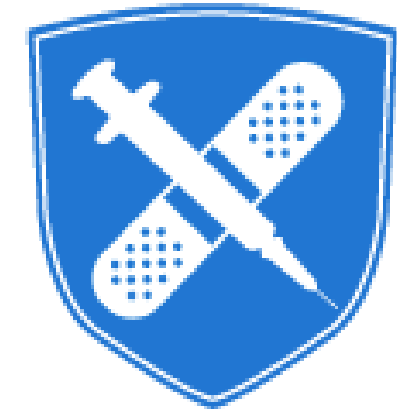


DEVELOPMENT AND IMPLEMENTATION OF THE FAILED MESSAGES INITIATIVE



PhilaVax

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PRESENTATION OUTLINE

- **Overview**
 - Background & Importance
 - Failed Messages Scope
 - HL7 Messages
 - HL7 Message Structure
 - Acknowledgement Codes
- **Failed Message Initiative**
 - Failed Message Report
 - Investigation Process
 - Documentation
 - Common Errors
- **Results**
- **Conclusion**



Overview



BACKGROUND & IMPORTANCE

- PDPH's IIS, PhilaVax, contains >3 million patient records and >40 million immunizations
- Receives >100,000 Health Level 7 (HL7) messages a day
 - Of the many messages sent to PhilaVax, an average of 550 messages fail a day
- Vaccination data from failed messages do not get stored in the IIS
 - Negatively impacts the data integrity and completeness of the immunization registry



FAILED MESSAGES INITIATIVE SCOPE

- Looks at failed HL7 messages
- Focus of the Failed Messages Initiative:
 - Identify Application Fail (AF) messages
 - Investigate root cause
 - Resolve Issue
 - Recover missing data when needed



HL7 MESSAGES

- Two types of HL7 Messages
 - VXU (VXU^V04) – Vaccination Updates
 - Sends new or historical immunization data
 - QBP (QBP^Q11) – Query by Parameter
 - Provider requests patient information
- Every HL7 message is made up of multiple segments
- Each segment contains information for an immunization



HL7 MESSAGE STRUCTURE

- **Message Segment Header (MSH)**
 - Sending Facility
 - Receiving Facility
 - Data/Time
 - Message Type

- **Patient Identifier Segment (PID)**
 - Name
 - DOB
 - Address
 - Race/Ethnicity

- **Pharmacy/Treatment Administration Segment (RXA)**
 - Date/time administered
 - Vaccine type
 - Manufacturer
 - Dosage

- **Pharmacy/Treatment Route Segment (RXR)**
 - Route
 - Site



CUSTOM ACKNOWLEDGEMENT CODES

- When HL7 messages are sent to the IIS, an acknowledge code is returned to the sending system
 - Helps to determine the quality of the HL7 message
- Six types of acknowledgement codes
 - Application Accept (AA) Application Error (AE)
 - Application Information (AI) Application Fail (AF)
 - Application Warning (AW) Application Reject (AR)
- Failed messages initiative specifically looks at AF messages



APPLICATION FAIL (AF) ACKNOWLEDGEMENT CODE

- HL7 messages with an AF acknowledgement code fail to execute
 - Prevents any part of the message from getting into IIS
 - Message contains a critical error
- Error typically occurs in a required field or due to a security error



Failed Messages Initiative



FAILED MESSAGE REPORT

- Using Microsoft SQL Server Management Studio, a weekly report of AF messages is generated
 - Gives overview of all the failed messages
 - Includes the following information: Vendor, Log ID, Facility ID, Reason for failure, Segment
- Reports are uploaded to SharePoint
- If the report cannot be run, AF messages can be viewed using the HL7 Messages Log in PhilaVax



HL7 MESSAGE LOG



PhilaVax

- Home
- Patients
- Immunizations
- IZ Quick Add
- Inventory
- Clinic Tools
- Program Tools

HL7 Message Log [Learn More](#)

