Data Quality Improvement Success Story: Collaborating through the Immunization Integration Program

HIMSS Interoperability & HIE Community

June 17, 2021

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Join Today

Our Leadership Team

Leslie Kelly Hall
Founder, Engaging Patient Strategy

Herman Oosterwijk
President, OTech

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Thank you to our sponsor

Meet Our Speakers

Melissa McClung

Immunization Integration Program Director, AIRA

Jacqueline Logan

Epidemiologist, Vaccine Preventable Disease and Immunization Program at Tennessee Department of Health

Amit Popat

Interoperability Standards & Regulations, Epic

Stuart T. Weinberg, MD

Associate Professor at Vanderbilt University Medical Center, Dept of Biomedical Informatics

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Today's Agenda

- **Background**
  - Immunization Information Systems (IIS)
  - Immunization Integration Program (IIP)

- **Tennessee Story**
  - IIS Role
  - Electronic Health Record (EHR) Role
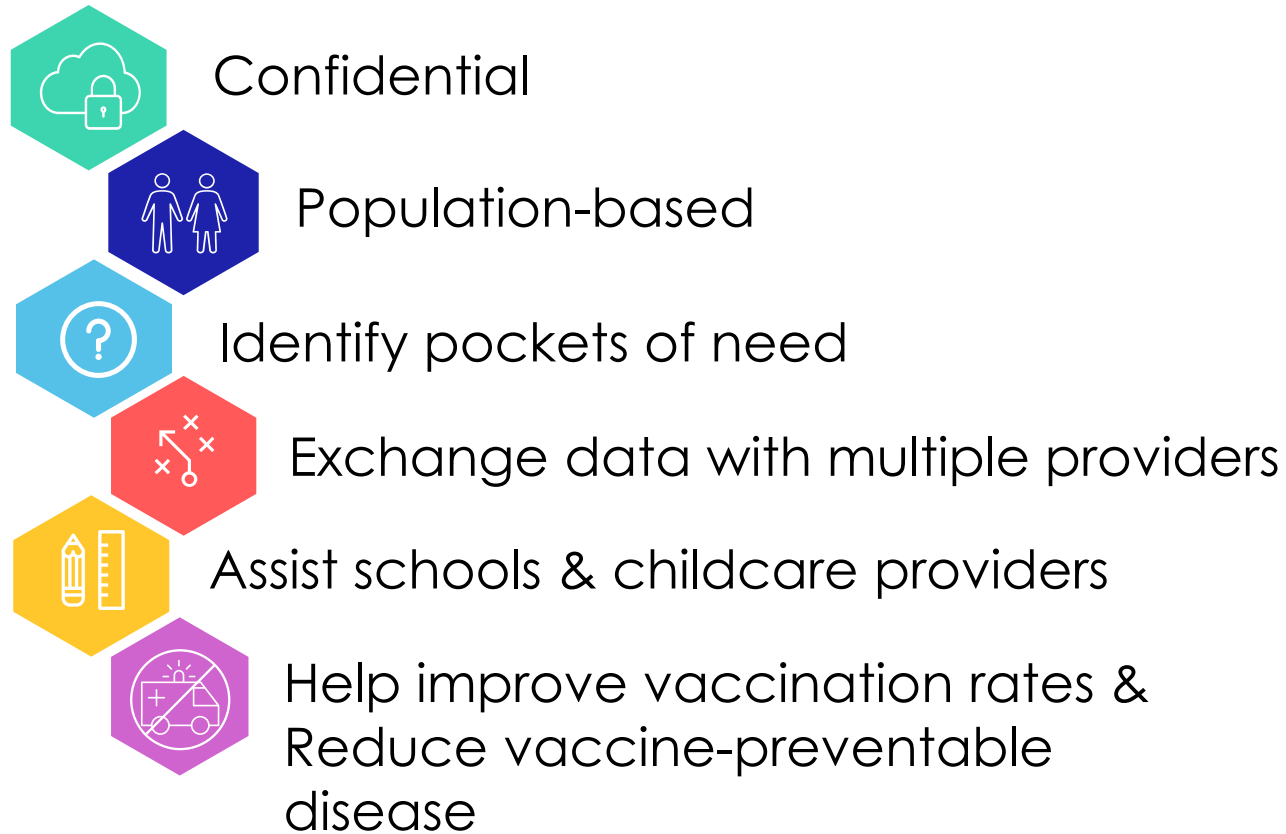 - Operational Workflow

- **Q&A Discussion**

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Learning Objectives

- **Discuss how the Immunization Integration Program (IIP) can improve immunization data quality and use through collaboration, measurement and technical support**

