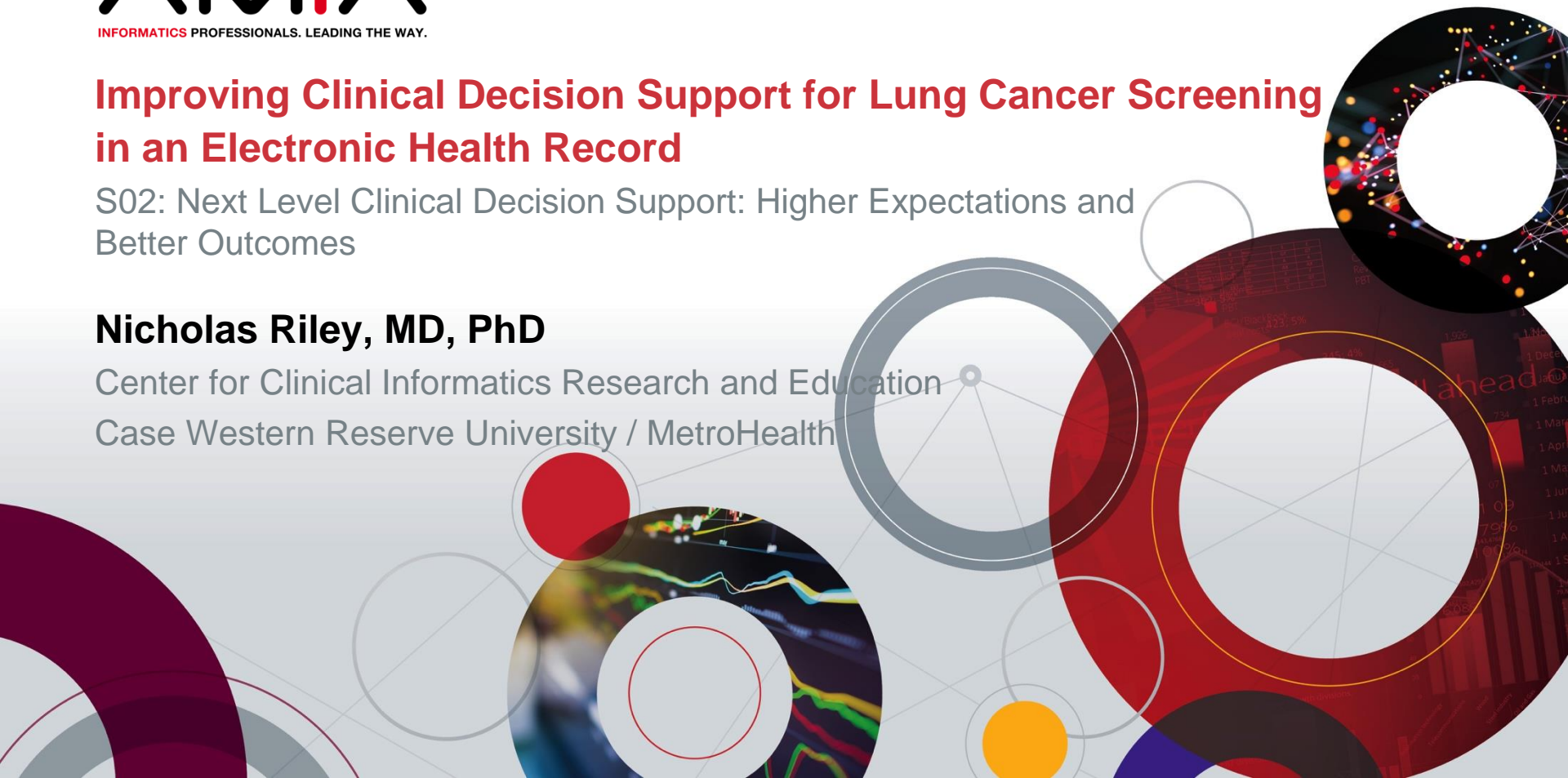


Improving Clinical Decision Support for Lung Cancer Screening in an Electronic Health Record

S02: Next Level Clinical Decision Support: Higher Expectations and Better Outcomes

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Disclosure

I disclose the following relevant financial relationship with commercial interests:

- MetroHealth is engaged in a collaborative research agreement with Siemens Healthineers (Siemens Medical Solutions USA, Inc.)
- The MetroHealth System receives in-kind remuneration from Siemens for this work.
- Dr. Riley receives compensation for his work.



