INFORMATICS PROFESSIONALS. LEADING THE WAY.

Rapid implementation of high-volume community-based SARS-CoV-2 PCR testing in Washington State

Lessons Learned the Hard Way from COVID-19: What Gaps in Laboratory Informatics do we need to Close Before the Next Pandemic?

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#AMIA2021

Disclosure

The speaker and spouse/partner has no relevant relationships with commercial interests to disclose.

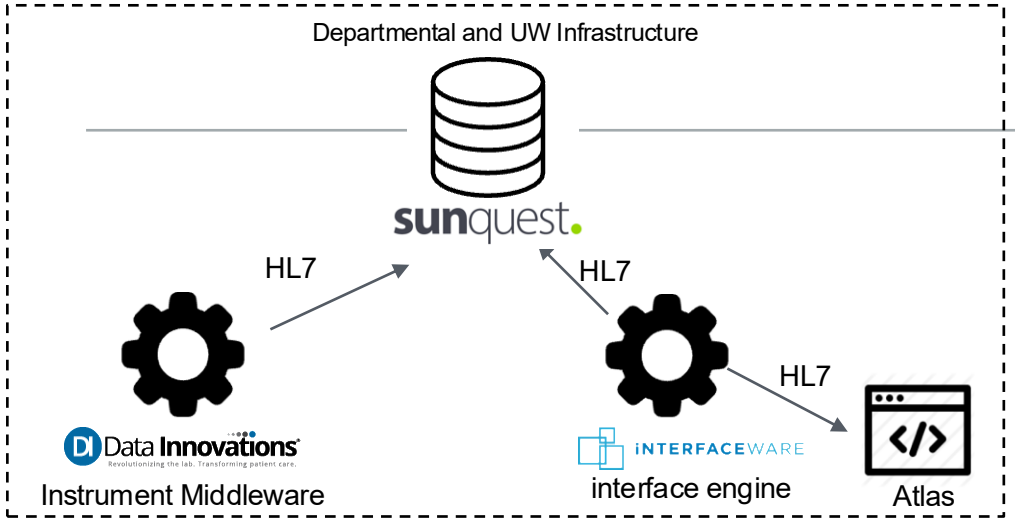
Learning Objectives

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

- Provide examples of IT infrastructure dependencies for development of solutions for rapidly changing ordering, resulting, and operational needs.
- Identify common limitations in IT infrastructure for delivery of services outside of traditional healthcare settings.
- Contrast uses, capabilities, and tradeoffs between commercial systems and custom-built applications.

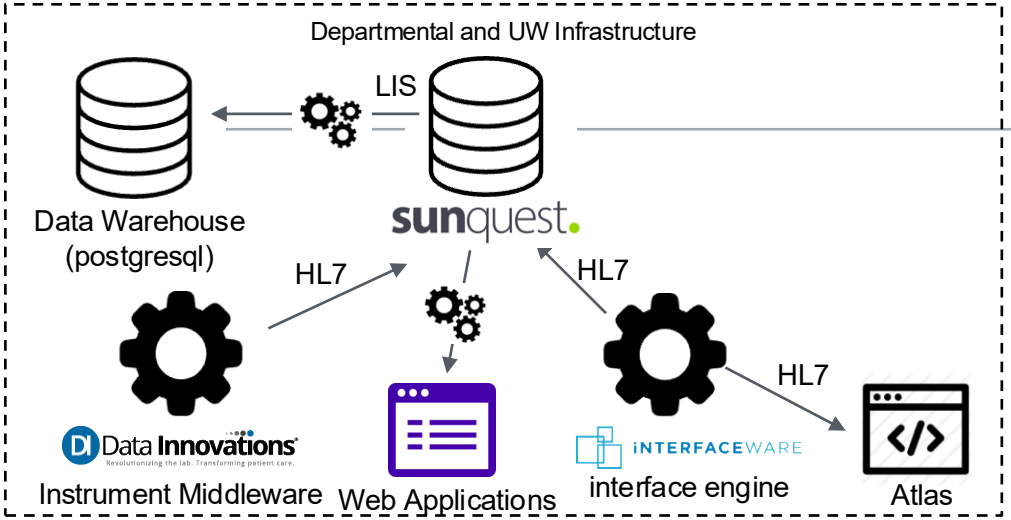
UW Department of Laboratory Medicine and Pathology

