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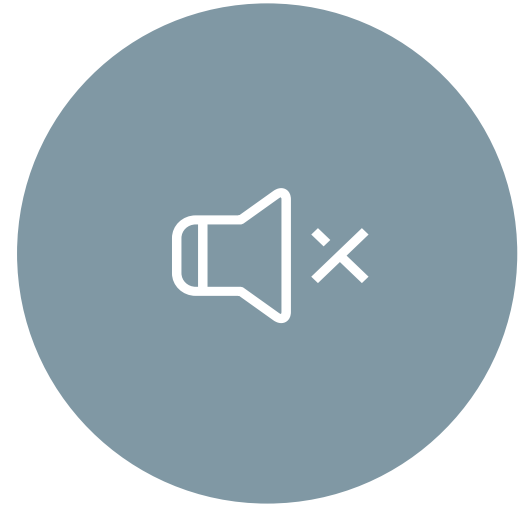
Data Quality Improvement Success Story: Collaborating through the Immunization Integration Program

Discovery Session
June 28, 2021
4 PM EST

AIRA Discovery Session



This meeting is being recorded
and will be posted in the
AIRA repository

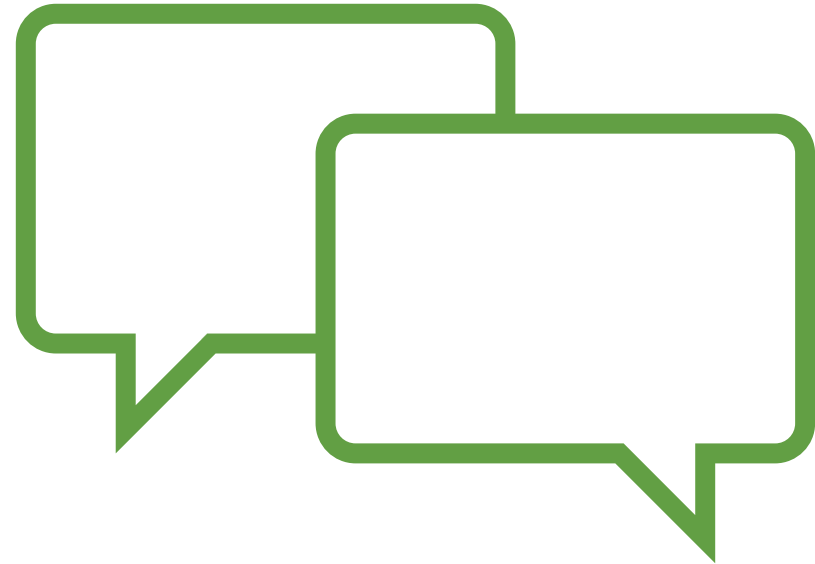


All phone lines
are muted



Technical Support

If you experience any technical issues during the meeting, please contact **Sarah Stein** via direct message in the Chat.



Today's 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 &
Pediatrics*

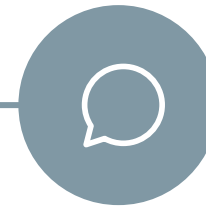


Questions

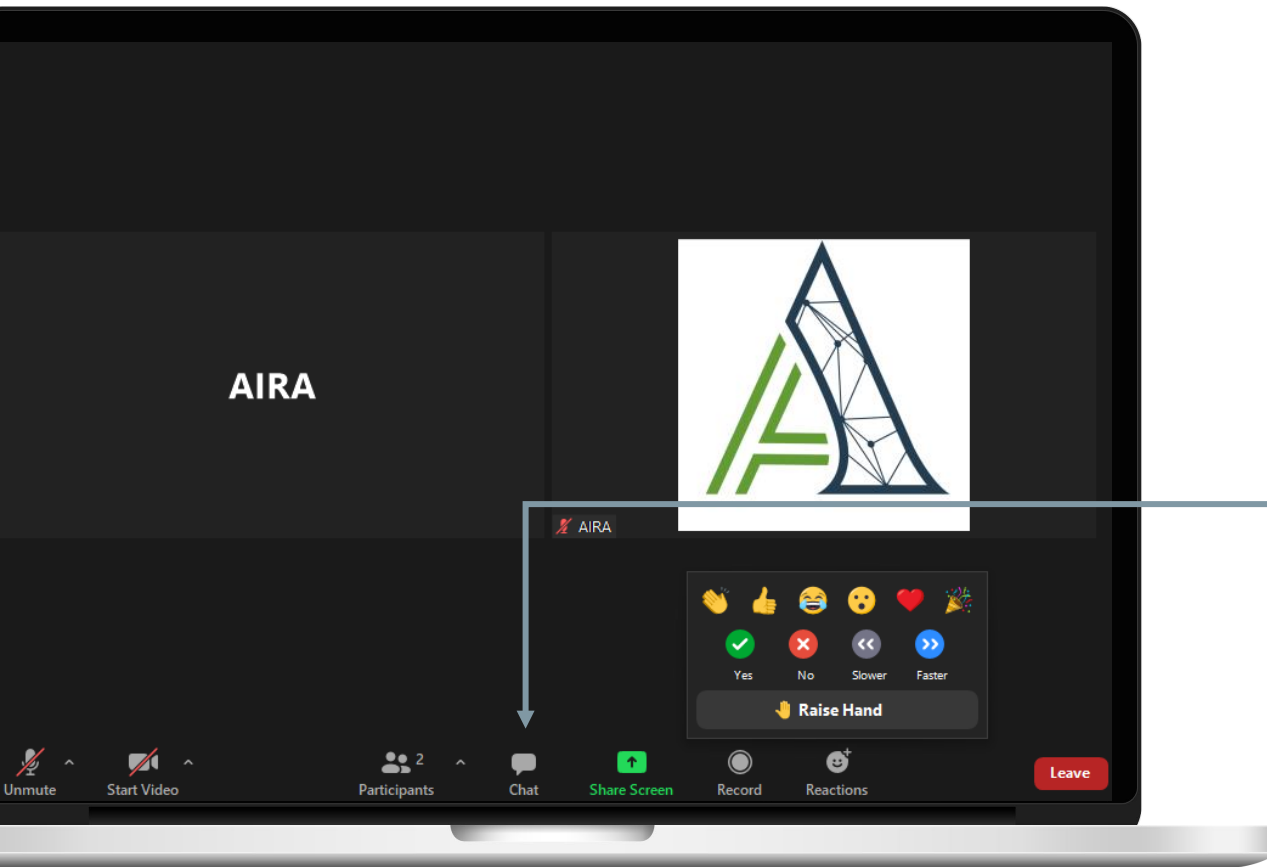
How do I ask a question?

There will be time allotted for Q&A following the presentations.

If you think of a question during the presentations:



Select the chat icon and type your question into the chat box.



