

# 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?

S96

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#AMIA2021



# Disclosure

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



# Learning Objectives

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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.

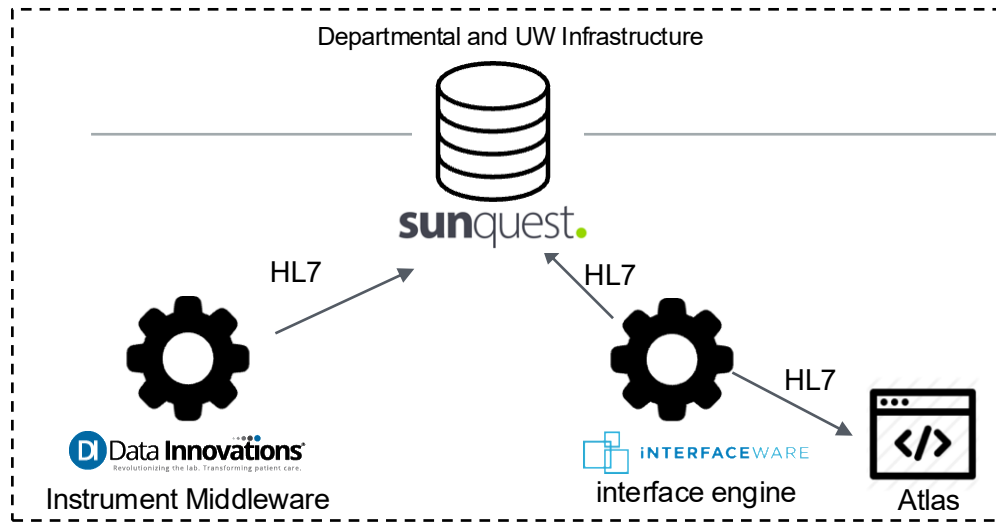


# UW Department of Laboratory Medicine and Pathology



- 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

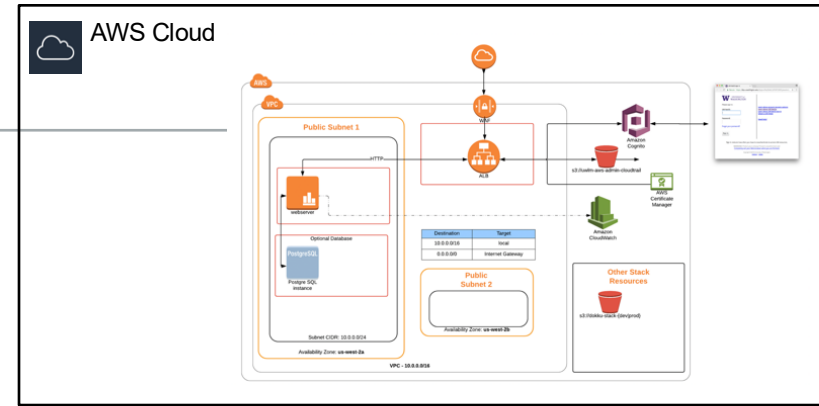
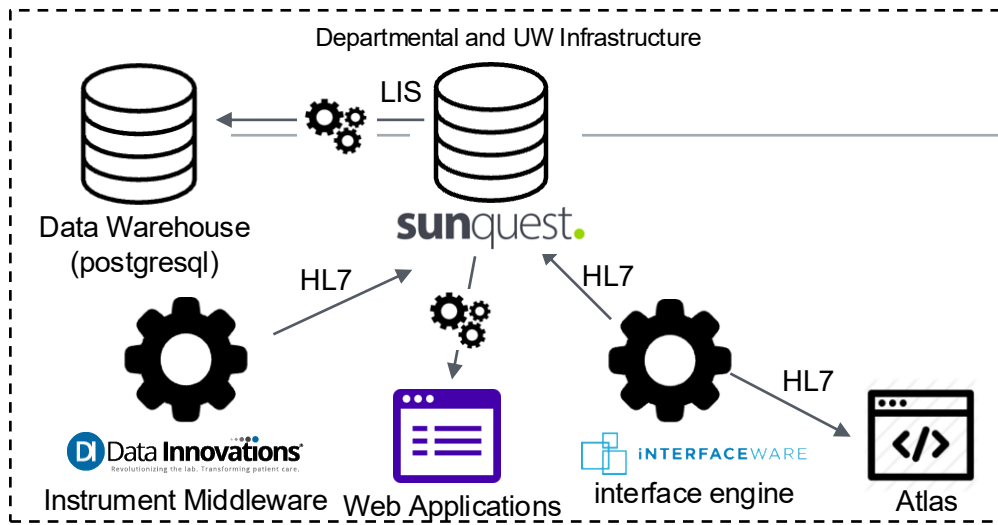