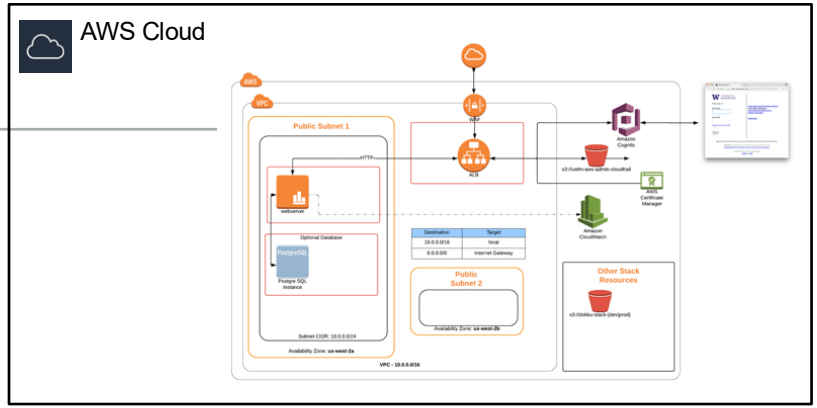
- Support UW Medicine's mission to improve the health of the public by providing laboratory services, educating laboratorians, and fostering research and development
- > 1500 staff & 150 faculty
- > 6 million laboratory orders & 30 million reportable results per year (pre-COVID)
- Outreach testing encompassing local primary care, regional and national specialized reference testing



Core lab informatics infrastructure

- Laboratory Information System (Sunquest)
- Instrument middleware (eg, Data Innovations = DI)
- HL7 interface engine (Interfaceware Iguana)
- Orders/results web portal (Sunquest Atlas)
- Billing software and services (Xifin)





"Extra" departmental infrastructure and capabilities

- Low-level access to LIS database (file-based, custom APIs)
- Departmental networking and system administration resources
- Secure, HIPAA-compatible internally and externally-facing web application hosting platforms (both local and on AWS)
- Laboratory data warehouse (Postgresql)
- User authentication: Internal (SAML SSO) or external access (AWS Cognito)
- Self-hosted VCS (Gitlab)

Responding to a pandemic

March 3, 2020

- **Order generation**
- **Specimen labeling**
- Pre-analytical specimen processing
- In-lab data management, labeling, and specimen flows
- Inventory management
- Instrument interfaces
- **Result distribution**
- Reporting to healthcare authorities
- Analytics

Orders and results beyond the EHR

Expanding SARS-CoV2 PCR testing to non-healthcare settings

- First use case: first responders
- No electronic system for collecting contact information outside of the EHR
- No electronic mechanism to distribute results to out of system patients
- Phone calls for reporting results are prohibitively labor intensive
- Collection sites are challenging environments for patient engagement and data collection

Limitations of the patient portal for community testing (Epic MyChart)

- Cumbersome registration workflow for new users
- Original portal sign-up process included delays (has since been streamlined)
- Challenging UI for many users

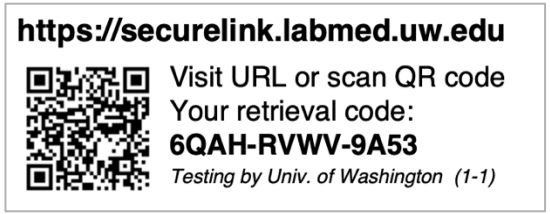
Specimen labeling and identification

Problems:

- Require reliable link between specimen and result
- On demand label printing typically not possible
- Pre-printed order-specific labels not an option
  - No pre-existing orders for walk in testing
  - Difficult to manage pre-printed labels

Solution: Pre-defined retrieval code on pre-printed labels, assign to specimen on collection

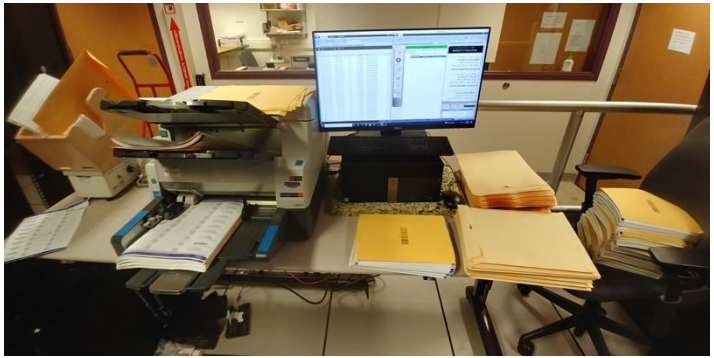
Place on lab req or specimen

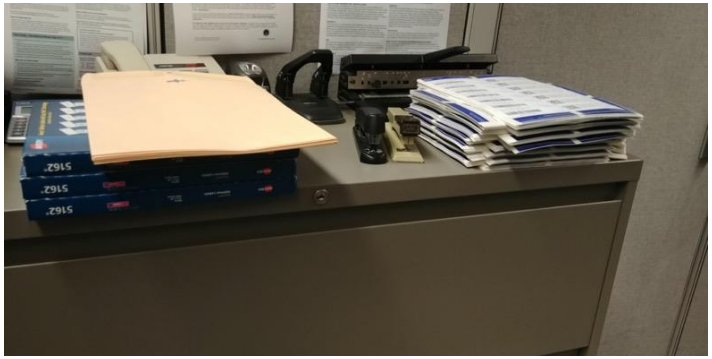


Provide to patient

Python command line utility using *reportlab*, *python-barcode*, *qrcode* packages

