Measure Authoring Development Integrated Environment (MADiE) User Guide

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1 Introduction

Measure Authoring Development Integrated Environment (MADiE) is a software tool that redefines the electronic Clinical Quality Measure (i.e., eCQM, measure) development and testing process by making it a self-contained process that includes dynamic authoring and testing within a single application. MADiE has been further designed to provide an increasingly intuitive and easy-to-use interface by leveraging modern, User Experience Research and Design philosophies. These philosophies continuously incorporate user feedback and iterative design to inform present and future development of MADiE.

1.1 Standards & Integration

MADiE has also been designed to integrate with the nationally recognized data standards that the Centers for Medicare & Medicaid Services (CMS) quality reporting programs use for expressing electronic Clinical Quality Measure (eCQM) logic for machine-to-machine interoperability. This integration provides enormous value to programs using eCQMs, federal policy leaders, and stakeholders, as it demonstrates MADiE's flexibility to facilitate evolving eCQM standards.

MADiE can generate measures following the Fast Healthcare Interoperability Resources (FHIR), Quality Measure Implementation Guide (QMIG) STU 3.0.0, and Clinical Quality Language (CQL) Normative Release. The QMIG specification provides direction for the metadata and framework of measures, while the CQL libraries provide the expression logic for calculating an eCQM. Additionally, MADiE can generate eCQMs containing the FHIR R4 and CQL which describe a measure and, programmatically convert both into an executable format that allows calculation of the measure directly from the specification. The currently supported models used within CQL for data interchange requirements are QI-Core and FHIR R4.

In addition to generating measures following the FHIR standard, MADiE also allows users to generate measures compliant with the Quality Data Model (QDM) and Clinical Quality Language (CQL).

Currently, all eCQMs are written using Clinical Quality Language (CQL) and the Quality Data Model (QDM) or Fast Healthcare Interoperability Resources (FHIR). With the release of MADiE MVP, measure developers will transition their measures to QI-Core, utilizing MADiE's improved tools for constructing and testing QI-Core measures. Measure developers can also generate new QDM measures in MADiE.

1.2 Overview of Measure Development & Testing

In MADiE, measure developers can build eCQMs and evaluate their performance by building out measure logic, creating synthetic patient records (referred to as test cases), and testing those synthetic patient records against a measure's logic. That process allows measure developers to understand the behavior of a measure's logic under semi-realistic scenarios and whether a measure's logic encodes their intent, through a process of iteration and testing.

1.3 Purpose of this Guide

The purpose of this document is to further describe MADiE and provide step-by-step instruction for engaging with key functionality used to create QDM and QI-Core measures. Many key functionalities in MADiE are the same for QDM and QI-Core with the differences between the models highlighted. Functionality works the same for both models if this guide doesn't specify a difference between QDM and QI-Core.

2 System Requirements & Availability

MADiE is available 24 hours a day, 7 days a week and can be accessed with an internet browser. Chrome, Firefox, and Edge are recommended. MADiE may not be available during system maintenance. MADiE users will be notified by email about scheduled and unscheduled system maintenance.

MADiE does not support copying text from Microsoft Word and pasting directly into MADiE. Copying from Microsoft Word can add symbols, accented letters and characters from different languages into MADiE that will result in MADiE errors, including the inability to save.

3 User Account Creation

There are a few steps required in creating an account and gaining access to MADiE. New MADiE users must first create a HARP account then request access to MADiE in HARP as detailed in the following sections.

3.1 Creating a HARP Account

New users must have a HARP Account to log in to MADiE. To create a new HARP account, go to https://harp.cms.gov/register and complete the registration process to create your HARP account. Registration requires users to enter profile information, account information, and successfully complete proofing (identify verification). HARP uses a third-party service provided by Experian to verify user identities.

After creating your HARP account, set up two-factor authentication if you have not already done so by following these steps:

1. After logging in to HARP, click on "Manage Two-Factor Devices."
2. Add a device and follow the prompts.

3.2 Configuring Your HARP Account for MADiE

To complete HARP account setup for use with MADiE, follow the instructions in the MADiE Access Guide found in the MADiE MVP Tab of the MAT public website.

3.3 HARP Account Management

To update your HARP Profile including your password, name, email address, and phone number log in to HARP and click on "View / Edit Profile Information."

4 Logging in to MADiE

To log in to MADiE, follow these steps:

1. In the MADiE login form, enter your HARP User ID
2. Enter your HARP password.
3. Click the "Sign In" button.
4. You will be presented with a two factor authentication, as determined by your HARP profile setting. Enter the authentication and you will be logged into MADiE.

4.1 Application Timeout

A user will automatically be logged out of MADiE after 30 minutes of inactivity. After 25 minutes of inactivity, a warning message will be displayed, indicating that their session will expire if the user remains inactive.

4.2 Long-term Account Inactivity

The MADiE-user role assigned to a MADiE user's HARP account will be deactivated if a user has not logged into MADiE for 60 days. A warning email, notifying a user of such will be sent if a user has not logged into MADiE for 30 days.

4.3 Forgotten User ID or Password

If you experience trouble logging in to MADiE, check that you are using your personal HARP User ID and password and have had the MADiE user role assigned through HARP. If you have not completed that yet, follow the instructions in the MADiE Access Guide found in the MADiE MVP Tab of the MAT public website.

If you have forgotten your HARP ID or password, go to the HARP Account Recovery page to retrieve your HARP User ID or reset a password.

4.4 UMLS® Integration

For MADiE to function properly, MADiE must connect to the Value Set Authority Center (VSAC). VSAC is provided by the U.S. National Library of Medicine (NLM) in collaboration with the Office of the National Coordinator (ONC) for Health Information Technology and CMS. The VSAC provides downloadable access to previously created value sets and direct referenced codes and is actively incorporating new value sets for other use cases, new measures, and for updating existing measures.

4.4.1 Requesting License

To integrate with the Value Set Authority Center (VSAC) through MADiE, users are required to have a Unified Medical Language System© (UMLS) Metathesaurus License. To request a license and create a UMLS account, go to [UMLS Terminology Services Sign Up Page](#).

4.4.2 Connecting to UMLS/VSAC for Value Set Data

Once logged into MADiE, you can establish an active connection to the VSAC and retrieve value set data. Click on the 'Connect to UMLS' link in the upper right of the header on any MADiE page to connect. Upon clicking, a "Please sign in to UMLS" modal will appear. Enter the API key associated with your UMLS account to connect. If you do not know your API key, follow the "WHERE'S MY KEY?" instructions. Once connected, the Connect to UMLS link will now read "UMLS Active," and the dot indicator will change from red to green.

5 Primary Navigation Header (White Header Bar)

The Primary Navigation Header is found at the top of every area in MADiE. It provides access to the following navigation and functionality that are always accessible:

1. **MADiE Logo:** The MADiE Logo (in the far left of the Primary Navigation Header) provides navigation to the Measures page (the initial landing page upon logging in), where both a user's eCQMs and all other eCQMs entered into MADiE can be accessed.
2. **Measures:** The Measures link (the first link in the right half of the Primary Navigation Header) provides navigation to the Measures overview page (the initial landing page upon logging in), where both a user's eCQMs and all other eCQMs entered into MADiE can be accessed.
3. **Libraries:** The Libraries link (the second link from the left in the right half of the Primary Navigation Header) provides navigation to the Libraries page, where both a user's standalone CQL Libraries and all other CQL Libraries entered into MADiE can be accessed.

4. **Help:** The Help link (the third link from the left in the right half of the Primary Navigation Header) provides navigation to help and troubleshooting resources.
5. **Connect to UMLS / UMLS Active:** When a user is not connected to the UMLS and thus not connected to the VSAC, the Connect to UMLS link (fourth link from the left in the right half of the Primary Navigation Header) is displayed. Clicking on the link opens a modal to connect as described in <u>section 4.4.2.</u> When connected, "UMLS Active" is displayed instead.
6. **User Profile Dropdown / Sign Out:** The User Profile Dropdown (on the far right of the Primary Navigation Header) provides a link for a user to "Sign Out."

6 Measures Overview Page (Initial Landing Page)

The Measures overview page is where users land after logging in to MADiE. This page displays all QI-Core and QDM measures that have been added to MADiE, and further organizes the measures into two areas: My Measures and All Measures. The My Measures table displays measures that you own or that have been shared with you. measures found in My Measures are measures that can be edited by you. The All Measures table displays all eCQMs entered into MADiE by all users. Most of the measures listed in All measures are likely to be view-only, since most measures are only editable by a limited number of users.

6.1 My Measures / All Measures Tables

My Measures and All Measures list measures in tables that also display the following information and interactive controls for each measure.