Today's Agenda

- **Immunization Integration Program Overview**
- **Tennessee Story**
 - Immunization Information System (IIS) Role
 - Electronic Health Record (EHR) Role
 - Operation Workflow
- **Q&A Discussion**



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Immunization Integration Program Overview



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

IIS

- Vast majority of IIS have adopted and fully implemented 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

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



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



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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



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IIS Role



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Tennessee Immunization Information System (TennIIS)

- **Statewide lifelong registry**
 - 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
 - **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:

- Patient first name missing
- Vaccination date in future

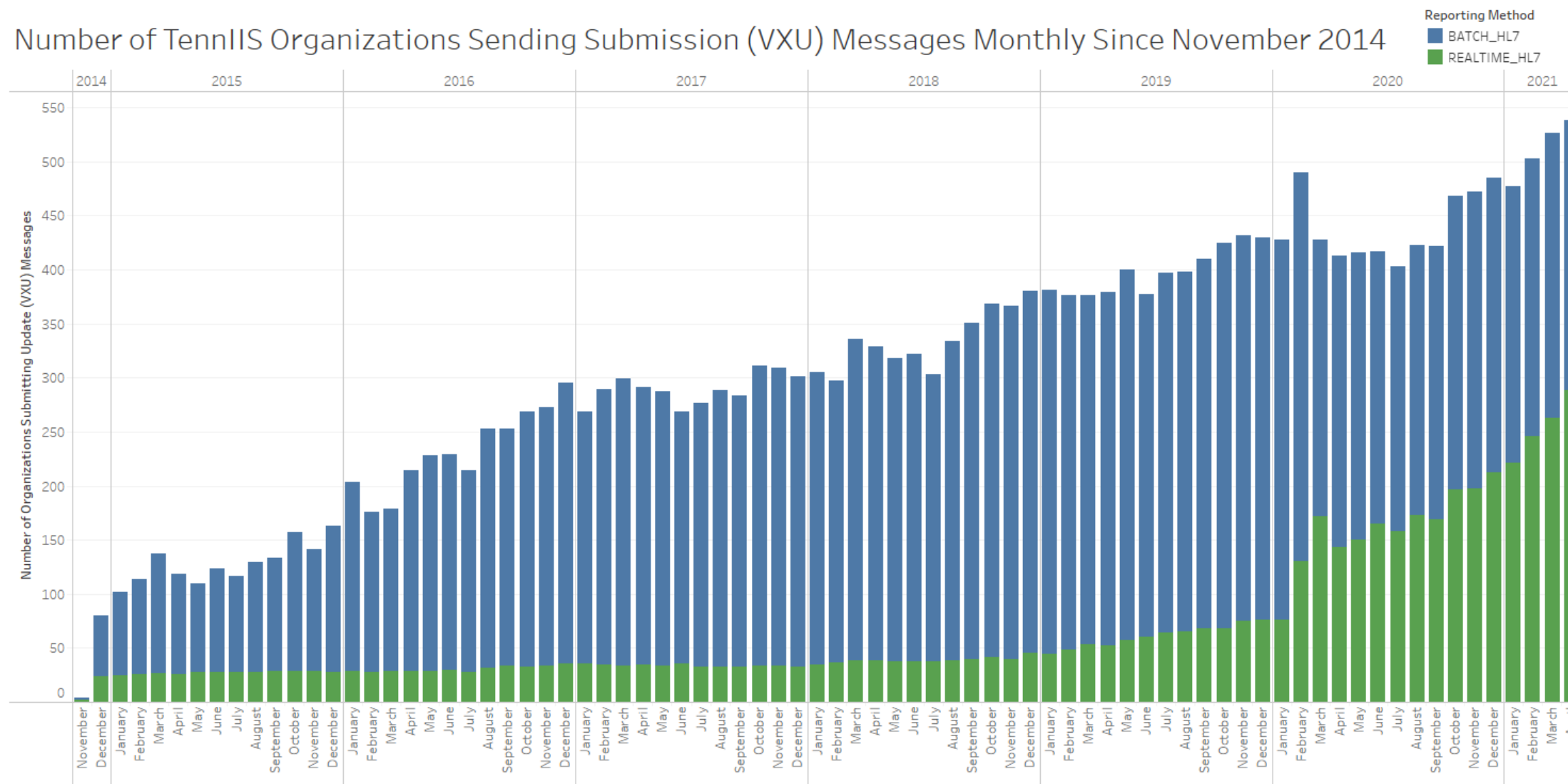


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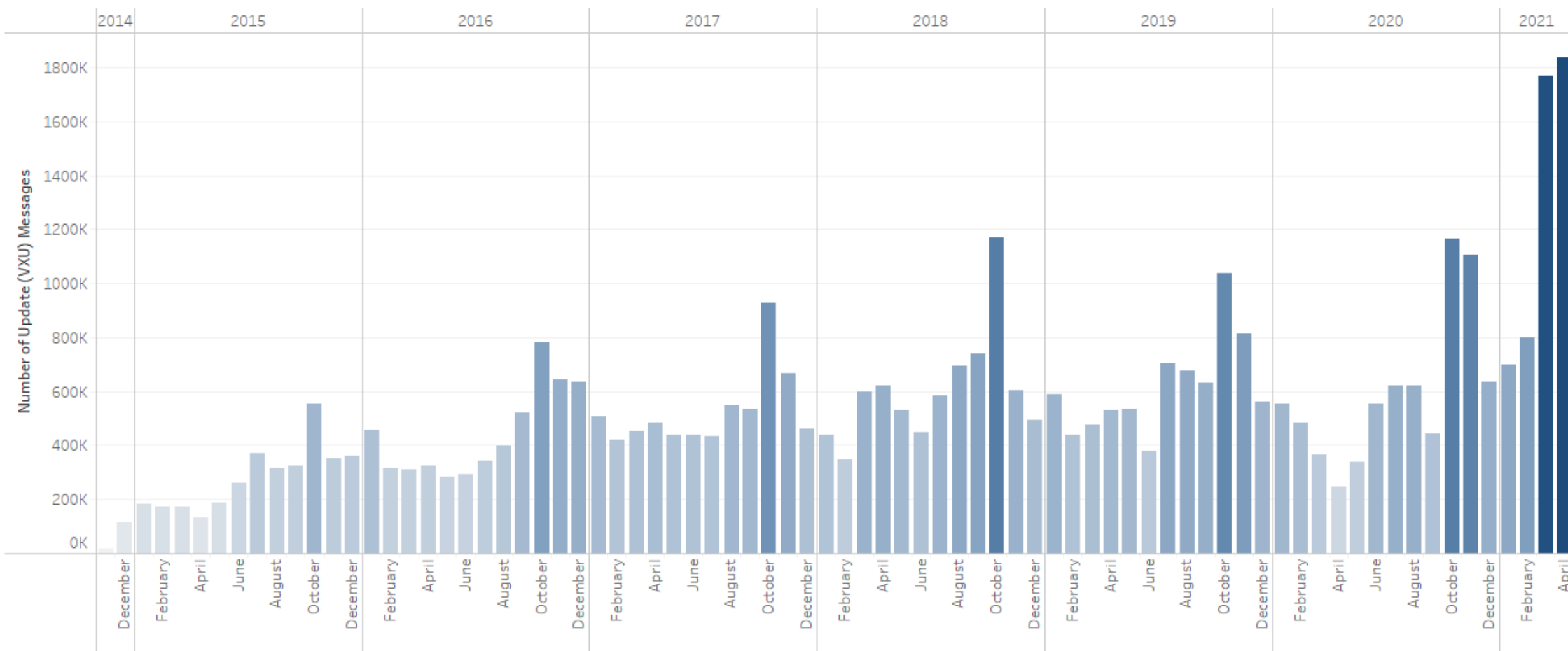
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Number of Submission (VXU) Messages Submitted Monthly Since November 2014



