# Sharing Bulk Immunization Data Using HL7 V2 and FHIR

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# HIMSS 23

# Welcome Our Speakers

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# *Conflict of Interest*

Speakers have no real or apparent conflicts of interest to report.

# *Agenda*

- Problem Statement & Bulk Query Definition
- Immunization Integration Program (IIP) Workgroup Effort
- Public Health Immunization Information Systems (IIS) Use Case & Best Practices
- Helios Fast Healthcare Interoperability Resources (FHIR) Accelerator for Public Health
  - IIS Bulk Data Query – Make Data in Public Health Systems Accessible in Bulk
- On the Horizon
- Audience Q&A

# *Learning Objectives*

1. Summarize the current landscape of bulk data exchange in the immunization community

2. Compare alternative approaches to sharing immunization data in bulk with authorized users

3. Describe how the HL7 Helios FHIR Accelerator for Public Health is exploring FHIR-based exchange of IIS data in bulk
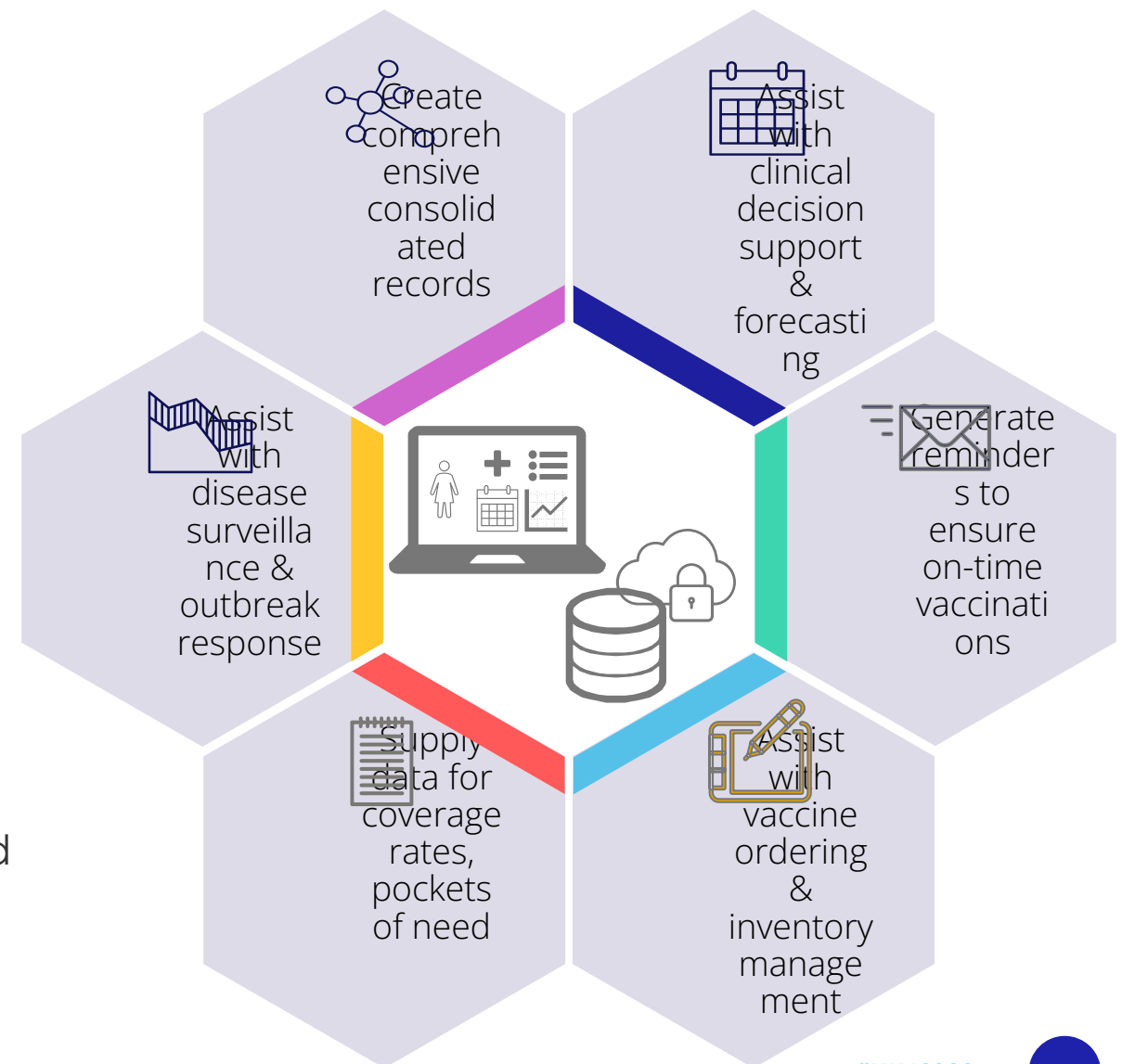
# *Current Landscape*