- **Identify existing opportunities to improve immunization interoperability**

- **Explore innovative cross-sector efforts to drive the adoption of solutions to improve information sharing and access by clinicians and public health**
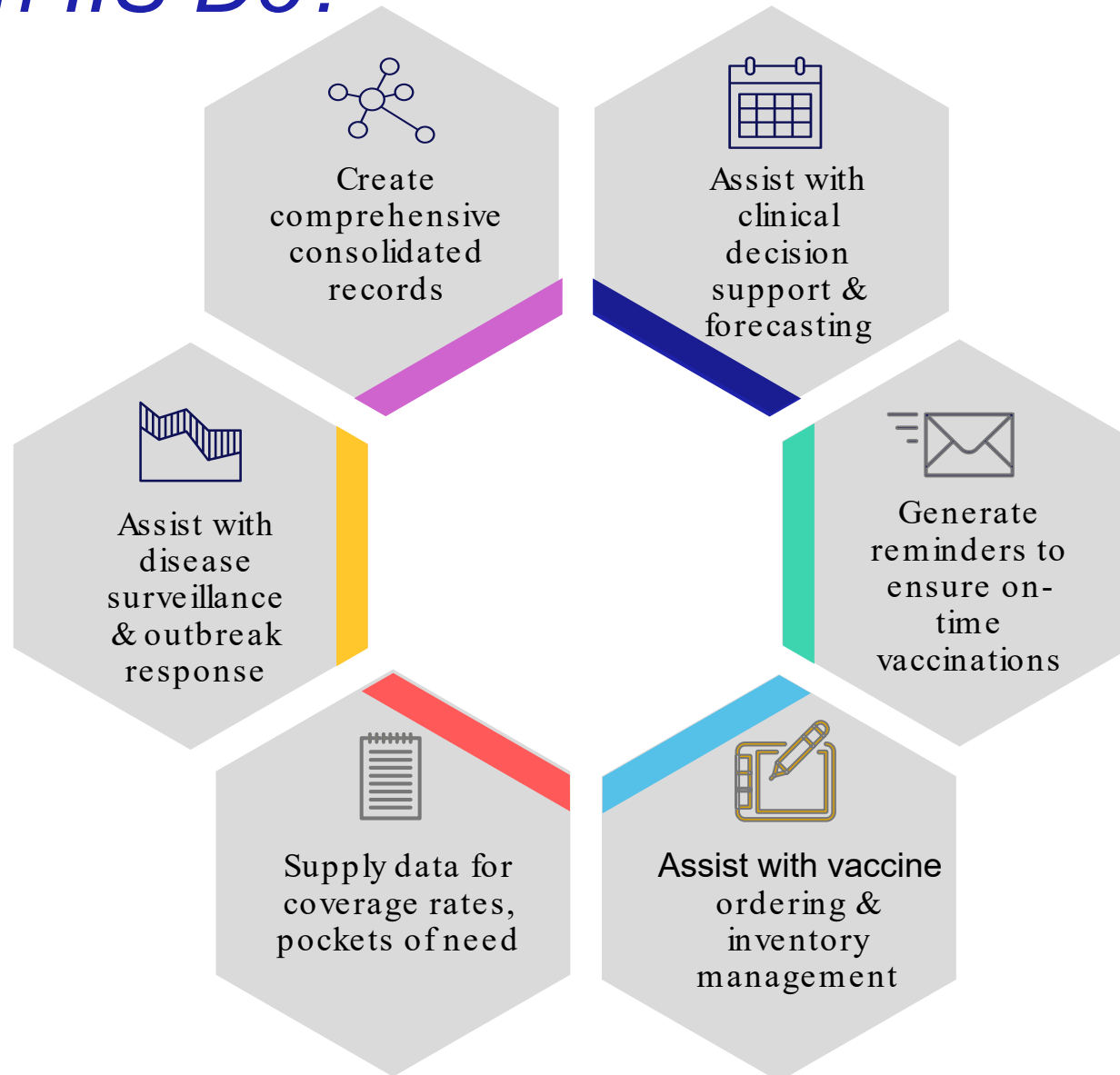
Background

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Immunization Information Systems

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What is an Immunization Information System (IIS)?

Confidential

Population-based

Identify pockets of need

Exchange data with multiple providers

Assist schools & childcare providers

Help improve vaccination rates & Reduce vaccine-preventable disease

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What Does an IIS Do?

Create comprehensive consolidated records

Assist with clinical decision support & forecasting

Assist with disease surveillance & outbreak response

Generate reminders to ensure on-time vaccinations

Supply data for coverage rates, pockets of need

Assist with vaccine ordering & inventory management

EHRs and IIS: Better Together

➢ **Connectivity**
- ○ Access to a patient's full immunization history

➢ **Collaboration**
- ○ Shared data results in complete and accurate information

➢ **Visibility**
- ○ Better sight into the history and forecasting future needs

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Immunization Integration Program

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Current State: Immunization Interoperability

EHRs

- Many use (or are evolving to use) 2015 Certified EHR Technology (CEHRT)

- Variation exists across products, and within configuration upon implementation

IIS

- Vast majority of IIS have adopted standards (HL7 V2.5.1 Release 1.5, SOAP Web Services)

- IIS are also governed by (and need to adhere to) state and local law and policy

- HIEs, ONC Rules and Regulations, CMS, jurisdictional policies play a role in influencing data exchange