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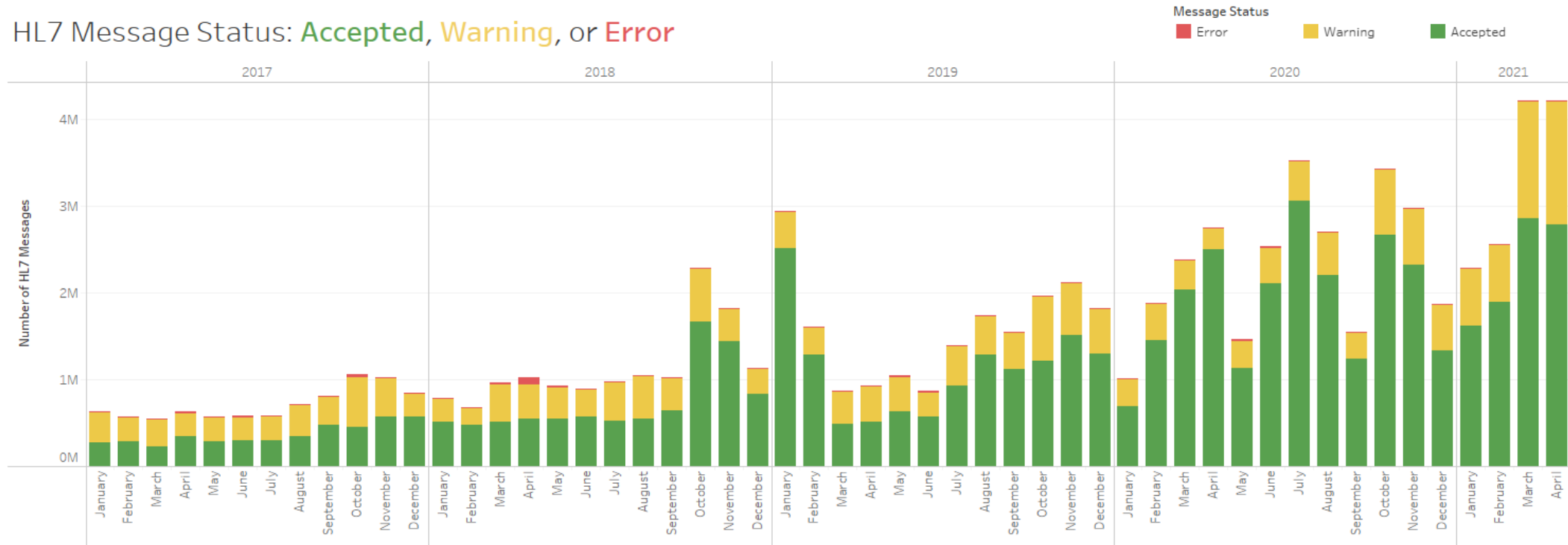
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ACK Message Summary

- 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**



TennIIS Error Reports

- Evaluate specific errors being returned to a provider in ACK messages
- Run a weekly error report to evaluate the percent of errors submitted by each provider that week
- Identify providers who submitted >5% errors and reason for errors
 - Emphasis on providers with 100% of messages erroring
- Contact providers to correct issues noting the overall % of messages that were erroring



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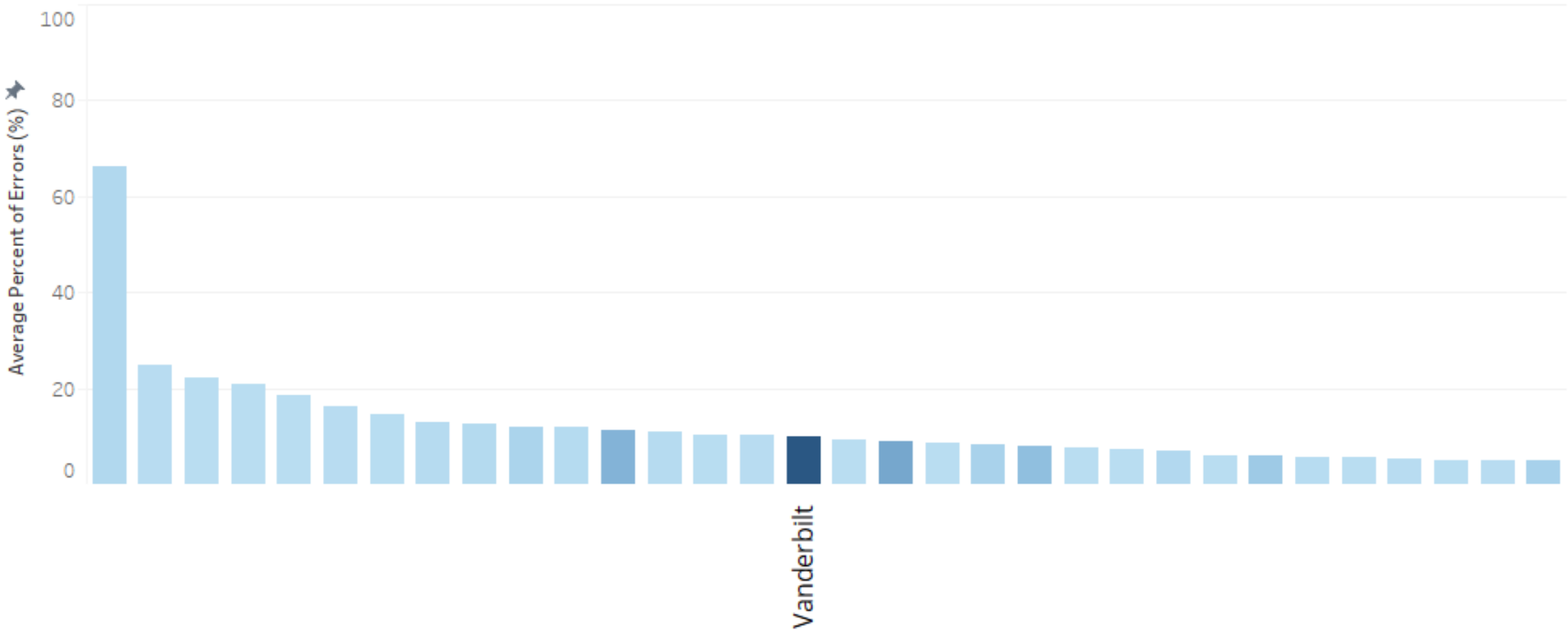


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Percent of Errors Submitted by TennIIS Organization

Note: Color scale by volume of incoming messages



ACK Error Summary

VANDERBILT

Review Date: 7-Day Period Starting 20210517 Through 20210523

- Started looking at percent of individual error type
- Run for messages submitted in the last week
- Breaks down response type and fatal errors that TennIIS rejected