Search

HL7 Message Log

Search Criteria

Facility : ALL FACILITIES

BEGIN TYPING FACILITY HERE

Log ID Batch Log ID Patient

Log Type Message Type Version Acknowledgement Code Message Text Custom Acknowledgement Code

AA AE AR AA AI AW
 AE AF AR

From Date From Time To Date To Time MSH 22 : Responsible Sending Organization

03/01/2026 12:00 AM (HH:MM A/P) 03/17/2026 11:59 PM (HH:MM A/P) BEGIN TYPING FACILITY HERE



INVESTIGATION PROCESS

- Use Log ID from report to locate VXU message in PhilaVax
- Examine the message using the HL7 Message Analyzer
 - Key information: Error details, Failing segment, Security log ID, Sending facility
- Identify Root Cause
 - Review detailed error box analyzer
- Search patient in PhilaVax to ensure immunization is not in their history
 - If immunization is present, provider may not need to be contacted



HL7 MESSAGE EXAMPLE

09/05/25 20413201
16:23:54

Incoming Request ph5003

VXUV04

AE

AF

2.5.1

View

Analyze

HL7 Message

```
MSH|^~\& [REDACTED] | [REDACTED] | [REDACTED] | 20250905082257+0000||VXU^V04^VXU_V04|175710377776:  
PID|1||3334^^^^MR||Kent^Clark^^^^L|Fuoco^^^^^M|19780108|M||2106-3^White^CDCREC|123 ^Test st^Philadelph:  
PD1|  
ORC|RE|1706^IIS|3152^PDPH SANDBOX TEST|||K2YB9AROMnMx2a0^Lemke^Freddie^Adolfo^^^NP^test  
RXA|0|1|20250905||03^MMR^CVX~00006-4681-01^M-M-R II^NDC|8.5|mL^milliliters^UCUM||00^New immunization recd  
RXR|C38299^Subcutaneous^NCIT|LA^Left Upper Arm^HL70163  
OBX|1|CE|64994-7^Eligibility Status^LN|1|MIA05^Medicare (parts A, B and D)^HL70064|||F|||20250905|||V  
OBX|2|CE|30963-3^Vaccine funding source^LN|2|PHC70^^^CDCPHINVS|||F|||
```



HL7 MESSAGE ANALYZER

ACK Code: **AE**

Log ID: 20413201

Date: 09/05/2025

Log Type: GET

Message Type: VXUV04

[Operations](#)

Custom ACK: **AF**

Version: 2.5.1

Engine: V3

Security Log ID: 2296072

Incoming Request

Outgoing Response

Message Map

- VXUV04
 - MSH
 - 1-FieldSeparator |
 - 2-EncodingCharacters ^~&
 - 3-SendingApplication
 - 4-SendingFacility
 - 5-ReceivingApplication
 - 6-**ReceivingFacility**
 - 7-DateTimeOfMessage
 - 8-Security
 - 9-MessageType
 - 10-MessageControlID 1757103777638
 - 11-ProcessingID
 - 12-VersionID
 - 13-SequenceNumber
 - 14-ContinuationPointer
 - 15-AcceptAcknowledgmentType ER
 - 16-ApplicationAcknowledgmentType AL
 - 17-CountryCode
 - 18-CharacterSet
 - 19-PrincipalLanguageOfMessage
 - 20-AlternateCharacterSetHandlingScheme
 - 21-MessageProfileIdentifier
 - 22-**ResponsibleSendingOrganization**
 - 23-ResponsibleReceivingOrganization
 - 24-SendingNetworkAddress
 - 25-ReceivingNetworkAddress
 - PID
 - ORDER