# *Problem Statement*

- Providers or organizations need to retrieve immunization information from immunization information systems (IIS) without relying on individual queries which can be time consuming for users and overwhelming for IIS.

- Near real-time query for an individual patient is broadly available across IIS. However, if information is needed on an entire patient group or set of health plan members, this method of single query may be slow and inefficient.

- The COVID-19 response demonstrated the value of IIS data.

- Current approaches vary by implementation and no existing method is accepted as "the standard".

# Public Health Immunization Information Systems (IIS)

- Purpose
  - Support clinical decisions at the point of care
  - Support the functions of immunization programs
- History
  - IIS began to be established in the 1970s
  - Support pediatric clinical care
  - First implementation guide to standardize messages and IIS essential functions were released 1995-1997
- Immunization Data Exchange
  - HL7 v2
  - Moving to FHIR as the next generation standard



Create comprehensive consolidated records

Assist with clinical decision support & forecasting

Generate reminders to ensure on-time vaccinations

Assist with disease surveillance & outbreak response

Supply data for coverage rates, pockets of need

Assist with vaccine ordering & inventory management

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# *Bulk Query Definition*

- A single request to an IIS for immunization information for an entire group of people (patients, members, or students) known to and affiliated with a requestor

- An asynchronous technical approach
  - Request is submitted but the requester does not maintain an active connection while awaiting a response

- Occurs when an authorized entity (e.g., healthcare organization) requests data for a group

- Single request containing a list of patient/member identifiers and demographics to be matched to records within [a source system]

- Size is not defined, could be 2 or 2 million

# *Immunization Integration Program (IIP)*

## Goals & Strategies

- Advance immunization capabilities in EHR products to improve data quality from the point of vaccination to data submission to public health

- Improve interoperability between IIS and EHRs

- The IIP leverages two strategies to achieve project goals:

  - The Testing & Recognition initiative gives EHRs the opportunity to validate their product's ability to successfully exchange immunization data with IIS

  - The Collaborative brings together stakeholders from the IIS and EHR communities to tackle and identify solutions for common interoperability issues

# Immunization Integration Program

**Convening Partners**

CDC, AIRA, HIMSS, Drummond & SME Consultants

**Testing & Recognition**

Allows EHRs to demonstrate and be tested for immunization capabilities – including exchanging data with IIS