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



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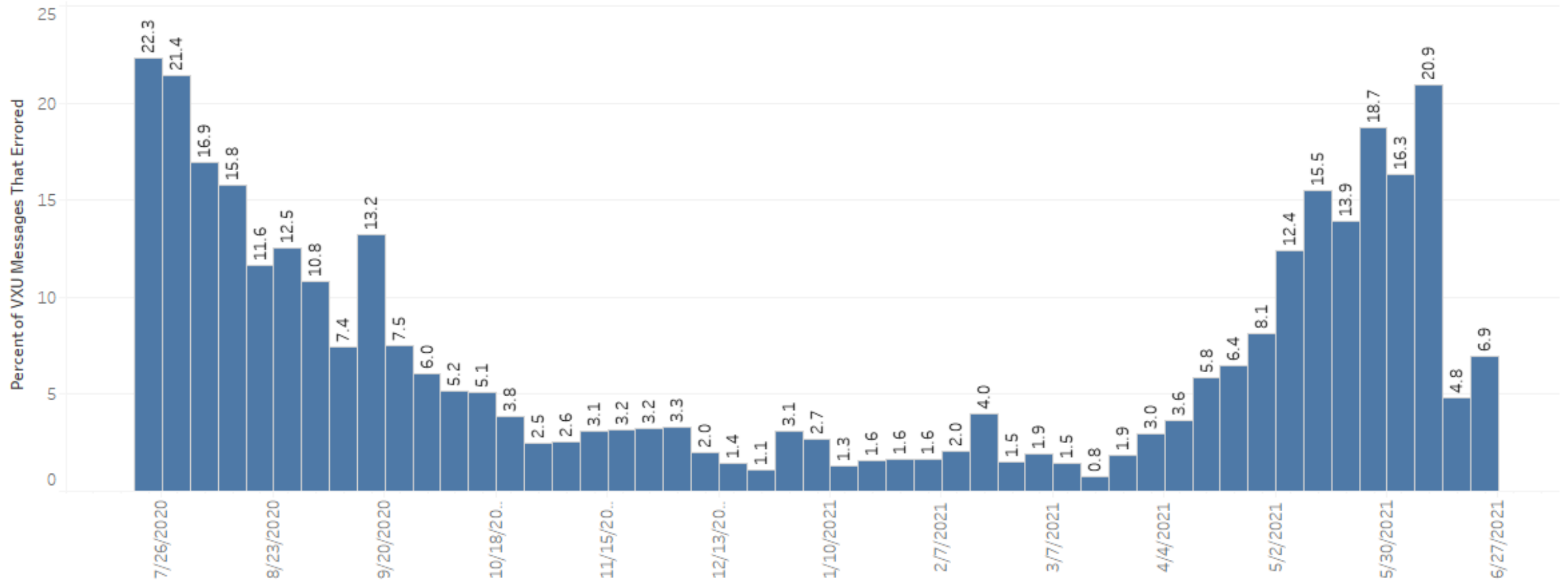
Vanderbilt Error Types

- More than 160,000 error segments returned to Vanderbilt since July 2020
- Highest frequency errors:

ERROR	Frequency Count	Percent of Total Frequency
PID^1^11-5; REQUIRED FIELD MISSING; PATIENT ADDRESS ZIP IS MISSING	36295	22.268373939
PID^1^11-3; REQUIRED FIELD MISSING; PATIENT ADDRESS CITY IS MISSING	36127	22.165299499
PID^1^11-4; REQUIRED FIELD MISSING; PATIENT ADDRESS STATE IS MISSING	36125	22.164072422
PID^1^11-1; REQUIRED FIELD MISSING; PATIENT ADDRESS STREET IS MISSING	33286	20.422237083
PID^1^5-1; REQUIRED FIELD MISSING; PATIENT LAST NAME IS MISSING	3520	2.159654946
PID^1^5-2; REQUIRED FIELD MISSING; PATIENT FIRST NAME IS MISSING	3520	2.159654946
RXA^1^5-1; TABLE VALUE NOT FOUND; VACCINATION NDC CODE IS UNRECOGNIZED	3217	1.9737528299
RXA^1^18; APPLICATION ERROR; VACCINATION REFUSAL REASON IS UNWANTED	2783	1.7074771917
RXA^1^3; APPLICATION ERROR; SUBSTANCE REFUSAL DATE IS UNWANTED	2783	1.7074771917
RXA^1^9; REQUIRED FIELD MISSING; VACCINATION INFORMATION SOURCE IS MISSING	2482	1.5228021523
RXA^1^5-1; REQUIRED FIELD MISSING; VACCINATION CVX CODE IS MISSING	1219	0.7479032327
RXA^1^5-1; REQUIRED FIELD MISSING; VACCINATION NDC CODE IS MISSING	1219	0.7479032327
RXA^1^3; APPLICATION ERROR; SUBSTANCE REFUSAL DATE IS MORE THAN 30 DAYS AGO	194	0.1190264374
PID^1^5-2; DATA TYPE ERROR; PATIENT FIRST NAME IS INVALID	163	0.1000067489
PID^1^5-1; DATA TYPE ERROR; PATIENT LAST NAME IS INVALID	35	0.0214738418
PID^1^8; REQUIRED FIELD MISSING; PATIENT GENDER IS MISSING	13	0.0079759984
RXA^1^3; APPLICATION ERROR; VACCINATION DATE IS BEFORE PATIENT DATE OF BIRTH	3	0.001840615
RXA^1^5-1; TABLE VALUE NOT FOUND; VACCINATION CVX CODE IS UNRECOGNIZED	3	0.001840615
RXA^1^3; APPLICATION ERROR; VACCINATION DATE IS AFTER PATIENT DEATH DATE	2	0.0012270767

Vanderbilt VXU Fatal Error Summary

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



EHR Role



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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 Work Group members
4. Analyzed data collected and gained insights to inform the Work Group's work
5. Agreed upon detailed goals for our effort
6. Reviewed and agreed on two major solution areas



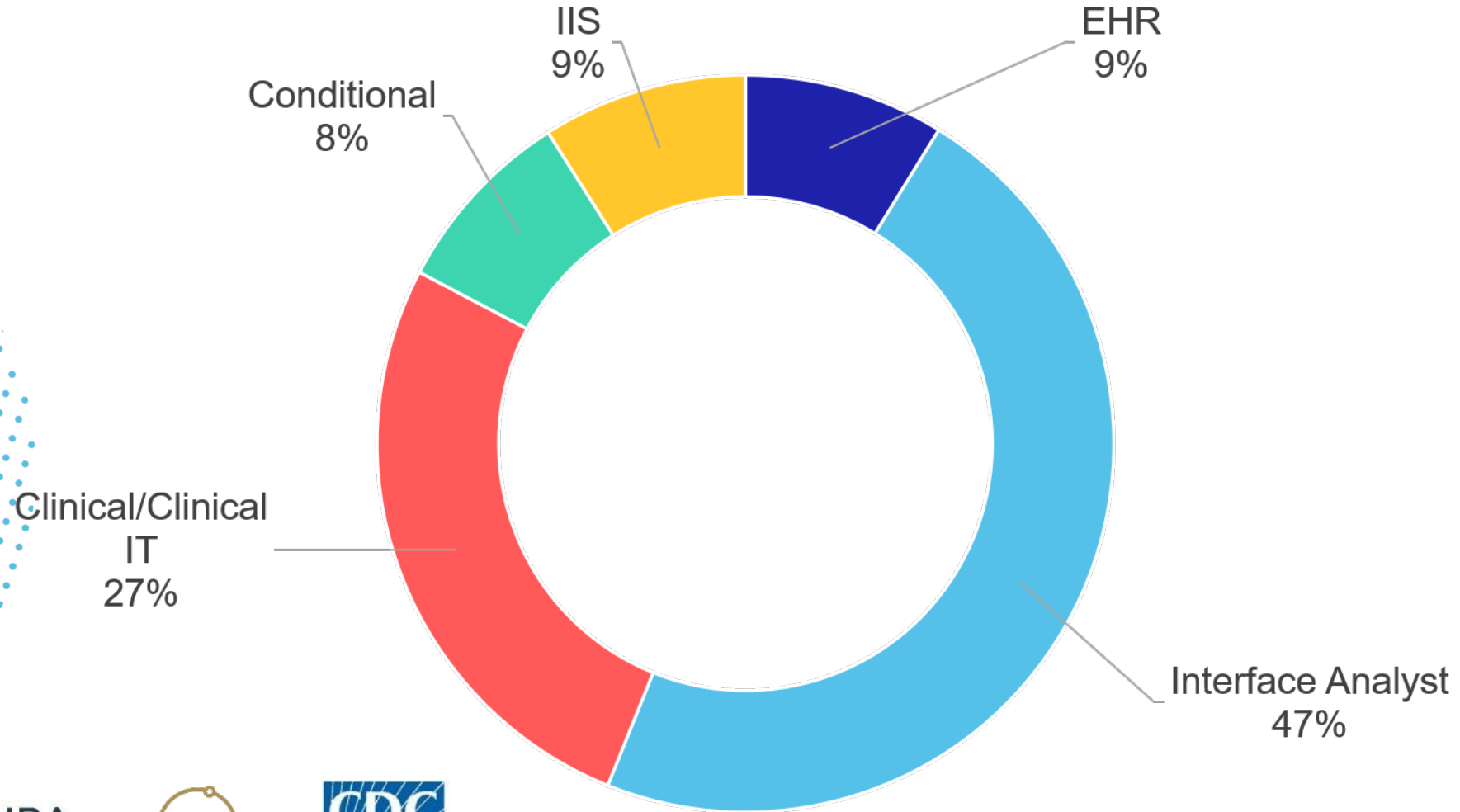
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How do these errors break down (who can fix it)?



