



AIRA

AMERICAN IMMUNIZATION
REGISTRY ASSOCIATION

Business Case

**The Message Quality Evaluation
(MQE) Tool**

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Executive Summary

Data quality assessment is just one step in a larger process of accepting, matching and importing data. Every message received by an IIS must be verified to meet minimum registry standards. The goal of the Message Quality Evaluation (MQE) tool is to assist sites in consistently evaluating and improving the quality of HL7 data coming into an IIS.

Many issues that affect data quality cannot be seen in just one message but instead become clear when looking at a cohort of submitted records. The aim of the MQE tool is to spot trends and larger patterns that point to areas that need attention. In addition to trend analysis, the tool details information specific to submitter practices and can be used to tailor the analysis appropriately. The MQE tool is able to:

- Handle data from providers differently depending on data quality issues encountered in the past and what kinds of data are expected.
- Review an entire batch for problems.
- Apply vaccination-specific rules and knowledge to a single message.
- Monitor and report back to submitters and IIS administrative staff on the status of imports at the submitter level.

It can also be adapted to map submitter code values into IIS-required values (e.g., National Drug Codes [NDCs] to CVX codes) as well as map non-standard format variations to IIS standards.

Integrating this tool as part of ongoing data quality assurance activities will facilitate onboarding new submitters by quickly identifying problems in existing data feeds. Messages are quickly analyzed to show IIS staff whether data are good, fair, or poor in an easy-to-read web-based report. Using this tool will help expedite onboarding by providing fast and thorough data checks on all incoming messages. In addition, automated metrics will give confidence to staff that are directly responsible for ensuring that incoming data meet quality expectations.

Introduction

The Message Quality Evaluation (MQE) tool is an application that was originally organized under the Open Immunization Software (OIS) project managed by Dandelion Software and Research (DSR) by Nathan Bunker. The application has been available in the open source marketplace for several years since its first incarnation as the Data Quality Assessment (DQA) tool. This document provides a business case for the IIS community with regard to the utility of this new tool when integrated into routine workflows.

The American Immunization Registry Association's Assessment Steering Committee's (ASC) Modeling of Immunization Registry Operations Workgroup (MIROW) produced a guidebook for best practices regarding data quality assurance for Immunization Information Systems (IIS) specific to incoming data. This guide outlines how an IIS can improve overall data quality (completeness, accuracy, and timeliness). The Message Quality Evaluation (MQE) tool is designed based on the principles and metrics delineated in that guide, including the ability to evaluate:

- Presence of mandatory data fields
- Duplicate records count
- General completeness of data
- Timeliness of data submission
- Inter-record conflict (i.e. vaccination date before patient birth date, combos and single antigens recorded on the same date)

The core of the MQE tool is to ingest HL7 v2 VXU messages and parse them to pull out relevant data. The tool focuses on evaluating relevant data and will generally ignore minor message construction rule violations which differentiates it from other tools like the publicly available NIST validator, although it does leverage the NIST message validation tool to identify HL7 conformance errors. It also means the MQE can process messages that meet different versions of the HL7 guide. The list of data quality checks¹ the MQE does, coupled with the ability to adjust the weight given to issues discovered (thus giving you control over how the reports work) is the real value of the tool.

Scope of this document

This purpose of this document is to provide decision makers with a high-level use case that describes the value of the MQE tool when implemented as part of the overall IIS data quality assurance strategies. It is not meant to imply that this is the only tool available, or that it should replace any existing data quality assurance efforts.

¹ See the MQE Functional Requirements document, Appendix B for a list of data quality checks provided by the MQE tool.

Purpose of the Message Quality Evaluation Tool

For immunization data, incoming data must be assessed in order to determine whether they meet the quality required for business processes. The MQE tool looks at whether data are of the right type and quantity to support their intended use. In the IIS community, this type of assessment is just one step in a larger process of accepting, matching and importing data. Every message received by an IIS must be verified to meet minimum registry standards. The MQE tool standardizes and automates message quality evaluation functions, which results in improved throughput and increased data quality.

