodule consistency
  - solid, part solid, non solid (aka ground glass nodule)
  - specific benign features (calcification, fat)
Classifying Screen-Detected Lung Nodules

- Solid
- Part solid
- Non solid
  aka GGO or GGN
## NEGATIVE SCREEN: ACR LungRADS™

<table>
<thead>
<tr>
<th>Category</th>
<th>Category Descriptor</th>
<th>Category</th>
<th>Findings</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative</td>
<td>No nodules and definitely benign nodules</td>
<td>1</td>
<td>no lung nodules</td>
<td>Continue annual screening with LDCT in 12 months</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>nodule(s) with specific calcifications: complete, central, popcorn, concentric rings and fat containing nodules</td>
<td></td>
</tr>
<tr>
<td>Benign Appearance or Behavior</td>
<td>Nodules with a very low likelihood of becoming a clinically active cancer due to size or lack of growth</td>
<td>2</td>
<td>solid nodule(s):&lt;6 mm new &lt; 4 mm part solid nodule(s):&lt;6 mm total diameter on baseline screening non solid nodule(s) (GGN):&lt;20 mm OR ≥ 20 mm and unchanged or slowly growing category 3 or 4 nodules unchanged for ≥ 3 months</td>
<td></td>
</tr>
</tbody>
</table>
LungRADS™ 2: Non solid nodule < 2 cm

Courtesy of Ann Leung
Baseline screens (57,496 participants):

- 2392 (4.2%) pure non solid nodules
- 26% resolved/decreased on f/u CT
- 73/2392 cancers (3%) - all stage 1 adenocarcinoma
- 8 AIS; 65 invasive including 19 that developed a solid component before resection
Repeat screens (64,677):
- 485 (0.7%) new non solid nodules
- 66% resolved/decreased on f/u CT
- 11/485 (2.3%) cancers - all stage I adenocarcinoma ≤ 15 mm
- No cancer dx for any NSN ≥15 mm

<table>
<thead>
<tr>
<th>Parameter</th>
<th>&lt;6 mm</th>
<th>6–9 mm</th>
<th>10–14 mm</th>
<th>15–30 mm</th>
<th>≥31 mm</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolved or decreased</td>
<td>125</td>
<td>113</td>
<td>53</td>
<td>28</td>
<td>3</td>
<td>322</td>
</tr>
<tr>
<td>Lung cancer</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Stable or growth</td>
<td>89</td>
<td>42</td>
<td>29</td>
<td>3</td>
<td>0</td>
<td>163</td>
</tr>
<tr>
<td>Pathologic diagnosis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lung cancer</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>AAH, ABP*</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Nonmalignant diagnoses</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>214</td>
<td>155</td>
<td>82</td>
<td>31</td>
<td>3</td>
<td>485</td>
</tr>
</tbody>
</table>
- 84 total cancers
- 22% developed a solid component before resection with a median time from NSN to PSN of 25 months
- Rx: 55 lobectomy, 2 bilobectomy, 26 sublobar resection, 1 RT
- 100% lung cancer survival (median f/u 78 months, IQR 45-122 months); no recurrence
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<td>solid nodule(s):</td>
<td>6 month LDCT</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>≥ 6 to &lt; 8 mm at baseline OR new 4 mm to &lt; 6 mm</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>part solid nodule(s)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>≥ 6 mm total diameter with solid component &lt; 6 mm OR new &lt; 6 mm total diameter</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>non solid nodule(s) (GGN) ≥ 20 mm on baseline CT or new</td>
<td></td>
</tr>
</tbody>
</table>
LungRADS™ 2 to 3: Non solid nodule < 2 cm