Approved alternative testing for ONC (f)(1) certification and additional capabilities & workflows
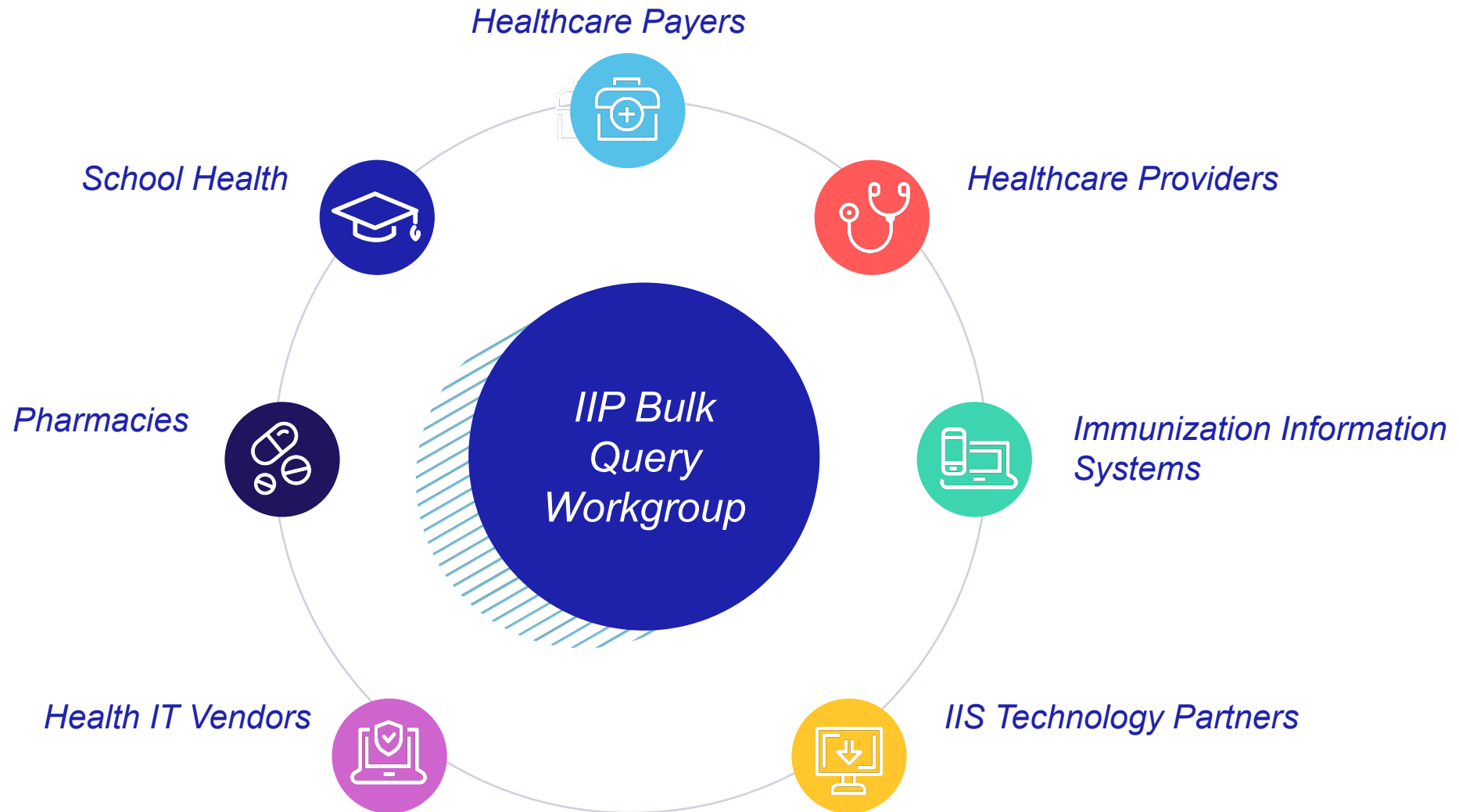
**Improve Immunization Interoperability**

**Volunteers**

Executive Committee, Technical Council, Workgroups & SMEs

**Collaborative**

Forum to develop interoperability recommendations & solutions

# *Approach to IIP Collaborative Issue Selection*

| Discovery | Prioritize |
|---|---|
| **Conduct community information gathering on each issue to:** <br> ✔ Define and categorize the problem <br> ✔ Learn IIS, EHR and provider community perspectives <br> ✔ Identify existing efforts to address the issue <br> ✔ Recommend solution-based approaches to address the issue <br> ✔ Address additional considerations to each issue such as policy and technical barriers | **Develop and apply screening and prioritization criteria for each issue to:** <br> ✔ Assess level of impact on quality, safety and public health, impact on EHR-IIS interoperability, and information sharing <br> ✔ Leverage existing resources and ensure feasibility of achieving consensus on and developing a solution <br> ✔ Ensure impact was broad and benefited key collaborator groups <br> ✔ Confirm the ability to effect change through policy and other levers <br> ✔ Align issue topics with IIP scope, goals, and objectives |