The MQE tool produces a series of standardized reports that indicate the level of quality in a batch of messages. These reports reflect evaluations in three specific areas:

- **Completeness:** Are required and recommended fields being sent as expected?
- **Quality:** Are there errors or warnings in the received data?
- **Timeliness:** Are reports of vaccination administration being received in an appropriate time frame?

At each level a score is generated, and these scores are grouped together until a final overall score is obtained.

Reports generated by the tool are dynamic. Users are able to drill down and get more specific detail at each reported metric within a batch of messages. Quality scores are generated for each batch based on requirements specified by the IIS to facilitate the quick triage of incoming data into three categories:

- High quality
- Good quality (few errors)
- Poor quality (many errors)

Having a standardized metric can help IIS staff to quickly take action on important data quality issues and give confidence to green-light good systems for production.

Description – Use Cases

Individual users will be able to take advantage of a stand-alone implementation of the MQE. More advanced implementers will be able to integrate the tool with their IIS to automate evaluation, report generation, and even make decisions about whether or not data are appropriate for IIS consumption.

Level 1: Stand-alone deployment

AIRA's Joint Development & Implementation (JDI) Advisory Workgroup² selected this use case because it exemplifies an effort to broaden and formalize the planning, coordination and implementation of a collaboratively developed product for the IIS community.

The MQE tool is designed to facilitate data quality assurance activities within an IIS. The tool was created to automate evaluation of large quantities of data that could be easily summarized. The reports generated by the MQE tool provide IIS staff the ability to identify, quantify, and report back to submitters data quality issues including population of required elements, appropriate use of vaccine codes, and timeliness of reporting. The MQE tool is not a one-size-fits-all solution for IIS, but is modular and adaptable such that any IIS could benefit from its use. For most IIS, the MQE tool will be an easy to implement, easy to maintain augmentation to their existing data quality assurance efforts.

In this use case, the MQE tool is installed on a desktop or convenient server location for ad-hoc use, producing reports on demand. The initial version will be able to be fully installed in less than an hour. While the tool is configurable, default settings are consistent with the current CDC HL7 2.5.1 Implementation Guide so very little configuration is needed before a user can get their first report. Furthermore, while the tool is configured based on the HL7 2.5.1 Release 1.5 standard, it will also accept HL7 2.3.1 and 2.4 messages.

In this type of deployment, data are manually delivered to the MQE tool, and the user controls the amount of data processed. This setup is ideal for augmenting current onboarding activities. This option needs very little planning, but does little to automate the data quality assessment processes. However, for IIS that do little more than validate the structure of incoming messages, or for those that struggle generating consistent reports for their submitters, this will be an ideal tool to facilitate this effort.

Finally, this level of deployment may also be useful for sites that want to evaluate and configure the MQE tool for use in higher levels of deployment so as to fully understand the tool before making more technical, and potentially more expensive decisions.

Level 2: Partial IIS Integration

This use case and level of implementation is out of scope for the JDI initiative, but is included here for IIS to see the potential value in adopting the tool as part of broader, ongoing data quality assurance activities.

In this use case, the MQE tool is installed on a server so that it is always running and ready to process new messages received. Copies of messages received are sent from the inbound IIS interface to the MQE tool. In some IIS this may be an extra feed off an

² To learn more about JDI, please visit <http://www.immregistries.org/initiatives/joint-development>

integration server while in others it might be an after-the-fact extract of messages received by the IIS. In either case the MQE tool is evaluating the data but has no effect on the final processing.

The primary advantage of implementation at this level is full automation of file delivery and report generation. In other words, quality reports can be generated for all received data on a regular basis, improving consistency in checking for data quality problems.

This level of deployment does require additional planning and some technical expertise to access and configure automation on the server.

Level 3: Full IIS Integration

This use case and level of implementation is also out of scope for the JDI initiative, but is included here for IIS to see the potential value in adopting the tool as part of broader, ongoing data quality activities.

In this level of deployment, the MQE tool is integrated either in front of the IIS or into the IIS such that it manages and augments responses from the IIS. In this setup, all of the information about data quality issues and the processing of messages by the IIS are returned in the ACK to the original submitter. The MQE tool is fully engaged with the sender and can communicate to the sender about data quality problems that need to be solved.

