Should your jurisdiction automate a syphilis Record Search process? Yes!!!!

November 18, 2021  3:00 – 4:00 PM ET

Sponsored by NCSD and CDC DSTDP
Informatics Webinar Facilitators and Presenters

**Dr. Saugat Karki**
Health Scientist
CDC Division of STD Prevention
Surveillance and Data Science Branch

**Robin Hennessy**
Public Health Advisor
CDC Division of STD Prevention
Surveillance and Data Science Branch

**James Matthias, MPH**
Epidemiologist
CDC Division of STD Prevention
Behavioral Science and Epidemiology Branch

**Charlie Rabins**
Capacity Building Consultant
National Coalition of STD Directors (NCSD)

**Talia Parker**
Project Director, Program Team
National Coalition of STD Directors (NCSD)
A Few Housekeeping Items

- Use the chat function to talk with or ask for help from facilitators
- Use the question and answer function to ask questions for the presenters
- If the facilitators loses web or voice connection during the presentation, please keep your video and audio connections until the facilitator reconnects
- Download today’s webinar slides from the chat function
- An audio/video recording and slides of this webinar will be posted on the NCSD Web site in the next week
Webinar Agenda

• NCSD Welcome and Overview – Charlie Rabins
• Syphilis Reactor Grids (SRG): What are they, and why do we Use them?– Robin Hennessy
• Automated Syphilis Record Search and Review Process: Why and How?– Dr. Saugat Karki
• Florida’s Experience with an Algorithm for Automating Syphilis Laboratory Results– JAMES MATTHIAS
• New York City’s Experience with an Algorithm for Automating Syphilis Laboratory Results – ROBIN HENNESSY
• Webinar Evaluation – Charlie Rabins
NCSD Welcome and Overview
Today’s Webinar Participants
Findings from Registration Questions

• 269 persons preregistered
• 64% work in a state health department
• 24% work in a county or city health department
• 14% (37 persons) work in an STD Program that currently has an automated record search algorithm for syphilis
• 87% (80 persons) indicated that their STD Program is interested in receiving technical assistance in developing an automated record search algorithm for syphilis
## Primary Job Role of Registrants – Self Identified

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<tr>
<th>Job Role</th>
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<td>Surveillance/Epidemiology</td>
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Syphilis Reactor Grids (SRG)
What are they, and why do we Use them?

Robin Hennessy, MPH
**Syphilis Reactor Grids (SRG)**
What are they, and why do we Use them?

- SRGs are an easy way to prioritize high volumes of syphilis laboratory reports for record search and investigation
- Should be based on local morbidity, priorities, and volume of syphilis tests
  - Low morbidity jurisdictions may not use SRG
  - High morbidity project areas need a way to prioritize
- Ought to be evaluated twice a year to ensure it continues to meet local needs

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RS=Record Search
AC=Administrative Closure
Sex determined from laboratory report
SRG: Pros and Cons

**Pro:**
- SRGs are easy, flexible, and familiar

**Con:**
- Can be resource intensive to evaluate
- Surveillance programs will miss cases!
- Manual Record Searches still require significant effort
- Can we do better?? Yes!

### Reactive Non-Treponemal Test (RPR/VDRL)

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Automated Syphilis Record Search and Review Process: Why and How?

Saugat Karki, MD, MS
Health Scientist

NCSD – CDC STD Informatics Webinar
11/18/2021
The syphilis ‘reactor grid’ (SRG) and manual record search and review process

The algorithm

What does this mean, and why is this important?
The syphilis ‘reactor grid’ (SRG) and manual record search and review process
Typical record search and review process

Serologies are reported to public health → Older patients with low titers: ‘reactor grid’ → Record search of previous serologies and surveillance data → Compare previous information to determine further investigation → Open field record for further investigation.

Administratively close without further investigation → Administratively close without further investigation.
Typical record search and review process

Serologies are reported to public health
Typical record search and review process

1. Serologies are reported to public health
2. Older patients with low titers: ‘reactor grid’
3. Administratively close without further investigation
Typical record search and review process

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Typical record search and review process

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Older patients with low titers: ‘reactor grid’

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Current process: ‘reactor grid’

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Open field record for further investigation

Administratively close without further investigation
Current process: ‘reactor grid’

Older patients with low titers: ‘reactor grid’
Current process: ‘reactor grid’

Older patients with low titers: ‘reactor grid’

Current process: ‘reactor grid’

Older patients with low titers: ‘reactor grid’

Missed Cases?