# IIP Collaborative Convening Ability



Healthcare Payers

School Health

Healthcare Providers

Pharmacies

IIP Bulk Query Workgroup

Immunization Information Systems

Health IT Vendors

IIS Technology Partners

# *Approaches to Sharing Bulk Data*

# Bulk Query Use Cases

Part 1 of 2

| Use Case Categories and Examples | Stakeholder Actions | Stakeholder Examples | |
|---|---|---|---|
| 1. Prepare pre-visit<br><br>2. Perform reminder/recall<br><br>3. Report performance metrics | -Providing and directing patient care and administering immunizations<br><br>-Responsible for healthcare payment | - Private Practices<br>- Healthcare System Clinics<br>- Occupational Health<br>- Pharmacy Clinics | - Public Health Clinics<br>- School-based Clinics<br>- Mobile Clinics<br>- Payers<br>- Private insurance<br>- Public Assistance |
| 4. Perform population outreach<br><br>5. Manage licensing/operational requirements | -Vaccine requirements for a population being served that do not administer vaccinations | - Schools<br>- Camps<br>- Child Care Centers | - Employers<br>- Public Health Clinics |

# *Bulk Query Use Cases*

Part 2 of 2

| Use Case Categories and Examples | Stakeholder Actions | Stakeholder Examples |
|---|---|---|
| 6. Perform case investigation (identify those at risk based on case clusters/ outbreaks)<br>7. Evaluate vaccination status of specific, known populations (e.g., patients living with HIV) | - Public health responsibilities | - Local Public Health Departments<br>- Public Health Surveillance |
| 8. Obtain patient data to support multiple stakeholder types | - Acting as third-party data intermediaries moving & storing patient data | - HIEs<br>- Other third-party aggregators |
| 9. Provide vaccination credentials<br>10. Provide consumer access to vaccine history | - Managing vaccine credentialing and consumer-facing access to vaccine information | - Credentialing organizations<br>- Consumer-facing application managers |
| 11. Query known patients (e.g., long-COVID diagnosis for vaccination history) | - Conducting public health, academic, post-market surveillance research | - Credentialing organizations<br>- Consumer-facing application managers |
| 12. Post-market surveillance | | -Researchers<br>-Pharmaceutical Companies<br>-Public Health Surveillance |

# *IIP Bulk Query Products & Resources*

## Bulk Query Toolkit

- Approaches to immunization group data exchange
- Business and technical requirements for sharing immunization data
- Strategies for mitigating potential conflicts
- Identified immunization use cases
- Specific recommendations

# IIP Bulk Query Toolkit

**1** *Prepare*

IIS and queries should prepare for eventual bulk query needs

**4** *Prioritize Data Submission to IIS*

- Use parallel environments
- Schedule during off-peak hours
- Throttle queries

**2** *Avoid Single Serial Queries*

Unless these work well for both IIS and queriers. Don't use for new implementations.

