Unlocking Radiology Reporting Data

An Implementation of Synoptic Radiology Reporting in Low Dose CT Cancer Screening

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Disclosures

Nothing to disclose
What is Synoptic Reporting?

<table>
<thead>
<tr>
<th>What’s the difference?</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Narrative</strong></td>
<td>Are report with little to no structure</td>
</tr>
<tr>
<td><strong>Standardized</strong></td>
<td>A report which has been standardized by a local institution, jurisdiction, professional body, or other organization</td>
</tr>
<tr>
<td><strong>Structured</strong></td>
<td>A standardized report with discrete fields (e.g. drop down menus, or multi-select lists)</td>
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<tr>
<td><strong>Synoptic</strong></td>
<td>A data mineable report from which information can automatically be extracted without manual intervention</td>
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</tbody>
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Problem Statement

• **Problem**: Narrative text reports are a barrier to
  • Information exchange
  • Quality improvement
  • Cancer surveillance
  • Data mining
  • Research

• **Aim**: Collect synoptic radiology reporting data for clinical analytics and measurement directly from radiology report dictation
Background

• Cancer Care Ontario (CCO) is an advisor agency to the Ontario Ministry of Health and Long Term Care for funding and delivery of cancer services

• Lakeridge Health is one of Ontario's largest community hospitals, serving approximately 650,000 people

• CCO and LH collaborated as part of the High Risk Lung Cancer Screening Pilot (HRLCSP)
Background

• HRLCSP was created to evaluate the feasibility of a provincial screening program
• Data collected will enable evaluation in fall 2018 and by end of 2019/20
• Lakeridge Health is only site collecting discrete radiology reporting data
Approach

Iterate on template design in VR System to represent data elements in a usable manner.
Approach

#SIIM18

CLINICAL INFORMATION
1. Clinical Information
2. Reason for exam: O Baseline scan O 12 month recall O 6 month follow up O 3 month follow up O Other follow up

COMPARISON STUDY (CS)
1. Comparison Study: O Store Available O Previous CT exam(s) ___________________________ (date(s))

IMAGING PROCEDURE DESCRIPTION
1. Overall image quality: O Adequate O Suboptimal O Non-diagnostic
2. Procedure protocol: O LDCT Study Protocol O Other:
3. All measurements obtained on axial CT Lung reconstruction series __________

FINDINGS
A. Nodules
1. Number of lung nodules present in total (any size) __________ (Any size if more than 10 nodules please enter “10”)
The 10 most worrisome/nodes (≥ 4 mm) need to be measured:

   2. Number of nodule(s) ≥ 4 mm: __________ (will up any means 1 if ≥ 4 mm)

   i) Image:

   ii) Level: O RUL, O RML, O RLL, O LUL, O LML, O LL (describe)

   iii) Location: O RML, O RLL, O LUL, O LML, O LL

   iv) Attenuation: O Solid

   Mean diameter: mm, Length: mm, Width: mm

   O Particulate

   Overall size: mean diameter: mm, Length: mm, Width: mm

   Size of solid component: mean diameter: mm, Length: mm, Width: mm

   Pure ground glass:

   Shear diameter: mm, Length: mm, Width: mm

   v) Composition:

   O None

   O Stable nodule

   O New nodule

   O Other:

   v) Other comments __________

   If there are additional nodules, please report Section A for nodules 1-10

   *Other comments (including nodule <4 mm):

B. INCIDENTAL FINDINGS
1. Lung or Pleura __________
2. Mediastinum or Mediastinal tissue __________
3. Chest wall and/or abdomen __________
4. Bones __________
5. Upper Abdomen: __________
6. Other: __________

IMPRESSION

1. Pulmonary nodule summary: __________

2. Nodules AOR Lung-RADS™ Category:

   The most worrisome nodule described above is assigned a Lung-RADS category

   O 0 Additional lung cancer screening CT images after comparison to prior chest CT examination is needed

   O 1 LDCT in 12 months

   O 2 LDCT in 6 months

   O 3 LDCT in 6 months

   O 4A Referral to a Lung Diagnostic Assessment Program (LDAP)

   O 4B Referral to a Lung Diagnostic Assessment Program (LDAP)

   O 4C Referral to a Lung Diagnostic Assessment Program (LDAP)

   O 4D Referral to a Lung Diagnostic Assessment Program (LDAP)

   *Additional comments: __________

   All patients must be followed for at least 6 months from the date of the prior CT.