Learning Objectives

After participating in this session the learner should be better able to:

- Understand the unique nature of lung cancer screening orders.
- Understand how CDS can benefit clinicians ordering these studies (and their patients).



Low dose chest CT for lung cancer screening

Eligibility criteria

- Age 55–77
- No signs or symptoms of lung cancer
- 30+ pack-years
- Current smoker or quit within 15 years
- Shared decision-making discussion of risks and benefits
- Benefit from treatment if indicated



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Challenges with lung cancer screening CDS

- Awareness of screening versus diagnostic studies
- Historical imaging
 - Scoring system for lung cancer screening (Lung-RADS®)
- EHR smoking history doesn't effectively capture cumulative exposure
- EHR smoking history out of date or wrong

LCS CDS version 1 (June 2016)

- Placeholder order

Reason for Exam (Free Text): Lung Cancer Screening. Smoking history will be obtained from upcoming decision support.

- Wizard style data collection
- Smoking history prepopulated
- Reason for study generated

Eligibility (required)		
▶ Does patient have signs/symptoms of lung cancer (i.e. weight loss/hemoptysis)	<input type="radio"/> Yes	<input type="radio"/> No
▶ Follow up needed of incidental pulmonary nodule or LUNG-RADS 3 or 4	<input type="radio"/> Yes	<input type="radio"/> No
<input checked="" type="checkbox"/> Smoking Pack Years	<input type="text" value="30"/>	
▶ Current Smoker	<input type="radio"/> Yes	<input type="radio"/> No
OR		
<input type="checkbox"/> Years since last cigarette	<input type="text"/>	
<input type="checkbox"/> Attestation: Patient counseled on risks and benefits of lung cancer screening using a low dose CT scan and agrees to proceed.		
Note: Smoking hx is prepopulated from Epic		
Reason for study: 62 yr-old female. 30 pack-yr history.		
Proceed with order validation >>		



LCS CDS version 1 → version 2

- Reason for exam placeholder text, if edited, not evaluated by CDS
 - Make reason for exam clinically meaningful
- Placeholder order not familiar
 - Use EHR ordering interface instead
- **Goal:** allow expert user to enter order without CDS intervention
 - Wizard appears if order incompletely specified



LCS CDS version 2 (June 2018)

CT Chest Low Dose Lung Cancer Screening

Sign Order

▼ Clinical History

- | | |
|--|---|
| <input type="checkbox"/> Current smoker — prepopulated | <input type="checkbox"/> No signs or symptoms of lung cancer |
| <input checked="" type="checkbox"/> Former smoker — prepopulated | <input type="checkbox"/> Not follow-up for incidental pulmonary nodule or Lung-RADS 3/4 |

▼ Purpose of study

- | | | |
|---|--|--|
| <input type="checkbox"/> Lung cancer screening, follow-up | <input checked="" type="checkbox"/> Lung cancer screening, initial | <input checked="" type="checkbox"/> Patient counseled on risks/benefits of lung cancer screening |
|---|--|--|

Reason for Exam (Free Text):

Smoking pack-years:

Years since last cigarette:

LCS CDS version 2 (June 2018)

CT Chest Low Dose Lung Cancer Screening

Sign Order

▼ Clinical History

☐ Current smoker

☒ Former smoker

▼ Purpose of visit

☐ Lung cancer screening

Reason for referral

Smoking pack years

Years since last cigarette

Eligibility (required)

Does patient have signs/symptoms of lung cancer (i.e. weight loss/hemoptysis)

☐ Yes ☒ No

Follow up needed of incidental pulmonary nodule or LUNG-RADS 3 or 4

☐ Yes ☐ No

☒ Smoking Pack Years

60

☐ Current Smoker

☐ Yes ☒ No

☐ Years since last cigarette

☒ Attestation: Patient counseled on risks and benefits of lung cancer screening using a low dose CT scan and agrees to proceed.

Reason for study: 65 yr-old male. **NO** active SSx of lung cancer. **NOT** a current smoker. 60 pack-yr history. Counseled on the risks-benefits of screening and agrees to proceed.