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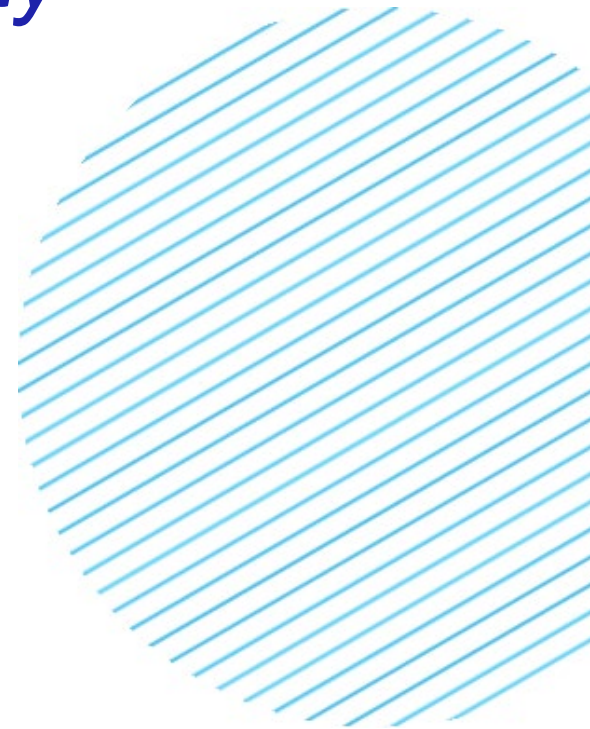
IIP Goals

- **Improve interoperability between EHRs and IIS**

- Provide timely access to complete and accurate immunization data to:

  - Improve clinical decision-making around immunization

  - Confidently and accurately increase vaccination coverage

  - Reduce vaccine-preventable diseases

Strategies and Structure

- *Strategies:*

  - **Testing & Recognition Initiative** - demonstrate and be tested on immunization capabilities

  - **Collaborative** - forum to develop interoperability recommendations and solutions

- Evaluation and Communication
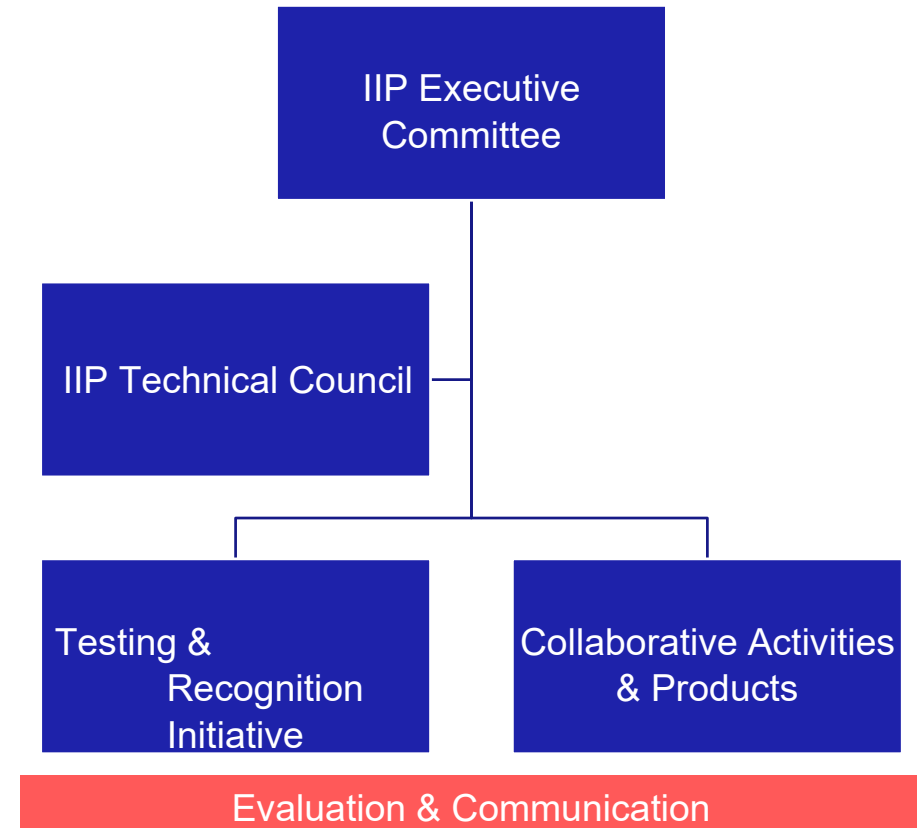
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Project Partners

- **CDC** – project sponsorship, expertise & support

- **American Immunization Registry Association (AIRA)** – project leadership and immunization-related expertise

- **Healthcare Information & Management Systems Society (HIMSS)** – project management, marketing & communications, trusted voice and thought leader within the health information & technology community-at-large

- **The Drummond Group** – clinical software vendor testing experience

- **Consultants/SMEs** – technical, clinical & evaluation expertise

2020-2021 Collaborative Priorities

1 Acknowledgment Message Handling

2 Standardized Transport Protocol Adoption

3 Multiple Patients Matched in a Query

4 Patient Matching and Identification

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Tennessee Story

IIS Role

Tennessee Immunization Information System (TennIIS)

- **Statewide lifelong registry**
  - o Vaccine for Children providers, health departments, and providers receiving COVID-19 vaccine are required to report
- **More than 7000** active facilities/physical locations
- **8.6 million** patients
- **82.5 million** vaccines reported as of January 1, 2021
  - o **Almost 7 million** vaccines were reported in 2020
- **34%** of vaccination data is entered manually through portal
- **66%** of vaccination data is submitted electronically