## Core lab informatics infrastructure

- 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



The screenshot shows a news article from KING 5. The top navigation bar includes links for News, Weather, Sports, Connect, and a Watch Live button. Below the navigation bar, there are several topic links: ELECTION 2020 COVERAGE, CORONAVIRUS, FACING RACE, and STAND FOR TRUTH. The article title is "UW Medicine now testing for coronavirus at Seattle laboratory". The text below the title states: "UW Medicine and the Washington State Public Health Laboratory in Shoreline are currently the only two locations in the state that can test for COVID-19." There is a video player thumbnail showing a laboratory setting with a pipette and various containers. Below the video player, the author is listed as Sebastian Robertson (KING5), published on 6:28 PM PST March 4, 2020, and updated on 6:28 PM PST March 4, 2020. Social media sharing icons for Facebook and Twitter are also present.

Author: Sebastian Robertson (KING5)  
Published: 6:28 PM PST March 4, 2020  
Updated: 6:28 PM PST March 4, 2020

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

Name: \_\_\_\_\_  
DOB (MM/DD/YYYY): \_\_\_\_\_



6QAH-RVWV-9A53

(1-1)

<https://securelink.labmed.uw.edu>



Visit URL or scan QR code  
Your retrieval code:  
**6QAH-RVWV-9A53**  
*Testing by Univ. of Washington (1-1)*

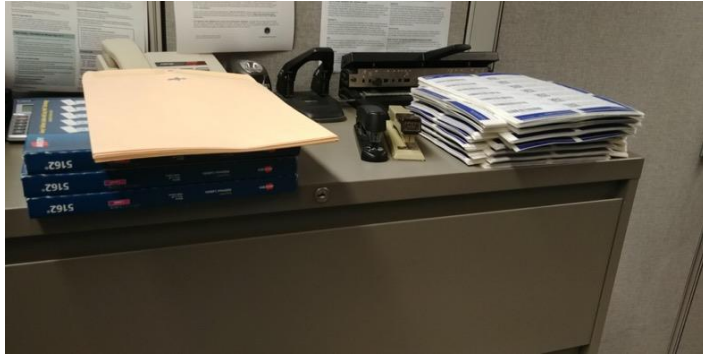
The image shows a grid of 10 specimen labels. Each label contains a form with fields for Name and DOB (MM/DD/YYYY), a barcode, and a QR code. To the right of each QR code is a URL and a retrieval code. The labels are numbered (1-1) through (1-10). The retrieval codes are: 6QAH-RVWV-9A53, 3EQQ-LAKS-6E06, 5LSJ-TS82-70F5, 25WV-PUNL-TED, 4B3W-PDQ7-RV39, 4DL-4D3A-EG86, 752A-TK66-R526, 3MCF-UQEU-BDXF, 99D-3B52-Y519, and 5CAM-NGRF-GSV1.