Working with Vanderbilt

VaccNack09062020_09132020 - Notepad

File Edit Format View Help

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9/13/2020|SEGMENT SEQUENCE ERROR|1033505|E|RXA|vaccination information source is missing - Message Rejected
9/13/2020|SEGMENT SEQUENCE ERROR|1033505|E|RXA|vaccination refusal reason is unwanted - Message Rejected
9/13/2020|SEGMENT SEQUENCE ERROR|1033505|E|RXA|substance refusal date is unwanted - Message Rejected
9/13/2020|SEGMENT SEQUENCE ERROR|1033520|E|RXA|vaccination information source is missing - Message Rejected
9/13/2020|SEGMENT SEQUENCE ERROR|1033520|E|RXA|vaccination refusal reason is unwanted - Message Rejected
9/13/2020|SEGMENT SEQUENCE ERROR|1033520|E|RXA|substance refusal date is unwanted - Message Rejected
9/13/2020|SEGMENT SEQUENCE ERROR|1033528|E|RXA|vaccination ndc code is unrecognized - Message Rejected
9/13/2020|SEGMENT SEQUENCE ERROR|1033552|E|PID|First name required - Message Rejected
9/13/2020|SEGMENT SEQUENCE ERROR|1033552|E|PID|Last name required - Message Rejected
9/13/2020|SEGMENT SEQUENCE ERROR|1033559|E|RXA|vaccination information source is missing - Message Rejected
9/13/2020|SEGMENT SEQUENCE ERROR|1033559|E|RXA|vaccination refusal reason is unwanted - Message Rejected
9/13/2020|SEGMENT SEQUENCE ERROR|1033559|E|RXA|substance refusal date is unwanted - Message Rejected
9/13/2020|SEGMENT SEQUENCE ERROR|1033569|E|RXA|vaccination information source is missing - Message Rejected
9/13/2020|SEGMENT SEQUENCE ERROR|1033569|E|RXA|vaccination refusal reason is unwanted - Message Rejected
9/13/2020|SEGMENT SEQUENCE ERROR|1033569|E|RXA|substance refusal date is unwanted - Message Rejected

```

VUMCVaxAckError.20210531T010011 - Notepad

File Edit Format View Help

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05/25/2021 03:57:07 PM|1609705|E|User Message: patient address zip is missing - Message Rejected|PID|VUMC STUDENT HEALTH SERVICE|20140829|02^OPV^CVX|01^Historical information - source unspecified^
05/25/2021 03:57:09 PM|1609706|E|User Message: patient address street is missing|PID(1)-11.1|VUMC STUDENT HEALTH SERVICE|20131109|115^TDAP VACCINE (ADACEL/BOOSTRIX)^CVX|01^Historical information - s
05/25/2021 03:57:09 PM|1609706|E|User Message: patient address city is missing|PID(1)-11.3|VUMC STUDENT HEALTH SERVICE|20131109|115^TDAP VACCINE (ADACEL/BOOSTRIX)^CVX|01^Historical information - s
05/25/2021 03:57:09 PM|1609706|E|User Message: patient address state is missing|PID(1)-11.4|VUMC STUDENT HEALTH SERVICE|20131109|115^TDAP VACCINE (ADACEL/BOOSTRIX)^CVX|01^Historical information - s
05/25/2021 03:57:09 PM|1609706|E|User Message: patient address zip is missing|PID(1)-11.5|VUMC STUDENT HEALTH SERVICE|20131109|115^TDAP VACCINE (ADACEL/BOOSTRIX)^CVX|01^Historical information - s
05/25/2021 03:57:09 PM|1609706|E|User Message: patient address street is missing - Message Rejected|PID|VUMC STUDENT HEALTH SERVICE|20131109|115^TDAP VACCINE (ADACEL/BOOSTRIX)^CVX|01^Historical ir
05/25/2021 03:57:09 PM|1609706|E|User Message: patient address city is missing - Message Rejected|PID|VUMC STUDENT HEALTH SERVICE|20131109|115^TDAP VACCINE (ADACEL/BOOSTRIX)^CVX|01^Historical infc
05/25/2021 03:57:09 PM|1609706|E|User Message: patient address state is missing - Message Rejected|PID|VUMC STUDENT HEALTH SERVICE|20131109|115^TDAP VACCINE (ADACEL/BOOSTRIX)^CVX|01^Historical inf
05/25/2021 03:57:09 PM|1609706|E|User Message: patient address zip is missing - Message Rejected|PID|VUMC STUDENT HEALTH SERVICE|20131109|115^TDAP VACCINE (ADACEL/BOOSTRIX)^CVX|01^Historical infor
05/25/2021 03:57:11 PM|1609707|E|User Message: patient address street is missing|PID(1)-11.1|VUMC STUDENT HEALTH SERVICE|20110921|147^MENINGOCOCCAL MC4, UNSPECIFIED^CVX|01^Historical information - s
05/24/2021 11:36:49 AM|1604790|E|User Message: patient address zip is missing|PID(1)-11.5|VUMC STUDENT HEALTH SERVICE|19990304|17^HIB^CVX|01^Historical information - source unspecified^HIP001^Up
05/25/2021 03:57:11 PM|1609707|E|User Message: patient address city is missing|PID(1)-11.3|VUMC STUDENT HEALTH SERVICE|20110921|147^MENINGOCOCCAL MC4, UNSPECIFIED^CVX|01^Historical information - s
05/25/2021 03:57:11 PM|1609707|E|User Message: patient address state is missing|PID(1)-11.4|VUMC STUDENT HEALTH SERVICE|20110921|147^MENINGOCOCCAL MC4, UNSPECIFIED^CVX|01^Historical information - s
05/25/2021 03:57:11 PM|1609707|E|User Message: patient address zip is missing|PID(1)-11.5|VUMC STUDENT HEALTH SERVICE|20110921|147^MENINGOCOCCAL MC4, UNSPECIFIED^CVX|01^Historical information - s