This level of integration requires extensive planning and technical expertise³.

Impact

Data quality, especially in the immunization registry community, is critically important. These are patient level health data whose accuracy is relied on for clinical decision support and maintaining population health.

The MQE tool source code is open source and available for download at no cost. It is the goal of AIRA, and the MQE Technical Team that users of the tool are invested in the quality of their data as well as the process and will contribute by participating in a regularly occurring MQE User Group. In addition, because this tool is open source, AIRA expects that developers and those with the appropriate technical skills will continue to maintain this tool, including identifying and implementing new requirements in the coming years⁴.

³ This level of integration is currently implemented in Michigan. Sites that decide to move forward with this level of integration are strongly encouraged to meet with the MQE Technical Team for lessons learned before adoption.

⁴ The MQE Technical Team, Governance Group, and User Group are still in their infancy, but documentation and processes about how this shared development and implementation initiative will be sustained are under development.

For IIS that do not currently have standardized data quality assurance processes in place, or those who are looking for options to provide feedback to submitters, use of this tool would be a relatively simple, straightforward extra step. The time spent on the front-end could have significant impact on the back-end in terms of identifying and correcting data quality issues before a submitter sends problematic data to an IIS.

Alternatives and Financial Analysis

Alternatives to this MQE tool might fall into one of these categories:

- Build and maintain a site specific MQE tool (or process) in-house
- Purchase a COTS MQE-like tool
- Purchase an IIS-specific vendor delivered MQE module

Understanding that resources and subject matter expertise vary by IIS, the below financial considerations for each level of implementation are presented to facilitate conversations about adoption locally as well as nationally.

Level 1: Stand-alone deployment

This use case was selected by AIRA's Joint Development & Implementation (JDI) Initiative.

Because the level of technical skill and configuration is minimal for this level of implementation, impact on workflow and financial investment is also anticipated to be minimal. Users must be able to install software on the machine (either locally or on a server) and have access to incoming HL7 data files. Costs would be limited to personnel time spent installing and becoming familiar with the software.

Furthermore, at this level of implementation, AIRA is working to develop resources that will facilitate use of the tool. The MQE Technical Team is already established and actively looking for additional developer resources. The MQE Governance Group is meeting to help prioritize requirements and documentation. An MQE User Group is being formed to provide a forum for new and existing users to share implementation strategies, identify new requirements, etc.

Level 2: Partial IIS Integration

This level of implementation is out of scope for the JDI initiative, but is included here for IIS to compare the anticipated cost and value of implementing at this level.

While the software available at this level is also free of charge, it is expected that an IIS would incur costs to implement at this level. Assuming that in-house technical staff are available and have adequate skill, these costs may still be minimal. In other words, it would include staff time to install and configure the tool as in a Level 1 deployment, but with additional IT costs associated with storage of message copies as well as time spent configuring the server to automate file delivery and report retrieval.

Level 3: Full IIS Integration

This level of implementation is out of scope for the JDI initiative, but is included here for IIS to compare the anticipated cost and value of implementing at this level.

While the software available at this level continues to be free of charge, it is expected that an IIS would incur even greater costs to implement at this level. The costs will vary greatly depending on the location and hosting of the IIS and whether in-house technical staff can be responsible for all configurations. It is expected that sites with vendor-supported IIS solutions that attempt this level of integration would incur the greatest costs.

Conclusion

The MQE tool was selected as a Joint Development & Implementation (JDI) project because it exemplifies the kind of collaborative product that will benefit the entire immunization community. Since every IIS needs to have some type of data quality protocol in place, the MQE tool offers a low cost option for sites at every level of sophistication and level of support. The tool itself provides access to a wide array of data quality checks that reflect the experience of the entire community. With multiple sites evaluating incoming data using the same tool, comparing the same elements, with the same code sets and metadata, sites will be able to better collaborate to solve common data quality issues – across messages, submitters, or even vaccine types. Some sites may already have robust data quality activities in place. For those that do not, this tool offers an easy-to-implement option; for those that do, this tool offers an opportunity to enhance those efforts; and if all sites adopted this tool, there could be an opportunity for community-wide shared practices included a shared technology resource.