- Reported large number (up to 66%) of missed cases where prevalence >2% *

Inaccurate?

- 11% missed by ‘reactor grid’ **
- 73% patients prioritized by ‘reactor grid’: **
  - History of treated syphilis or false-positives


**McLean, Catherine A. MD; Kohl, Katrin MD, MPH; Baker, Meghan A. MD; Sinclair, Maureen F. MPH; Ciesielski, Carol A. MD; Markowitz, Lauri E. MD The Syphilis Reactor Grid., Sexually Transmitted Diseases: August 2003 - Volume 30 - Issue 8 - p 650-653 doi: 10.1097/01.OLQ.0000085945.93505.61
Current process: record search and review

Serologies are reported to public health

Older patients with low titers: ‘reactor grid’

Administratively close without further investigation

Record search of previous serologies and surveillance data

Compare previous information to determine further investigation

Administratively close without further investigation

Open field record for further investigation
Current process: record search and review

Record search of previous serologies and surveillance data
Current process: record search and review

Time utilized for record search and review?

- Reconciling duplicate serologies: 10 - 12 person-hours per week, could be more

- Manual review for each record: 4 – 8 minutes and 13 – 19 minutes

The automated record search and review algorithm
Current process: record search and review

Serologies are reported to public health

Older patients with low titers: ‘reactor grid’

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Serologies are reported to public health

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Compare previous information to determine further investigation

Administratively close without further investigation
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Automated record search and review algorithm

Open field record for further investigation

Compare previous information to determine further investigation

Administratively close without further investigation
Testing and validation of the algorithm
Testing and validation of the algorithm

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What does this mean and why is it important?
Algorithm performance

- 36 missed cases: 12,753/12,789 cases opened for investigation

- Eliminated 28,328 additional investigations (@10 min/investigation)

Why is it important?

Serologies are reported to public health

Older patients with low titers: ‘reactor grid’

Administratively close without further investigation

Record search of previous serologies and surveillance data

Compare previous information to determine further investigation

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Open field record for further investigation
Why is it important?

Automated record search and review algorithm

Serologies are reported to public health

Open field record for further investigation

Compare previous information to determine further investigation

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Why is it important?

- Administratively close more cases (49% vs 27%)
- Close serologies more confidently (accuracy 99%)
- Open more investigations, resulting in fewer missed cases
- Reallocate resources (additional 590 workdays)
Next steps

- CDC team available for consultation and technical assistance
- Python codes are available to test on local data
- If your jurisdiction has a similar approach, let’s learn about it
Tom Peterman, MD, MSc
Ninad Mishra, MD, MS
Hillard Weinstock, MD, MPH
Jim Matthias, MPH
Craig Wilson
Robin Hennessy, MPH
Kimberly Johnson, MS
For more information, please contact:

Skarki@cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.
Florida’s Experience with an Algorithm for Automating Syphilis Laboratory Results

James Matthias, MPH
Epidemiologist

November 18, 2021
ELR ingestion of reactive non-treponemal tests increased 58% from 2006 (n=34,808) to 2015 (n=55,001) and 101% from the 2009 nadir (n=27,424)
## Syphilis Reactor Grid

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</table>

FR = Field Record; AC = Administrative Closure; R = Reactive; WR = Weakly Reactive
Two Key Issues

1. Serofast patients
2. Discordant serologic syphilis results / biological false positives
Evaluation Question

- Could we design an algorithm to process syphilis laboratory results using typical information received through ELR to improve specificity without losing much sensitivity?
Algorithm #1

1. Reactive Non-Treponemal Test
   - 372,902 Tests 44,688 Cases

2. Able to Match Lab to Profile in PRISM?
   - Yes
     - 27,509 Tests 13,001 Cases
   - No
     - 85,575 Tests 19,916 Cases

3. Non-Reactive Treponemal Test ≤14 Days Prior to non-Treponemal Test?
   - Yes
     - 24,032 Tests 155 Cases
     - 132,160 Tests 33,271 Cases
   - No
     - 108,128 Tests 33,116 Cases