1. **Measure Name:** The Measure Name column displays the name of a measure.
    a. **In-Use:** If a measure which you have editing privileges for (i.e., A measure you own or a measure shared with you) is being edited by someone else, the measure is in a "view-only" state until the other user navigates away from editing. A yellow "In-Use" tag appears next to the Measure Name when in that state.
2. **Version:** The Version column displays the version # of the measure listed. Measures that are currently in a draft state will show a blue tag 'Draft' beside the version number.
3. **Model:** The "Model" column displays the assigned model and version of the measure.
4. **Actions:**
    a. Edit: Users who own or have share access to the measure will have an Edit button. This allows users to open up the measure for editing.
    b. View: Users who do not own or have share access to the measure will have a view button. This allows users to open up the measure for view only access.
    c. Version: Allows a measure currently in a draft state to be versioned (see <u>section 6.2</u>).
    d. Draft: Allows a measure currently in a version state to be drafted (see <u>section 6.3</u>).

      e. Export: Allows a measure to be exported from MADiE (see [section 9](#)). – **Note:** This function is not currently available for QDM Measures

5. **Filter measures / Search:** Allows the user to search for a specific measure by typing in a measure's name or eCQM Abbreviated Title.

6.2 Versioning a Measure (QI-Core Only)

Versioning for QDM measures has been temporarily disabled.

A Measure in a Draft state can be versioned by selecting "Version" from the "Actions" dropdown. A pop up will appear where a user can select Major, Minor, or Patch version. The pop up will also display the current version number, the future version number after versioning is complete, and a text area for the user to confirm the new version number. Users will need to type in the version number, and it will need to match what the tool will be updating the version number to in order to proceed. After typing the version number, click "Continue." MADiE will now attempt to version the Measure. Measures that do not contain valid CQL or Population Criteria cannot be versioned. If the measure cannot be versioned an error message will appear, and the measure will not be versioned. If your measure had invalid Test Cases MADiE will prompt you to ensure you want to version with them. If you click "Yes, Version My Measure," the measure will be versioned with invalid test cases. If you select "No, I want to fix my Test Cases," the measure version will be canceled. If a measure can be versioned, then clicking "Continue" will take the user back to the My Measures tab where the versioned measure can be viewed.

6.3 Draft a Measure

A Measure in a versioned state can be versioned if no other versions of that measure are currently in a Draft state. A user can draft a measure by selecting "Draft" from the "Actions" dropdown. A pop up will appear where a user can change the Measures Name. This field is auto populated to the current versioned Measure Name. Users do not need to change the name; however, Measure Name is required before continuing. Once a user decides on the Measure Name, click "Continue." A draft will now be created, and the user will be directed back to the My Measures tab where the new draft will be visible. From there a user can edit the measure.

7 Adding Measures in MADiE

There are two options for adding measures into MADiE. A new measure can be created by using the "+ New Measure" button, or measure can be transferred from the MAT into MADiE.

7.1 Transferring Existing Measures from the Measure Authoring Tool (MAT) into MADiE

Before initiating a transfer from the MAT:

1. **Confirm you are the measure owner** in MAT and the intended measure owner upon transferring to MADiE. If you want another user to be the measure owner, transfer measure ownership to that user in MAT first, then have them initiate the transfer.
2. Verify the measure being transferred is a **FHIR or QDM 5.6** measure.
3. Verify the measure being transferred is **not a Composite measure.**
4. Verify the measure being transferred has been **successfully packaged.**
   a. Validation errors must be addressed in order to successfully package.

After completing the transfer, open the measure in MADiE, preform a minor change to the CQL such as adding a space, then save the measure. This will complete the measure transfer process. Until this step is complete you may see a CQL error notification on the Test Cases screen and/or during Measure Export.

Note, the vast majority of measure content will be transferred, but for FHIR:

1. Data and selections for fields that no longer exist in MADiE and are not part of any future development plans will not be transferred (e.g., Measure Set, etc.).
2. Any stratifications within a measure group will not be transferred.
3. Any population criteria that contain measure observations will not be transferred.
4. Some measure metadata (e.g., Definitions) will not be immediately available but will be transferred and stored in MADiE until the containing areas are fully developed.
5. MADiE QI-Core accepts measure types that are present in the HL7 measure type list. These types include Outcome, Patient Reported Outcome, Process and Structure. Measures that are transferred from MAT to MADiE that are not one of the above types will automatically be mapped to one of the supported types. Users can update the measure type after it has been transferred to MADiE.

MAT	MADiE QI-Core
Appropriate Use Process	Process
Cost/Resource Use	Structure
Efficiency	Structure
Intermediate Clinical Outcome	Outcome
Outcome	Outcome
Patient Engagement/Experience	Patient Reported Outcome
Patient Reported Outcome Performance	Patient Reported Outcome

Structure	Structure

For QDM Measures:

1. Measure Meta data
2. Measure CQL
3. Measure groups(s) will be created
4. Measure Types will be transferred and be retained
5. Stratification data will be transferred
6. Measure Observation data will be transferred

After confirming the items above, follow the steps below to initiate the transfer.

1. Find the measure you want to transfer.
   a. It can be in "Draft" and does not need to be versioned.
2. Select/Highlight the measure in the measure list page.
3. Click "Export."
4. Select the "Transfer to MADiE" option.
5. Click "Save," and the measure will become available in My Measures within MADiE.
   a. **Note:** Contact the MADiE Helpdesk if your measure does not appear after transferring.

After attempting to transferring your measure an email will be sent with information about the transfer, including:

- MeasureId
- Measure Name
- Measure Version
- Measure revision Number
- Measure CQL Library Name
- CMSID
- Transferred Measure ID
- Measure transfer status

Should the transfer fail, an error message will also be provided to help the user troubleshoot the problem. If no email is received, users should check their spam folder to see if it was filtered there. Should you need to retransfer the measure after the measure transfer failed, reach out to the help desk for assistance.

7.1.1 Retransfer Measures (QDM Only)

QDM measures can be retransferred from MAT to MADiE. To retransfer measures, open your QDM measure in MAT and follow steps in section 7.1 to transfer the measure. The retransfer process will match the measure GUID in MAT and MADiE. Should you have multiple versions of the measure in MADiE, all previous versions of the measure will be deleted in MADiE during the retransfer process. The most recent version or draft will be replaced with a draft of the measure retransferred from MAT. After the retransfer is complete all QDM measures will have a version of 0.0.000 regardless of the version they were in MAT.

Test cases in MADiE will be retained for measures that are retransferred if the following values were the same in both MAT and MADiE prior to the retransfer (this includes expected values):

- Measure scoring
- Population basis
- Measure population criteria
- Populations within each criteria
- Stratifications
- Measure observations

Should any of the above values be different in MAT and MADiE prior to retransfer, the test cases will be deleted and need to be recreated or imported after the retransfer is complete. See section 8.8 for instructions on importing test cases and section 8.5.3 for instructions on generating test cases and section 8.5.4.2 for instructions on building QDM test cases.

Test cases in MADiE will be retained (but expected values will be cleared) for measures that are retransferred with a different population basis or with multiple measure groups.

Measures in MADiE that have been shared with other users via a share request will retain those share privileges after retransfer, allowing those users with share privileges to edit the retransferred measure.

7.1.2 Disabled "Transfer to MADiE" Option

The Transfer to MADiE option may be disabled in the Measure Authoring Tool (MAT) because:

1. You are not the owner of the measure.
2. You have already transferred the measure.
3. You have already transferred another version of the measure.
4. The measure has a QDM version lower than 5.6.
5. The measure is a composite measure.

7.1.3 Unintentional Transfer of an Incorrect measure Version

If you unintentionally transfer the incorrect version of a measure, follow these steps to remove and replace it, as only one version of the measure is allowed to be transferred using the "Transfer to MADiE" option.

1. Find the version of the measure that you wish to remove in the Measures overview page within MADiE.
2. Open the measure by clicking "View" in the "Action" column corresponding to the measure.
3. Once opened, click the "Delete Measure" button in the header. That will delete the measure and all test cases. Note – only the measure owner can delete the measure.
4. Submit a helpdesk ticket, indicating that you unintentionally transferred the incorrect measure version, and we will remove the flag blocking multiple transfers from the same measure version family.
5. You will be notified when the flag has been removed, and you can proceed with transferring the desired version of your measure from the MAT.

7.2 Creating a New Measure

To create a new measure in MADiE, initiate the process by clicking on the + New Measure button in the upper right of the screen while on the Measures overview page. The New Measure creation modal will appear, prompting you to enter the following information:

1. **Measure Name:** The Measure Name is used to identify and refer to a measure. It is often descriptive of what the measure assesses.
2. **Measure CQL Library Name:** The Measure CQL Library Name is used to identify and refer to a CQL Library within a measure. When creating the Measure CQL Library Name, it must adhere to the following requirements:
   a. The name must be unique and not match any other CQL Library Name in MADiE.
   b. The first character must be a capitalized letter.
   c. Other valid characters include alphanumeric characters and underscores.
   d. Spaces are not allowed.
3. **eCQM Abbreviated Title:** The eCQM Abbreviated Title must be 32 characters or less.
4. **Model:** The Model dropdown displays all available models and model versions that can be assigned to a measure currently supported by MADiE. Currently MADiE supports QI-Core v4.1.1 or QDM v5.6
5. **Measurement Period - Start Date/End Date:** The Measurement Period - Start Date/End Date fields establish the measurement period for the measure. Start and end dates must be entered in "mm/dd/yyyy" format. Note: MADiE will include additional precision when

the dates are saved, although this precision will not be visible in MADiE. For example, Start Date is entered as 01/01/2024 MADiE will save the start date as 2024-01-01T00:00:00.000+00:00. Similarly, if the end date is entered as 12/31/2024 MADiE will save it as 2024-12-31T23:59:59.999+00:00. This will allow Measurement period to have additional precision and time zone offset to successfully execute measures.