**5** *Apply Bulk FHIR (under development for Immunization Bulk Query)*

- Look to Helios bulk data effort
- Adopt once fully tested

**3** *Use agreed upon data exchange methods*

Keep doing what works for all

# Rhode Island – RICAIR Background

- Rhode Island's IIS – Rhode Island Child and Adult Immunization Registry (RICAIR) – is a component of a larger integrated public health information system (KIDSNET/RICAIR)
  - Contains information for coordination of care for patients under 18
  - Backbone for immunization program's vaccine ordering system (OSMOSSIS)
- RICAIR web-based application allows providers to generate patient reports for immunization (including flu, COVID, school eligibility), lead, newborn screening, and newborn summary
- Adult immunization in IIS launched just prior to the COVID-19 immunization response
- Like other public health systems, the number and frequency of queries for immunization data dramatically increased during the COVID response
  - Fortunate to have the adult portion live for the start of the COVID vaccine response
  - Difficult to know what adult immunization demand might have been prior to the pandemic

# *Rhode Island – RICAIR Background*

- While our team is excited that the data is reaching a wider audience, our systems are also increasingly under siege internally by new data teams, increases in use of epi staff, desire to update dashboards, run ad hoc queries, case investigators, research, etc.

- Strategies for dealing with heavy HL7 v2 Query/Response volume to date have avoided throttling or limiting

- Attempts to work with our larger data submitters to schedule their queries to "off hour" or the overnight when overall system usage is lower met with mixed results

# Rhode Island – RICAIR on FHIR

- Looking to FHIR bulk query to address the challenge
  - Allows providers to efficiently access up-to-date immunization data from IIS using modern tools and protocols
  - Particularly useful for use cases where there is a need to be kept up-to-date on the immunization status of large groups of patients
  - The need to optimize the timeliness and availability of the data in our system, improve user experience related data access, and the load management of the system will be enhanced by FHIR Bulk Query
- Some of the bulk query use cases identified:
  - More efficient data exchange with our larger health systems, school districts, large chain pharmacies
  - Lessen the volume of single message queries, Batch HL7v2, and sharing of flat/delimited files
- As bulk query uses evolve, we expect partners to query for both history and forecast

# *Rhode Island – RICAIR on FHIR*

- Migrating large and repetitive HL7 query submitters like healthcare systems, national pharmacy chains, school districts, college and university health systems would better serve their needs while improving system and data availability for other users

- To other jurisdictions who are interested in permitting bulk queries - suggest that every consideration be given to employing FHIR Bulk Query as the first or primary option for adoption

- As we all are aware, moving someone to something new after they have a working process – regardless of whether it the best option – is very difficult

- It is our intent to implement FHIR Bulk Query with all our partners eventually

# *Rhode Island – FHIR Architecture*

- FHIR Façade Model using open source HL7 Application Programming Interface (HAPI) FHIR server
- Doubles as an application modernization strategy: replacing legacy web applications with modern front-ends that communicate with the FHIR back-end:
  - Immunization data entry
  - Other potential uses: immunization display, vaccine credentials, school forms, etc.
- Bulk Query:
  - Predefined groups, or search and define custom groups
  - Query Patient, Immunization, ImmunizationRecommendation, and ImmunizationEvaluation resources
  - Download up to 100k patients or more in a fraction of the time of HL7 v2
  - Server has flexibility in scheduling and allocating resources to query

