Lung Cancer Screening: Manage Your Metrics

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Mayo Clinic

08/06/2019
Learning Objectives

After completing this activity, the participant should be better able to:

1. Review Lung Cancer Screening (LCS) metrics captured by the ACR registry and additional suggested LCS metrics.

2. Discuss management strategies for collected LCS metrics.

3. Recognize challenges related to LCS metrics.
Physician Accreditation Statement

- The American College of Radiology is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education for physicians.

Physician Credit Designation

- The American College of Radiology designates this live activity for a maximum of 1.0 AMA PRA Category 1 Credit™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Instructions to Receive Credit

- In order to successfully complete the activity, participants must complete an activity evaluation and claim credit commensurate with their participation in the activity.
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The following planners and managers have no financial relationships to disclose:

Tiffany Gowen, MHA – Planner/Manager
Carlye Armstrong – Planner/ Reviewer
Allison Ferreira, DO- Faculty
Lung Cancer Screening

“Lung cancer screening is not solely an imaging test; it is a process that should take place within an organized program.” Mazzone. (2015) 147(2), 295–303.

- Multi-disciplinary team
- Lung Cancer Screening Coordinator/Navigator
NLST results to be used in Shared Decision-Making

**Review the evidence from the NLST**

- 20% reduction in lung cancer mortality LDCT screening (3 rounds – prevalence 2 annual incidence, 6.5 year follow-up)

- 6.7% reduction all-cause mortality LDCT screening

- Stage shift – 70% of lung cancers detected Stage 1 and 2 with LDCT; reverted to 37% during follow-up after screening rounds completed

- 26.6% false positive rate baseline scan – reduced to 12.8% in a retrospective analysis with ACR LungRADS

- Less than 0.5% intervention for benign disease

- Less than 1.5 mSv radiation exposure

- Estimated 18% overdiagnosis; majority (15%) of overdiagnosis for what is now known as carcinoma in situ (bronchoaveolar cell carcinoma)

https://www.lungcancerscreeningguide.org/
Comparison to other screening modalities

Number needed to screen LDCT less than mammography and colonoscopy


- Screening Colonoscopy NNS = 1250 (J Med Screen 2001;8:125-127)


Screening LDCT more deaths prevented as compared to mammography and PSA testing

- LDCT – 3 deaths averted
- Mammography – 0.1-1.6 deaths averted
- PSA – 0-1 death averted

LCS is the only cancer screening test to reduce overall mortality.

https://www.lungcancerscreeningguide.org/
CMS LCS Metrics Requirement

- Collect and submit data to a CMS-approved registry for each LDCT lung cancer screening performed
- Primary purpose: document compliance with coverage criteria
- Secondary purpose: aid in studying the clinical benefits of screening

CMS Decision Memo for Screening for Lung Cancer with Low Dose Computed Tomography (LDCT). 2/2015.
CMS LCS Metrics Requirement

- The data collected and submitted to a CMS-approved registry must include, at minimum, all of the following elements:
<table>
<thead>
<tr>
<th>Data Type</th>
<th>CMS Minimum Data Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility Identifier</td>
<td></td>
</tr>
<tr>
<td>Radiologist (reading)</td>
<td>National Provider Identifier (NPI)</td>
</tr>
<tr>
<td>Patient Identifier</td>
<td></td>
</tr>
<tr>
<td>NPI</td>
<td></td>
</tr>
<tr>
<td>Manufacturer, Model</td>
<td></td>
</tr>
<tr>
<td>Lung cancer LDCT screening, absence signs or symptoms of lung cancer</td>
<td></td>
</tr>
<tr>
<td>Lung nodule identification, classification and reporting system</td>
<td></td>
</tr>
<tr>
<td>Current status (current, former, never)</td>
<td>Years since quittingPack-yearsSmoking cessation interventions available</td>
</tr>
<tr>
<td>CT Dose Index (CTDIvol)</td>
<td></td>
</tr>
<tr>
<td>Screen date, initial or subsequent screen</td>
<td></td>
</tr>
</tbody>
</table>
Additional CMS registry requirements:

- Steering committee and governance board
- Quality assurance plan
Additional CMS registry requirements:

- Steering committee and governance board
- Quality assurance plan

ACR Registry
ACR Registry **Required** Elements

- Refused to answer SSN
- Refused Medicare ID
- Date of birth
- Patient sex
- Patient height
- Patient weight
- Smoking status
- Pack years
- Number of years since quit
ACR Registry **Required** Elements

- Did physician provide guidance
- Documentation of shared decision making
- Ordering practitioner NPI
- Reading radiologist NPI
- Exam date
- Signs or symptoms of lung cancer
- Indication of exam
ACR Registry **Required Elements**

- Modality
- CT scanner manufacturer
- CT scanner model
- Reconstructed image width
- CTDI<sub>vol</sub>
- DLP

- CT exam result Lung RADS
- CT exam result modifier S
- CT exam result modifier C
ACR Registry Optional Elements

- Exam unique ID
- Patient name
- Other ID (MRN)
- Patient SSN
- Medicare Beneficiary ID
- Ordering practitioner name
ACR Registry **Optional** Elements

- Date of death
- Cause of death
- How cause was determined
- Other method of determining
- Non-lung cancer cause
- Death within 30 days
ACR Registry **Optional** Elements

- Other comorbidities
- COPD
- Interstitial lung disease
- Pulmonary fibrosis
- Cancer related history
- Years since prior diagnosis

- Radon exposure
- Occupational exposures
- Second hand smoke exposure
- History of cancers
- Lung cancer in first degree relative
ACR Registry *Optional* Elements

- Tube current time
- Tube voltage
- Scanning time
- Scanning volume
- Pitch
- Reason for recall
- Mass specifics

- Patient race
- Patient ethnicity
- Health insurance
- Education level
ACR Registry Optional Elements

- Date of follow-up
- Follow-up diagnostic
- Tissue diagnosis
- Tissue diagnosis method
- Location from sample obtained

- Histology
- Stage, clinical or pathologic
- Overall stage
- T status
- N status
- M status
Shared Decision Making Requirements

- Determination of eligibility
- Use of one or more decision aids
- Benefits and harms of screening
- Follow up diagnostic testing
- Overdiagnosis

CMS Decision Memo for Screening for Lung Cancer with Low Dose Computed Tomography (LDCT). 2/2015.
Shared Decision Making Requirements

- False positive rate
- Total radiation exposure
- Counseling on importance of adherence to annual LDCT LCS
- Impact of comorbidities and ability or willingness to undergo diagnosis and treatment

CMS Decision Memo for Screening for Lung Cancer with Low Dose Computed Tomography (LDCT). 2/2015.
Shared Decision Making Requirements

- Counseling on importance of maintaining cigarette smoking abstinence or beginning/continuing tobacco use cessation
- Providing information about tobacco cessation interventions
- If appropriate, provide written order for LCS with LDCT including DOB, current smoking status, pack-year history, # years since quitting, asymptomatic, NPI ordering provider

CMS Decision Memo for Screening for Lung Cancer with Low Dose Computed Tomography (LDCT). 2/2015.
Additional Data Elements/Future Work

- Institutional positivity rate (provided by ACR)
- Number of cancers (true positives)
- False positive rate
- Treatment, Survival outcomes
- Complications
Additional Data Elements/Future Work

- Impact of screening participation, smoking cessation rates
- Predictor model use
- Biomarker status
- Institutional adherence rates for annual exams
  - Uncover unknown barriers, redirect outreach efforts
- Identification of unscreened groups of patients
- Rate of incidental findings
Metrics Management Strategies

- LCS Coordinator
- Integration with EMR and reporting system
- ACR Registry reports
- Institutional databases
CT Chest Screening Lung Cancer

Process Inst:
1. Willing and able to undergo lung cancer treatment
2. No signs/symptoms of lung cancer or respiratory infection in past 12 weeks
3. Minimum of 30 pack-years of smoking
4. If former smoker, quit within 15 years
5. Age 55-77 years
6. No history of lung cancer ever or other comorbidities that limit life expectancy to less than 5 years.

Status:
- Normal
- Standing
- Future

Expected Date: 10/2/2019
- Today
- Tomorrow
- 1 Week
- 2 Weeks
- 1 Month
- 3 Months
- 6 Months
- Approx.