4. Prior Syphilis Non-Treponemal Test?
   - Yes
     - 258,918 Tests 11,471 Cases
   - No
     - 19,076 Tests 54 Cases

5. Titer reported?
   - Yes
     - 240,742 Tests 11,417 Cases
   - No
     - 287,327 Tests 24,772 Cases

6. ≥ 4 Fold Titer Increase or Non-Treponemal Seroconversion?
   - Yes
     - Cut a New Syphilis Field Record for Investigation
   - No
     - Administratively Close Field Record

7. Cut a New Syphilis Field Record for Investigation

8. Administratively Close Field Record
Outcomes

- **Sensitivity** was 98.5%
- **Specificity** increased from 27.5% to 73.5%
  - Less time working on non-cases
- **Positive predictive value of a lab** increased from 15.5% to 32.0%
  - More time investing cases
• Algorithm #2
• Similar outcomes to algorithm #1
• Fixed some gaps in #1
• Added some additional sensitivity
• Written more programming friendly
Challenges in Implementation

▪ Skilled development staff and subject matter experts

▪ Duplicate / qualitative non-treponemal laboratory results

▪ Treponemal test result processes

▪ Quality Assurance testing and validation
Key Takeaway

- **The algorithm for syphilis laboratory processing is:**
  - More specific and nearly as sensitive
  - Will save time and better focus efforts towards cases
  - Reduce misclassification

- **The algorithm for syphilis laboratory processing is not:**
  - Perfect, but neither is the reactor grid
  - Simple to implement, requires significant cooperation between development and subject matter experts to implement and validate
  - Operational, but in development
Contact Info

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The findings and conclusions in this presentation are those of the authors and do not necessarily represent the official position of the Florida Department of Health or the Centers for Disease Control and Prevention
New York City’s Plan to Implement an Algorithm for Automating Syphilis Record Searches

Robin Hennessy, MPH
Public Health Advisor

November 18, 2021
Example: New York City - Current

- In 2010, the NYC STI Program implemented Maven as our surveillance and case management system

- Using custom code, and workflows in Maven we automated the SRG

- Pros:
  - Administrative Closure process is excellent
  - Distribution of remaining tests for review by priority (pregnant people, high titers) works well

- Cons:
  - Not flexible
  - Misses cases!
  - Requires significant human resources

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<thead>
<tr>
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<th>Reactive: titer not reported</th>
<th>1:1</th>
<th>1:2</th>
<th>1:4</th>
<th>1:8</th>
<th>1:16</th>
<th>1:32</th>
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<td>Female AC</td>
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<td>AC</td>
<td>Male RS</td>
<td>Female AC</td>
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<td></td>
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</tbody>
</table>

RS=Record Search
AC=Administrative Closure
Sex determined from laboratory report
Example: New York City - Proposed

- Maven recently improved rules engine to include lab tests, NYC in progress of moving the SRG into the rules engine which will allow for greater flexibility

- Using the more flexible rules engine, NYC will try to automate the Record Search Algorithm presented today to RS every result, redeploy resources and (hopefully) not miss any cases

- Recent funding opportunities will allow us to engage the vendor, but jurisdictions with expertise in the Maven rules engine may be able to implement on their own

- Will report back on our successes and lessons learned

### Reactive Non-Treponemal Test (RPR/VDRL)

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<tr>
<th>AGE</th>
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RS=Record Search
For more information:

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  - rhenness@health.nyc.gov
  - btj2@cdc.gov
Webinar Evaluation Poll Questions

Q1: Webinar Rating

Q2: Webinar Time Value
Thanks for Participating

• We hope you found this webinar worthwhile.

• If you have topic suggestions for future Informatics Webinars, please email us:
  
  ➢ Charlie Rabins crabins@ncsddc.org
  
  ➢ Robin Hennessy btj2@cdc.gov
Supplemental slides
## Algorithm performance

<table>
<thead>
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<td>Closed</td>
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</tbody>
</table>

*Algorithm closed: 49.9%*

*‘Reactor grid’ closed: 27.0%*

*Algorithm opened: 98.3%*

*Not investigated: Uncertain how many were cases*