# Rhode Island – Data Example
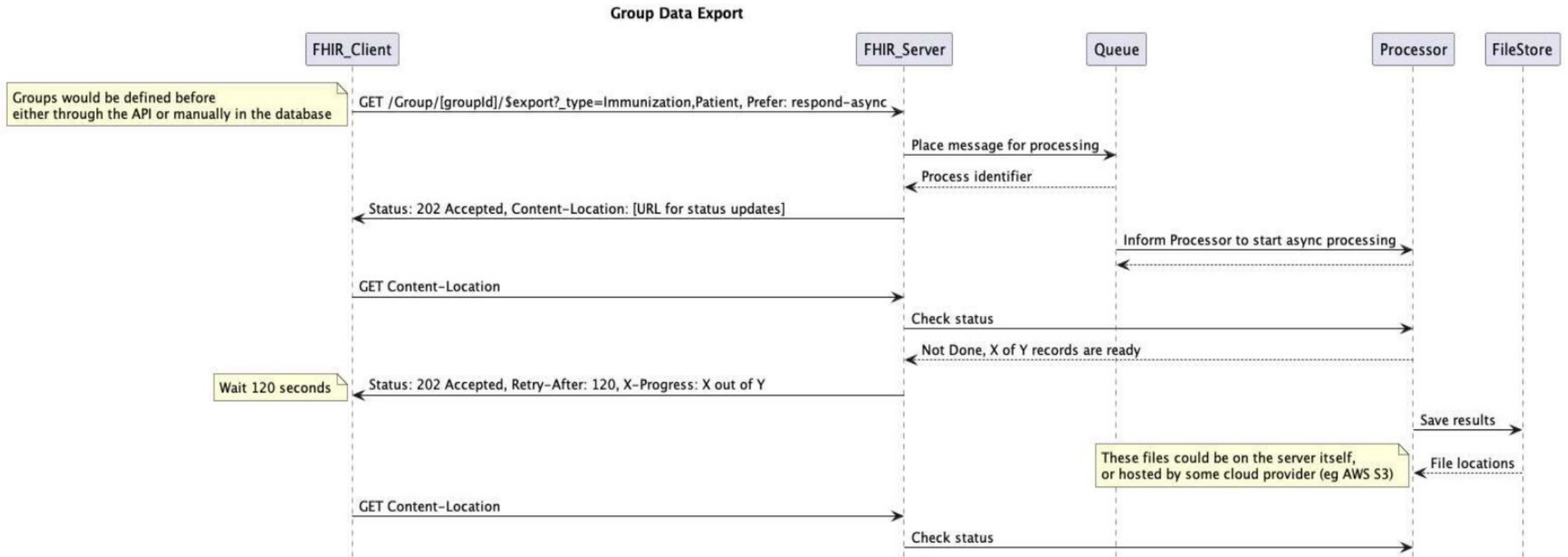
```
"name": [
    {
        "text": "TEST A HIMSS-PATIENT",
        "family": "HIMSS-PATIENT",
        "given": [
            "TEST",
            "A"
        ]
    }
],
"birthDate": "2022-04-20",
```

Patient

**Patient Info**

First Name: TEST    Middle: A    Last: HIMSS-PATIENT

Date of Birth: 04/20/2022                                Age: 10m 16d

| VALID DOSES | | | | | NEXT DUE |
|---|---|---|---|---|---|
| COVID-19<br>2 valid doses | 10/20/2022<br>COV19 PF PFR<br>6m-5<br>6m 0d | 11/20/2022<br>COV19 PF PFR<br>6m-5<br>7m 0d | | | **Due Now**<br>(On or after 01/15/2023)<br>Dose 3<br>🖨 Covid Record |
| Influenza | | | | | **Due Now**<br>(On or after 10/20/2022)<br>Dose 1 |
| Hepatitis B<br>3 valid doses | 04/20/2022<br>HepB ped/adol<br>0m 0d | 06/20/2022<br>VAXELIS<br>2m 0d | 08/20/2022<br>VAXELIS<br>4m 0d [1] | 10/20/2022<br>VAXELIS<br>6m 0d | **End of Series** |
| DTaP/DT/Tdap/Td<br>3 valid doses | 06/20/2022<br>VAXELIS<br>2m 0d | 08/20/2022<br>VAXELIS<br>4m 0d | 10/20/2022<br>VAXELIS<br>6m 0d | | **Due in the Future**<br>(07/20/2023 - 12/17/2023)<br>Dose 4 |
| Pneumo<br>1 valid doses | 06/20/2022<br>PCV15<br>2m 0d | | | | **Past Due** |
| Polio<br>3 valid doses | 06/20/2022<br>VAXELIS<br>2m 0d | 08/20/2022<br>VAXELIS<br>4m 0d | 10/20/2022<br>VAXELIS<br>6m 0d | | **Due in the Future**<br>(04/20/2026 - 05/17/2029)<br>Dose 4 |
| Hib<br>3 valid doses | 06/20/2022<br>VAXELIS<br>2m 0d | 08/20/2022<br>VAXELIS<br>4m 0d | 10/20/2022<br>VAXELIS<br>6m 0d | | **Due in the Future**<br>(04/20/2023 - 09/16/2023)<br>Dose 4 |
| Rotavirus<br>0 valid doses | | | | | Maximum Age<br>Reached |