Proceed with order validation >>

LCS CDS version 2 → version 3

- Not clear that “negatives” must be answered
 - Require answers in order
- What is a screening study?
 - Screening order only for **annual** screening
 - Remove mentions of incidental pulmonary nodule
- **Goal:** Ask only what is required
 - Wizard only if order change recommended



LCS CDS version 3 (October 2019)

CT Chest Low Dose Lung Cancer Screening (annual)

Sign Order

CMS authorizes annual lung cancer screening in adults aged 55 to 77 years with a 30+ pack-year smoking history who currently smoke or have quit within the past 15 years. Discontinue screening if a health problem substantially limits life expectancy or the ability or willingness to have curative lung surgery (USPSTF B recommendation).

Clinical History:

No signs or symptoms of lung cancer

Signs or symptoms of lung cancer

▼ Shared Decision-Making

- ☒ Patient counseled on risks/benefits of lung cancer screening

LCS CDS version 3 (October 2019)

CT Chest Low Dose Lung Cancer Screening (annual)

[Sign Order](#)

CMS authorizes annual lung cancer screening in adults aged 55 to 77 years with a 30+ pack-year smoking history who currently smoke or have quit within the past 15 years. Discontinue screening if a health problem substantially limits life expectancy or the ability or willingness to have curative lung surgery (USPSTF B recommendation).

Clinical History:

No signs or symptoms of lung cancer

Signs or symptoms of lung cancer

Purpose of Study:

Initial or annual screening

Follow up, Lung-RADS 1-2

Follow up, Lung-RADS 3

Follow up, Lung-RADS 4a

Follow up, Lung-RADS 4b-4x

— prepopulated

Smoking Status:

Current smoker

Former smoker

Never smoker

— prepopulated

Smoking Pack Years:

60 — prepopulated

▼ Shared Decision-Making

- ☒ Patient counseled on risks/benefits of lung cancer screening

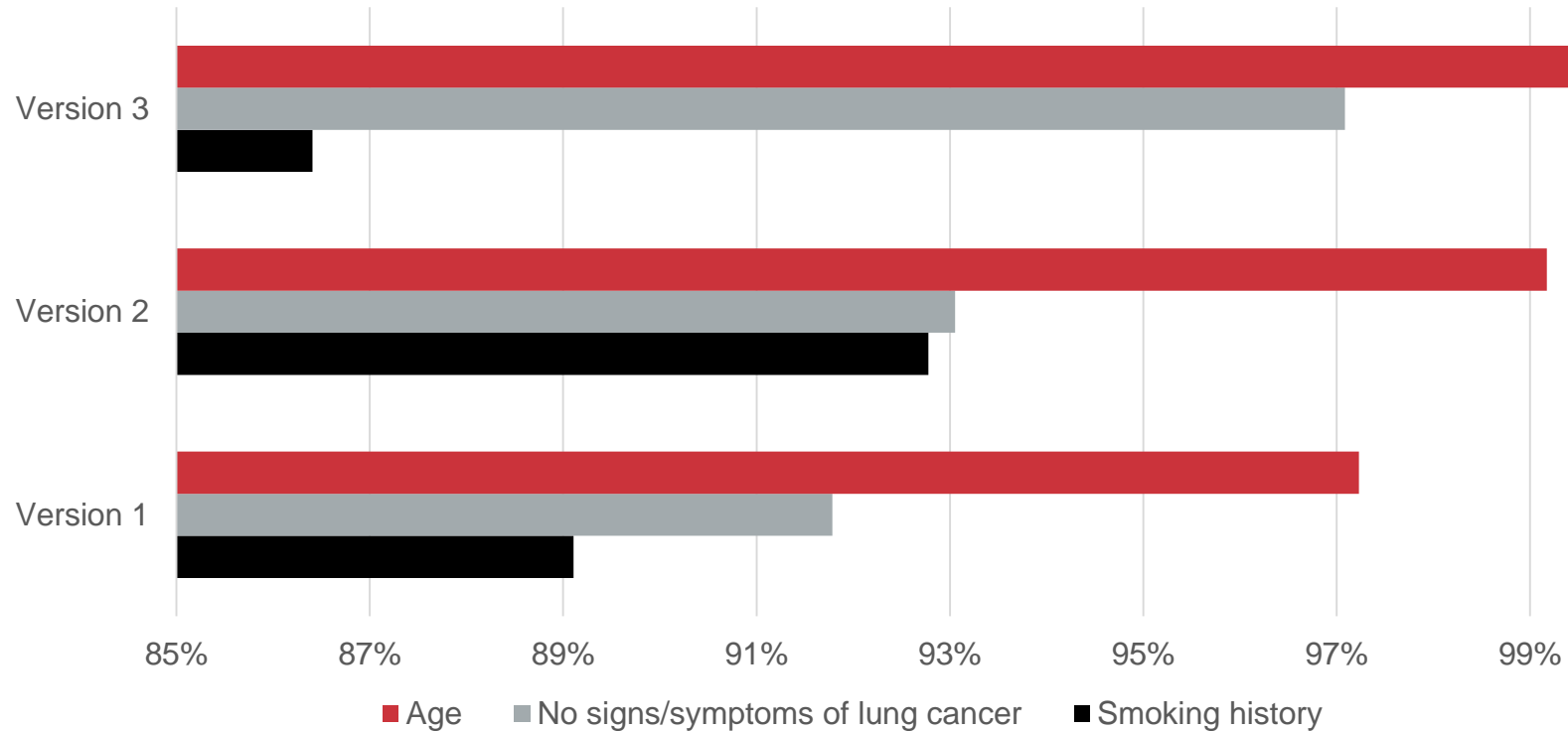
Evaluating LCS CDS performance