Expires:
- 10/2/2019
- 1 Month
- 2 Months
- 3 Months
- 4 Months
- 6 Months
- 1 Year
- 18 Months

Last Resulted:

<table>
<thead>
<tr>
<th>Component</th>
<th>Time Elapsed</th>
<th>Value</th>
<th>Range</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUN</td>
<td>212 days (09/02/18 0355)</td>
<td>16</td>
<td>10 - 20 mg/dL</td>
<td>Final result</td>
</tr>
<tr>
<td>Creatinine</td>
<td>212 days (09/02/18 0355)</td>
<td>0.75 (L)</td>
<td>0.80 - 1.50 mg/dL</td>
<td>Final result</td>
</tr>
<tr>
<td>eGFR</td>
<td>212 days (09/02/18 0355)</td>
<td>91</td>
<td>&gt; 60 mL/min/1.73 m²</td>
<td>Final result</td>
</tr>
</tbody>
</table>

Comments: The eGFR was calculated using the CKD-EPI equation. As with all creatinine based estimates of kidney function, eGFR values calculated with the CKD-EPI equation are not accurate in patients with acute kidney failure, extremes of body mass or the acutely ill. http://tinyurl.com/DSMCRtkf
Reference Links: 1. Lung Ca CT Screening Decision Aid

Priority: Routine

Class: Ancillary Performed

Where will study be performed? Lebanon Radiology

Reason for exam and clinical history: Lung Cancer Screening

Other pertinent information: Asymptomatic but at high risk for lung cancer

Smoking status: Current

How many years ago did patient quit? 2

Pack Years: 30

Shared decision required for first billed scan - see link above for decision aid. Use the smartphrase "CTLUNGCANCER" for documentation.

Shared Decision Making Documented: This is not the first screen

Does the patient show any signs or symptoms of lung cancer? Yes

Is this the first (baseline) CT or annual? Annual
## Patient Information

<table>
<thead>
<tr>
<th>Name</th>
<th>DOB</th>
<th>MRN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- [ ] On Precaution
- [ ] Is or May Be Pregnant
- [ ] Diabetic
- [ ] Wheelchair
- [ ] IV
- [ ] O₂
- [ ] Deaf
- [ ] Blind
- [ ] Stretcher
- [ ] Disoriented

## Indication / Request Details

- [ ] CT
- [ ] Part to be Examined: CT Chest Lung Cancer Screening (MG0556)
- [ ] Baseline Screen
- [ ] Annual

**Signs / Symptoms:** Asymptomatic but at high risk for lung cancer

**Question to be Answered:** Screening for signs of lung cancer

## ICD-10 Code

- [ ] Former smokers Z87.891 "History of Tobacco Use"
- [ ] Current smokers F17.260 "Nicotine Dependence"

**Comments:**

## Referring Provider Information

<table>
<thead>
<tr>
<th>Name</th>
<th>NPI (National Provider Number - Required):</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- [ ] Staff Physician
- [ ] Resident / Intern
- [ ] NP / APRN / PA
- [ ] Other (outside DH)

**Signature**

**Date**

## By Signing This Order You Certify and the Medical Record Reflects That the Patient:

- [ ] Is 55 – 77 Years of Age
- [ ] Is asymptomatic for lung cancer (no fewer, chest pain, new shortness of breath, new or changing cough, coughing up blood, or unexplained significant weight loss)
- [ ] Has no history of lung cancer ever or other comorbidities that limit life expectancy to less than 5 years
- [ ] Has at least a 30 pack year history of smoking - Document smoking history below

**Helpful Website for Multiple Starting/Quitting Dates:** [http://smokingpackyears.com/](http://smokingpackyears.com/)

- [ ] Current Smoker
- [ ] Former Smoker Quit less than 15 years ago: Year quit ______
- [ ] Pack Years Must be Documented: Packs/day [20 cigarettes/pack] ____ X Years smoked ____ = ______

- [ ] If this is the first screening CT to be billed to insurance: Has participated in a shared decision making session during which potential risks and benefits of CT lung screening were discussed using a decision aid.