Immunization

```
"status": "completed",
"vaccineCode": {
    "coding": [
        {
            "system": "http://hl7.org/fhir/sid/cvx",
            "code": "215",
            "display": "PCV15"
        }
    ],
    "text": "Pneumococcal conjugate PCV15, polysaccharide CRM197 conj
},
"patient": {
    "reference": "11469529",
    "type": "Patient"
},
"occurrenceDateTime": "2022-06-20",
"recorded": "2023-01-01T07:10:39-05:00",
"primarySource": true,
"manufacturer": {
    "reference": "MSD",
    "type": "Organization",
    "display": "Merck & Co., Inc."
},
"lotNumber": "FK0101",
"expirationDate": "2024-01-01",
"site": {
    "coding": [
        {
            "system": "http://terminology.hl7.org/CodeSystem/v2-0163",
            "code": "LA",
            "display": "LEFT ARM"
        }
```
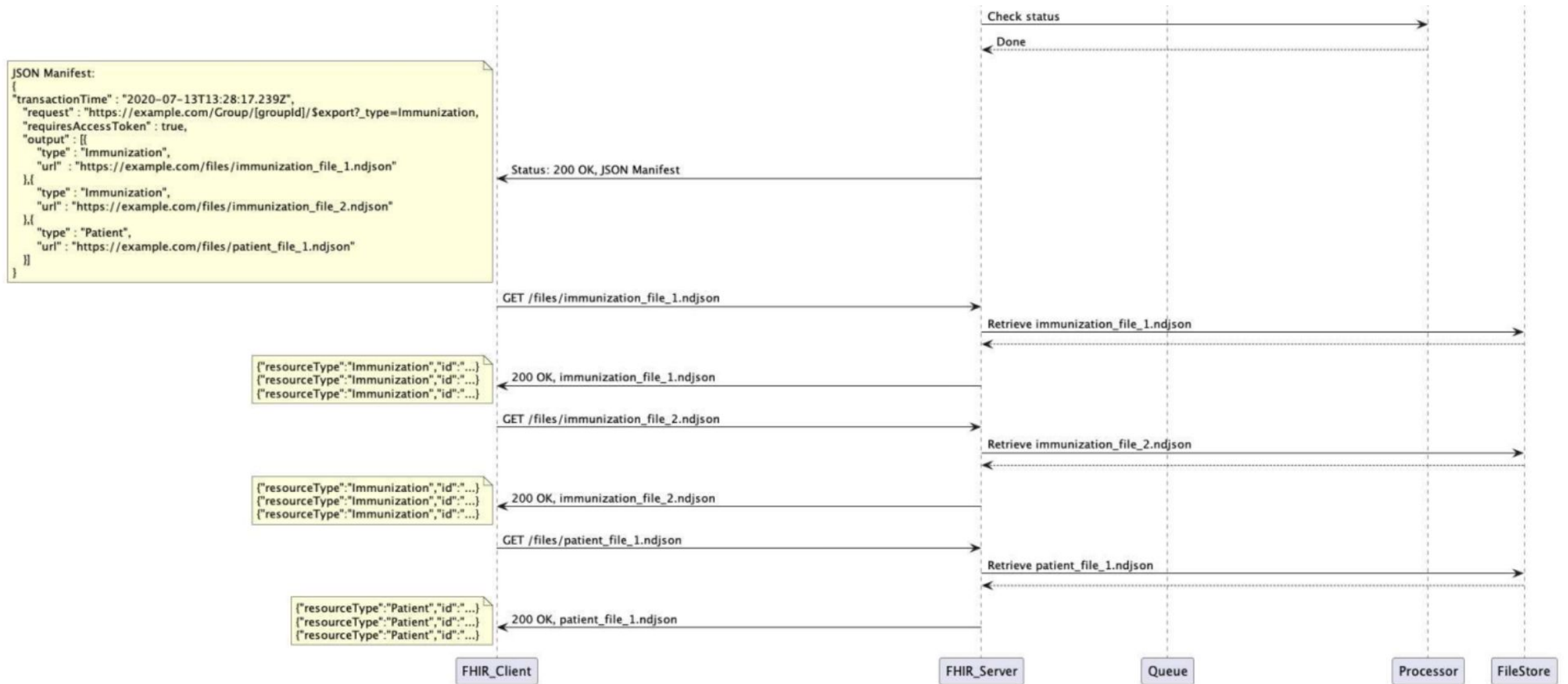
*Courtesy of the Rhode Island IIS