CDS overridden because:

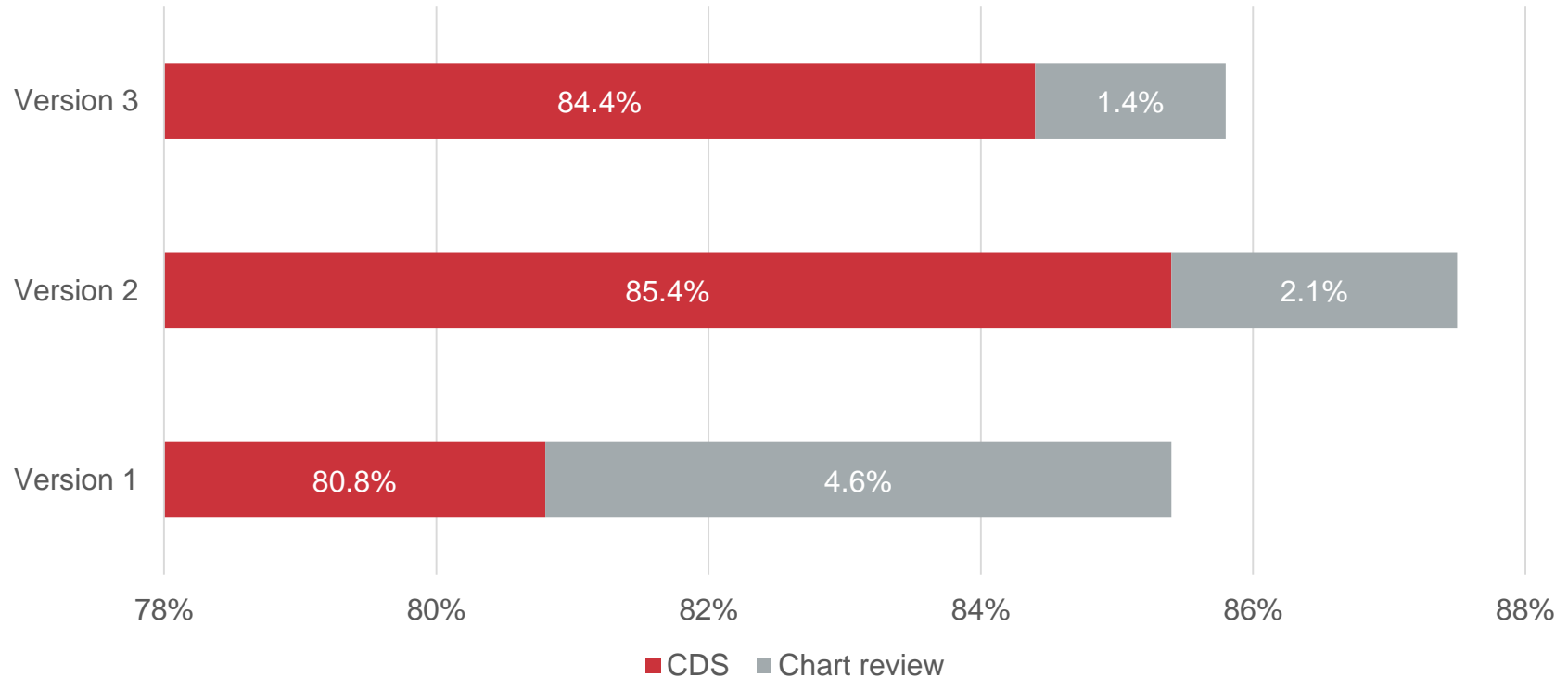
- Patient ineligible / clinician misunderstood criteria
- CDS did not “see” eligibility