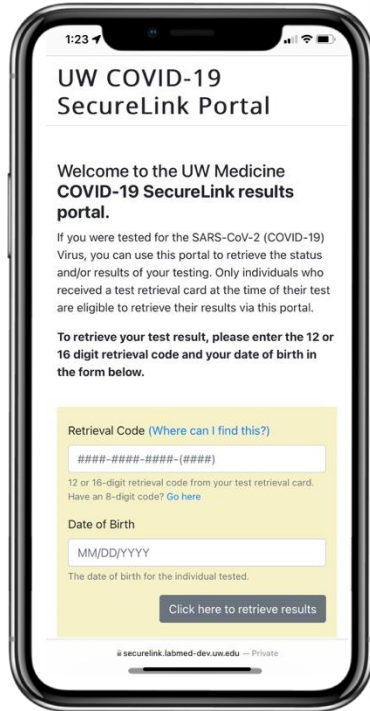
Python command line utility  
using *reportlab*, *python-barcode*,  
*qrcode* packages

Place on lab req or specimen

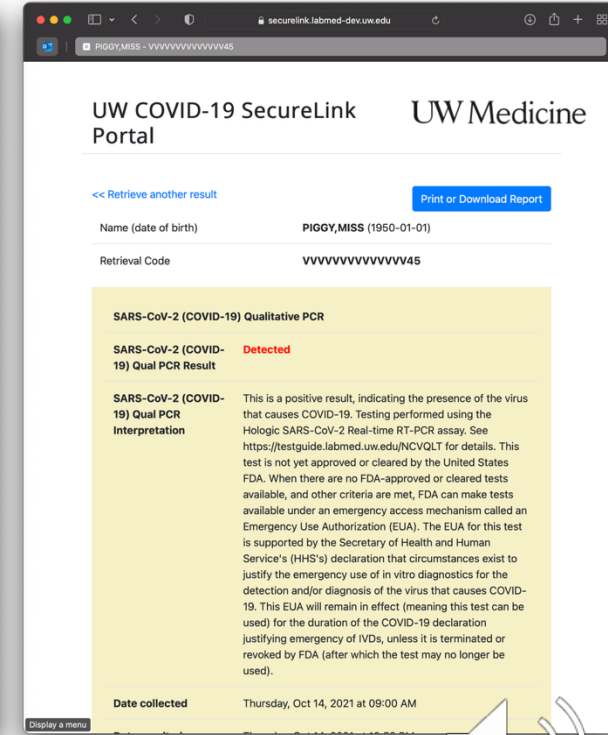
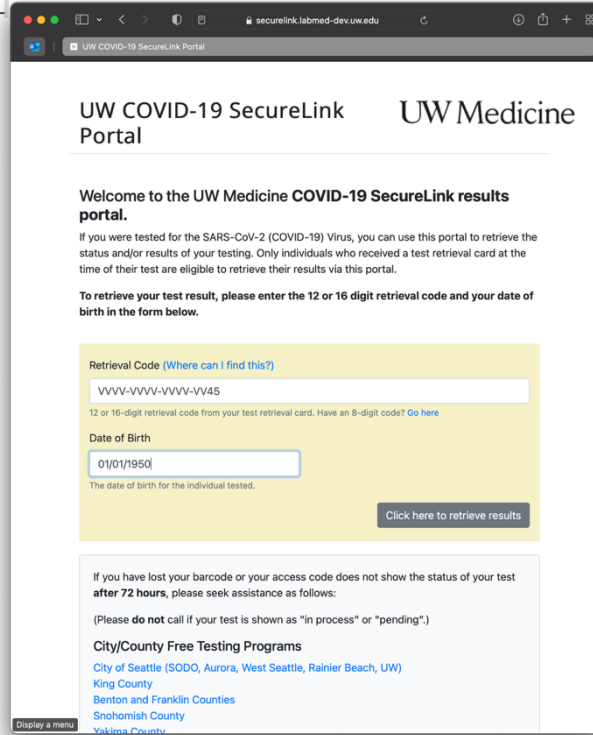
Provide to patient

# Label production





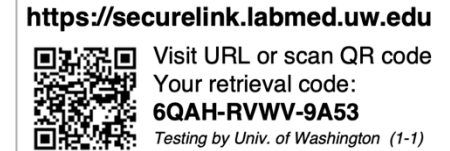
**Nik Krumm,  
MD, PhD**



# Initial UW Securelink data flow

Name: \_\_\_\_\_  
DOB (MM/DD/YYYY): \_\_\_\_\_  
  
6QAH-RVWV-9A53 (1-1)