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HL7 Immunization Message Summary

- **Submission (VXU) messages**
  - Receive acknowledgment (ACK) messages with summary of data content issues (errors and warnings)
- **Query (QBP) messages**
  - Receive response (RSP) messages with patient vaccination history and forecast
- Acknowledgment messages contain errors and warnings to inform sending system of submission outcome

  Examples:
  - o Patient first name missing
  - o Vaccination date in future

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Number of TennIIS Organizations Sending Submission (VXU) Messages Monthly Since November 2014
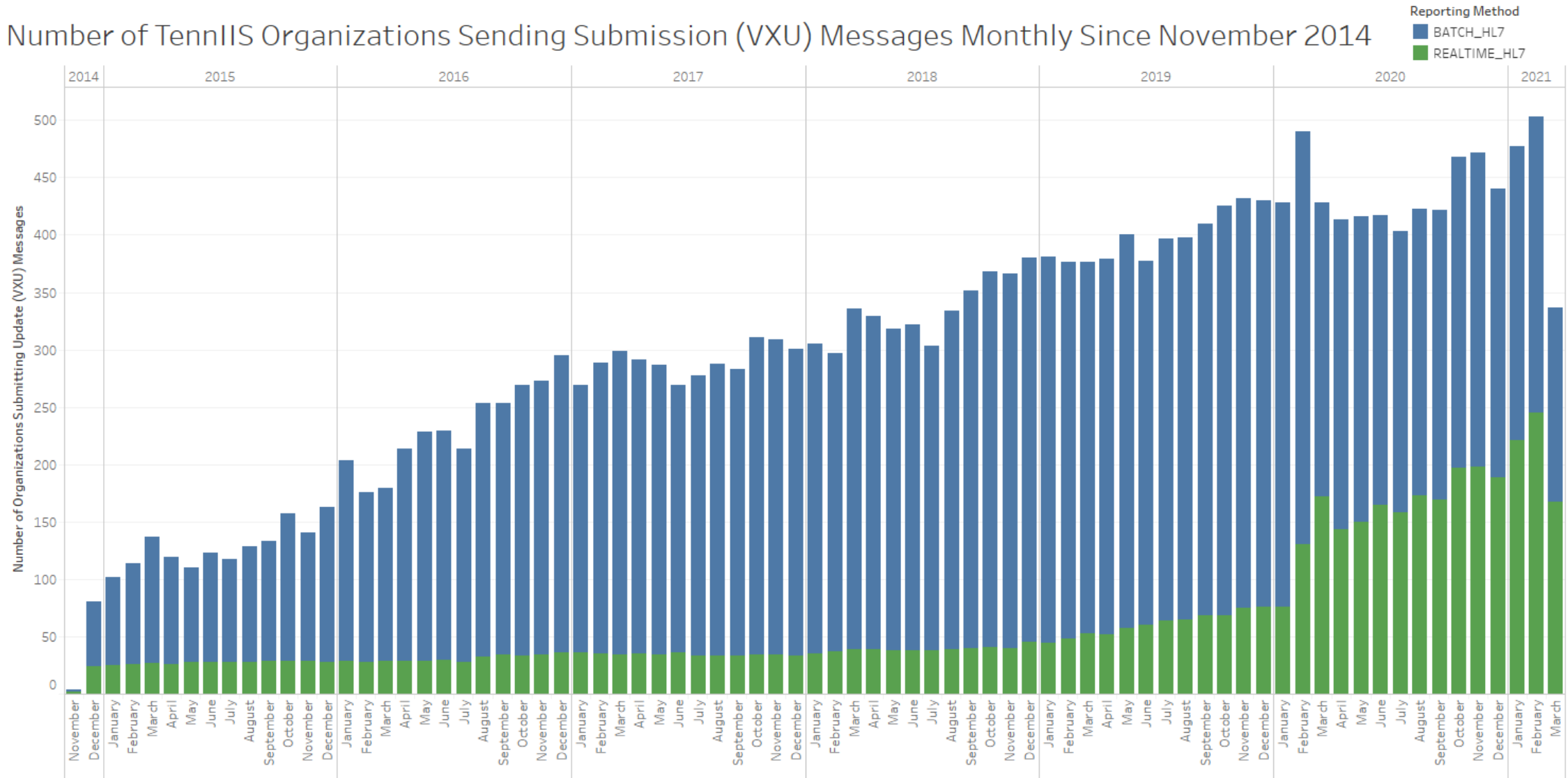
Number of Submission (VXU) Messages Submitted Monthly Since November 2014
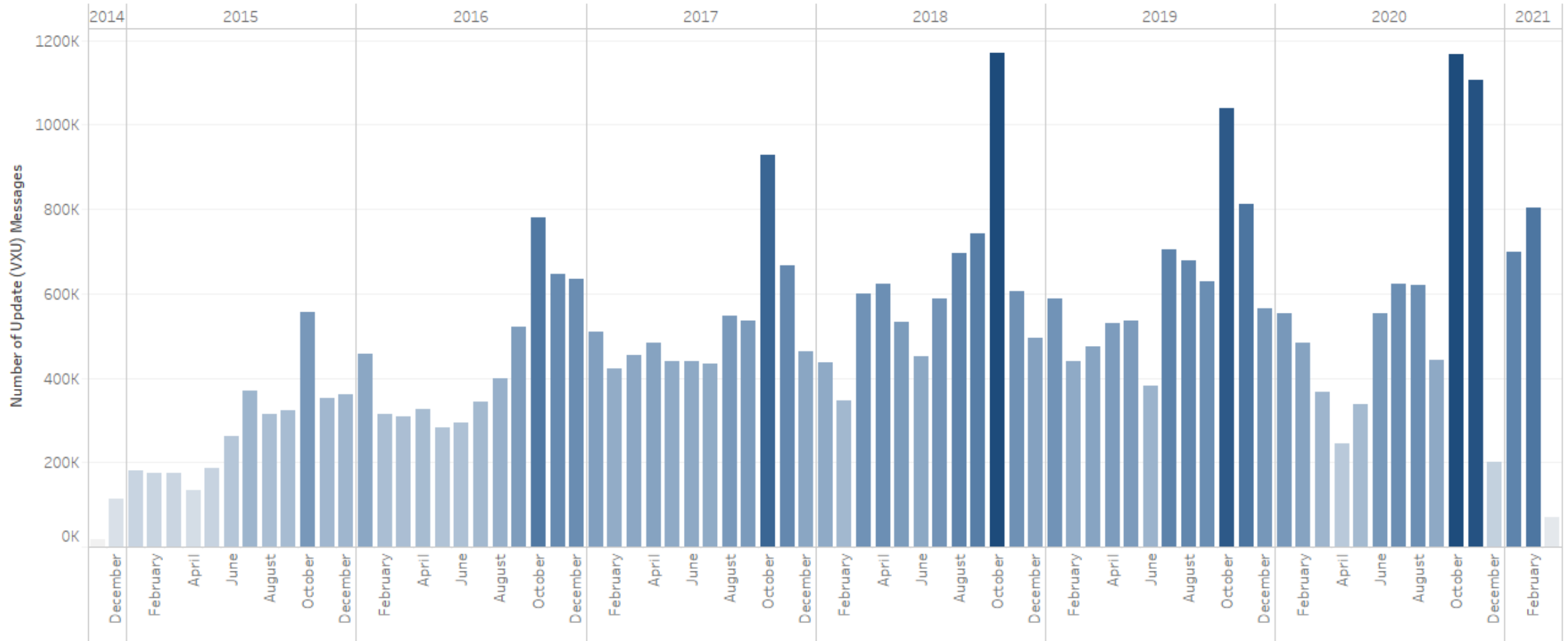
ACK Message Summary