   *Note: images presented in this format are not full.
Approach

Rads must manually insert nodule macro for each nodule found greater than 4mm up to 10 nodules.
Approach

Nodule:

i) Image: [ ]

ii) Lobe: [ RUL, RML, RLL, LLU, Lingula, LLL ]

iii) Location: [ Parenchymal, Subpleural, or Fissural ]

iv) Attenuation:
   - Solid: Mean Diameter [ ], mm, length: [ ], mm, width: [ ] mm
   - Part-solid: Overall mean diameter: [ ] mm, length: [ ] mm, width: [ ] mm
   - Size of Solid component: mean diameter: [ ] mm, length: [ ] mm, width: [ ] mm
   - Pure ground glass: Mean diameter [ ] mm, length: [ ] mm, width: [ ] mm

v) Comparison: [ No Prior Comparison ]
   - Stable nodule
   - New nodule
   - Interval increase in solid component; previous mean diameter: [ ] mm
   - Compared to most recent CT or Compared to: [ date ]
   - Interval increase in ground glass component; previous diameter: [ ] mm
   - Interval decreased in size

vi) Margins: [ Spiculated, Smooth, Lobulated, Polygonal, Halo or Obscured ]

vii) Calcifications: [ None, Benign Pattern or Indeterminate ]

viii) Other characteristics: [ None, Fat, Cavitation, or Other ]

ix) Other Comments: [ ]
# SIIM2018 Challenges

## Data Collection
- Picklists appear alphabetically instead of by frequency
- No validation upon data entry
- Multiple Macros increase complexity
- Blank fields – intentional or not?

## Data Submission
- Manual submission in CSV format
- Data mapping challenges (validation, structure)
Challenges

RadLex Codes help expert panel decide on terminology choices.

Send to Hospital

Clinical template

PACS Admin builds template

Vendor

Reporting Application Template

Report sent to RIS/HIS/R

CSV saved in RIS with discrete data

RadLex Codes make querying data easier with consistent Unique ID.

RadLex Codes help expert panel decide on terminology choices.
<table>
<thead>
<tr>
<th>Case Number</th>
<th>Modality</th>
<th>Initial Date</th>
<th>Radiologist</th>
<th>Comment</th>
<th>Details</th>
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<tbody>
<tr>
<td>5948.001</td>
<td>CT High Risk Lung Initial</td>
<td>4/10/2017</td>
<td>&quot;MERCY, LEE&quot;</td>
<td>Number of dominant nodules (Lakeridge Health)</td>
<td>10</td>
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<td>CT High Risk Lung Initial</td>
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<td>Number of total pulmonary nodules (Lakeridge Health)</td>
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<td>Other characteristics (Lakeridge Health)</td>
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<td>Other comments (Lakeridge Health)</td>
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<tr>
<td>5948.001</td>
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<td>Other incidental findings (Lakeridge Health)</td>
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<td>4/10/2017</td>
<td>&quot;MERCY, LEE&quot;</td>
<td>Other nodule comments (Lakeridge Health)</td>
<td>3 nodules less than 4mm in RUL</td>
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<td>5948.001</td>
<td>CT High Risk Lung Initial</td>
<td>4/10/2017</td>
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<td>Other procedure protocol (Lakeridge Health)</td>
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<td>Overall Image Quality (Lakeridge Health)</td>
<td>Suboptimal</td>
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<td>5948.001</td>
<td>CT High Risk Lung Initial</td>
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<td>Part-solid Length (Lakeridge Health)</td>
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<td>Part-solid mean diameter (Lakeridge Health)</td>
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<td>&quot;MERCY, LEE&quot;</td>
<td>Part-solid Overall Size (Lakeridge Health)</td>
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<td>Part-solid Width (Lakeridge Health)</td>
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<td>5948.001</td>
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<td>Procedure protocol (Lakeridge Health) LDCT Study Protocol</td>
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<td>Pulmonary Nodule Summary (Lakeridge Health)</td>
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<td>Pure ground glass length (Lakeridge Health)</td>
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<td>Pure ground glass mean diameter (Lakeridge Health)</td>
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<td>&quot;MERCY, LEE&quot;</td>
<td>Reason for exam (Lakeridge Health)</td>
<td>Other follow-up</td>
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<td>CT High Risk Lung Initial</td>
<td>4/10/2017</td>
<td>&quot;MERCY, LEE&quot;</td>
<td>Recommendation for follow-up (Lakeridge Health)</td>
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<td>Solid Length (Lakeridge Health)</td>
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<td>Solid Mean Diameter (Lakeridge Health)</td>
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<td>&quot;MERCY, LEE&quot;</td>
<td>Summary other reason for exam (Lakeridge Health)</td>
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<td>5948.001</td>
<td>CT High Risk Lung Initial</td>
<td>4/10/2017</td>
<td>&quot;MERCY, LEE&quot;</td>
<td>Abdomen (Lakeridge Health)</td>
<td>normal</td>
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</tbody>
</table>
Outcome

Anonymized Data

No nodules found

Indicates Macro Number and Type have 1s, 2s, 3s...10s, and 1p, 2p, 3p...10p. S & P macros types have different measurement fields to fill out.

Variation in number of decimal places

Many omissions in Picklist field indicate a usability or training issue.
Conclusion

• Implemented 1 reporting template for 35 radiologists across 3 sites with different VR reporting solutions, 1 site reporting discrete data

• Success in capturing discrete data using current technology and solutions despite challenges

• **Future Directions:** Analysis of data for patient level reporting, completeness of reports, peer review, local/regional projections, report template improvement, intelligent templating, auto-staging, patient friendly reports
Acknowledgements

• Lakeridge Health Team
• CCO HRLSCP Team
• CCO Cancer Imaging Program Team