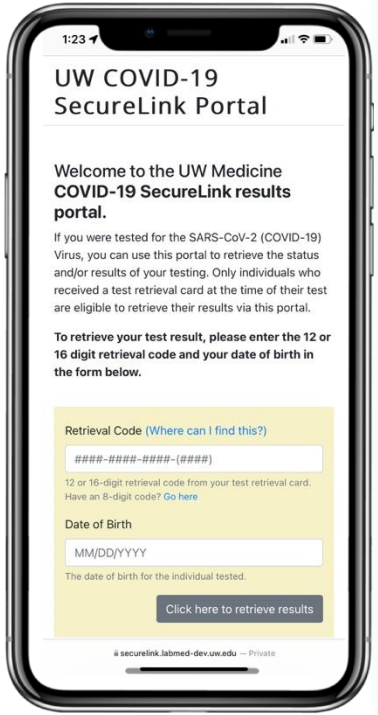
Label production

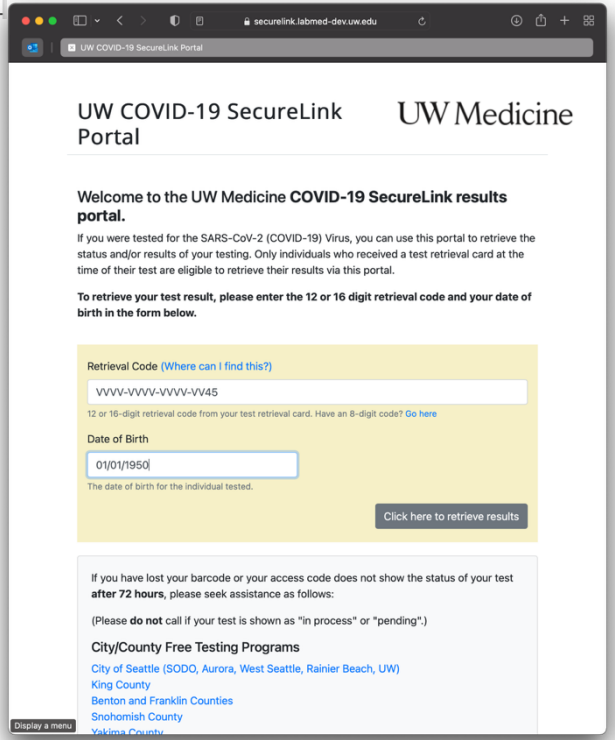


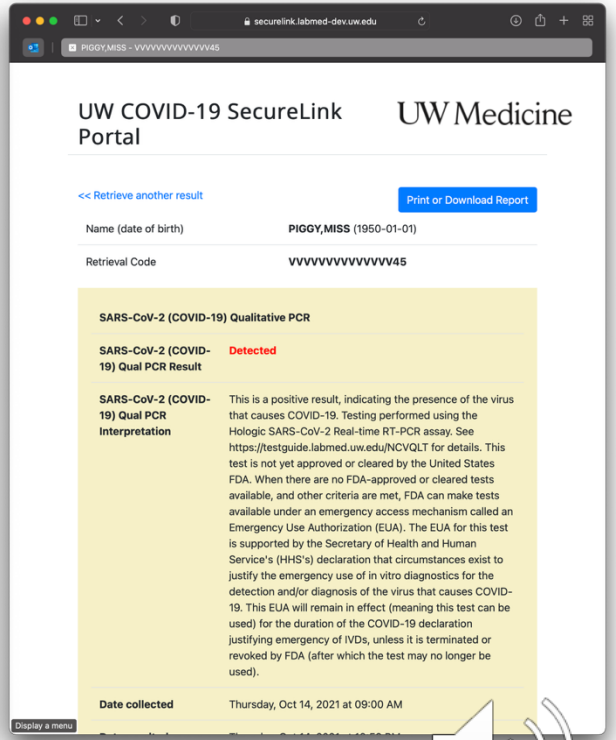


Nik Krumm, MD, PhD

https://securelink.labmed.uw.edu
Visit address above or scan QR code (1-1)
Your retrieval code:
ZT8F-RMWT-6E4E-7ZJF
Testing performed by the University of Washington



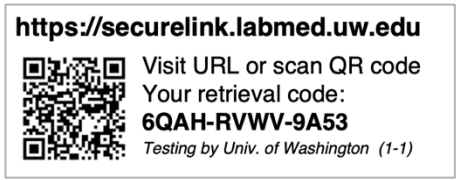




First commit, March 11, online March 18

Initial UW Securelink data flow

< 2 weeks from inception to go-live (mid-March, 2020)



Create manual order from paper requisition

Retrieve result

AWS

Scan code-128 retrieval code into battery component

File containing results and retrieval codes

Create database record for each result

Display result given retrieval code and DOB

Specimen processing

Caché MUMPS routine

Python task (EC2), PostgreSQL (RDS)