Message Code

Select a Theme to save your default LIGHT WITH SYNTAX

```

1 MSH|^~\&|██████████|██████████|██████████|20250905082257+0000||VXU^V04^VXU_V04|1757103777638|P|2.5.1|||ER
2 PID|1||3334^MR|Kent^Clark^L|Fuoco^M|19780108|M||2106-3^White^CDCREC|123 ^Test st^Philadelphia^pa^19134^P|
3 PD1|
4? ORC|RE|1706^IIS|3152^PDPH SANDBOX TEST|||K2YB9AROMnMx2a0^Lemke^Freddie^Adolfo^NP^test
5? RXA|0|1|20250905||03^MMR^CVX-00006-4681-01^M-M-R II^NDC|8.5|mL^milliliters^UCUM||00^New immunization record^NIP001^JmoNI
6 RXR|C38299^Subcutaneous^NCIT|LA^Left Upper Arm^HL70163
7? OBX|1|CE|64994-7^Eligibility Status^LN|1|MIA05^Medicare (parts A, B and D)^HL70064|||F||20250905||VXC40^Eligibility
8 OBX|2|CE|30963-3^Vaccine funding source^LN|2|PHC70^CDCPHINVS|||F|||
9? OBX|3|CE|69764-9^Document Type^LN|3|253088698300012711210806^MMR Vaccine (Measles, Mumps, and Rubella) VIS^cdcgs1vis|||
10 OBX|4|DT|29768-9^Date Vaccine Information Statement Published^LN|3|20250905|||F||20250905
11 OBX|5|DT|29769-7^Date Vaccine Information Statement Presented^LN|3|20250905|||F||20250905
12
    
```

[Done!]

Search: Type: [clear]

Problem	Type
MSH-6 (ReceivingFacility): No matching facility found for [██████████].	ERROR
MSH-6 (ReceivingFacility): Unable to process this message: Expected value [PH0000] but found [██████████].	ERROR
MSH-22 (ResponsibleSendingOrganization): No matching facility found for [██████████].	ERROR
OBX-5 (ObservationValue): Unrecognized/unsupported value: [MIA05^Medicare (parts A, B and D)^HL70064]. Expectation: value in OBX-5.1 (ObservationValue) must have a value in HL70064 when OBX-3.1 (ObservationIdentifier) is "64994-7" (Eligibility Status) and OBX-2 (ValueType) is "CE".	WARNING
OBX-5 (ObservationValue): Unrecognized/unsupported value: [253088698300012711210806^MMR Vaccine (Measles, Mumps, and Rubella) VIS^cdcgs1vis]. Expectation: value in OBX-5.1 (ObservationValue) must have a value in CDCGS1VIS when OBX-3.1 (ObservationIdentifier) is "69764-9" (Document type) and OBX-2 (ValueType) is "CE".	WARNING

◀ 1 2 ▶

Knowledgebase

[See Full Details](#)
[HL7 Index // 2.5.1 // VXUV04](#)

VXUV04

# Seg	Min Rep	Max Rep	Usage	Description
1 MSH	1	1	R	Message Header Segment
2 SFT	0	Infinite	O	Software Segment
3 PID	1	1	R	Patient Identification Segment
4 PD1	0	1	O	Additional Demographics
5 NK1	0	Infinite	O	Next of Kin/Associated Parties
6 PATIENT	0	1	O	PATIENT Group
7 PV1	1	1	R	Patient Visit
8 PV2	0	1	O	Patient Visit - Additional Info
9 GT1	0	Infinite	O	Guarantor
10 INSURANCE	0	Infinite	O	INSURANCE Group
11 IN1	1	1	IX	Insurance
12 IN2	0	1	IX	Insurance Additional Info
13 IN3	0	1	IX	Insurance Add'l Info - Cert.
14 ORDER	0	Infinite	O	ORDER Group
15 ORC	1	1	R	Common Order
16 TIMING	0	Infinite	O	TIMING Group
17 TQ1	1	1	R	Timing/Quantity
18 TQ2	0	Infinite	O	Timing/Quantity Order Sequence
19 RXA	1	1	R	Pharmacy Administration Segment
20 RXR	0	1	O	Pharmacy Route
21 OBSERVATION0	Infinite	O	O	OBSERVATION Group
22 OBX	1	1	R	Observation/Result
23 NTE	0	Infinite	O	Notes (Regarding Immunization)



INVESTIGATION PROCESS

- Compile information for provider
 - Patients Name, Type of Vaccine, Date of Vaccination
- Contact provider or vendor to inform them of the issue
- Two emails will be sent to provider
 - Email containing the cause of the message failure and any data quality issues
 - Encrypted email containing PHI
 - Request back data when needed



FAILED MESSAGE EMAIL TEMPLATE

Hello,

I am reaching out to you because the Philadelphia IIS, PhilaVax, received a message that failed upon receipt from (facility name – facility code). The data in messages that fail do not get stored in PhilaVax.