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



↓ Create manual order from  
paper requisition

Scan code-  
128 retrieval  
code into  
battery  
component

Specimen processing



File  
containing  
results and  
retrieval  
codes

Caché MUMPS  
routine



AWS

Create  
database  
record for  
each result

Python task (EC2),  
PostgreSQL (RDS)



Retrieve result



Display result  
given retrieval  
code and  
DOB

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

Seattle Testing made possible in partnership with:



UW Medicine  
LABORATORY MEDICINE

Solv.

US DIGITAL  
RESPONSE.org

Public Health  
Seattle & King County

COVID-19: How to Register for Free Testing

English 한국어 繁體中文 한국어 Soomaali Español

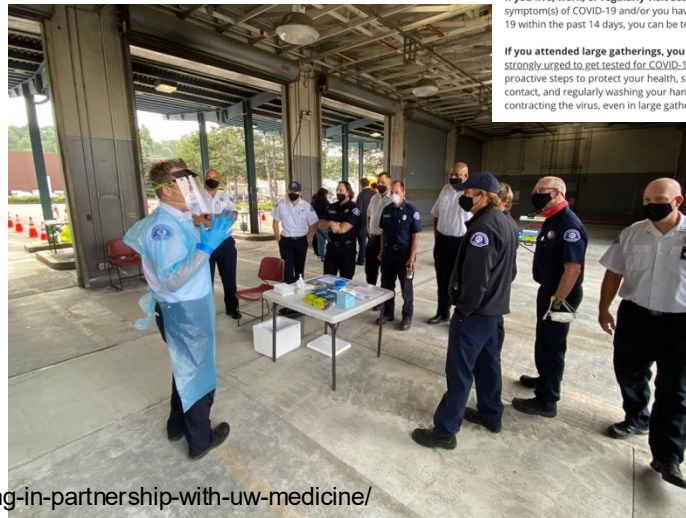
Trang Việt

The City of Seattle is now offering free COVID-19 testing, for all ages, across Seattle through a partnership with King County and UW Medicine. Drive-through and walk-up testing is available, but you must first register online.

## Who Can Get Tested for Free?

If you live, work, or regularly visit Seattle, and you are experiencing a symptom(s) of COVID-19 and/or you have been exposed to someone with COVID-19 within the past 14 days, you can be tested for free.

If you attended large gatherings, you MAY have been exposed. You are strongly urged to get tested for COVID-19 if you develop ANY symptoms. Taking proactive steps to protect your health, such as wearing a mask, avoiding physical contact, and regularly washing your hands, can cut down on your risks of contracting the virus, even in large gatherings.



<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)**

The screenshot displays the Solv Health booking page for the City of Seattle SODO Site. The page is titled "City of Seattle, SODO Site - B..." and the URL is "solvhealth.com/book-online/0xvwpj". The main content area includes the "UW Medicine LABORATORY MEDICINE" logo, the site name "City of Seattle SODO Site", and the service "FREE COVID-19 TESTING". It indicates the site is "Open now" from "9:00am to 5:30pm PST" at "3820 6th Ave S, Seattle, WA 98108" with the phone number "(206) 684-2489". A map shows the location near the Seattle Bridge. A text box lists requirements for free testing: a photo ID with date of birth, insurance/Medicaid, or a doctor's note. The right sidebar contains a "REASON FOR VISIT" field, a "CHOOSE A DATE AND TIME" section for "Today, November 5th (PST)" and "Tomorrow, November 6th (PST)", and a "PATIENT INFO" section with fields for name, birth date, sex, mobile number, and email address. A "HAVE YOU BEEN TO CITY OF SEATTLE BEFORE?" section has "No" and "Yes" buttons.