Stage 1A adenocarcinoma

 Courtesy of Ann Leung
<table>
<thead>
<tr>
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<th>Findings</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Suspicious</td>
<td>Findings for which additional diagnostic testing and/or tissue sampling is recommended</td>
<td>solid nodule(s):</td>
<td>3 month LDCT; PET/CT may be used when there is a ≥ 8 mm solid component</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- ≥ 8 to &lt; 15 mm at baseline OR</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- growing &lt; 8 mm OR</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- new 6 to &lt; 8 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>part solid nodule(s):</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- ≥ 6 mm with solid component ≥ 6 mm to &lt; 8 mm OR</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- with a new or growing &lt; 4 mm solid component</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>endobronchial nodule</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>solid nodule(s)</td>
<td>chest CT with or without contrast, PET/CT and/or tissue sampling depending on the *probability of malignancy and comorbidities. PET/CT may be used when there is a ≥ 8 mm solid component</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- ≥ 15 mm OR</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- new or growing, and ≥ 8 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>part solid nodule(s) with:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- a solid component ≥ 8 mm OR</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- a new or growing ≥ 4 mm solid component</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Category 3 or 4 nodules with additional features or imaging findings that increases the suspicion of malignancy</td>
<td></td>
</tr>
</tbody>
</table>
LungRADS 2 – 3 – 4
International Multidisciplinary Classification of Lung Adenocarcinoma

AAH 2

MIA 3

AIS 2

INVASIVE 4B
Expected to reduce positives screens from > 1 in 4 to 1 in 10

Based on relatively high percentage of screens on which there is published data are baseline screens vs. continuous screening over 25 years
- NLST 1 year baseline, 2 years subsequent screens
- USPSTF 25 years, 1 in 25 years are baseline screens if enter at age 55
2180 consecutive high-risk patients undergoing clinical CT screening between 1/2012-05/2014 reclassified using ACR LunRADS

- no clinical follow-up in 577 patients (26%)

ACR Lung-RADS:
- Reduced positive screen rate from 27.6% to 10.6%
- No false negatives in the 152 patients with >12-month follow-up reclassified as benign
- Increased PPV for malignancy from 6.9% to 17.3%

http://www.jacr.org/article/S1546-1440(14)00473-6/abstract
ACR LungRADS™

Performance of Lung-RADS in the National Lung Screening Trial: A Retrospective Assessment

- Reclassified NLST CT screening exams using LungRADS
- 26,722 LDCT arm subjects (26,309 baseline; 48,671 post-baseline)

<table>
<thead>
<tr>
<th></th>
<th>BASELINE</th>
<th>POST BASELINE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LungRADS (NLST)</td>
<td>LungRADS (NLST)</td>
</tr>
<tr>
<td>FPR (1-Specificity)</td>
<td>12.9% (26.6%)</td>
<td>5.3% (27.4%)</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>86.1% (93.8%)</td>
<td>78.6% (94.4%)</td>
</tr>
<tr>
<td>PPV</td>
<td>6.9% (3.8%)</td>
<td>10.9% (2.4%)</td>
</tr>
</tbody>
</table>

*Paul F. Pinsky, PhD; David S. Gierada, MD; William Black, MD; Reginald Munden, MD; Hrudaya Nath, MD; Denise Aberle, MD; and Ella Kazerooni, MD Annals of Internal Medicine February 2015
False negative LungRADS screens were nodules with no growth and/or pure nonsolid nodules (5 year survival 64% TPs vs. 73% FNs)

Compared to the original NLST criteria

- FPRs with LungRADS were ½ at baseline and ¼ post-baseline
- Sensitivity was 8% and 15% lower at baseline and post-baseline
- PPV was 2-3 fold higher for LungRADS
Incidental clinically significant findings in 7.5%

- Reported to be as high as 14% in a systematic review; varying definition of “clinically significant”
- some lead to health benefit
- others require additional testing with no health benefit
- require further evaluation
  - cardiac
  - COPD
  - vascular (aneurysms)
  - masses (upper abdomen, neck, mediastinal)

- ACR incidental findings guidelines on managing incidental findings (abdomen, thyroid; thoracic in progress; included in ACRSelect™ decision support tool; MIPPA
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Approved by CMS as a qualified registry March 5, 2015

ACR National Radiology Database Registries (NRDR) aid facilities with quality improvement programs & efforts to improve patient care by comparing facility data to others regionally and nationally and are approved by CMS as a Qualified Clinical Data Registry (QCDR) for Physician Quality Reporting System (PQRS)

NRDR registries include:
- Dose Index Registry (DIR)
- CT Colonography Registry (CTC)
- National Mammography Database (NMD)
- National Oncologic PET Registry (NOPR)
- General Radiology Improvement Database (GRID)
ACR Lung Cancer Screening Registry™