Once the information above has been entered you have the option to:

1. **Cancel:** The Cancel button discontinues the creation of the new measure and closes the modal.
2. **Continue:** The Continue button saves the initial information entered in the New Measure creation modal and brings the user to the next screen, where the rest of the measure content can be populated.

8   Viewing & Editing a Measure

Upon opening an existing measure or continuing from the New Measure creation modal, the measure content viewing/editing area is displayed. The viewing/editing area displays key content and functionality for the opened/newly created measure and additional areas to further view/edit the rest of a measure.

8.1 Measure Header

In the blue header area, the following information and functionality about the measure is displayed:

1. **Measure Name:** The Measure Name field displays the current name of the measure. The Measure Name is typically a brief description of the measure's focus and target population, providing an intuitive way to identify and refer to the measure. The measure name may be truncated if needed to fit the available space followed by ellipses. A tooltip will provide the full measure name if the user mouses over the ellipses.
2. **Model & Version:** The model and model version can be found below the Measure Name.
3. **Measurement Period:** The measurement period can be found under the measure Name and to the right of the model and model version.
4. **Navigation Breadcrumbs:** Above the measure name are navigation breadcrumbs, indicating what area of MADiE is currently displayed and providing a way to navigate back to the measures page.
5. **Delete Measure Button:** On the right side of the blue header area, the Delete Measure functionality is available. Only measures in a draft status may be deleted. Engaging

Delete Measure will display a modal confirming if you would like to remove the measure and all its test cases. Note – only the measure owner can delete the measure.

8.2 Details Tab

Also displayed upon opening an existing measure or continuing on from the New Measure creation modal, is a measure's Details tab, similar to the Measure Details tab in the MAT. The Details tab consists of the eight subareas, described below.

8.2.1 General Information

The Information subarea of the Details tab contains mostly identifying information related to a measure. Content in this subarea includes:

8.2.1.1 Name, Version, & ID

1. **Measure Name:** The Measure Name field displays the current name of the measure. The Measure Name is typically a brief description of the measure's focus and target population, providing an intuitive way to identify and refer to the measure.
2. **Measure CQL Library Name:** The Measure CQL Library Name field displays the current name of measure CQL library within the measure. Users often specify a name similar to that of the measure Name.
3. **Measure ID:** The Measure ID provides a unique identifier to reference the measure from which its versions and drafts originated. It is shared between all versions and drafts of the same measure, but unique between different measures. The Measure ID cannot be edited and is automatically generated by MAT/MADiE.
4. **Version ID:** The Version ID provides a unique identifier to reference a specific version of a measure. Every time a new version of a measure is created, a new, unique identifier is assigned. The Version ID cannot be edited and is automatically generated by MADiE.
5. **eCQM Abbreviated Title:** The eCQM Abbreviated Title must be 32 characters or less.
6. **CMS ID:** The CMS ID, also called the eCQM Identifier, is an assigned number unique to the versions and drafts of the measure. It will not be assigned to any other measure. The use of this field is optional. To assign a CMS ID, select the blue 'Generate Identifier' link. Once a CMS ID has been generated, you will not be able to modify or remove it from any draft or version of that measure. FHIR CMS IDs will be appended with the term FHIR.
7. **Experimental:** The 'Experimental' field defaults to "No" for new measures, indicated by an unchecked checkbox. To state that it is experimental, check the checkbox.

8. **Program Use Context:** The Program Use Context field defaults to blank and allows users to select the program or project of work the measure is applicable to. The dropdown contains the following options:

Code	Display	Definition
mips	MIPS	Merit-Based Incentive Payments System (MIPS)
ep-ec	EP/EC	CMS Promoting Interoperability Eligible Professionals/Eligible Clinicians.
eh-cah	EH/CAH	CMS Promoting Interoperability Eligible Hospitals or Critical Access Hospitals.
qpp	QPP	Quality Payment Program.
aapm	AAPM	Advanced Alternative Payment Models.
cpcp	CPC+	Comprehensive Primary Care Plus (CPC+)

9. **Endorsing Organization:** The Endorsing Organization consists of two fields. One field is to select the organization that endorses the measures and one to enter the endorsing number. Endorsing Organization is not required. If no Endorsing Organization is selected, then the Endorsing Number must be blank. If an Endorsing Organization is selected, an Endorsing Number is required. Currently these fields correlate to Endorsed by NQF and NQF number in the MAT. For QDM measures these values have been updated to CMS Consensus Based Entity (CBE) instead of NQF.

8.2.1.2   Model & Measurement Period

1. **Model: The model used to create the measure. Currently QI-Core v4.1.1 and QDM v5.6 are the only supported models.**
2. **Measurement Period - Start Date/End Date:** The Measurement Period - Start Date/End Date fields establish the measurement period for a measure. Note: MADiE will include additional precision when the dates are saved, although this precision will not be visible in MADiE. For example, Start Date is entered as 01/01/2024 MADiE will save the start date as 2024-01-01T00:00:00.000+00:00. Similarly, if the end date is entered as 12/31/2024 MADiE will save it as 2024-12-31T23:59:59.999+00:00. This will allow Measurement period to have additional precision and time zone offset to successfully execute measures.

8.2.1.3   Steward & Developers

The Steward & Developers subarea indicates those organizations responsible for maintaining and contributing to the measure. Content in this subarea includes:

1. **Steward:** The Steward dropdown allows selection of the organization responsible for a measure's content and maintenance. The Steward is also commonly referred to as the measure publisher.

2. **Developers:** The Developers dropdown allows selection of the organization(s) that is/are responsible for authoring a measure. Choose the desired organization(s) from the dropdown menu.

Note: Organizations not included in the Steward/Developers dropdowns can be added by making a request to the MADiE Helpdesk.

8.2.2   Measure Overview

8.2.2.1   Description

The Description subarea communicates the measure intent. Examples of Description content is available in the human readable files of published measures within the eCQI Resources Center.

8.2.2.2   Rationale

The Rationale subarea describes why a measure is needed and includes content related to important criteria such as impact, gap in care and evidence. Example Rationale content is available in the human readable files of published measures within the eCQI Resource Center.

8.2.2.3   Guidance (Usage)

The Guidance (Usage) subarea describes how to interpret or implement certain components of a measure. Implementers can reference Guidance (Usage) for additional information about the measure's data elements, logic, and timing. If Guidance (Usage) information is not being included for a measure, enter "None" into this field.

8.2.2.4   Definition (QDM Only)

Enter a definition or description of individual terms, if needed. For measures that do not have definition information, enter "None" into this field.

8.2.2.5   Clinical Recommendation

The Clinical Recommendation subarea includes a clinical recommendation statement or general advice regarding the measure and its content from the expert panel that created the measure. The clinical recommendation statement is a summary of relevant clinical guidelines or recommendations supporting the measure.

8.2.2.6   References (QDM Only)

Enter information that identifies bibliographic citations or references to clinical practice guidelines, sources of evidence or other relevant materials supporting the measure's intent and rationale. To add a reference, click the "+ Add Reference" button. A modal will be displayed. Select the reference type and then enter the reference text. Clicking "Save" will add the reference

to the reference table. Users can continue adding references until all have been entered. The reference table will sort alphabetically, first by type and then by reference text.

To edit a reference, click the actions drop down arrow and select the "Edit" button on the reference to be edited. A modal will be displayed allowing users to update the reference information. Clicking "Save" will update the reference and reorder the references alphabetically.

To Delete a reference, click the actions drop down arrow and select the "Delete" button on the reference to be deleted. A confirmation dialogue is shown. Click "Cancel" to continue without deleting the reference and click "Yes, Delete" to permanently delete the reference from the measure.

8.2.2.7   Transmission Format (QDM Only)

The Transmission Format subarea allows users to enter URLs that provide the transmission formats that are specified for a reporting program. For measures that do not have transmission format information enter "None" into this field.

8.2.2.8   Measure Set (QDM Only)

A measure set is a unique grouping of measures that, when viewed together, provide a robust picture of the care within a given domain (e.g., cardiovascular care, pregnancy). For measures that do not have a measure set, enter "None" into this field.

8.2.3 Legal

8.2.3.1   Copyright

The Copyright subarea includes the organization(s) who own the intellectual property represented by the measure. For measures that do not have copyright information, enter "None" into this field.

8.2.3.2   Disclaimer

The Disclaimer subarea includes disclaimer information for a measure. For measures that do not have disclaimer information, enter "None" into this field.

8.3 CQL Editor Tab

A measure's CQL, including Parameters, Definitions, and Functions can be viewed and edited in the CQL Editor tab (second tab from the left, next to Details, after opening a measure). All information except for the measure CQL Library Name and Version can be added, edited, and deleted.