- More than 4 million HL7 messages received in April 2021
  - 38,370 (0.91%) errored
- Errors were sent by 250+ separate organizations

HL7 Message Status: Accepted, Warning, or Error

Message Status
■ Error   ■ Warning   ■ Accepted

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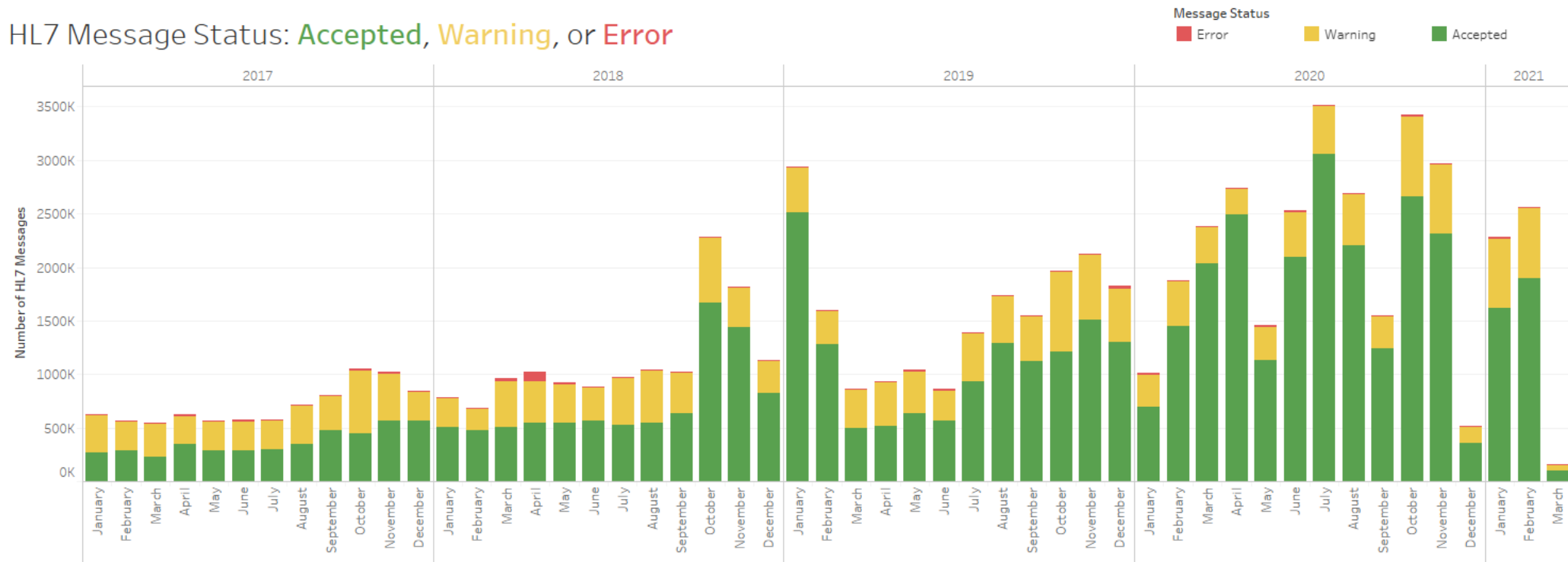
Provider ACK Error Summary