Signed LCS orders satisfying eligibility criteria



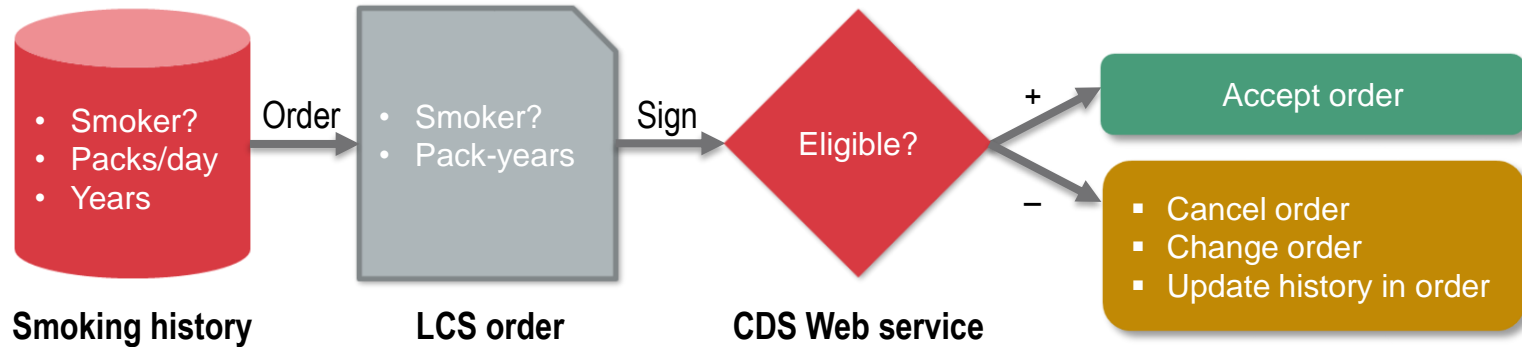
Signed LCS orders satisfying CDS



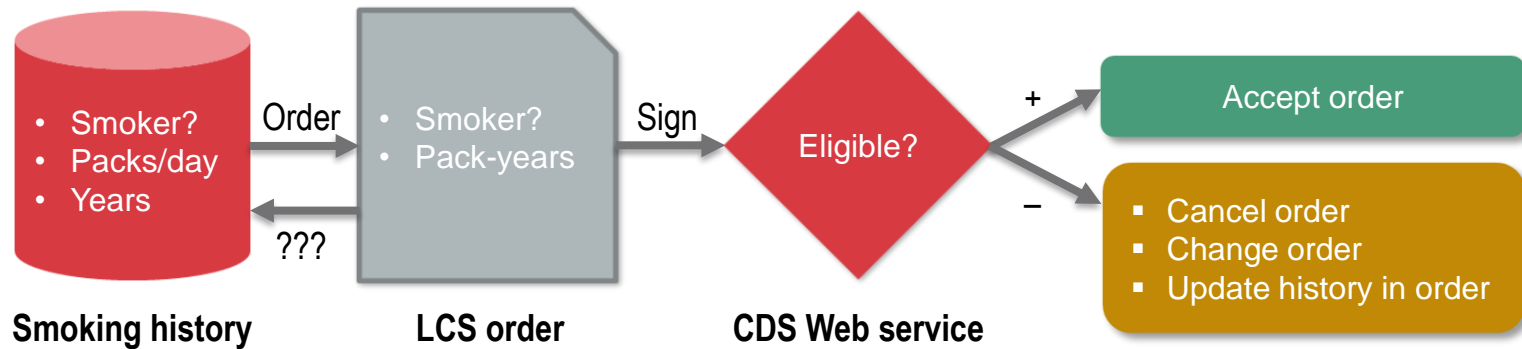
Challenges with lung cancer screening CDS