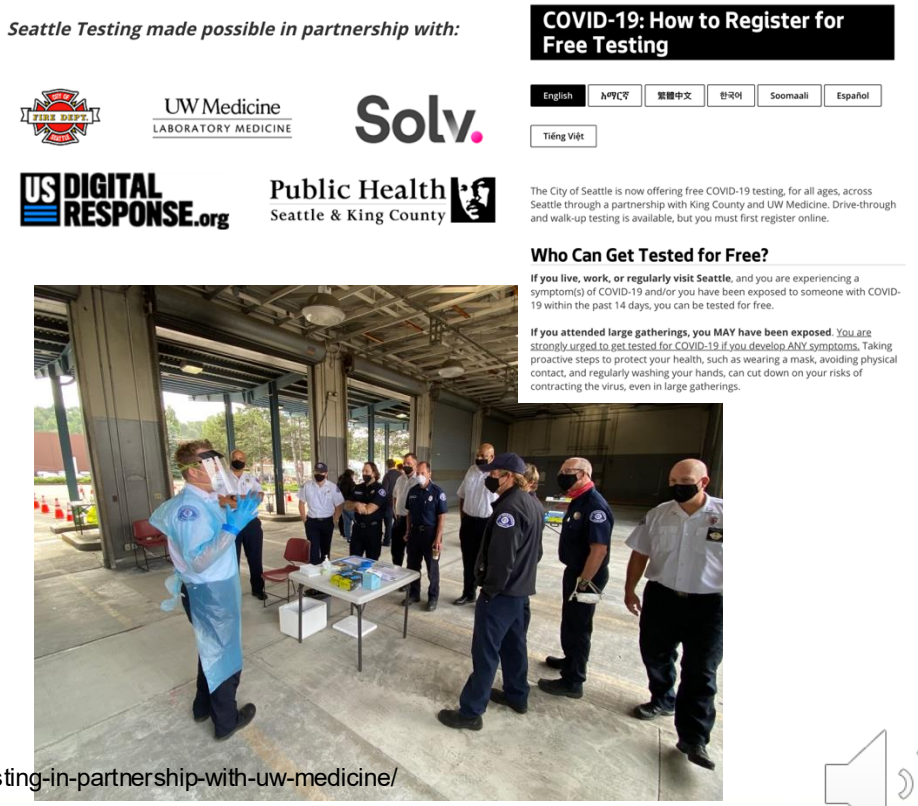
Securelink web application (Python/Flask)

June 2020: City of Seattle free COVID testing

Emergency order from Seattle Mayor Jenny Durkan to lease two former emissions testing sites for drive-through COVID PCR testing

Project launched June 4 with about two weeks to implement

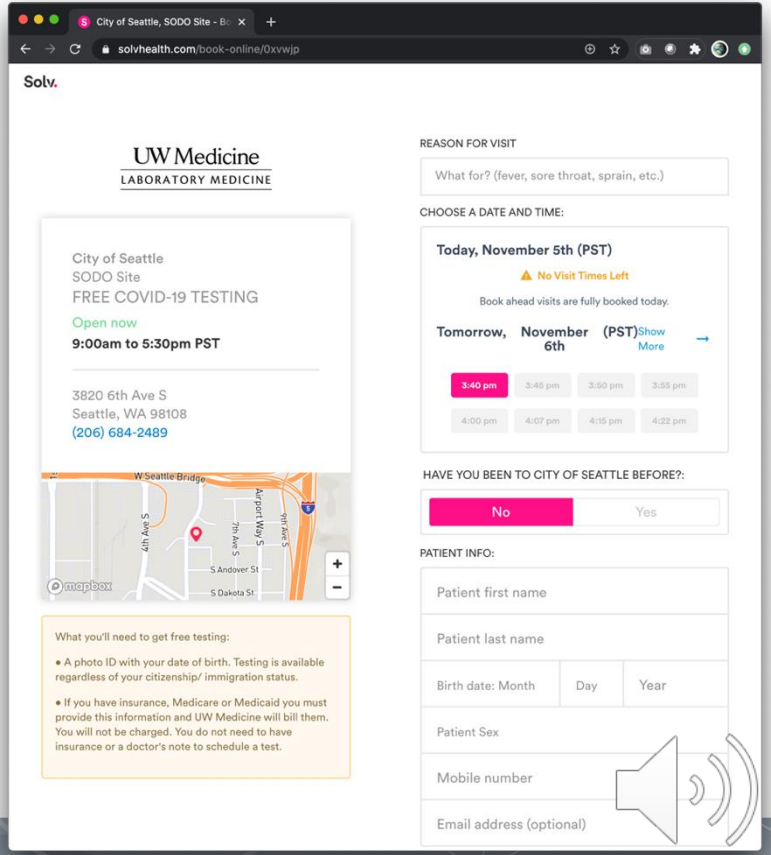
- PCR testing by UW Medicine Virology
- Staffing by Seattle FD and City employees
- US Digital Response worked with mayor's office to select Solv health for booking and data collection