- Evaluate specific errors being returned to a provider in ACK messages
- Work with provider to identify and correct issues identify

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Review Date: 7-Day Period Starting 20210517 Through 20210523

Number of VXU Messages Reviewed: **18990**

Response Type Breakdown (MSA-1):
AA: **2097** (11.04%)
AE: **16893** (88.95%) ---   **3414** (20.2%) contained fatal errors and   **13479** (79.79%) contained only warnings.
AR: **0** (0%)

Fatal errors will be rejected by TennIIS and will not enter the system. See below for the type and frequency of common errors being submitted (Note: could be more than one error per VXU message).

ERROR LOCATION AND DESCRIPTION	MESSAGE COUNT	MESSAGE PERCENT
PID^1^11-5; REQUIRED FIELD MISSING; PATIENT ADDRESS ZIP IS MISSING	3387	26.05
PID^1^11-3; REQUIRED FIELD MISSING; PATIENT ADDRESS CITY IS MISSING	3323	25.56
PID^1^11-4; REQUIRED FIELD MISSING; PATIENT ADDRESS STATE IS MISSING	3323	25.56
PID^1^11-1; REQUIRED FIELD MISSING; PATIENT ADDRESS STREET IS MISSING	2873	22.10
PID^1^5-1; REQUIRED FIELD MISSING; PATIENT LAST NAME IS MISSING	44	0.34
PID^1^5-2; REQUIRED FIELD MISSING; PATIENT FIRST NAME IS MISSING	44	0.34

Vanderbilt VXU Fatal Error Summary

Weekly Percent (%) of VXU Messages That Contained Fatal Errors
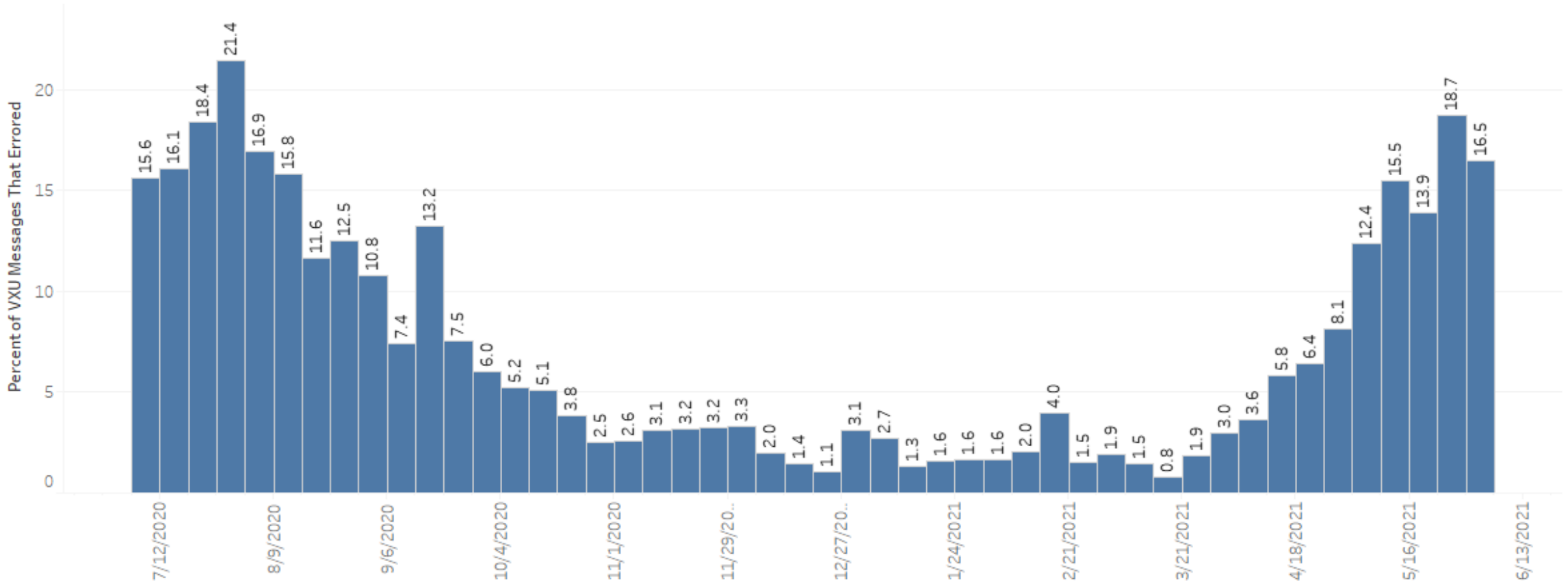
EHR Role