All CQL must be entered in correct CQL syntax. When saving, any errors in the CQL will be displayed. CQL containing errors can be saved but may prevent dependent functionality from working properly (e.g., population criteria configuration, test case calculation, etc.). Make sure that the CQL is fully completed, and errors are resolved to ensure proper functionality of areas dependent on the CQL.

MADiE will validate that the CQL Using statement matches the value selected when the measure was created. If the Measure was created as a QDM measure the using statement must specify "Using QDM." If the measure was created as a QI-Core measure the using statement must specify "Using FHIR" or "Using QI-Core." If the CQL does not contain the correct using statement MADiE will overwrite the value. If the using statement is missing completely MADiE will provide an error message prompting one to be added.

8.4 Population Criteria Tab

Population Criteria varies depending on the Model of the Measure being edited.

8.4.1 QI-Core Population Criteria Tab

8.4.1.1 Criteria Sub Tab(s)

Population criteria for a measure can be added, configured, and managed in the Population Criteria tab (third tab from the left, next to CQL Editor, after opening a measure). In MADiE, measures may have multiple sets of population criteria (represented by Population Criteria 1, Population Criteria 2, etc.). To add additional population criteria, click the "Add Population Criteria" button below existing Criteria. Each population criteria can potentially have its own configuration for the following fields and subareas:

1. **Description:** The Description field describes a population criteria's intent.
2. **Measure Type:** The Measure Type dropdown indicates whether the measure and population criteria configuration are used to examine a process, an outcome over time, a patient-reported outcome, or a structure measure such as utilization.
3. **Population Basis:** The Population Basis dropdown specifies the type of elements in the populations. Note: If a user changes the Population Basis for a specific Population, a warning will appear and if a user continues, Test Case expected values for that Population will be cleared.
4. **Scoring:** The Scoring dropdown indicates how calculation is performed for the measure.
5. **Scoring Unit:** The Scoring Unit field defines the expected units of measure for the measure score.

6. **Populations:** The Populations subarea within a set of population criteria display configurable populations corresponding to the Scoring selected. Populations that may be displayed include:
   a. Initial Population
   b. Measure Population
   c. Measure Population Exclusion
   d. Denominator
   e. Denominator Exclusion
   f. Numerator
   g. Numerator Exclusion
   h. Denominator Exception
   i. Observation

   Note: If changes are made to any populations that have previously been included in the test cases they will be removed.

7. **Population Description:** For each population that is displayed a description field is also provided. They allow narrative about what the populations are measuring to be added.

8. **Stratifications:** The Stratifications subarea within a set of population criteria allows stratifications to be added, configured, and managed. Description fields are also included to communicate details about each stratification.

9. **Reporting:** The Reporting subarea includes the following:
   a. **Rate Aggregation:** The Rate Aggregation field describes how to combine calculated information based on logic in each of several populations into one summarized result. For measures that do not have rate aggregation, enter "None" into this field.
   b. **Improvement Notation:** The Improvement Notation dropdown provides direction for whether an increase or decrease in score is the preferred result. For QDM measures an "Other" option is present. Users are also provided a text area to enter a description of what indicates an improvement for this measure. The text area is required when the user selects "Other" and is optional for the remaining available options.

8.4.1.2   Supplemental Data Tab

Supplemental data elements (SDE) are those that should be identified for each patient for whom the measure is applicable. This additional data can be used to evaluate disparities in care.

The CMS defines four supplemental data elements for each measure (payer, ethnicity, race and ONC Administrative Sex). These are defined in the SupplementalDataElements standalone library. To include them in your measure, include the SupplementalDataElements library and in your measure CQL create definitions that reference the definitions in the library.

Any definitions created in the CQL workspace are available to be included in the measure as supplemental data elements if desired and can be viewed in the Definition multi select dropdown. Select all definitions that should become supplemental data elements.

One SDE description exists per measure. Fill in the description value and hit save to set SDEs.

8.4.1.3   Risk Adjustment Tab

Risk adjustment is the method of adjusting for clinical severity and conditions present at the start of care that can influence patient outcomes, making it difficult to make valid comparisons of outcome measures across providers.
Any definitions created in the CQL workspace are available to be included in the measure to be Risk Adjustment Variables (RAV) if desired and can be viewed in the Definition multi select dropdown. Select all definitions that should become Risk Adjustment Variables.

One RAV description exists per measure. Fill in the description value and hit save to set RAVs.

8.4.2   QDM Population Criteria Tab

8.4.2.1   Base Configuration Sub Tab

When developing a measure in MAT users select the Scoring and Patient Basis when creating the measure. In MADiE these elements are selected on the Base Configuration Sub Tab. Base Configuration has the following fields:

1. **Type:** The Type dropdown indicates whether the measure and population criteria configuration are used to examine a process, an outcome over time, a patient-reported outcome, or a structure measure such as utilization.
2. **Population Basis:** The Population Basis dropdown specifies the type of elements in the populations. **Note:** If the Population Basis for a specific Population is changed, a warning will appear. If a user chooses to continue, the Test Case expected values for that Population will be cleared.
3. **Scoring:** The Scoring dropdown indicates how calculation is performed for the measure. **Note:** If Scoring is changed, the population fields on the Criteria Sub Tab will be reset.

8.4.2.2   Criteria Sub Tab(s)

In MADiE, measures may have multiple sets of population criteria (represented by Population Criteria 1, Population Criteria 2, etc.). To add additional population criteria, click the "Add Population Criteria" button below existing Criteria. Each population criteria can potentially have its own configuration for the following fields and subareas:

1. **Description:** The Description field describes a population criteria's intent.
2. **Scoring Unit:** The Scoring Unit field defines the expected units of measure for the measure score.
3. **Populations:** The Populations subarea within a set of population criteria display configurable populations corresponding to the Scoring selected. For each population that is displayed a description field is also provided. The description allows narrative about what the populations are measuring to be added.
3. Populations that may be displayed include:
   a. Initial Population
   b. Measure Population
   c. Measure Population Exclusion
   d. Denominator
   e. Denominator Exclusion
   f. Numerator
   g. Numerator Exclusion
   h. Denominator Exception
   i. Observation

   Note: If changes are made to any populations that have previously been included in the test cases the populations will be removed.
4. **Stratifications:** The Stratifications subarea within a set of population criteria allows stratifications to be added, configured, and managed. For each stratification that is displayed a description field is also provided. The description allows narrative to communicate details about each stratification.

8.4.2.3 Reporting Sub Tab

The QDM Reporting sub tab includes the following:
   a. **Rate Aggregation:** The Rate Aggregation field describes how to combine calculated information based on logic in each of several populations into one summarized result. For measures that do not have rate aggregation, enter "None" into this field.
   b. **Improvement Notation:** The Improvement Notation dropdown provides direction for whether an increase or decrease in score is the preferred result.

8.4.2.4 Supplemental Data Sub Tab

Supplemental data elements (SDE) are those that should be identified for each patient for whom the measure is applicable. This additional data can be used to evaluate disparities in care.

Any definitions created in the CQL workspace are available to be included in the measure as supplemental data elements if desired. These definitions can be viewed in the Definition multi select dropdown. Select all definitions that should become supplemental data elements.

Along with the multi select dropdown is a single text area for users to enter narrative around the measure's SDEs. Select all definitions, enter any relevant narrative, and select "Save" to set SDEs.

8.4.2.5   Risk Adjustment Sub Tab

Risk adjustment is the method of adjusting for clinical severity and conditions present at the start of care that can influence patient outcomes, making it difficult to make valid comparisons of outcome measures across providers.

Any definitions created in the CQL workspace are available to be included in the measure as Risk Adjustment Variables (RAV) if desired and can be viewed in the Definition multi select dropdown. Select all definitions that should become Risk Adjustment Variables.

In addition to the multi select dropdown, there is a text area to enter narrative for the RAVs. Select all definitions, enter any relevant narrative, and select "Save" to set RAVs.

8.5 Test Cases Tab

Test cases for a measure can be added, edited, and managed in the Test Cases tab (fourth tab from the left, next to Population Criteria, when a measure is open). The Test Cases tab displays a table of all test cases that have been created along with Pass/Fail and coverage results. Above the table in the Test Cases tab, the following are displayed:

1. **Test Cases Passing Indicator:** The Test Cases Passing Indicator displays the percentage of test cases that are passing (i.e., have matching expected and actual values) as it relates to measure logic relevant to a measure's first set of population criteria. The indicator also shows the percentage as a fraction, displaying the number of passing test cases to the total number of test cases. Click the Run Test(s) button to calculate results. Clicking on this tab will show the Test Case Table List, see below for more details.
2. **Test Cases Coverage Indicator:** The Coverage Indicator displays the percentage of the measure logic that has been evaluated by the test cases as it relates to a measure's first set of population criteria. Click the Run All Tests button to calculate results. Clicking on the Coverage tab will show you code coverage highlighting.
3. **Delete All Button:** Allows a user to delete all test cases created for the given measure. This action cannot be undone. See section 8.5.6 for more details.

4. **Import Test Cases Button:** Allows users to import test cases into MADiE. See [section 8.7](#) For QI-Core details and [section 8.8](#) for QDM details.

5. **+ New Test Case Button:** The + New Test Case button initiates the creation of a new Test Case.