# *Rhode Island – Bulk FHIR Workflow*



**Group Data Export**

| FHIR_Client | FHIR_Server | Queue | Processor | FileStore |

Groups would be defined before either through the API or manually in the database

GET /Group/[groupId]/$export?_type=Immunization,Patient, Prefer: respond-async

Place message for processing

Process identifier

Status: 202 Accepted, Content-Location: [URL for status updates]

Inform Processor to start async processing

GET Content-Location

Check status

Not Done, X of Y records are ready

Wait 120 seconds — Status: 202 Accepted, Retry-After: 120, X-Progress: X out of Y

Save results

These files could be on the server itself, or hosted by some cloud provider (eg AWS S3)

File locations

GET Content-Location

Check status

*Courtesy of the Rhode Island IIS

# Rhode Island – Bulk FHIR Workflow



*Courtesy of the Rhode Island IIS

# *FHIR-Based Efforts*

# Helios FHIR Accelerator for Public Health

IIS Bulk Data Query – Make Data in Public Health Systems Accessible in Bulk

- Align public health with the widespread standardization and transformation that is happening across healthcare
- Bring together public health, healthcare, philanthropic organizations and the private sector
- Access and act on critical data that public health has not had immediate access to before

# Helios FHIR Accelerator for Public Health

IIS Bulk Data Query – Make Data in Public Health Systems Accessible in Bulk

Objective:

- How might we make data in public health information systems, such as IIS, more accessible to authorized users beyond public health (e.g., State Medicaid programs, healthcare providers, private insurers, etc.)?

# Helios FHIR Accelerator for Public Health

IIS Bulk Data Query – Make Data in Public Health Systems Accessible in Bulk

Deliverables:

- Create a uniform process for querying immunization data in IIS, leveraging Bulk FHIR
- Develop implementation guidance
- Engage the community with a vision for bulk data exchange
- Test and pilot solutions for real-world implementation

# *HL7 FHIR Connectathon 32*

Helios Accelerator Bulk Data Track

Henderson, Nevada | January 14-15, 2023

- Participants
  - American Immunization Registry Association (AIRA) & National Institutes of Standards and Technology
  - MITRE
  - Envision Technology Partners
  - HLN & Rhode Island Department of Health
  - STChealth
  - Epic
  - Amazon Web Services (AWS)
  - Intersystems

# HL7 FHIR Connectathon 32

Helios Accelerator Bulk Data Track – Results

- Exchange between most client/server pairs up to 100,000s of patients
- Agreement that even with unoptimized testing systems, it is practical to exchange large data sets
- Application of generic bulk data tools to succeed at the immunization use case
- Discussion with other (non-public health) communities about the bulk patient matching use case

# *On the Horizon*

HL7 FHIR Connectathon 32 – Helios Accelerator Bulk Data Track

- Define a minimum viable product for moving to a more real-world pilot
- Collaborate to develop a reusable strategy for matching patients in bulk
- Address authorization, authentication and security
- Create guidance for community implementation
- Disseminate outcomes and recruit further participants

# *Questions*

# Thank you!

**Connect with us!**

**http://himss.org/iip**

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