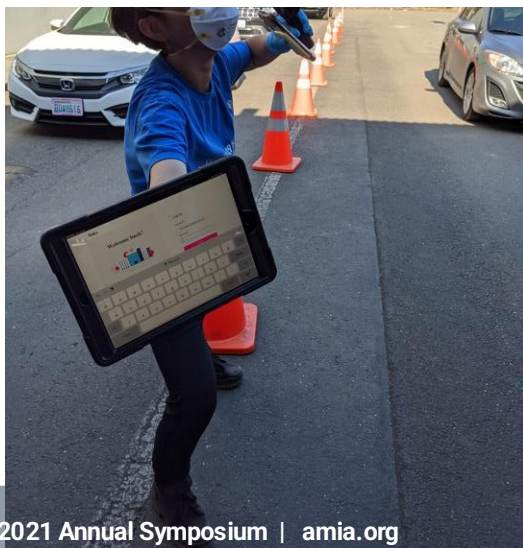


Name: \_\_\_\_\_  
 DOB (MM/DD/YYYY): \_\_\_\_\_  
  
 2BUH-YRXY-WC2U-GM8D (1-1)  
 specimen

<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)



IT
Ima Testpateint

Profile
Insurance
Paperwork
Consent Forms

Basic Details
Save

First Name Imma
Last Name Testpateint
Date Of Birth 01/01/2000

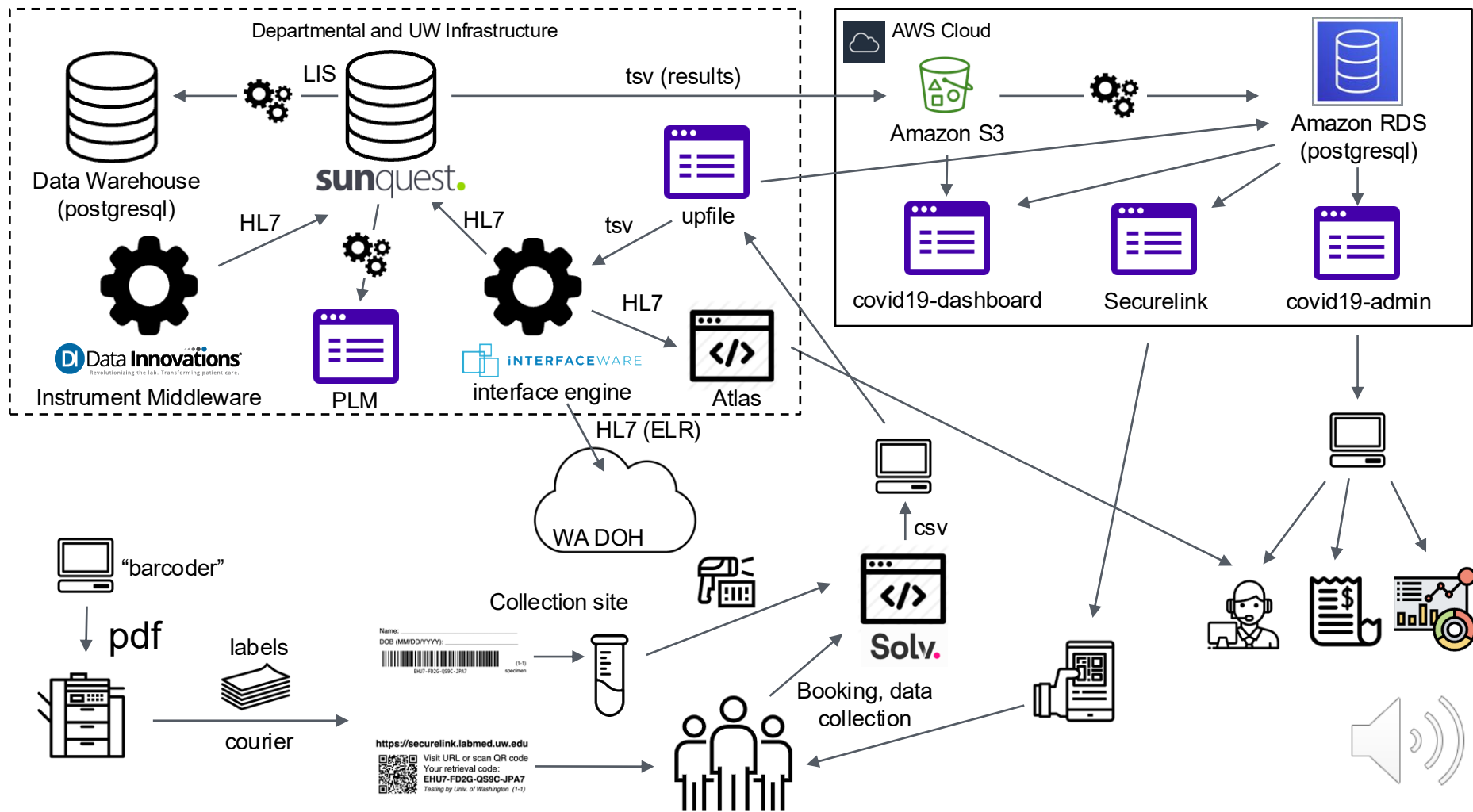
Phone Number (999) 999-9999
Email Address ima@testpatient.com
Patient Sex Male