6. **Run Test(s) Button**: The Execute Test Cases button initiates calculation of all test cases against measure logic related to the population criteria selected. The Test Cases Passing Indicator, Coverage Indicator, and individual test case, Pass/Fail results are updated. The Run Test(s) Button must be clicked each time to calculate new results.

7. **Export Test Cases Button**: Currently only available for QI-Core measures. Allows users to export test cases as a "Transaction Bundle" or a "Collection Bundle." See [section 8.6](#) for more details.

The Test Cases table lists all the measure's test cases and displays additional information about each test case including:

1. **Pass/Fail/Invalid:** When the Run All Tests button has been clicked, the Pass/Fail column displays Pass or Fail for a test case, indicating if the test case's expected values match actual values calculated. Pass/Fail results are no longer automatically calculated after opening a measure. The Run All Tests button must be clicked each time to calculate new results. If "Invalid" is displayed it means the test cases contained errors that need to be corrected before it can be executed successfully.

2. **Title:** The Title column displays the title of a test case.

3. **Test Case Group:** The Test Case Group column displays the name of the test case group to which a test case may be assigned.

4. **Description:** The Description column displays the description given to a test case.

5. **Actions:** The Actions column displays the Select button, which opens a test case to view and/or edit its content. It also contains any other actions you can perform on the test case.
    a. **Edit/View** –
        i. **Edit** - Users who own or have share access to the measure will have an Edit button. This allows users to open up the test case for editing.
        ii. **View** - Users who do not own or have share access to the measure will have a view button. This allows users to open up the test case for view only access.
    b. **Export Transaction Bundle (QI-Core Only) –** Exports the transaction bundle for that specific test case.

    c. **Export Collection Bundle (QI-Core Only)** – Exports the collection bundle for that specific test case.

d. **Clone (QDM Only) –** Allows users to clone that test case. This feature will duplicate the test case, adding the test case unique id to the title to ensure unique test case name. The title can be edited on the Test Case Details tab.

e. **Delete –** Allows user to delete the specified test case.

8.5.1 Using Existing Test Cases from Bonnie FHIR to Create New Test Cases in MADiE

Test cases from Bonnie FHIR can be exported into JSON files, allowing a user to import an individual test case (see section 8.7) or "Copy-and-paste" the content within the JSON files and into new test cases in MADiE. In order to carry out the process, follow these steps:

1. Log in to Bonnie FHIR and open the measure containing the test cases that are to be transferred.
2. Click on the gear icon to the right of "Test Patients" and select "Export" in the bar that appears.
3. A zip file will be downloaded containing:
   a. All test cases are consolidated into a single JSON file.
   b. All test cases are separated into individual JSON files.
   c. **Note:** Downloaded JSON files will not contain Expected and Actual values.
4. Info from the individual JSON files can then be imported (section 8.7) or copied + pasted to construct new test cases for a measure in MADiE.
5. Test cases that are imported will have some QI-Core default values added, but both imported and copied will need to be updated to use complete QI-Core profiles.

8.5.2 Using Existing Test Cases from Bonnie QDM to Create New Test Cases in MADiE

Test cases from Bonnie QDM can be exported into JSON files, allowing a user to import QDM measure test cases into MADiE (see section 8.8).

8.5.3 Creating a New Test Case

To create a new test case, initiate the process by clicking on the + New Test Case button in the upper right, below the blue header area. The Create New Test Case modal will appear, prompting you to enter the following information:

1. **Title:** The Title field is the name of your test case.
2. **Description:** The Description field communicates what the test case is testing.
3. **Group:** Group field assigns a test case to a group that can be used to sort and organize the test case table according to your preferences.

Once the information above has been entered you have the option to:

1. **Cancel:** The Cancel button discontinues the creation of a new test case and closes the modal.
2. **Save:** The Save button saves the test case using the information entered into the Create New Test Case modal.

8.5.4 Test Case Builder

Once a test case has been created, it can be opened for building by clicking on the test case's select button in the test case table. Once opened, the test case shows two panels on each side of the screen. The left panel contains the test case builder. The right panel contains Logic Calculation Highlighting information. See section 8.5.5 for more information.

8.5.4.1 JSON Editor (QI-Core Measures)

The JSON editor is only available for QI-Core measures. QDM measures do not have a standard JSON representation and JSON cannot be utilized for QDM measures in MADiE.

The JSON Editor is where the JSON logic of a test case can be viewed and edited. All information can be added, edited, deleted, and must be in correct JSON syntax. When saving, any errors in the JSON will be displayed. JSON files may contain errors and warnings. JSON containing errors can be saved but may prevent dependent functionality from working properly (e.g., test case calculation). JSON files containing just warnings can be saved and calculated. Verify the JSON is complete, and errors are resolved to ensure proper functionality of areas dependent on it.

MADiE will validate the PatientID used for the patient throughout the test case JSON. When the test case JSON is saved MADiE will automatically add a PatientID for the patient if it was not included and will overwrite the PatientID if the PatientID used was inconsistent. This will be in UUID format. At this time, only the PatientID will be overwritten or added. No reference to the patient will be updated with the new PatientID.

8.5.4.2 User Interface (QDM Measures)

Currently, only QDM measures have a User Interface (UI) editor for test cases.

Since QDM does not have a standardized JSON format MADiE allows the user to build test cases via a UI. This UI allows the user to enter information about the Test Case via drop downs, date time fields, and from form text fields.

8.5.4.2.1   Demographics

Demographics contains information about the Test Cases Demographics

- Date of Birth – Required fields where users enter the test case's date and birth in "MM/DD/YYYY hh:mm aa" form. Users can either type the date and time manually or utilize the date time picker.
- Living Status – Drop down allowing users to specify the living status of the test case
- Race – Drop down allowing users to specify the Race of the test case. The contents of the drop down are populated based on an VSAC expansion of value set 2.16.840.1.114222.4.11.836 (expansion version: eCQM Update 2023-05-04).
- Gender – Drop down allowing users to specify the Gender of the test case.
- Ethnicity – Drop down allowing users to specify the Ethnicity of the test case. The contents of the drop down are populated based on a VSAC expansion of value set 2.16.840.1.114222.4.11.837 (expansion version: eCQM Update 2023-05-04).

8.5.4.2.2   Elements

The Elements section is where users will add the QDM Elements relevant to the measure. It is comprised of three different sections:

- Category tabs
- Elements Builder
- Elements Table

First, is a list of category tabs, i.e., Encounter, Medication, etc. Each measure will contain a different list of categories as only the categories utilized in the measure CQL will display. Each category lists the different elements that can be added to the Test Case. To see elements under different categories, click on the desired category. To add an element to the test case, click on that element's "+" button. This will open the element builder.

The element builder is where users will provide additional data about the element. It has a few sections:

- Timing Section – where users will enter any time information about the element, e.g., "Relevant Period – Start," "Relevant Period – End," etc.
- Codes Tab – where users will enter information about the primary code for the element. by selecting "Custom Code" or a code system that is utilized in the CQL of the measure.
    - Custom – two free text boxes will appear for the user to enter a custom code system and custom code.
    - Existing Code System – a drop down containing all the available codes in that code system will appear for the user to select from.

  After the user fills in or selects all fields the user will then select "Add" to add the code to the elements.

- Attributes Tab – where users will select from an attribute drop down containing attributes that are relevant to the element. Selecting an attribute will populate the type drop down. Users should select the type needed. Many times, only one type is available. Biased on the type of attribute different UI elements will appear for the user to populate. Once all required fields are populated, select "Add" and the attribute will be added to the element. Users can add as many or as few attributes to the element that are needed.

At the bottom of this section is the Elements table. This table contains a row for each element added and a column for its Datatype, Value Set & Code, Timing, Attribute(s), and Actions. The number of columns for attributes is dynamic based on the number of attributes added to different elements. The table will become scrollable as the number of attribute columns grows. To edit the element, add or remove attributes, or adjust timing click on "Actions" and select "Edit." To delete the element from the test case, click on "Actions" and select "Delete." To clone an element, click on "Clone." The cloned element will retain the same timing and attributes as the original element.

Test case edits will not be saved to the database until the user clicks the "Save" button. Prior to saving users can execute the test case by clicking "Run Test". If the user determines the test case requires updating, changes can be made prior to saving. After saving the test case, if the user makes updates, clicks "Run Test" and determines the updates are not desirable the user can click 'Discard Changes".

8.5.5 Logic Calculation Highlighting Information

This section is found on the right side of the edit test case screen. It contains four sections, Measure CQL (View Only), Highlighting, Expected/Actual, and Details. The Test Case Builder on the left-hand side can be used to build test cases. See section 8.5.4 for more information.

8.5.5.1 Measure CQL (View Only)

The right panel initially displays the measure CQL to aid in building the test case JSON. However, the measure CQL is view-only and cannot be edited in this area. CQL edits can only be made in the CQL Editor tab.