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- ✓ Historical imaging
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Tobacco smoking history collection in CDS v3



Tobacco smoking history collection in CDS v3

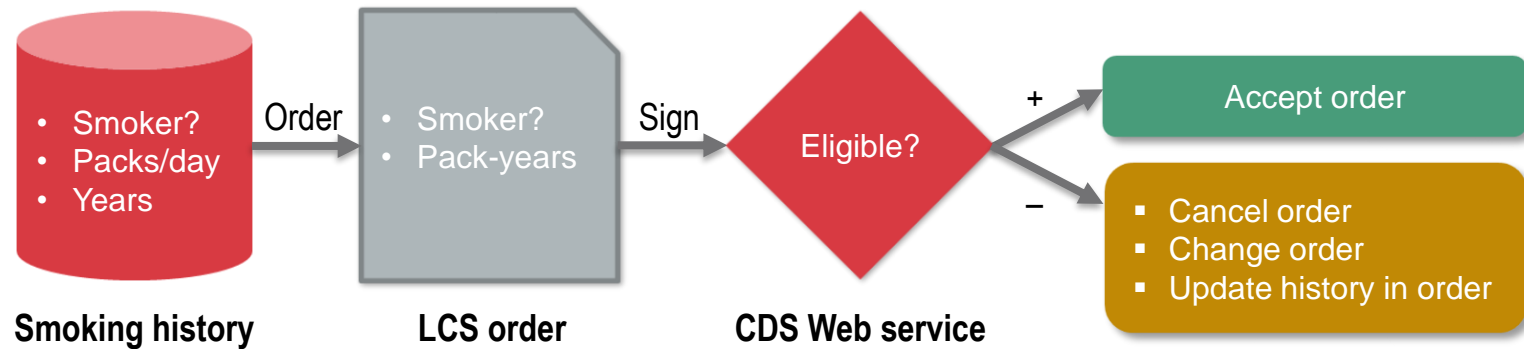


Tobacco smoking history in history versus order

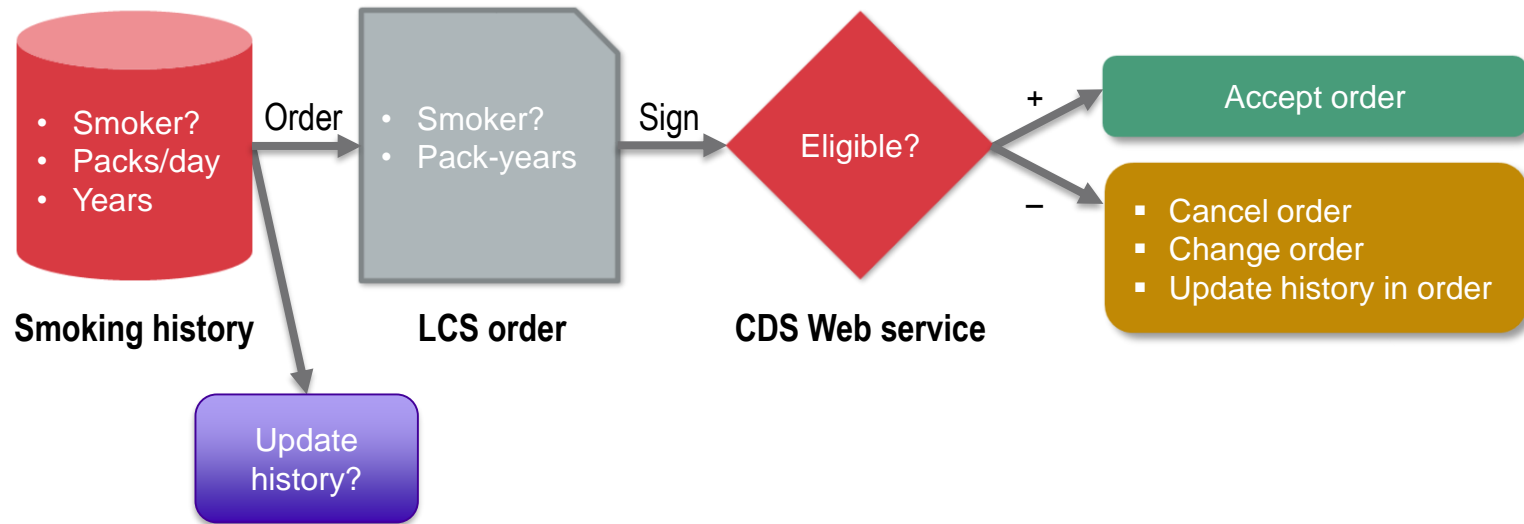
Version	Order pack-years > History pack-years	Order pack-years < History pack-years	Order pack-years = History pack-years
1	26.4%	7.7%	49.4%
2	19.7%	3.3%	65.9%
3	13.7%	6.6%	62.2%