Visit Details
Reserved
Here
Ready
In Exam
Done
Cancelled
No Show
Transfer

Reason for Visit symptoms
Notes VGTHHTGA77HS7GHY

Wait in
New
Ech
Blisht

Photos:  
 Leah  
 Tivoli





☑ COVID testing sites

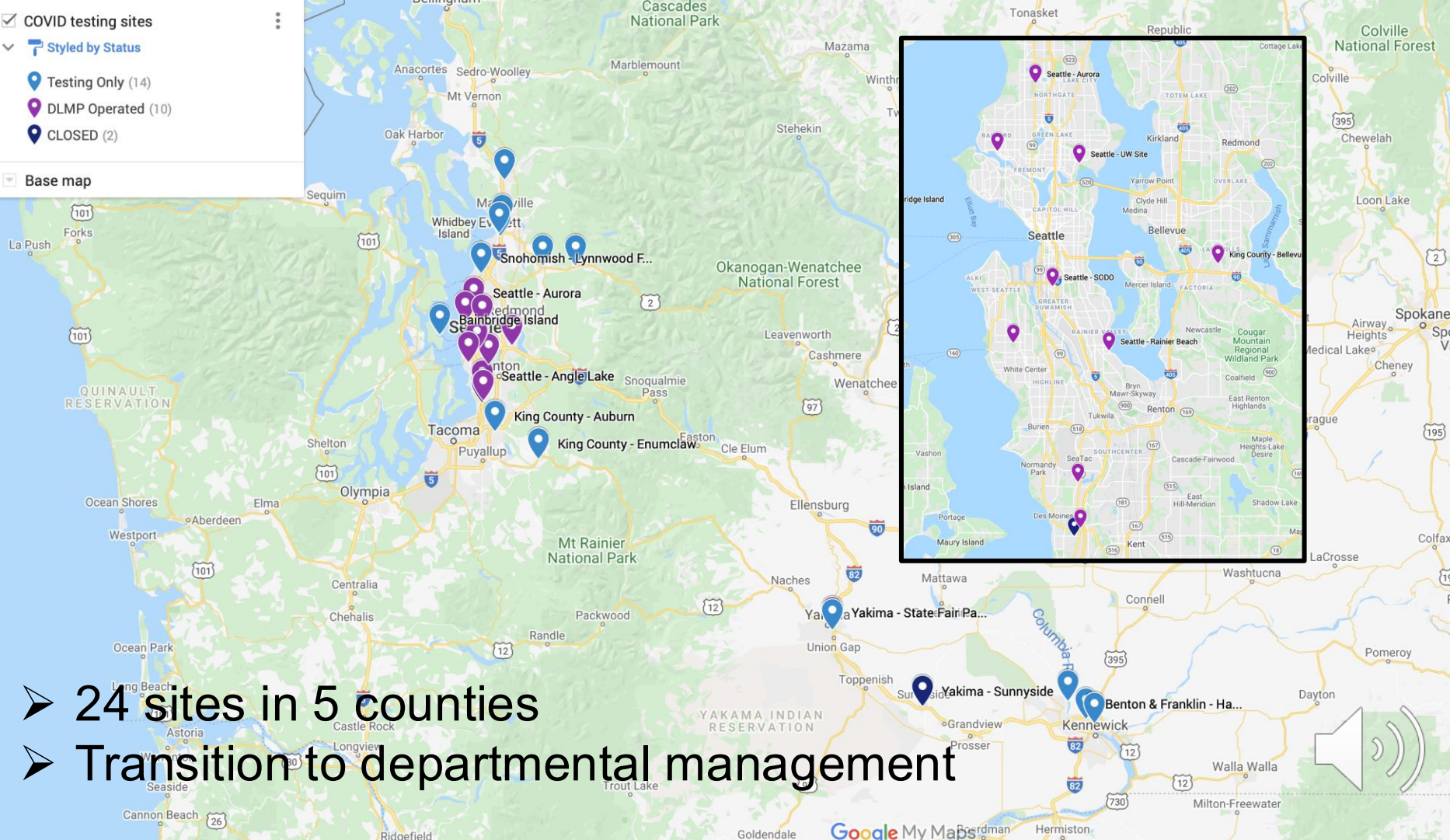
▼  Styled by Status

 Testing Only (14)

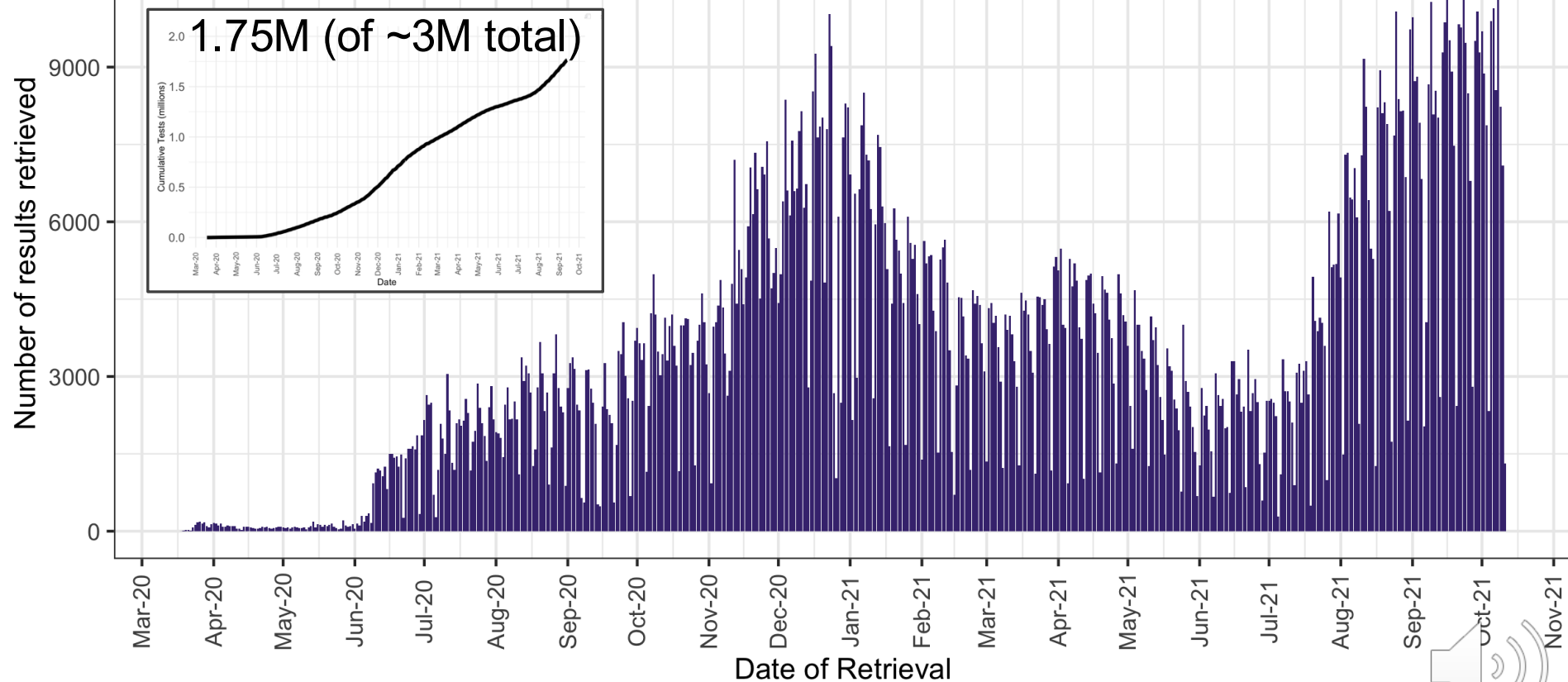
 DLMP Operated (10)