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05/25/2021 03:57:11 PM|1609707|E|User Message: patient address zip is missing - Message Rejected|PID|VUMC STUDENT HEALTH SERVICE|20110921|147^MENINGOCOCCAL MC4, UNSPECIFIED^CVX|01^Historical infc
05/25/2021 03:57:11 PM|1609708|E|User Message: patient address street is missing|PID(1)-11.1|VUMC STUDENT HEALTH SERVICE|20030120|10^IPV VACCINE (IPOL)^CVX|01^Historical information - source unspe
05/25/2021 03:57:11 PM|1609708|E|User Message: patient address city is missing|PID(1)-11.3|VUMC STUDENT HEALTH SERVICE|20030120|10^IPV VACCINE (IPOL)^CVX|01^Historical information - source unspe
05/25/2021 03:57:11 PM|1609708|E|User Message: patient address state is missing|PID(1)-11.4|VUMC STUDENT HEALTH SERVICE|20030120|10^IPV VACCINE (IPOL)^CVX|01^Historical information - source unspe
05/25/2021 03:57:11 PM|1609708|E|User Message: patient address street is missing - Message Rejected|PID|VUMC STUDENT HEALTH SERVICE|19990304|17^HIB^CVX|01^Historical information - source unspe
05/25/2021 03:57:11 PM|1609708|E|User Message: patient address zip is missing|PID(1)-11.5|VUMC STUDENT HEALTH SERVICE|20030120|10^IPV VACCINE (IPOL)^CVX|01^Historical information - source unspe
05/25/2021 03:57:11 PM|1609708|E|User Message: patient address street is missing - Message Rejected|PID|VUMC STUDENT HEALTH SERVICE|20030120|10^IPV VACCINE (IPOL)^CVX|01^Historical information - s
05/25/2021 03:57:11 PM|1609708|E|User Message: patient address city is missing - Message Rejected|PID|VUMC STUDENT HEALTH SERVICE|20030120|10^IPV VACCINE (IPOL)^CVX|01^Historical information - sol
05/25/2021 03:57:11 PM|1609708|E|User Message: patient address state is missing - Message Rejected|PID|VUMC STUDENT HEALTH SERVICE|20030120|10^IPV VACCINE (IPOL)^CVX|01^Historical information - sc
05/25/2021 03:57:11 PM|1609708|E|User Message: patient address zip is missing - Message Rejected|PID|VUMC STUDENT HEALTH SERVICE|20030120|10^IPV VACCINE (IPOL)^CVX|01^Historical information - sour
05/25/2021 03:57:13 PM|1609709|E|User Message: patient address street is missing|PID(1)-11.1|VUMC STUDENT HEALTH SERVICE|20030404|10^IPV VACCINE (IPOL)^CVX|01^Historical information - source unspe
05/25/2021 03:57:13 PM|1609709|E|User Message: patient address city is missing|PID(1)-11.3|VUMC STUDENT HEALTH SERVICE|20030404|10^IPV VACCINE (IPOL)^CVX|01^Historical information - source unspe
05/25/2021 03:57:13 PM|1609709|E|User Message: patient address state is missing|PID(1)-11.4|VUMC STUDENT HEALTH SERVICE|20030404|10^IPV VACCINE (IPOL)^CVX|01^Historical information - source unspe
05/25/2021 03:57:13 PM|1609709|E|User Message: patient address zip is missing|PID(1)-11.5|VUMC STUDENT HEALTH SERVICE|20030404|10^IPV VACCINE (IPOL)^CVX|01^Historical information - source unspe
05/25/2021 03:57:13 PM|1609709|E|User Message: patient address street is missing - Message Rejected|PID|VUMC STUDENT HEALTH SERVICE|20030404|10^IPV VACCINE (IPOL)^CVX|01^Historical information - s
05/24/2021 11:36:49 AM|1604790|E|User Message: patient address city is missing - Message Rejected|PID|VUMC STUDENT HEALTH SERVICE|19990304|17^HIB^CVX|01^Historical information - source unspecific
05/25/2021 03:57:13 PM|1609709|E|User Message: patient address city is missing - Message Rejected|PID|VUMC STUDENT HEALTH SERVICE|20030404|10^IPV VACCINE (IPOL)^CVX|01^Historical information - sol
05/25/2021 03:57:13 PM|1609709|E|User Message: patient address state is missing - Message Rejected|PID|VUMC STUDENT HEALTH SERVICE|20030404|10^IPV VACCINE (IPOL)^CVX|01^Historical information - sc
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```

Ln 1, Col 1

100% Unix (LF)

UTF-8



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CENTERS FOR DISEASE
CONTROL AND PREVENTION

Configurable Extract

MC VACC ACK ERROR EXTRACT [100273]

Snapshot

/UMC VACC ACK ERROR EXTRACT
Extract Viewer

VUMC VACC ACK ERROR EXTRACT [100273]

VUMC VACC ACK ERROR EXTRACT

Input:		Parent			
Base Database:		AIL			
Setup Data Extension:		33900-PAF Column Setup for RW Template 304			
Additional Databases:		AMS			
Format:		Delimited (strip delimiters from data)			
#	Field	Data Source	Max Length	Data Format	Lines/Line Option
1	Error Instant [8106]	Data Item: AIL - 50		MM/DD/YYYY HH:MM:SS TT	
2	Error Message Number [8100]	Extension: AIL - AI - MESSAGE NUMBER [33230]			
3	VUMC ACK ERROR SEVERITY [103964]	Extension: AIL - EDI - Error Param Value [94616]			
4	HL7v2 - PID-3 (Patient Identifier List) [8208]	Extension: AMS - AI - GET MESSAGE FIELD [33208]			
5	Error Text [8110]	Data Item: AIL - 300			All lines