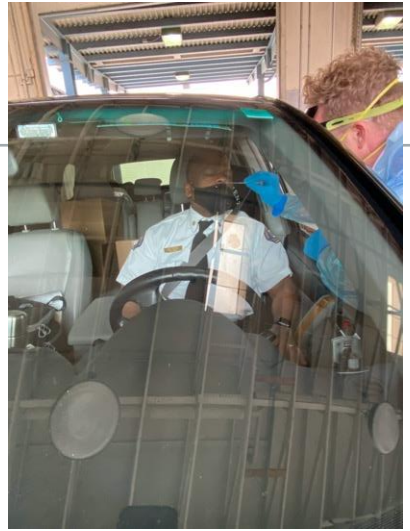


https://durkan.seattle.gov/2020/06/mayor-jenny-durkan-announces-free-citywide-testing-in-partnership-with-uw-medicine/

Solv Health: scheduling and data collection

- Consumer-facing practice management software
- Schedule visits to community testing sites (also walk-ins)
- Used for collection of demographics and other data needed for testing, public health reporting, reimbursement (including specimen identifier)
- **Orders generated in LIS using exported data in CSV format (via custom application for validation and location mapping and interface engine)**





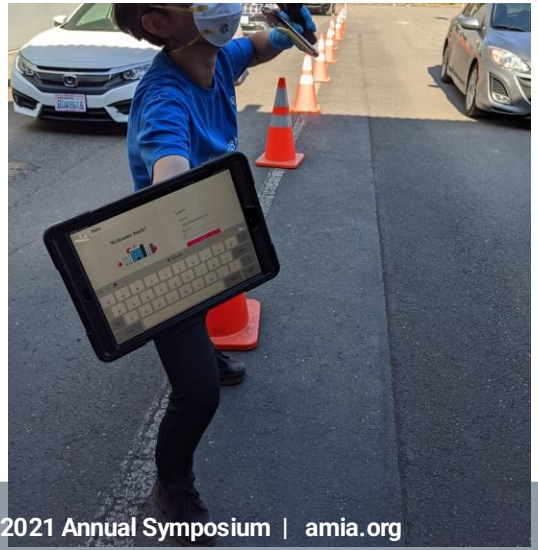
Name: _____

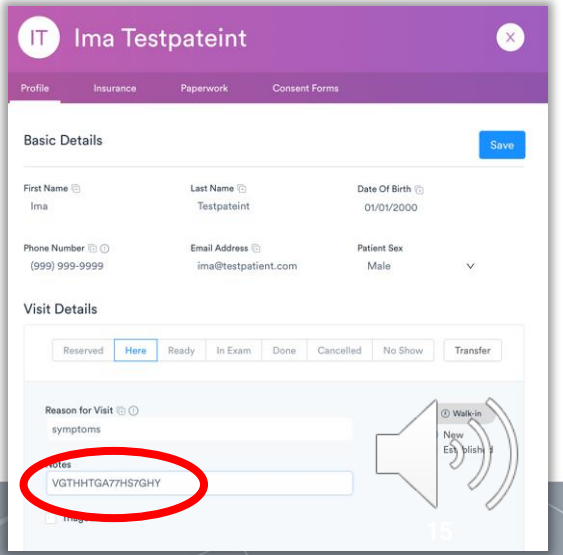
DOB (MM/DD/YYYY): _____

2BUH-YRXY-WC2U-GM8D (1-1) specimen

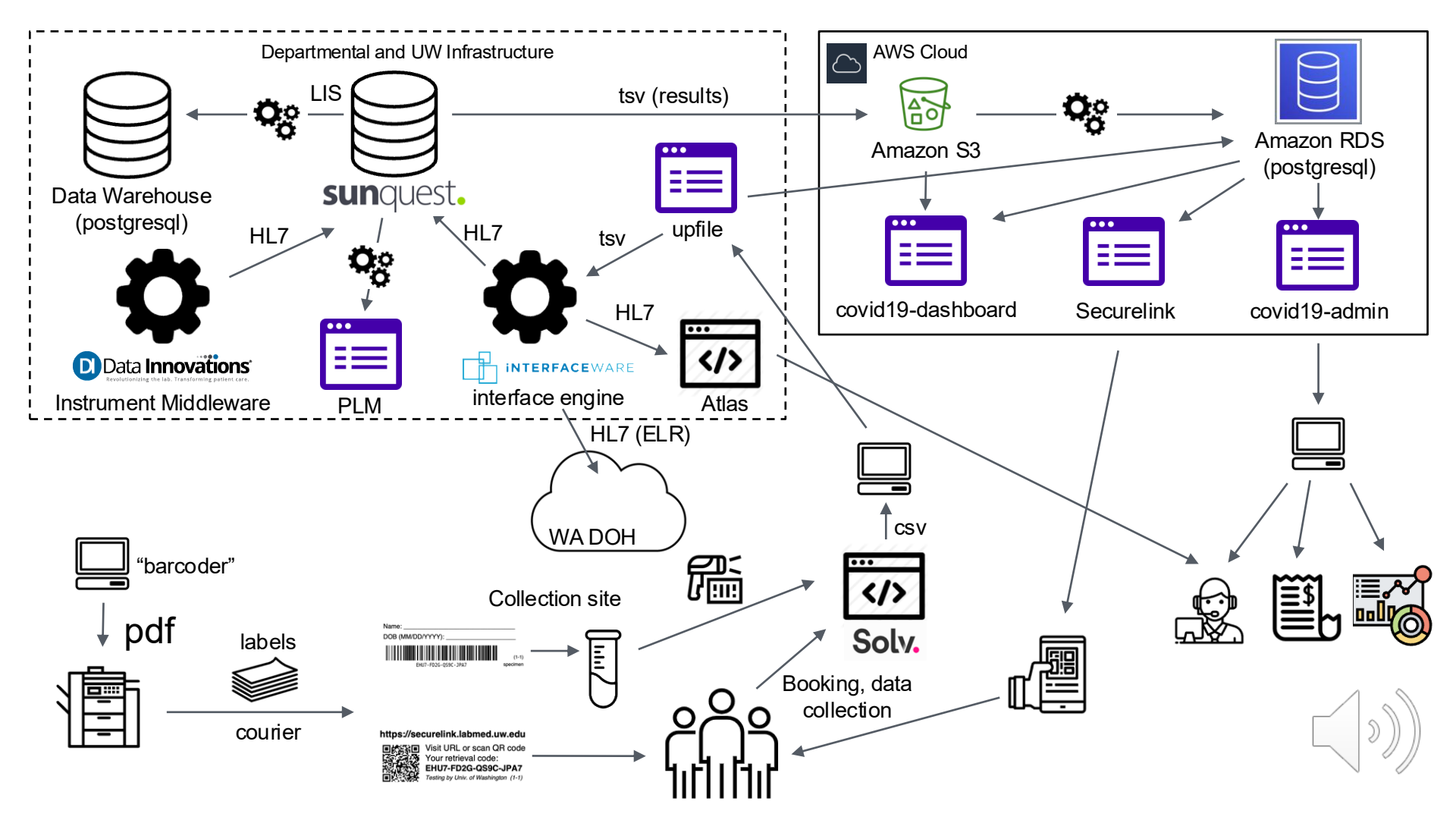
https://securelink.labmed.uw.edu

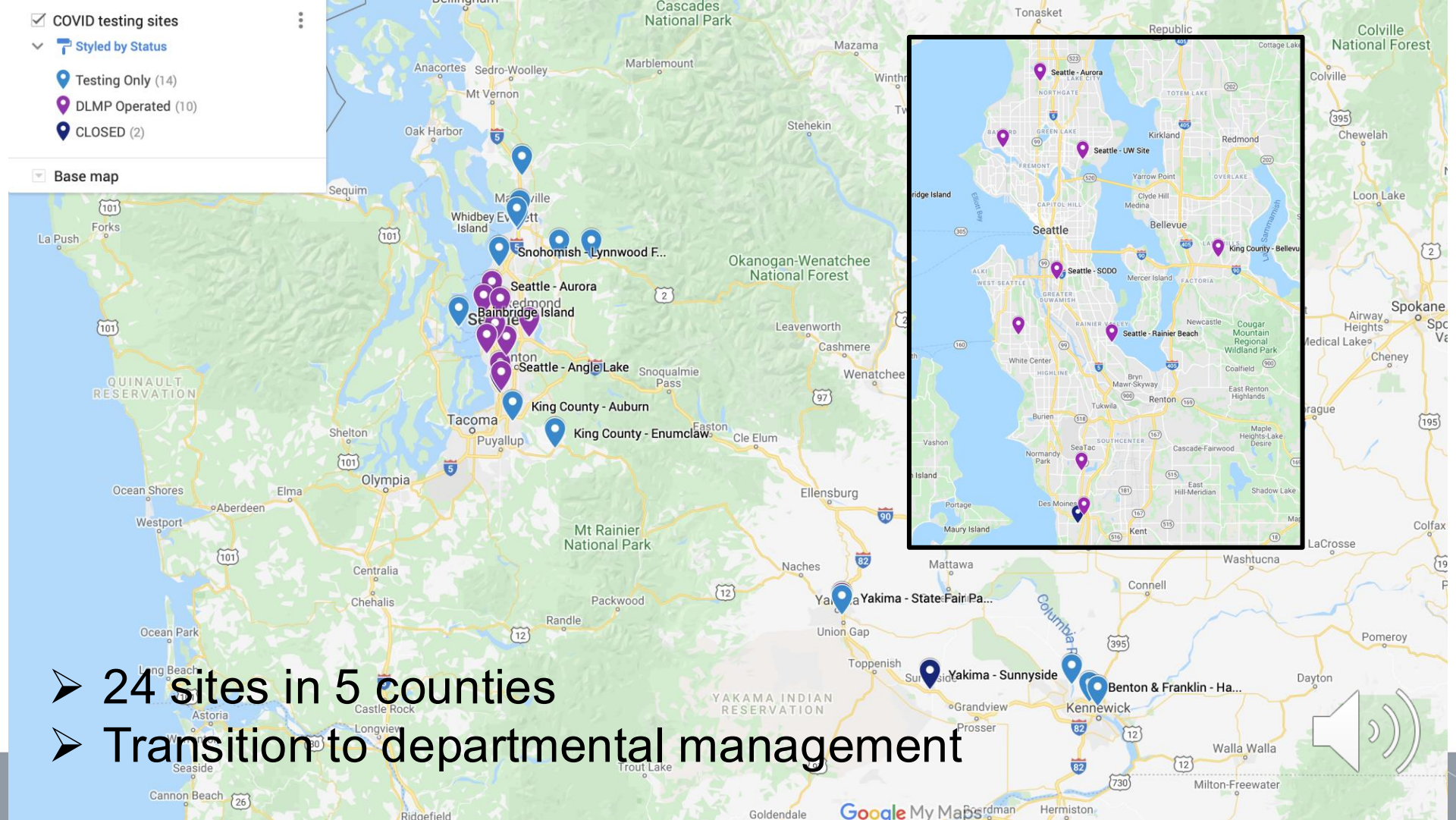
Visit URL or scan QR code
Your retrieval code:
2BUH-YRXY-WC2U-GM8D
Testing by Univ. of Washington (1-1)