The message failed because a required field, (insert segment & issue) was sent incorrectly. Please see below for more detail on the issue and the other errors in the message.

I will securely email a list of patients' names who need to have their immunization data resent. Please fix the errors listed below and resend the data that could not be stored by XXXX.

Thank you and let me know if you have any questions.

Best,

(Insert name)



DOCUMENTATION

- All failed messages projects are documented on the Failed Message Board using the platform Monday.com
- Projects are categorized as Active Issues and Resolved Issues
 - This gives the ability to refer to previous projects
 - Site Facility ID, Reason for Failure, Log ID, Date Failed, Status, Notes
- Progress on each project is documented under the Notes tab



FAILED MESSAGE BOARD

Failed Messages ▼

Sidekick AI suggestions New Integrate Automate / 7 EG Invite / 2 ...

Main table ... Table +

New site ▼ × Person Filter ▼ Sort Hide Group by ... ^

... ▼ Active Issues

<input type="checkbox"/>	Site		Facility Code	Reason for Failure	Log ID	Second Reason for Failure	Log ID 2	Date Failed	
<input type="checkbox"/>	TEST			PID: Name		PID: DOB		Mar 3	
<input type="checkbox"/>	+ Add site								

> Resolved			Reason for Failure		Second Reason for Failure				
1 Site									

+ Add new group



COMMON ERRORS

PID Errors

Errors with the patient demographics

Typically related to either PID-3 (Patient Identification List) or PID-7 (DOB)

Missing value or incorrectly formatting will cause message failure

Resolution

- Gather patient data for all PID-related failed message per facility ID
- Draft two emails
 - Cause for the message failures and steps to resolve issue
 - Send the patient data in encrypted email
- Document progress
- Periodically check to ensure data has been resent correctly



COMMON ERRORS

Authorization Errors

- Errors typically occur when there is an issue with the providers E-user account or the HL7 message is missing their facility ID in the MSH-4 (Sending Facility)
- Once resolved, the failed messages will need to be reloaded
- Three types of Authorization Errors

1. Authorization Error: User does not have permission to send for this facility

- Occurs if the clinic is inactive or E-users password expires
 - Verify site is inactive in PhilaVax.
 - If site is not marked 'Active', check Master Log
 - If there are no issues, and site is active, check to see if user's password is expired



COMMON ERRORS

2. Authorization Error: No matching facility found

- Occurs when an HL7 message is missing MSH-4 (Sending Facility)
 - Check the security log
 - Looks for clues within the VXU message
 - Check to see if patient has an existing record
 - Reach out to the vendor found in the MSH segment