Acknowledgment Message Handling

ACK Workgroup Overarching Goal:
Improve quality, completeness of immunization data both within the IIS and the healthcare provider setting

- Improve the "handling" of acknowledgment messages
- Improve the percentage of "E" errors or rejections that are resolved
- Reduce the number of "E" errors or rejections
- Improve the understandability and actionability of messages
- Improve compliance with established standards

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Acknowledgments Data Collected

1. Engaged commitment from eight sources of information including IIS programs, IIS vendors, EHR developers, and health care providers

2. Conducted research, gained your input, sought input from others, developed draft current state

3. Collected data on acknowledgement messages—ultimately more than 72M—through collaboration with workgroup members

4. Analyzed data collected and gained insights to inform the workgroup's work

5. Agreed upon detailed goals for our effort

6. Reviewed and agreed on two major solution areas

How do these errors break down (who can fix it)?

IIS
9%

EHR
9%

Conditional
8%

Clinical/Clinical
IT
27%

Interface Analyst
47%

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Working with Vanderbilt

Generalize to Maximize Benefit

Generalize for the Industry

- **IIS Summary Reports**

- **EHR / Submitter Summary Reports**

- **Stuart Weinberg's Tools At Vanderbilt**

- **AIRA Spreadsheet Tool**

Operational Workflow

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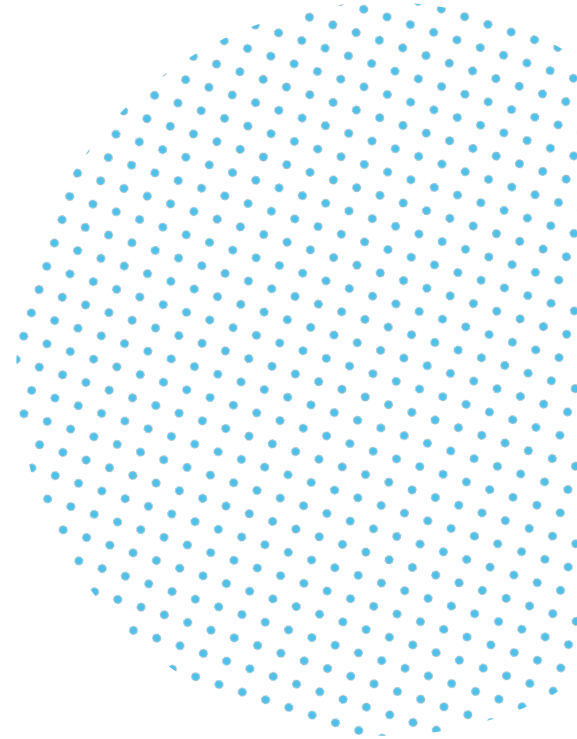
Putting It All Together

How the combined efforts from both the Tennessee Immunization registry (TennIIS) and the electronic health record (EHR) make it possible to identify patterns of errors from immunization messages that can be addressed, corrected, and resubmitted.

TennIIS Weekly Summary

Covers the previous 7 days, provides a statistical overview and details the fatal error types in decreasing frequency. Scheduled emails sent to Vanderbilt (me!) on Monday mornings.

Automatic Export of ACK and VXU Message Data from the EHR

Text file containing specific fields from fatal ACK messages received – along with data from the relevant VXU messages – over the same 7-day period is automatically compiled each Monday AM.

Vanderbilt Data Analytics Tool

A tool developed by Vanderbilt's Dept of Biomedical Informatics processes the exported text file and presents customized views of the data, including categorizations by vaccine, type of error, and clinical location where the vaccine was documented.

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Automatic Export of ACK and VXU Data from EHR

The specific data fields from the ACK messages include:
- Message Date and Time
- Message ID Number
- ERR-2 – Error Location (example: '**PID(1)-11.1**')
- ERR-8 – User Message (example: '**patient address street is missing**')

The specific data fields from the related VXU messages include:
- PID-3 – Patient Identifier List (example: medical record number)
- PD1-3 – Primary Facility (example '**VUMC ADULT HOSPITAL**')
- RXA-3 - Start Date of Administration
- RXA-5 - Administered Code [Vaccine Code, Name, Coding System] (example: '**208^SARS-COV-2 (COVID-19) VACCINE, PFIZER^CVX**')
- RXA-9 - Administration Notes (example: '**00^New immunization record^NIP001~**')
- RXA-11 - Administered-at-Location (example: '**101000416^^^101000^^^^^VUMC MASS VACCINATION VUH**')

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Vanderbilt Data Analytics Tool

- Web-based tool written in PHP

- Allows for selection of exported file and type of report from dropdown lists

- Summary of data presented first before details of selected report

20210524 ⌄	By Vaccine Type ⌄	Display

Summary of ACK (Acknowledgement) Errors from TennIIS

Date/Time Range: **05/17/2021 06:00:27 AM** through **05/23/2021 11:06:52 PM**

Total Number of errors: **26000**

Distinct ACK message id numbers: **3413** (match with number of AE fatal errors from TennIIS)