8.5.5.2 Highlighting

The Highlighting subarea [second link from the left in the right panel, next to the Measure CQL (View Only) link] displays a test case's highlighting results calculated against the measure CQL. No highlighting will display until after clicking the "Run Test" button. Green and/or red highlighting is generated. Green highlighting indicates a passing result for any applicable lines of measure CQL, while red highlighting indicates a failing result for any applicable lines of measure CQL. Highlighting is broken down and displayed on separate tabs, one each for:

- Measure Populations (a list of the populations applicable to the measure)
- Definitions
- Functions
- Unused

Users can click through the tabs to get targeted highlighting information. If users would like to look at highlighting for a different Population Criteria, they will click the drop down at the top of the section. It will open a list of Population Criteria, and users can select the population criteria they want to view. The "Run Test" button must be clicked each time a user would like to calculate new results.

The highlighting tab also contains a Results section for each definition. The Results section can be found directly below each definition and can be expanded and collapsed. It displays the results of the logic evaluated on the test case.

8.5.5.3   Expected/Actual

The Expected/Actual subarea (third link from the left, next to the Highlighting link, in the right panel) displays population criteria tables, where expected values for populations, stratifications, and observations within each set of population criteria can be configured. Upon clicking the "Run Test" button, Actual values are displayed along with pass/fail results for the test case across each set of population criteria. The "Run Test" button must be clicked each time a user would like to calculate new results.

8.5.5.4   Details

The Details subarea (last link the right panel, next to the Expected/Actual link) displays:

1. **Title:** The Title field is the current name of a test case.
2. **Description:** The Description field communicates what a test case is testing and is auto populated with any Description field content entered during the creation of the test case.
3. **Test Case Group:** The Test Case Group field assigns a test case to a group that can be used to sort and organize the test case table according to a user's preferences. It is auto populated with any Test Case Group assignments entered during the creation of the test case.

8.5.6   Deleting Test Cases

8.5.6.1   Deleting an Individual Test Case

After a test case has been created, it can be deleted by clicking on the test case's select button in the test case table. Then select "Delete." A confirmation dialog is shown. Select "Cancel" to

continue editing and "Delete" to permanently remove the test case. Please note, deleting test cases cannot be undone.

8.5.6.2 Deleting All Test Cases on a Measure

To delete all the test cases on the measure, select "Delete All" in the upper right of the test case table. A confirmation dialog is shown. Select "Cancel" to continue without deleting any test cases and "Yes, Delete" to permanently remove all the test cases associated with the measure. Please note, deleting test cases cannot be undone.

8.5.7 Include Supplemental Data Elements in Test Case Calculation (QDM Only)

For QDM Measures MADiE will allow users to specify if they would like to include Supplemental Data Elements (SDE) in the test case calculation and code coverage highlighting. To include SDEs in calculations locate the Configuration section on the left had side of the Test Case List page. Select the SDE tab. Update the "Include Supplemental Data" radio button to "Yes." Click Save. The SDEs will now be included in the calculation and coverage percentages. You can specifically see the SDE Highlighting on the highlighting tab of the Edit test case page.

Users that do not want to include SDEs in the measure calculation verify that the "Include Supplemental Data" radio button is set to "No".

8.6 Export QI-Core Test Cases

MADiE allows users to export QI-Core test cases as either transaction bundles or collection bundles. The test cases will be exported in a JSON format with information about the measure and expected values added into a Measure Report Resource in the JSON file.

8.6.1 Export Individual Test Cases

To export an individual Test Case, navigate to the Test Case List Page, select the Test Case you want to export, and click the Test Case action Icon and select "Export Transaction Bundle" to export the test case as a transaction bundle, or "Export Collection Bundle" to export the test case as a collection bundle. A .zip file will be created with the PatientID included in the folder name. The folder will contain the JSON file for the Test Case. The zip file will also include a read me file linking the PatientID to the Test Case Title and Test Case Group.

8.6.2 Export All Test Cases

To export all Test Cases associated with a measure navigate to the Test Case List Page and select "Export All Test Cases" at the top of the page. From the dropdown of options, select "Transaction Bundle" to export the test cases as a transaction bundle, or "Collection Bundle" to

export the test cases as a collection bundle. A zip file will be created with a folder for each Test case named with the PatientID. Each folder will contain the JSON file for the Test Case Export. Also present in the zip file will be a read me file linking the PatientID to the Test Case Title and Test Case Group.

8.7 Import QI-Core Test Cases

MADiE allows users to import QI-Core test cases from a JSON format. Users can import an individual test case JSON that was exported from Bonnie FHIR or import multiple test cases for a measure that was exported from MADiE.

8.7.1 Import Individual Test Case JSON from Bonnie FHIR

MADiE allows users to import individual test case JSON that was exported from Bonnie FHIR, see section 8.5.1 to learn how to export JSON test cases from Bonnie FHIR. Open the .ZIP file containing the test cases exported from Bonnie FHIR. The ZIP file shall contain one JSON test case file whose name is the PatientID for that test case. Ensure these JSON files are saved outside the zip file before continuing. In order to import this JSON, follow these steps:

1. Log in to MADiE and open the measure you wish to import the test case to.
2. Create (see section 8.5.2) a new test case or open an existing test case to edit (see section 8.5.4).
3. Click "Import" in the button bar on the left side (see the image below).
4. MADiE will prompt you to select a file using the browser's default selector. Select and open the individual test case JSON file that corresponds to the test case you are trying to create.
5. The JSON contained in the file will now be placed in the JSON editor on the left side of the screen, overwriting any JSON previously there.
6. As the JSON is added to the editor, QI-Core defaults are automatically added (see section 10 for the QI-Core defaults that are added).
7. Set any other elements in the test case as needed.
8. Click "Save" to finalize importing the test case JSON and added defaults. Note: MADiE does not automatically add all required QI-Core elements, users may still need to add additional elements to be QI-Core compliant.
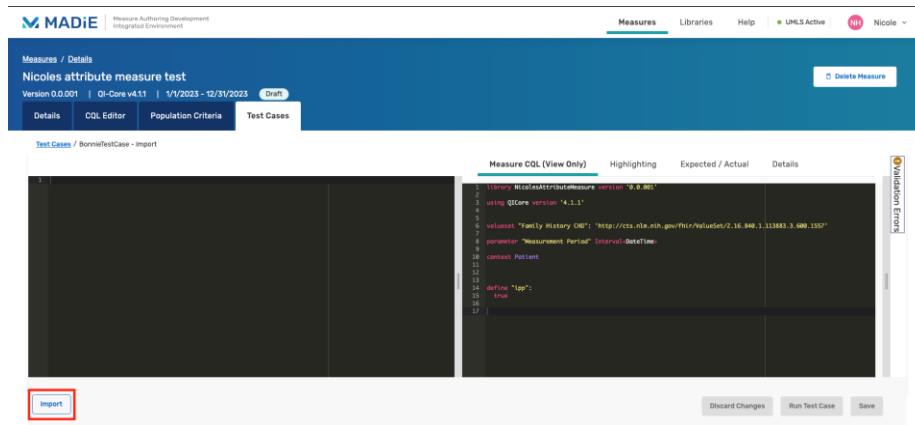
Image: QI-Core Test Case Edit Page – Import Button

8.7.2 Import Multiple Test Cases for a Measure from MADiE

MADiE allows users to import multiple test cases for a measure that was exported from MADiE, see section 8.6.2 to learn how to export test cases from MADiE. Follow these steps to import multiple test cases for a measure:

1. Log in to MADiE and open the measure you wish to import the test cases to.
2. Navigate to the Test Case(s) tab.
3. Click the "Import Test Cases" button (see image below). Note: This button cannot be used to import test cases from Bonnie. See section 8.7.2 to import test cases from Bonnie.
4. A Test Case Import screen will appear. Click the "Select Files" button.
5. MADiE will prompt you to select a file using the browser's default selector.
6. Select and open the .ZIP file containing the test cases exported from MADiE. The structure of the file must be retained from the MADiE export (that is the ZIP file shall contain one folder for each test case whose name is the PatientID for that test case, and each folder shall contain one JSON test case file).
7. Once you have selected a valid test case .ZIP file, click the "Import" button.
8. MADiE will replace the existing test case JSON with the imported JSON for all test cases whose PatientID's match. Measure report information such as expected and actual values will not be updated during the import process for existing test cases, users will need to manually update those after the import is complete. Test cases that do not have a matching PatientID in the current measure will be imported as new test cases on the measure, including expected values. Note: when importing new test cases MADiE uses the Family and Given fields in the JSON to create the Test Case Group and Title. These fields must be unique to the measure to successfully import the test case to the measure in MADiE. Test cases that fail to import due to the Family and Given not being unique to the measure will be listed after the import processing is complete.
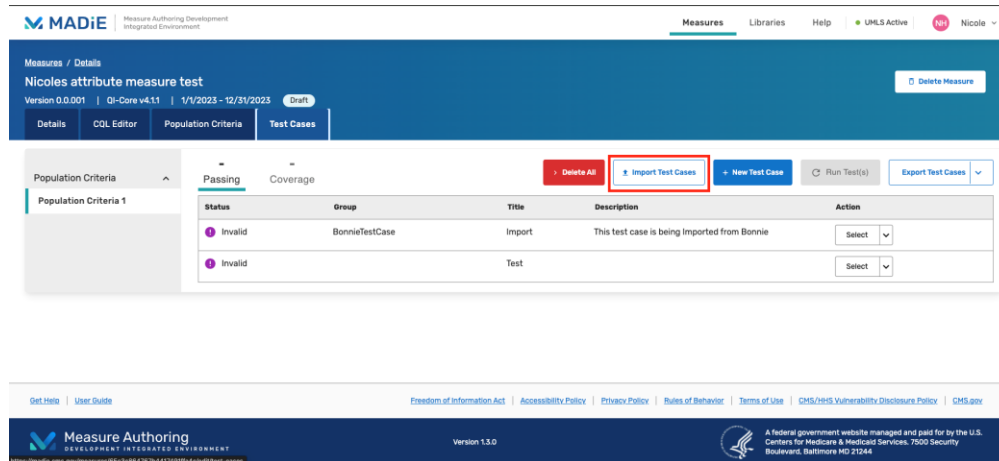
Image: QI-Core Test Case Tab – Import Test Cases from MADiE Button