Prepopulation is one-way — no incentive to update

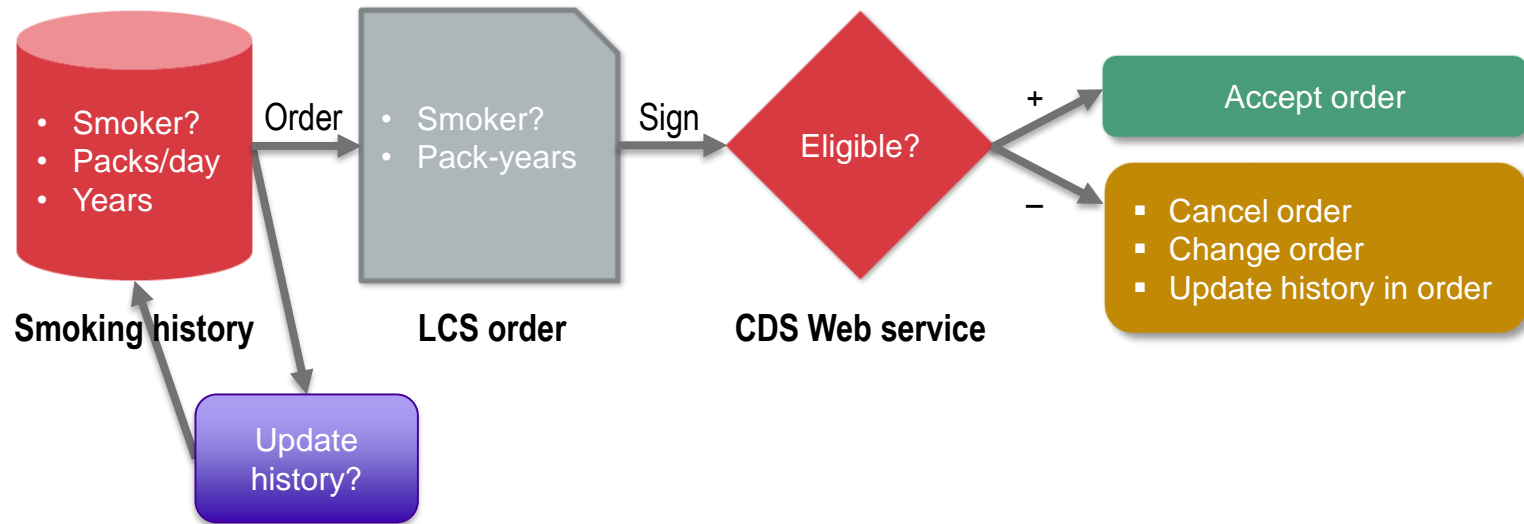
Tobacco smoking history update workflow



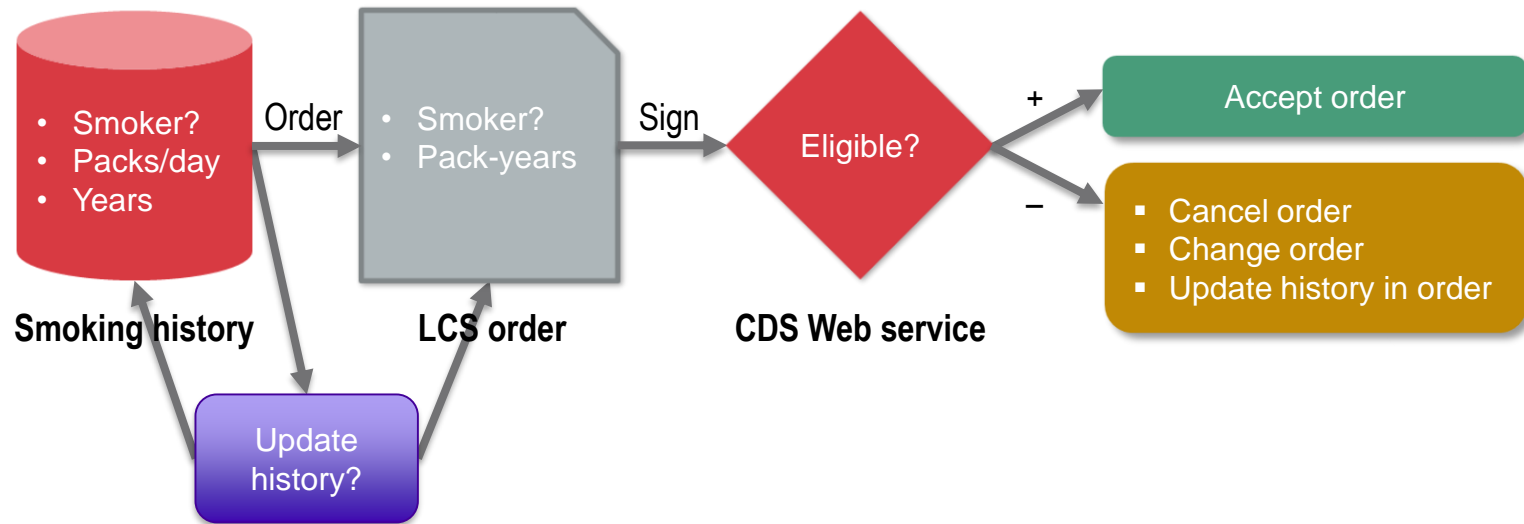
Tobacco smoking history update workflow



Tobacco smoking history update workflow



Tobacco smoking history update workflow



Conclusions and future directions

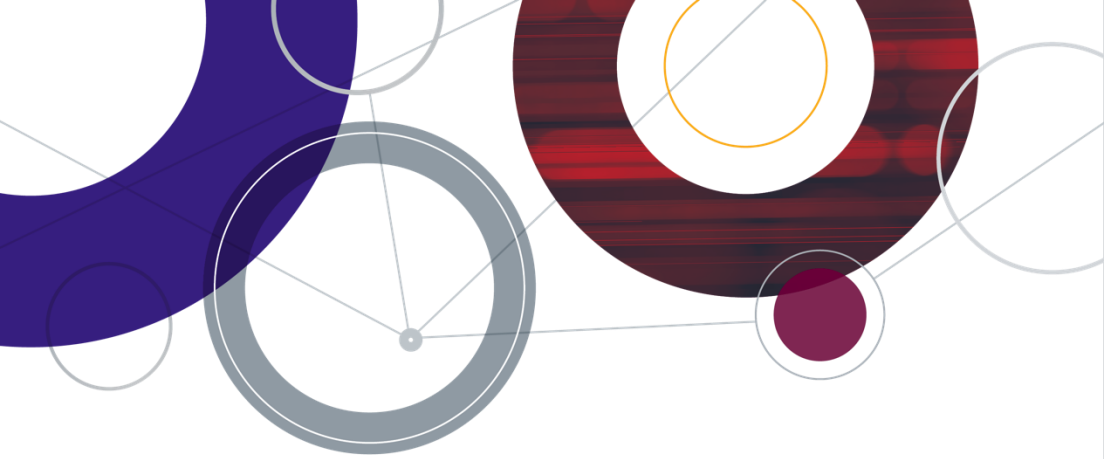
LCS CDS is useful

- Refine usability
- Limit unnecessary data collection
- Override = CDS failure

More to do

- Update tobacco smoking history
- Assist in determining packs/day
- Integrate shared decision-making
- Incidental pulmonary nodules





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Thank you!
nriley@metrohealth.org