6	VUMC ACK MESSAGE LOCATION [103965]	Extension: AIL - EDI - Error Param Value [94616]			
7	VUMC HL7v2-PD1-3 (Primary Facility) [7048336]	Extension: AMS - AI - GET MESSAGE FIELD [33208]			
8	HL7v2 - RXA-3 (Date/Time Start of Administration) [8918]	Extension: AMS - AI - GET MESSAGE FIELD [33208]			
9	HL7v2 - RXA-5 (Administered Code) [8919]	Extension: AMS - AI - GET MESSAGE FIELD [33208]			
10	HL7v2 - RXA-9 (Administration Notes) [8920]	Extension: AMS - AI - GET MESSAGE FIELD [33208]			
11	HL7v2 - RXA-11 (Administered-at Location) [8917]	Extension: AMS - AI - GET MESSAGE FIELD [33208]			
12	Error Code [8302]	Data Item: AIL - 200	25	Title & Num	
13	Interface ID [8102]	Data Item: AIL - 565	25	Title & Num	
14	Error Queue [8300]	Data Item: AIL - 250	25		



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Generalize to Maximize Benefit

Error Code Frequency Report [9804623] as of Wed 5/26/2021 8:50 AM

Filters Options Re-run Report Expand Message Delete Errors Undelete Errors Resubmit Retrigger

Detail Ack Error Severity Breakdown Ack Error Msg Loc Breakdown **Administered Code Breakdown**

Vaccination Ack Error Totals By Administered Code

Grouped by: [RXA-5 - Administered Code](#), [ACK Error Severity](#)

Total count of Instant of Error

Grand Total	8160
01^DTP^CVX	112
E	112
02^OPV^CVX	100
E	100
03^MMR VACCINE^CVX	648
E	648
05^MEASLES^CVX	24
E	24
06^RUBELLA^CVX	8
E	

Error Code Frequency Report [9804623] as of Wed 5/26/2021 8:50 AM

Filters Options Re-run Report Expand Message Delete Errors Undelete Errors Resubmit Retrigger

Detail Ack Error Severity Breakdown **Ack Error Msg Loc Breakdown** Administered Code Breakdown

Vaccination Ack Error Totals by Message Location

Grouped by: [ACK Message Location](#)

Total count of Ack Error Msg Loc

Grand Total	8160
PID	4073
PID(1)-11.1	922
PID(1)-11.3	1039
PID(1)-11.4	1039
PID(1)-11.5	1039
PID(1)-5.1	15
PID(1)-5.2	19
RXA	7
RXA(1)-18	3
RXA(1)-3	4

Generalize to Maximize Benefit (Workqueue)

Interface Error Workqueue - EDI VACC ADMIN ACK ERRORS [9015] Last refreshed: 5/26/2021 9:03:33 AM

[Refresh](#)
[Expand message](#)
[Resubmit message](#)
[Retrigger message](#)
[Skip message](#)
[Translation Table](#)
[Transfer](#)
[Delete error](#)
[Release](#)
[Add note](#)

Errors (Total: 150,244)

Date/Time of Message	Message ID	Message Type	Message Content	ACK MESSAGE RXA-3	Date/Time	RXA-11 Administered Loc	Primary Facility	VACCINE
2021022509...	1...	0...	D... User Message: patient first name is missing	PID(1)-5.2	20210225	101000143^A^101000...	VUMC ADUL...	115^TDAP VACCINE...
2021022509...	1...	0...	D... User Message: patient last name is missing	PID(1)-5.1	20210225	101000143^A^101000...	VUMC ADUL...	115^TDAP VACCINE...
2021022509...	1...	0...	D... User Message: patient address street is missing	PID(1)-11.1	20210225	101000143^A^101000...	VUMC ADUL...	115^TDAP VACCINE...
2021022509...	1...	0...	D... User Message: patient address city is missing	PID(1)-11.3	20210225	101000143^A^101000...	VUMC ADUL...	115^TDAP VACCINE...
2021022509...	1...	0...	D... User Message: patient address state is missing	PID(1)-11.4	20210225	101000143^A^101000...	VUMC ADUL...	115^TDAP VACCINE...
2021022509...	1...	0...	D... User Message: patient address zip is missing	PID(1)-11.5	20210225	101000143^A^101000...	VUMC ADUL...	115^TDAP VACCINE...
2021022509...	1...	0...	D... User Message: First name required - Message Rejected	PID	20210225	101000143^A^101000...	VUMC ADUL...	115^TDAP VACCINE...
2021022509...	1...	0...	D... User Message: Last name required - Message Rejected	PID	20210225	101000143^A^101000...	VUMC ADUL...	115^TDAP VACCINE...
2021022509...	1...	0...	D... User Message: patient address street is missing - Message Rejected	PID	20210225	101000143^A^101000...	VUMC ADUL...	115^TDAP VACCINE...
2021022509...	1...	0...	D... User Message: patient address city is missing - Message Rejected	PID	20210225	101000143^A^101000...	VUMC ADUL...	115^TDAP VACCINE...
2021022509...	1...	0...	D... User Message: patient address state is missing - Message Rejected	PID	20210225	101000143^A^101000...	VUMC ADUL...	115^TDAP VACCINE...
2021022509...	1...	0...	D... User Message: patient address zip is missing - Message Rejected	PID	20210225	101000143^A^101000...	VUMC ADUL...	115^TDAP VACCINE...
2021022513...	1...	0...	G... User Message: patient first name is missing	PID(1)-5.2	20210225	101000143^A^101000...	VUMC ADUL...	115^TDAP VACCINE...
2021022513...	1...	0...	G... User Message: patient last name is missing	PID(1)-5.1	20210225	101000143^A^101000...	VUMC ADUL...	115^TDAP VACCINE...

ERROR REPORT