- Developed in response to the CMS registry reporting requirement included in the national coverage decision
- Final data elements posted March 2015
- Major data categories:
  - Appropriateness of screening
  - Screening test itself
    - CT radiation exposure
    - LungRADS structured reporting category
  - Outcomes at 12 months from the screening CT event

http://www.acr.org/Quality-Safety/National-Radiology-Data-Registry/Lung-Cancer-Screening-Registry
CMS - Lung Cancer Screening Decision
Defines Minimum Registry Data Elements

- Facility Identifier
- Radiologist NPI
- Patient Identifier
- Ordering practitioner NPI
- CT scanner manufacturer, model
- Indication screening; no s/sx lung cancer
- System lung nodule classification/reporting
- Smoking history pack years, current/former
- Effective radiation dose CTDIvol
- Screening baseline or subsequent
Outcomes at 12 months after a screening CT
- Diagnostic follow up: imaging, tissue sampling
- Tissue diagnosis
- Lung cancer diagnosis, including stage

Additional risk factors for lung cancer, optional
Benchmark Reports:
- Individual radiologists within the imaging facility
- Local, regional and national performance comparisons on core metrics
  - Appropriateness
  - Radiation exposure
  - LungRADS™ category distribution
  - Diagnostic testing & tissue sampling rates
  - Lung cancer diagnosis rates
ACR Lung Cancer Screening Registry™

- Requires sites to input data on all patients screened at the facility – not just CMS beneficiaries
- Requires SS# as the patient identifier to facilitate outcome tracking as patients move across providers
- Active participation meets the newly Part IV practice quality improvement requirements for ABR diplomates participating in MOC
ACR Lung Cancer Screening Registry™

- Data submission began 9/15/15
- Manual data entry
- Working on electronic data submission with vendors
  - 8 currently validated & available

IT DOCUMENTS

ACR Connect Authentication Service
ACR LCSR JSON Mapping
NRDR LCSR Exam Data Exchange
### ACR NRDR Registries & LCSR at 4 months

#### Number of Participating Facilities

**January 2016**

<table>
<thead>
<tr>
<th>Facility</th>
<th>Pending</th>
<th>Active</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTC</td>
<td>65</td>
<td>14</td>
<td>79</td>
</tr>
<tr>
<td>DIR</td>
<td>534</td>
<td>1,079</td>
<td>1,613</td>
</tr>
<tr>
<td>GRID</td>
<td>264</td>
<td>170</td>
<td>434</td>
</tr>
<tr>
<td>ICE</td>
<td>61</td>
<td>25</td>
<td>86</td>
</tr>
<tr>
<td>LCSR</td>
<td>763</td>
<td>417</td>
<td>1,180</td>
</tr>
<tr>
<td>NMD</td>
<td>145</td>
<td>85</td>
<td>230</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,358</strong></td>
<td><strong>1,491</strong></td>
<td><strong>2,769</strong></td>
</tr>
</tbody>
</table>
ACR Lung Cancer Screening Registry™

- For CT screens in 2015
- Entered as of 2/26/16
  - 434 facilities
  - 1549 radiologists
  - 16,096 screens (Dec '15 n = 7,077)
- Top 5 states: FL TX VA MI OH
ACR Lung Cancer Screening Registry™

- **Appropriateness:**
  - Using USPSTF criteria
  - 2015 screens entered as of 2/26/16
  - 90% (14417 / 16096)
Smoking cessation offered:
- 2015 screens entered as of 2/26/16
- All screens (baseline and f/u)
- 73% (11689 / 16096)
- Note: not yet broken down by 1st screen vs. subsequent screens, or current vs. former smokers
- Radiation exposure (1):
  - 2015 screens entered as of 2/26/2016

<table>
<thead>
<tr>
<th>Radiation Exposure</th>
<th>Overall Mean CTDIvol</th>
<th>Underweight CTDIvol</th>
<th>Normal CTDIvol</th>
<th>Overweight CTDIvol</th>
<th>Obese CTDIvol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean CTDIvol</td>
<td>3.18</td>
<td>2.20</td>
<td>2.53</td>
<td>2.84</td>
<td>4.01</td>
</tr>
<tr>
<td>Mean CTDIvol</td>
<td>16096</td>
<td>(407)</td>
<td>4187</td>
<td>5481</td>
<td>5426</td>
</tr>
</tbody>
</table>
Radiation exposure (2):
- 2015 screens entered as of 2/26/2016