- [ ] Was informed of the importance of adherence to annual screening, impact of comorbidities, ability/willingness to undergo possible treatment for lung cancer
- [ ] Was informed of the importance of smoking cessation and/or maintaining smoking abstinence,
Data for submission pulls from:

- Order question entries
- Patient’s EMR
- CT technologist ‘End Exam Navigator’
- Exam report data fields
Registries Console

NRDR LCSR - v1.0

DH MHMH LUNG SCREENING SUBMISSION
12/01/18 - 12/31/18

Patient record for submission has been created by the system

Not ready to submit: 21
Ready to submit: 1
Submitted: 0

DH MAN LUNG SCREENING SUBMISSION
12/01/18 - 12/31/18

Patient record for submission has been successfully submitted

Not ready to submit: 16
Submitted: 0

Mark Complete

Patient record for submission is missing no required data elements

Do this when all records for the date range are shown as submitted.
**Important (4)**

<table>
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<tr>
<th>Field</th>
<th>Value</th>
<th>Message</th>
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<tr>
<td>Pack-years:</td>
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<td>The value 0 is outside the valid range (1 - 999).</td>
</tr>
<tr>
<td>CTDIVol:</td>
<td>No value</td>
<td>Item missing: CTDIVol</td>
</tr>
<tr>
<td>DLP:</td>
<td>No value</td>
<td>Item missing: DLP</td>
</tr>
<tr>
<td>Reconstructed Image</td>
<td>No value</td>
<td>Item missing: Reconstructed Image Width</td>
</tr>
<tr>
<td>Width:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Essentials

- Proper notification of results
  - Lung-RADS ‘positive’ versus ‘negative’ exam
  - EMR/report
  - Telephone
  - Mailing
- Proper follow up of results
- Reminder of annual exam
  - Improving ease of adherence
- Confirming continued eligibility
- Ensuring access to smoking cessation assistance
<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Accrual</td>
<td>Summary data including number of exams registered, cancelled, in progress and completed for the user’s facility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exam Status</td>
<td>Patient ID, Physician, exam status, and form submission dates</td>
<td>Ad hoc</td>
<td></td>
</tr>
<tr>
<td>Exam Detail</td>
<td>Exam and follow-up data, by exam</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LCSR Data Export</td>
<td>All data from Lung Exam and Lung Follow-Up forms submitted to registry for user’s facility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LCSR Quarterly Aggregate Report</td>
<td>Aggregated measures for facility compared to other sites by type, location, and geographical region, and to entire registry</td>
<td></td>
<td>All</td>
</tr>
<tr>
<td></td>
<td>Measures for each physician compared to entire registry</td>
<td>Quarterly</td>
<td></td>
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<tr>
<td></td>
<td>List of physicians participating in ABR PQI</td>
<td></td>
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<tr>
<td></td>
<td>Sample LCSR Quarterly Aggregate Report</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LCSR Corporate Account Reports</td>
<td>Excel spreadsheet with same data as <em>National Comparison</em> table in Quarterly Aggregate Report, but with data for each facility shown side-by-side compared to entire corporate account (i.e. all facilities combined), and the LCSR.</td>
<td></td>
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</table>
### Facility 100853 National Comparison