8.8 Import QDM Test Cases

MADiE allows users to import test cases that were exported from Bonnie QDM in a JSON format. Ensure the JSON file is saved outside the zip file downloaded from Bonnie before continuing. Make sure you do not use the file with "_meta" in the title. Follow these steps to import multiple test cases for a measure:

1. Log in to MADiE and open the measure you wish to import the test cases to.
2. Navigate to the Test Case(s) tab.
3. Click the "Import Test Cases" button.
4. A Test Case Import screen will appear. Click the "Select Files" button.
5. MADiE will prompt you to select a file using the browser's default selector.
6. Select and open the .JSON file containing the test cases previously saved.
7. Once you have selected a valid test case .JSON file, click the "Import" button.

MADiE will then try to import your test cases. When importing QDM test cases MADiE uses the Family and Given fields in the JSON to create the Test Case Group and Title. These fields must be unique to the measure to successfully import the test case to the measure in MADiE. Test cases that fail to import due to the Family and Given not being unique to the measure will be listed after the import processing is complete. If the populations on the measure match the populations on the test case exactly, expected values will be set on import. Should they not match, i.e., your measure contains a denominator exclusion, and your test case does not, then no expected values will be transferred for that test case.

9 Measure Export

MADiE allows for most measures, QDM and QI-Core, to be exported by any user. To export a measure, navigate to the Measure List Page, and use the search function to find the measure you want to export. Open the measure action dropdown and select "Export." A loading message will appear as MADiE generates the Export files. Measures do not need to be versioned to export but the measure needs to have the Measure Description, Measure Developers and Measure Steward populated, no errors in the CQL and the population criteria must be filled out. Test cases do not factor into the ability to export a measure. If a measure can't be exported an error message explaining the issue will display. If a measure is successfully exported a success message will display and a zip file containing the measure package will be downloaded to the user's computer.

9.1 QDM Exports

9.1.1 Files in Export

At this time MADiE only exports measures and included library data. No test case data is exported with the measure. The following files are included in the export zip file:

1. **Measure HTML**: This is the human readable representation of the measure.
2. **Measure HQMF**: The HQMF representation of the measure.
3. **CQL Folder**
   a. **Measure CQL**: The CQL the user entered for the measure.
   b. **CQL for all Included Libraries**: The CQL for any library that was included in the measure.
4. **Resource Folder**
   a. **JSON File for All Included Libraries**: The JSON representation of any included library.
   b. **XML File for All Included Libraries**: The XML representation of any included library.

9.1.2 File Naming Convention

The following naming convention is how MADiE names the QDM export files:

- Zip File: {eCQM Abbreviated Title}-v{MeasureVersion}-QDM V {ModelMajorVersion}.zip
- HTML File: {eCQM Abbreviated Title}-v{MeasureVersion}-QDM .html
- HQMF File: {eCQM Abbreviated Title}-v{MeasureVersion}- QDM .xml
- Measure CQL: {eCQM Abbreviated Title}-{MeasureVersion}.cql
- Included Library CQL: {libraryName}-{libraryVersion}.cql
- Included Library JSON: {libraryName}-{libraryVersion}.json

- Included Library XML: {libraryName}-{libraryVersion}.xml

9.2 QI-Core Exports

9.2.1 Files In Export

At this time MADiE only exports measure and included library data. No test case data is exported with the measure. The following files are included in the export zip file:

5. **Measure HTML**: This is the human readable representation of the measure.
6. **Measure JSON**: The JSON representation of the measure.
7. **Measure XML**: The XML representation of the measure.
8. **CQL Folder**
    a. **Measure CQL**: The CQL the user entered for the measure.
    b. **CQL for all Included Libraries**: The CQL for any library that was included in the measure.
9. **Resource Folder**
    a. **JSON File for All Included Libraries**: The JSON representation of any included library.
    b. **XML File for All Included Libraries**: The XML representation of any included library.

9.2.2 File Naming Convention

The following naming convention is how MADiE names the QI-Core export files:

- Zip File: {eCQM Abbreviated Title}-v{MeasureVersion}-FHIR V {ModelMajorVersion}.zip
- HTML File: {eCQM Abbreviated Title}-v{MeasureVersion}-FHIR.html
- JSON File: {eCQM Abbreviated Title}-v{MeasureVersion}- FHIR.json
- XML File: {eCQM Abbreviated Title}-v{MeasureVersion}- FHIR.xml
- Measure CQL: {eCQM Abbreviated Title}-{MeasureVersion}.cql
- Included Library CQL: {libraryName}-{libraryVersion}.cql
- Included Library JSON: {libraryName}-{libraryVersion}.json
- Included Library XML: {libraryName}-{libraryVersion}.xml

10 QI-Core Defaults

QI-Core requires many attributes when a user includes a given resource into their test case JSON. Many of these required elements are not commonly included in a measure, resulting in the measure developers having to manually add the attributes. To alleviate some of the additional time that would require MADiE now adds some required QI-Core elements as default values on

import of the individual test cases. See section 8.5.3 for instructions in how to import an individual test case. Coverage and Practitioner are resources that are always added, the rest of the attributes are added only if the resource is present in the JSON file and the attribute is not. No existing attributes will be overwritten.

10.1 Added Default Values

Resource	Attribute	Default Value
QICoreCondition	Condition.subject	Reference to current test case
QICoreCondition	Condition.category	- Encounter Diagnosis if condition is referenced by encounter - Problem List otherwise
QICoreCoverage	Coverage.beneficiary	Reference to current test case
QICoreCoverage	Coverage.payor	Reference to Default Organization
QICoreCoverage	Coverage.status	active
QICoreDevice	Device.patient	Reference to current test case
QICoreEncounter	Encounter.status	finished
QICoreEncounter	Encounter.subject	Reference to current test case
QICoreMedicationAdministration	MedicationAdministration.subject	Reference to current test case
QICoreMedicationRequest	MedicationRequest.intent	order
QICoreMedicationRequest	MedicationRequest.status	active
QICoreMedicationRequest	MedicationRequest.subject	Reference to current test case
QICoreMedicationRequest	MedicationRequest.requester	Reference to the default Practitioner
QICoreObservation	Observation.subject	Reference to current test case
QICorePractitioner	Practitioner.identifier	123456
QICorePractitioner	Practitioner.name.family	Evil
QICorePractitioner	Practitioner.name.prefix	Dr
QICoreProcedure	Procedure.status	completed
QICoreProcedure	Procedure.subject	Reference to current test case
QICoreServiceRequest	ServiceRequest.intent	order
QICoreServiceRequest	ServiceRequest.status	active
QICoreServiceRequest	ServiceRequest.subject	Reference to current test case

10.2 Default Organization

The Default Organization in MADiE is set to Blue Cross Blue Shield of Texas. We've set the address to P.O. Box 660044, Dallas, TX 75266-0044. With the phone number 972-766-6900

11 Measure Ownership

11.1 Sharing a Measure

Currently, MADiE does not contain self-service functionality to share measures. To share a measure and all test cases for the measure, the measure owner must complete the Measure Sharing Request Form v1.1 located on the MADiE MVP tab of the MAT Public website and submit it via email to the Helpdesk at semanticbits-madie-help@icf.com. **This form must be submitted via email and NOT submitted using the Bonnie MAT MADiE Jira Issue tracker as it contains HARP IDs.

Please consider the following before submitting a request:

1. All existing and future measure versions and drafts will be shared.
2. Once a measure is shared, all of its test cases are shared, since MADiE consolidates measure creation and testing functionality into a single tool.
3. Once a measure is shared, those who have access must coordinate to avoid overwriting each other's work. Overwriting prevention will not be immediately available and all users that the measure is shared with will have access to the measure and its test cases without restriction.
4. Once a measure and its test cases are shared, sharing cannot be reversed. Support for unsharing is currently not available.

If you want to share your measure, take the following steps:

1. Verify the measure already exists in MADiE.
2. Review who the measure is currently shared with by selecting the measure in the MAT and clicking the "Share" button.
3. Review previously submitted Bonnie Group Account forms to identify who has access to the measure's test cases in Bonnie FHIR.
4. Collect the HARP IDs of the MADiE users with which the measure and test cases are to be shared.
5. Submit the completed MADiE Measure and Library Sharing Request form to semanticbits-madie-help@icf.com.