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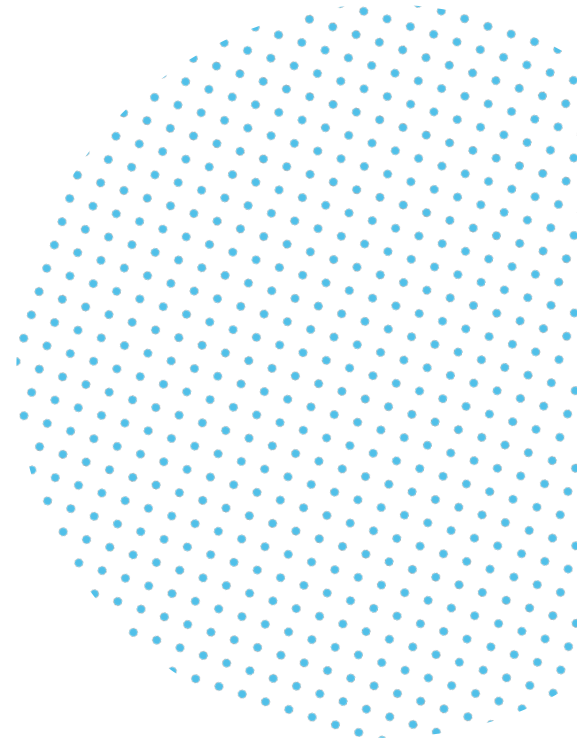
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Generalize for the Industry

- **IIS Summary Reports**
- **EHR / Submitter Summary Reports**
- **Stuart Weinberg's Tools At Vanderbilt**
- **AIRA Spreadsheet Tool**



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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

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

<u>Example:</u> In early September 2020, a significant increase seen in the error ' RXA^1^5-1; TABLE VALUE NOT FOUND; VACCINATION NDC CODE IS UNRECOGNIZED '
<u>Issue:</u> incorrect NDC code entered in the IIS Product Settings for an influenza vaccine
<u>Fix:</u> TennIIS updated the NDC code, Vanderbilt resubmitted (on 9/23) 2,571 vaccine messages for influenza vaccines that had previously been rejected

<u>Example:</u> In early October 2020, the most frequent error was ' RXA^1^18; APPLICATION ERROR; VACCINATION REFUSAL REASON IS UNWANTED '
<u>Issue:</u> TennIIS could not accept refusal messages and returned an error
<u>Fix:</u> With TennIIS' blessing(!), Vanderbilt subsequently filtered out refusals (as of 10/21) to reduce the numbers of errors generated

Type, Pattern and Impact of Fatal Errors - EHR

<u>Example:</u> In mid-February 2021, the most frequent error was ' RXA; SEGMENT SEQUENCE ERROR; VACCINATION CVX CODE IS MISSING – MESSAGE REJECTED '
<u>Issue:</u> a mapping error affecting certain influenza vaccines and a few other vaccines as well
<u>Fix:</u> 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
<u>Example:</u> early May TennHIS summary included the error ' RXA^1^3; APPLICATION ERROR; VACCINATION DATE IS AFTER PATIENT DEATH DATE '
<u>Issue:</u> 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)
<u>Fix:</u> date fixed(!), and 2 COVID vaccines administered to the patient were re-submitted

Type, Pattern and Impact of Fatal Errors - EHR

Why have our errors been recently skyrocketing?!

Example: Statistics from the **6/7-6/13** TennIS weekly summary showed that **5,640** of the **20,936** vaccine VXU messages submitted were rejected (**26.94%**). **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 TennIS in real-time. Errors are occurring because of missing demographics in Vandy's EHR.

Fix: Working to filter out submission of those records. **[fixed 6/15! - 6/14-6/20 stats: 468/11,903 = 3.93%]**

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

Fix: This is being urgently addressed. **[fixed 6/17?? - resubmitted 1,602 vaccinations (incl 519 COVID)]**



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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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Recommendations for the IIS Community

- Please try to avoid duplicate error messages for the same error

PID; SEGMENT SEQUENCE ERROR; PATIENT ADDRESS ZIP IS MISSING - MESSAGE REJECTED	1335
PID^1^11-5; REQUIRED FIELD MISSING; PATIENT ADDRESS ZIP IS MISSING	1335

- Please make sure the text description of errors is accurate

PID; SEGMENT SEQUENCE ERROR; FIRST NAME REQUIRED - MESSAGE REJECTED	101
PID; SEGMENT SEQUENCE ERROR; LAST NAME REQUIRED - MESSAGE REJECTED	101

- Are fatal errors consistent from one IIS to another? (inconsistencies with PID-5.7 Name Type Code = 'U' being accepted by some IISs and rejected by others?)



Next Steps



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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**
 - Developing a Sustainable Evaluation Plan
- **Multiple Patients Matched In a Query To An IIS**
- **Come Visit Us!**
 - AIRA 2021 National Meeting – August 3 - 5th
 - HIMSS21 – August 9 - 13th

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!

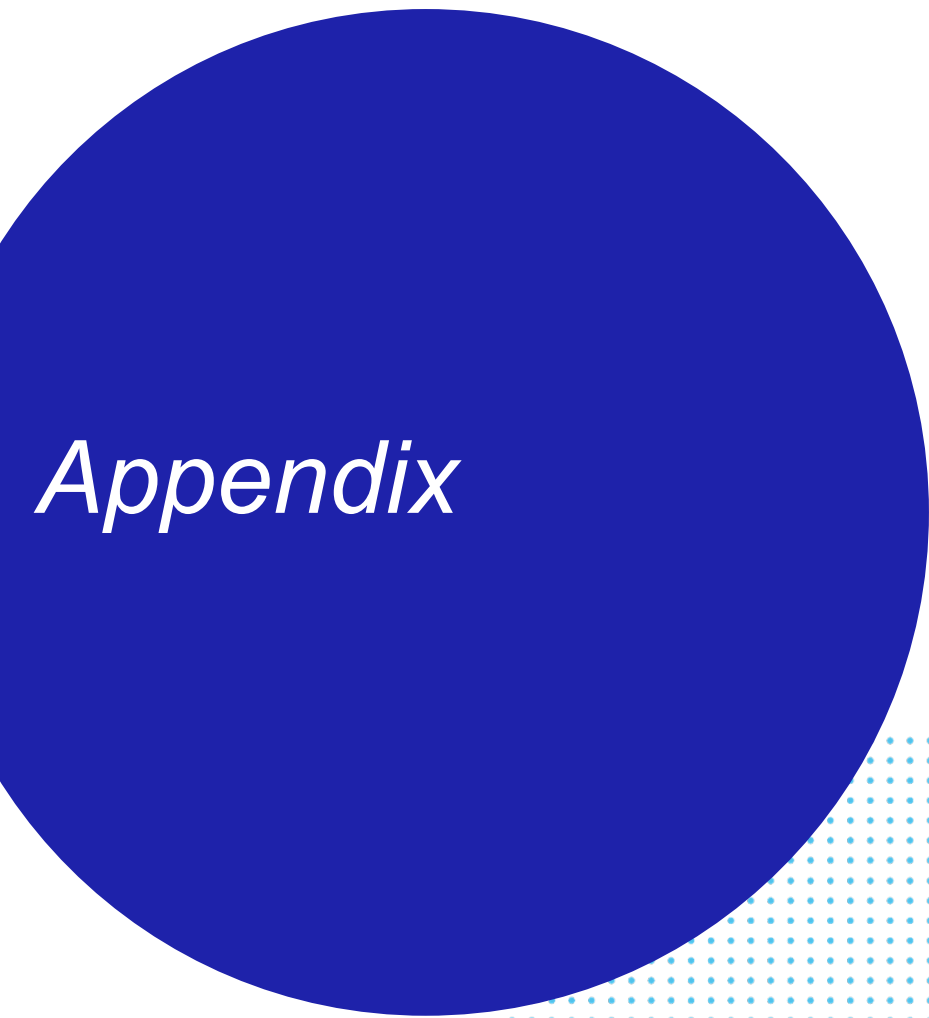


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Appendix



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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](#)



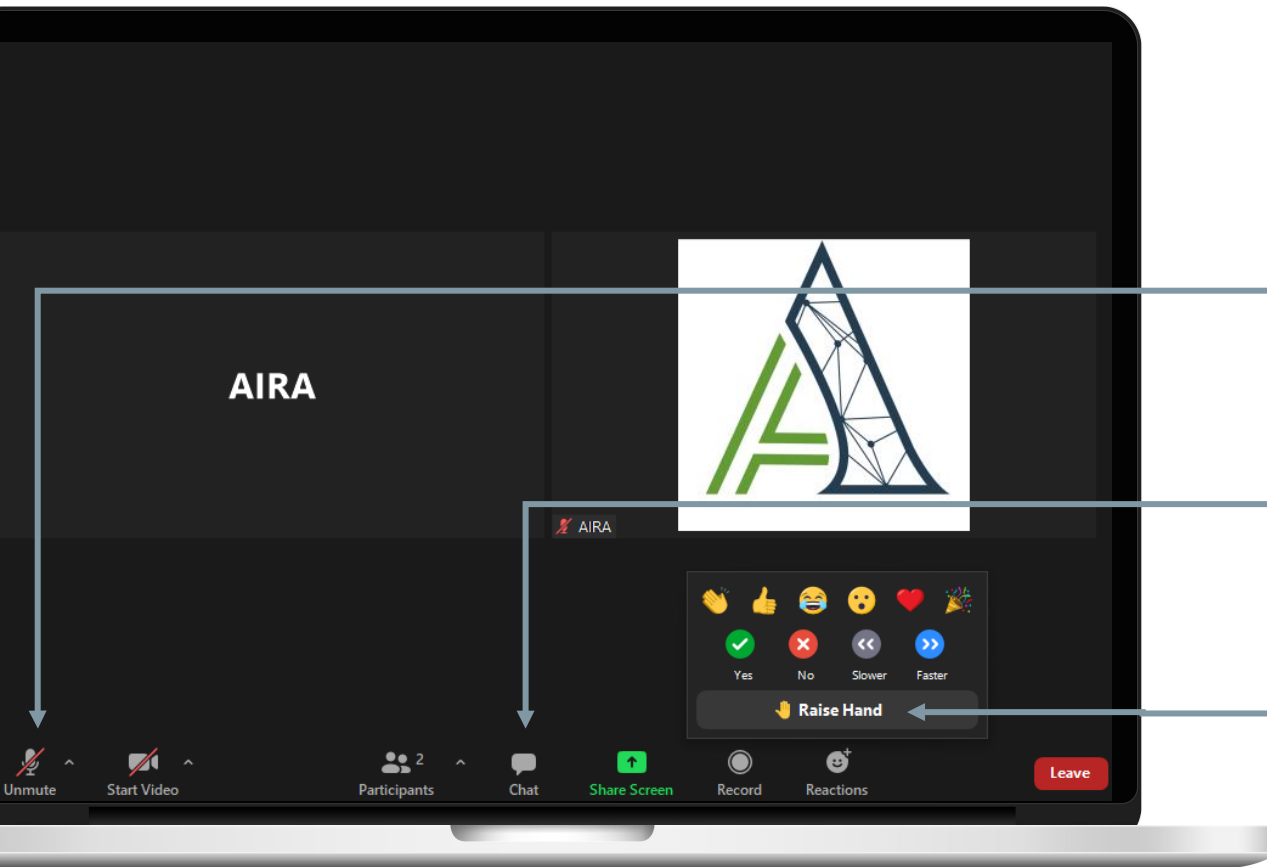
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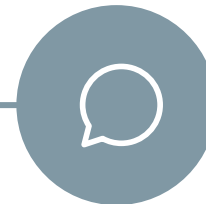
Question & Answer



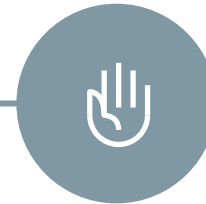
How do I ask a question?



Select the unmute icon and ask your question verbally.




Select the chat icon and type your question into the chat box.



Select the reactions icon, select "Raise Hand," and you will be called on.





Thank you to our presenters, and thanks to all of you for joining us!

Please complete a brief evaluation survey.

The next Discovery Session
will be on July 12, 2021