**Jan-Dec 2018**

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<tr>
<th>Measure</th>
<th>2018</th>
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<tr>
<td></td>
<td></td>
<td>Your Facility (100853)</td>
<td>All LCSR</td>
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<td></td>
<td>Rate</td>
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<td>Rate</td>
<td>Num-Den</td>
<td>Rate</td>
<td>Num-Den</td>
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<tr>
<td><strong>All Exams</strong></td>
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<tr>
<td>Appropriateness of screening by USPSTF criteria (%)</td>
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<tr>
<td></td>
<td>90.35</td>
<td>119609 / 132379</td>
<td>90.32</td>
<td>372592</td>
<td>412546</td>
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<tr>
<td>Smoking cessation counselling offered (%)</td>
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<td></td>
<td>76.35</td>
<td>101070 / 132379</td>
<td>76.94</td>
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<tr>
<td>Radiation exposure 1</td>
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<tr>
<td>Smoking cessation counselling offered among current smokers (%)</td>
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<tr>
<td></td>
<td>83.86</td>
<td>64559 / 76980</td>
<td>84.35</td>
<td>203777</td>
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<td>Mean CTDIvol - Overall (mGy)</td>
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<tr>
<td></td>
<td>3.23</td>
<td>NA / 132379</td>
<td>3.23</td>
<td>NA / 412546</td>
<td>NA / 16838</td>
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</tr>
<tr>
<td>Mean CTDIvol - underweight (BMI &lt;18.5) (mGy)</td>
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<tr>
<td></td>
<td>2.61</td>
<td>NA / 5140</td>
<td>2.67</td>
<td>NA / 100078</td>
<td>NA / 16838</td>
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<td>Mean CTDIvol - normal (BMI of 18.5 -24.9) (mGy)</td>
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<td>2.75</td>
<td>NA / 32174</td>
<td>2.68</td>
<td>NA / 100078</td>
<td>NA / 16838</td>
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<tr>
<td>Mean CTDIvol - overweight (BMI of 25 -29.9) (mGy)</td>
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<td>3.06</td>
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<td>3.04</td>
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<td>NA / 16838</td>
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<td>Mean DLP - Overall</td>
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<td>NA / 132379</td>
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<td>NA / 412546</td>
<td>NA / 16838</td>
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</tr>
<tr>
<td>Mean DLP - underweight (BMI &lt;18.5) (mGy-cm)</td>
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<td>NA / 5140</td>
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<td>Mean DLP - normal (BMI of 18.5-24.9) (mGy-cm)</td>
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<td>79.24</td>
<td>NA / 32174</td>
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<td>NA / 16838</td>
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<td>Mean DLP - overweight (BMI of 25-29.9) (mGy-cm)</td>
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<td>NA / 131690</td>
<td>NA / 16838</td>
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<tr>
<td>Mean DLP - obese (BMI of 30 or greater) (mGy-cm)</td>
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<td>113.89</td>
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<tr>
<td>Abnormal Interpretation Rate (%)</td>
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<td></td>
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<td></td>
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<tr>
<td>(Lung-RADS 3, 4a, 4b, 4x)</td>
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<td>Abnormal Interpretation Rate, at baseline exam (%)</td>
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<td>Abnormal Interpretation Rate, at annual exam (%)</td>
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</tr>
<tr>
<td></td>
<td>10.81</td>
<td>4702 / 43484</td>
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<td>135087</td>
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</tr>
<tr>
<td>Cancer Detection Rate (CDR) per 1000</td>
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<tr>
<td>CDR per 1000 for prevalent cancers, detected at baseline exam</td>
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<td></td>
<td>2.68</td>
<td>355 / 132379</td>
<td>2.60</td>
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<td>CDR per 1000 for incident cancers, detected at annual exam</td>
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<td>3.12</td>
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<tr>
<td>Positive Predictive Value 1 (PPV1) (%)</td>
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<tr>
<td>PPV1 for lung cancers detected on percutaneous biopsies (%)</td>
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<td>49.46</td>
<td>182 / 368</td>
<td>51.24</td>
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<tr>
<td>PPV1 for lung cancers detected on bronchoscopies (%)</td>
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<tr>
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<td>40.72</td>
<td>90 / 221</td>
<td>39.22</td>
<td>273</td>
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<tr>
<td>PPV1 for surgically detected lung cancers (%)</td>
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<td>66.06</td>
<td>109 / 165</td>
<td>65.53</td>
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<tr>
<td>Positive Predictive Value 2a (PPV2a) (%)</td>
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<td>73 / 16834</td>
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Challenges/ Ongoing work

- Quality of data input (e.g. smoking history, comorbidities, pathology correlation)
- Shared decision making verification
- Adherence to registry submission
- Sensitivity
  - False negatives
- Overdiagnosis
- Lung-RADS updates
Recap

- Effective LCS requires a multidisciplinary program
- ATS/ALA Lung Cancer Screening Implementation Guide
- Integration with EMR, reporting system
- Importance of LCS Coordinator
- Accurate and complete LCS metrics
  - Institutional and national LCS analysis
  - Future research efforts
- ACR Lung Cancer Screening Registry
References

- ACR – STR Practice Parameter for the Performance and Reporting of Lung Cancer Screening Thoracic Computed Tomography (CT), 2014.
- American Thoracic Society and American Lung Association Implementation Guide for Lung Cancer Screening
Special Thank You

- Dr. Bill Black, Dartmouth-Hitchcock Medical Center
- Molly Housman, Dartmouth-Hitchcock LCS Coordinator
- Dr. Darin White, Mayo Clinic
- Dr. David Midthun, Mayo Clinic
- LCS Steering Committee 2.0