3. Authentication Error: Your account has been locked, Invalid Username or Password

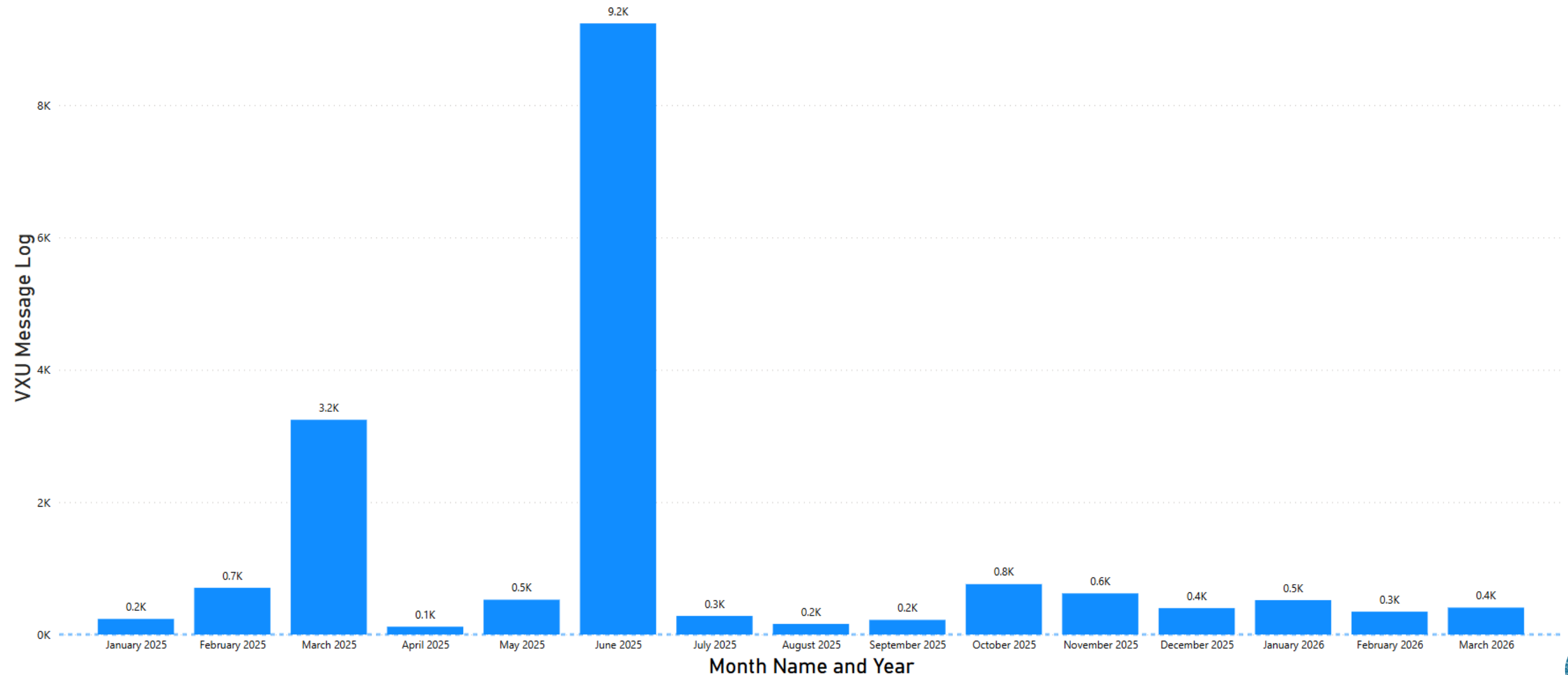
- Occurs when the password for the user account expires
- Typically, the provider's EHR system
 - Verify the issue in PhilaVax
 - If expired, update the expiration date
 - Once corrected, have the failed messages reloaded