 CLOSED (2)

▼ Base map

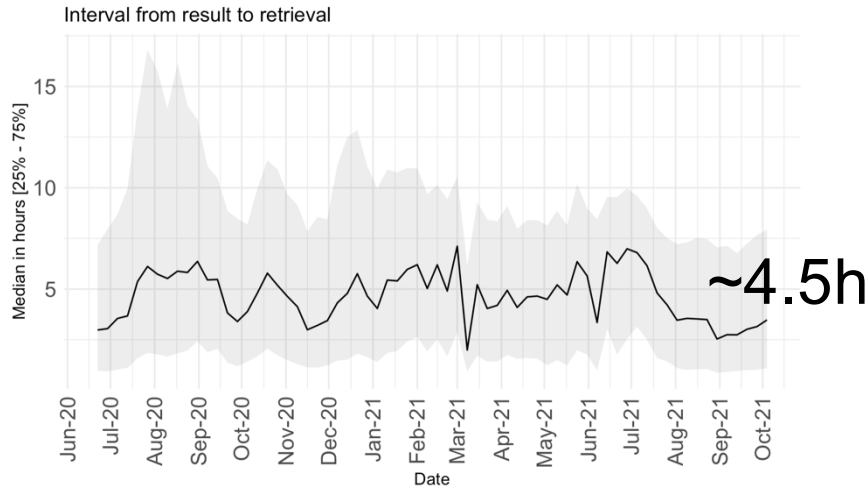


# Results delivered via Securelink portal

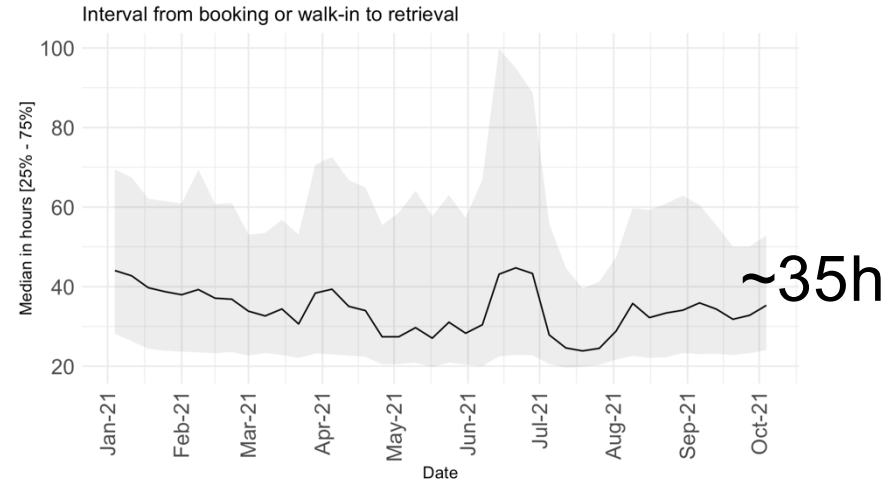


# Effectiveness of result delivery

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

Lab Medicine and Pathology  
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Brian Wallace

Sarah Smith

Leah Tivoli

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Lauren Tien

Adam Zook



# Thank you!

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