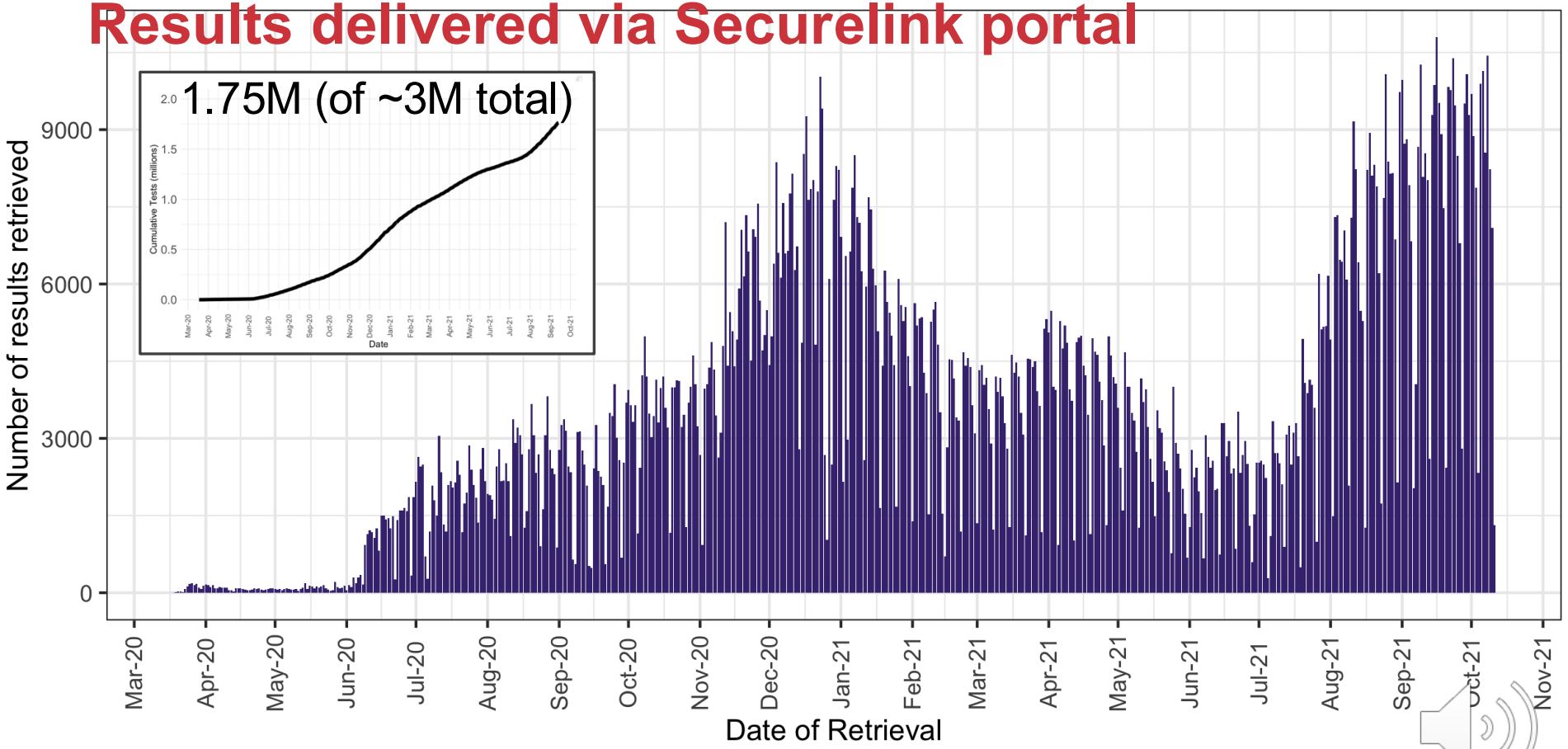
Photos: Leah Tivoli


Departmental and UW Infrastructure
LIS
tsv (results)
Data Warehouse
(postgresql)
sunquest
AWS Cloud
Amazon S3
Amazon RDS
(postgresql)
upfile
HL7
HL7
tsv
HL7
covid19-dashboard
Securelink
covid19-admin
Data Innovations
Instrument Middleware
PLM
INTERFACEWARE
interface engine
Atlas
HL7 (ELR)
WA DOH
csv
"barcoder"
pdf
labels
courier
Collection site
Solv.
Booking, data
collection
https://securelink.labmed.uw.edu
Visit URL or scan QR code
Your retrieval code:
EHU7-FD2G-QS9C-JPA7



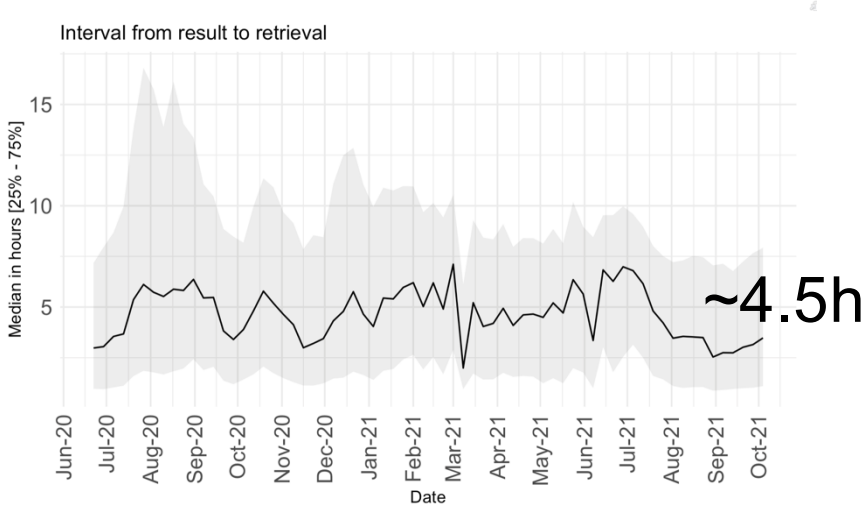
- 24 sites in 5 counties
- Transition to departmental management

Results delivered via Securelink portal

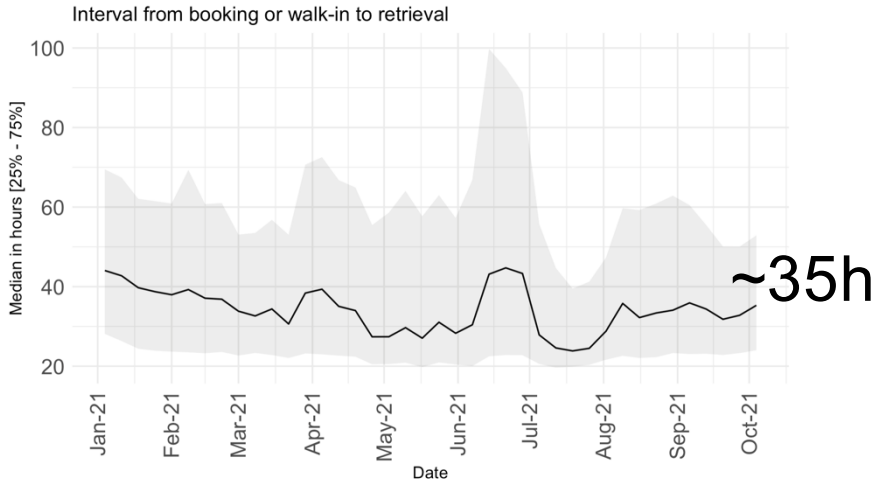


Effectiveness of result delivery

Interval from availability of result to retrieval



Interval from desire to test to retrieval of result



Lessons learned

(Relatively) simple custom solutions can fill in gaps in functionality not provided by core systems

- Streamlined scheduling and data collection outside of pre-existing healthcare settings
- Standardized approaches to interoperability
- Result delivery and notification

Ownership and technical mastery of core information systems are fundamental requirements for a rapid response to changing needs

Big payoff for investment in expertise and tools for development of custom applications

Achieve scale through iterative improvements

Acknowledgements

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City of Seattle

Michael Sayre
Brian Wallace
Sarah Smith
Leah Tivoli

Solv Health

Lauren Tien
Adam Zook

Thank you!

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