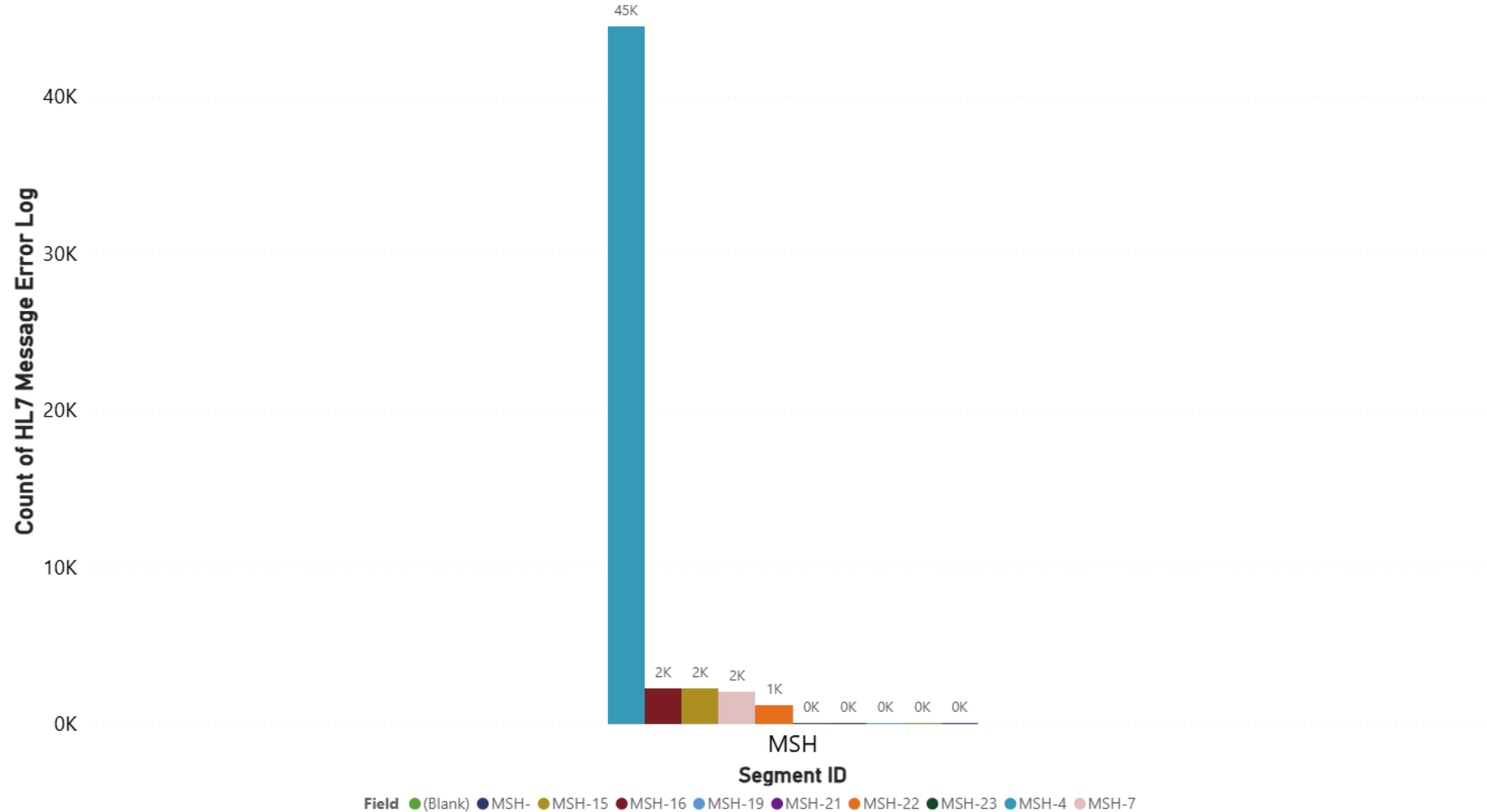
Results



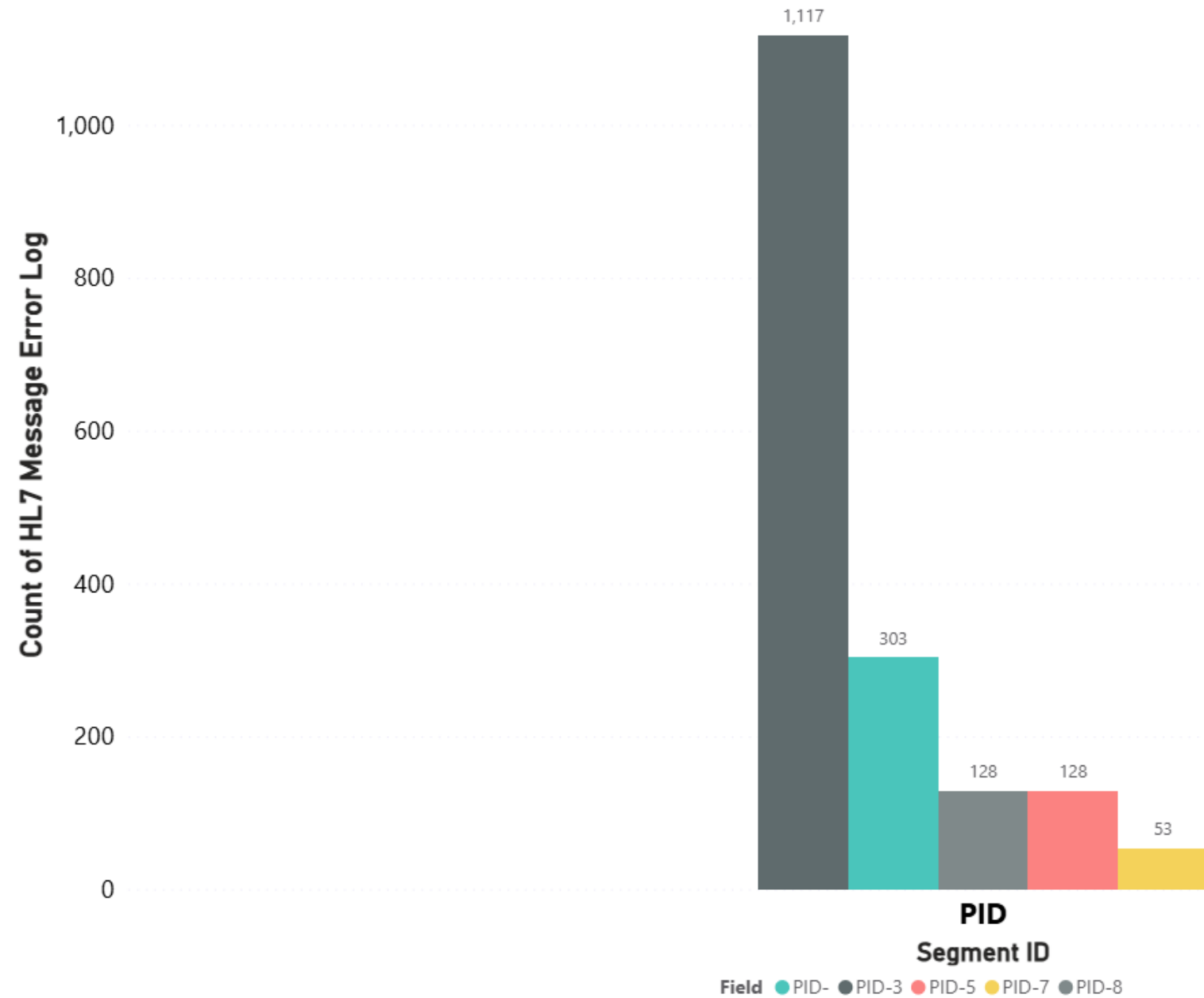
COUNT OF VXU AF ERROR MESSAGES BY MONTH AND YEAR JANUARY 2025-MARCH 2026



COUNT OF VXU AF MESSAGE ERRORS BY SEGMENT ID AND FIELD FOR JANUARY 2025-MARCH 2026



COUNT OF VXU AF MESSAGE ERRORS BY SEGMENT ID AND FIELD JANUARY 2025-MARCH 2026



Conclusion



OUTCOME AND BENEFITS

- Allow us to monitor and quickly catch abnormal amounts of failed messages
- Contributes to more complete patient records
- Improves/maintains the integrity of the IIS
- Improves coverages rates
- Identifies data that did not store in IIS
 - Can request missing patient data



NEXT STEPS

- Continue to investigate VXU messages with no site information
 - Messages have incorrect or missing MSH-4 or RXA-11 information
- Integrate monitoring QBP messages into the failed message initiative
 - Message failures are typically due to MSH-4 (sending facility) or authorization errors
 - If sites do not have bidirectional functionality, we can reach out to gauge interested in bidirectional functionality
- Track trends of failed messages to measure impact of the initiative
- Expand initiative to include AW messages



Thank you!

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