Distinct MRNs with errors: **210**

Distinct EPIC Dept IDs with errors: **14**

Distinct Vaccine CVX Codes with errors: **44**

Distinct Error Text Descriptions: **22**

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Type, Pattern and Impact of Fatal Errors - IIS

Configuration Errors

Example: In early September 2020, a significant increase seen in the error '**RXA^1^5-1; TABLE VALUE NOT FOUND; VACCINATION NDC CODE IS UNRECOGNIZED**'

Issue: incorrect NDC code entered in the IIS Product Settings for an influenza vaccine

Fix: TennIIS updated the NDC code, Vanderbilt resubmitted (on 9/23) **2,571** vaccine messages for influenza vaccines that had previously been rejected

Missing Functionality

Example: In early October 2020, the most frequent error was '**RXA^1^18; APPLICATION ERROR; VACCINATION REFUSAL REASON IS UNWANTED**'

Issue: TennIIS could not accept refusal messages and returned an error

Fix: With TennIIS' blessing(!), Vanderbilt subsequently filtered out refusals (as of 10/21) to reduce the numbers of errors generated

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Type, Pattern and Impact of Fatal Errors - EHR

Configuration Errors
Example: In mid-February 2021, the most frequent error was '**RXA; SEGMENT SEQUENCE ERROR; VACCINATION CVX CODE IS MISSING – MESSAGE REJECTED**'
Issue: a mapping error affecting certain influenza vaccines and a few other vaccines as well
Fix: mapping fixed, and Vanderbilt resubmitted **3,710** vaccine messages (on 3/3) for influenza vaccines that had previously been rejected in the past 120 days

And the Quirky
Example: early May TennIIS summary included the error '**RXA^1^3; APPLICATION ERROR; VACCINATION DATE IS AFTER PATIENT DEATH DATE**'
Issue: Vandy analytics tool quickly identified the patient, and investigation revealed a somewhat-hidden and previously unknown record field where there was a documented death date (12/08/2008)
Fix: date fixed(!), and 2 COVID vaccines administered to the patient were re-submitted

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Type, Pattern and Impact of Fatal Errors - EHR
Why are our errors now skyrocketing?!

Student Health

Example: Statistics from the 5/24-5/30 TennIIS weekly summary showed that **4,454** of the **17,669** vaccine VXU messages submitted were rejected (**29.47%**). **That's terrible**.

Issue: Vandy analytics tool revealed that **98%** were caused by downloading *historical* vaccine information from Vandy's Student Health system to Vandy's EHR, which are sent to TennIIS in real-time. Errors are occurring because of missing demographics in Vandy's EHR.

Fix: Working with TennIIS to filter out the submission of those records.

Wrong Name Type Code

Example: Patients who arrive in the emergency room before their legal name is established are often given a temporary name and a name type code of 'Anonymous'. After the legal name is determined, the name type code is sometimes not changed back to 'Legal'.

Issue: TennIIS only accepts the 'Legal' name type code. Over **500 COVID vaccines** (along with other vaccines) have been rejected from TennIIS for this reason.

Fix: This is being urgently addressed.

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What Did We Learn From These Efforts?

- **Collaboration between the IIS, EHR vendor, and the end-user was critical in iterating and developing tools to best visualize and investigate errors**
  - The tools are meant to serve as examples that can be replicated

- **The TennIIS weekly summary served the very important role of providing a high-level condensed view of the types and frequencies of errors, which varied from week to week**

- **The EHR's ability to combine specific ACK/VXU data elements made it possible – through both exporting capabilities and some basic reporting and work queue functionalities – to more easily identify patterns of errors which led to quicker solutions**

- **Nearly all of the errors in our 'Tennessee Story' were based on system issues with either the IIS or EHR, not individual user error**
  - An initial assumption that these errors should be displayed to the user in a real-time environment turned out to be incorrect

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What's Next for the IIP?

- **Acknowledgment Pilot/Technical Assistance Opportunities**

- **Immunization Interoperability Issue Identification And Prioritization**

- **Program Evaluation Results and Recommendations**
  - Integrating Into Sustainable Efforts

- **Multiple Patients Matched In a Query To An IIS**

- **Come Visit Us!**
  - 2021 AIRA National Meeting – August 3 - 5th
  - HIMSS21 – August 9 - 13th

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Resources

Resources

- [2.5.1 VXU and ACK Technical Specifications for the Tennessee Department of Health (TDH) Immunization Information System (TennIIS)](#)

- [Guidance for HL7 ACK Messages to Support Interoperability](#)

- [Link to IIP Acknowledgments Page - Guidance](#)

- One sheet resources:
  - [EHR and IIS: Their Differences and How They Work Together](#)
  - [The Value of IIS](#)
  - [IIS 101: The Basics](#)

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Audience Q&A

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Immunization Integration Program (IIP)

Get Engaged!

Learn more about becoming a pilot site, early adopter, workgroup participant and how the IIP is improving immunization interoperability, information sharing and management at IIP@himss.org or visit www.himss.org/immunization-integration-program.

We look forward to engaging with you to fuel immunization interoperability.

Thank you!

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