<table>
<thead>
<tr>
<th>BMI Category</th>
<th>Mean DLP</th>
<th>Screens Entered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight (BMI &lt; 18.5)</td>
<td>79.45</td>
<td>407</td>
</tr>
<tr>
<td>Normal (BMI of 18.5–24.9)</td>
<td>81.95</td>
<td>4187</td>
</tr>
<tr>
<td>Overweight (BMI of 25–29.9)</td>
<td>91.90</td>
<td>5481</td>
</tr>
<tr>
<td>Obese (BMI of 30 or greater)</td>
<td>115.10</td>
<td>5426</td>
</tr>
</tbody>
</table>
Abnormal interpretation rate:

- 2015 screens entered as of 2/26/16
- All screens (baseline and f/u)
- LungRADS 3, 4A, 4B, 4X
- 20%* (3355 / 16096)
- Note: not yet broken down by 1st screen vs. subsequent screens

* under the radar symptomatic cancers; difficulties recognizing lung cancer symptoms vs. smoking related symptoms in practice; potential skew to the highest risk individuals
ACR Lung Cancer Screening Registry™

- Too early to report outcomes
  - Cancer detection rate (CDR / 1000)
  - PPV1 (for percut bx, bronch, surgery)
  - PPV2
  - PPV3
<table>
<thead>
<tr>
<th>Date</th>
<th>Facilities</th>
<th>CT screens</th>
</tr>
</thead>
<tbody>
<tr>
<td>2/2/16</td>
<td>434</td>
<td>16,096</td>
</tr>
<tr>
<td>5/31/16</td>
<td>928</td>
<td>51,265</td>
</tr>
</tbody>
</table>
# ACR Lung Cancer Screening Registry™

## Core Documents
- Upload Template for LCSR Record Layout
- LCSR Case Registration Form
- LCSR Exam Form
- LCSR Required Data Elements
- LCSR Data Dictionary
- Lung-RADS Assessment Categories
- Suggested order form information
- LCSR User Guide
- The Lung Cancer Screening Registry Information Letter
- How to Add LCSR to Your Registration
- Association of Coronary Artery Calcification and Mortality in the National Lung Screening Trial: A Comparison of Three Scoring Methods
- CMS Final Decision
- List of Active LCSR Participants
- Lung Cancer Screening Registry Annual Sample Report, 2015

## NRDR RESOURCES
- NRDR Introduction and Overview
- Lung Cancer Screening Registry and Designation Comparison
- New Facility Registration
- Registration Process and Fee Structure
- NRDR Participation Agreement
- NRDR Participation Agreement Addendum
- NRDR FAQ
- IRB Exemption
- NRDR User Guide
- NRDR Brochure
- Using NRDR as an ABR PQI project
- Representative List of NRDR Facilities
- NRDR and Related Publications
- 2014 Data Registries Forum Slides
- Application of Meaningful Use Public Health Objective in NRDR

ACR Lung Cancer Screening Resources

ACR is your best resource for providing safe, effective lung cancer screening with the latest research, toolkits and key patient information.

- **ACR CT Accreditation**
  Earn the ACR gold standard in CT accreditation and show that your facility meets the highest quality and safety standards in medical imaging.

- **Lung Cancer Screening Registry**
  The ACR Lung Cancer Screening Registry, approved by CMS for reimbursement and PQRS participation, will calculate audit measures and provide peer comparisons.

- **Lung Cancer Screening Education**
  Learn how to implement a comprehensive, multidisciplinary program in your practice; receive CME/SA-CME credits and comply with ACR requirements for lung cancer screening through this all-new, interactive eLearning activity.
  - ACR Designated Lung Cancer Screening Center
    Earn the ACR Designated Lung Cancer Screening Center status and demonstrate to your referring partners that you provide safe and effective care.

- **Lung-RADS**
  Standardize your lung cancer screening CT scoring and management.

http://www.acr.org/Quality-Safety/Resources/Lung-Imaging-Resources
Lung Cancer Screening

- It’s very early in lung cancer screening implementation, and we have a lot to learn and do.
- Awareness & education among patients and providers is not at the level of breast cancer or colon cancer screening.
  - October breast cancer awareness month – pink
  - February colon cancer awareness – dark blue
  - November for lung cancer awareness - white
Essential Elements of Effective Lung Cancer Screening Programs: Best Practices

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Cardiothoracic Radiology
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