11.2 Transferring Measure Ownership

Currently, MADiE does not contain self-service functionality to Transfer measures. To transfer a measure ownership and all test cases for the measure, the measure owner must complete the MADiE Measure or Library Ownership Transfer Request Form located on the MADiE MVP tab of the MAT Public website and submit it via email to semanticbits-madie-help@icf.com. **This

form must be submitted via email and NOT submitted using the Bonnie MAT MADiE Jira Issue tracker as it contains HARP IDs.

The current owner needs to approve the request to transfer, so it is recommended, when possible, that the current measure owner send the email request.

Once the request is processed, the new user will own the measure and all measure versions. The privileges of the initial owner are now passed to the new measure owner. The new measure owner will have the ability to draft, version, delete, and share. The initial owner will no longer have those privileges. All share privileges previously set will remain present.

12 Libraries Overview Page

The Libraries Overview page displays all standalone CQL Libraries that have been added to MADiE and further organizes the CQL Libraries into tables in two areas: My CQL Libraries and All CQL Libraries. The My Libraries table displays a list of CQL Libraries you own or have been shared with you. The All Libraries table displays all CQL Libraries in the system. Both areas also include:

1. **Search:** The Search field can be used to find a specific CQL Library by Library Name.
2. **Library Name:** The Library Name column displays the name of a CQL Library.
3. **Version:** The Version column displays the assigned version number of the library. Libraries that are in draft state will display a blue "Draft" tag beside its version number.
4. **Model:** The Model column displays the model and model version of a CQL Library.
5. **Actions:** The Actions column provides access to two options:
   a. **View/Edit:** The View option opens a selected CQL Library.
   b. **Version:** The Version option creates a version or draft of a selected CQL Library.

A standalone CQL Library cannot be included into a measure unless it is in a versioned state. However, please note that once a standalone CQL Library has been versioned, it cannot be edited. To make any changes, a new draft of that standalone CQL library must be made.

13 Creating a New CQL Library

To create a new CQL Library, initiate the process by clicking on the "+ New Library" button in the upper right of the screen while on the Measures page. The New Library creation modal will appear, prompting you to enter the following information:

1. **Library Name:** The Library Name is the name of the standalone CQL library. The CQL Library Name must be unique within MADiE, start with an alpha-character or underscore followed by an alpha-numeric character(s) or underscore(s) and must not contain spaces.

2. **Model:** The Model dropdown assigns an available Model and Model version to the CQL library. QI-Core v4.1.1 and QDM v5.6 are currently available for library creation.
3. **Description:** The Description field describes the intent of the CQL Library.
4. **Publisher:** This is the organization responsible for the library content and maintenance. Choose the desired organization from the dropdown menu. **Note:** Organizations not included in the Publisher dropdown can be added by making a request to the MADiE Helpdesk.

Once the information above has been entered you have the option to:

1. **Cancel:** The Cancel button discontinues the creation of a new CQL library and closes the modal.
2. **Continue:** The Continue button saves the new CQL library using the information entered into the New Library creation modal and opens the newly created CQL Library for further editing.

14 Viewing & Editing a CQL Library

Upon opening an existing CQL Library or continuing from the New Library creation modal, the CQL Library content viewing/editing area is displayed. The viewing/editing area displays key content for the opened/newly created CQL Library and additional areas to further view/edit the rest of the CQL Library.

14.1 CQL Library Header

In the blue header, the following information and functionality about a CQL Library is displayed:

1. **CQL Library Name:** The CQL Library Name is displayed below the Navigation Breadcrumbs and above the Model, Model Version, and measurement period.
2. **Model & Version:** The model and model version are displayed below the CQL Library Name.
3. **Last Update Date:** The date when the CQL Library was last updated is displayed below the CQL Library Name and to the right of the model and model version.
4. **Navigation Breadcrumbs:** Above the CQL Library Name are navigation breadcrumbs, indicating what area of MADiE is currently displayed and providing a way to navigate back to the Libraries page.

14.2 CQL Editor (for Standalone CQL Libraries)

Below the blue header and in the left panel is the CQL Editor where a Standalone CQL Library logic including Parameters, Definitions, and Functions can be viewed and edited. All information except for the measure CQL Library Name and Version can be added, edited, and deleted.

All CQL must be entered in correct CQL syntax. When saving, any errors in the CQL will be displayed. CQL containing errors can be saved but may prevent dependent functionality from working properly (e.g., measures including the library). Make sure that the CQL is fully completed, and errors are resolved to ensure proper functionality.

14.3 CQL Library Details

Below the blue header and in the right panel are where the CQL Library Details can be edited, including:

1. **Library Name:** The Library Name is the name of the standalone CQL library. The Library Name displays the name entered when the CQL Library was created or last edited by anyone with access. CQL Library Names must be unique within MADiE, start with an alpha-character or underscore followed by an alpha-numeric character(s) or underscore(s) and must not contain spaces.
2. **Description:** The Description field describes the intent of the CQL Library.
3. **Experimental Checkbox:** The Experimental Checkbox can be selected if a CQL Library is Experimental.
4. **Publisher:** This is the organization responsible for the library content and maintenance. Choose the desired organization from the dropdown menu. **Note:** Organizations not included in the Publisher dropdown can be added by making a request to the MADiE Helpdesk.

5. **Program Use Context:** The Program Use Context field defaults to blank and allows users to select the program or project of work the measure is applicable to. The dropdown contains the following options:

Code	Display	Definition
mips	MIPS	Merit-Based Incentive Payments System (MIPS)
ep-ec	EP/EC	CMS Promoting Interoperability Eligible Professionals/Eligible Clinicians.
eh-cah	EH/CAH	CMS Promoting Interoperability Eligible Hospitals or Critical Access Hospitals.
qpp	QPP	Quality Payment Program.
aapm	AAPM	Advanced Alternative Payment Models.
cpcp	CPC+	Comprehensive Primary Care Plus (CPC+)

15 Library Ownership

15.1 Sharing a Library

Currently, MADiE does not contain self-service functionality to share libraries. To share a library, the library owner must complete the MADiE Measure and Library Sharing Request Form located on the MADiE MVP tab of the MAT Public website and submit it via email to the Helpdesk at semanticbits-madie-help@icf.com. **This form must be submitted via email and NOT submitted using the Bonnie MAT MADiE Jira Issue tracker as it contains HARP IDs.

Please consider the following before submitting a request:

1. All existing and future library versions and drafts will be shared.
2. Once a library is shared, those who have access must coordinate to avoid overwriting each other's work. Overwriting prevention libraries will not be immediately available and all users that the library is shared with will have access to the library without restriction.
3. Once a library is shared, sharing cannot be reversed. Support for unsharing is currently not available.

If you want to share your library, take the following steps:

1. Verify the library already exists in MADiE.
2. Collect the HARP IDs of the MADiE users with which the library is to be shared.
3. Submit the completed MADiE Measure and Library Sharing Request form to semanticbits-madie-help@icf.com.

15.2 Transferring Library Ownership

Currently, MADiE does not contain self-service functionality to Transfer Libraries. To transfer ownership of a Library, the Library owner must complete the MADiE Measure or Library Ownership Transfer Request Form located on the MADiE MVP tab of the MAT Public website and submit it via email to semanticbits-madie-help@icf.com. **This form must be submitted via email and NOT submitted using the Bonnie MAT MADiE Jira Issue tracker as it contains HARP IDs.

The current Library owner needs to approve the request to transfer, so it is recommended, when possible, that the current Library owner send the email request
Once the request is processed, the new user will own the library and all library versions. The privileges of the initial owner are now passed to the new library owner. The new library owner

will have the ability to draft, version, and delete. The initial owner will no longer have those privileges.

15.3 Deleting a Draft Library

MADiE allows users to delete a draft library. Library drafts can be deleted by selecting "Delete" from the View/Edit dropdown on the My Libraries list. Engaging Delete will display a modal confirming if you would like to delete the library. Note – only the library owner can delete the library.

16 Feedback and Support

An issue tracker and feedback email list are available to support the resolution of issues and to answer questions related to the MADiE application. The Bonnie MAT MADiE issue tracker is available on the [ONC Jira system](#).

MADiE users should create a ticket in the issue tracker to report bugs, ask questions, or to request new features. To add an issue, users must create a login account in the Jira system. Once an issue has been entered, the MADiE team will review and prioritize it.

Acronyms

Acronym	Definition
CMS	Centers for Medicare & Medicaid Services
CQL	Clinical Quality Language
CQM	Clinical Quality Measure
eCQM	Electronic Clinical Quality Measure
FHIR	Fast Healthcare Interoperability Resources
IP	Initial Population
JSON	JavaScript Object Notation
MADiE	Measure Authoring Development Integrated Environment
MAT	Measure Authoring Tool
NLM	National Library of Medicine
ONC	Office of National Coordinator for Health Information Technology
QI-Core	Quality Improvement Core
QDM	Quality Data Model
QMIG	Quality Measure Implementation Guide
UMLS	Unified Medical Language System
VSAC	Value Set Authority Center
XML	Extensible Markup Language