Prepared for:

Centers for Medicare & Medicaid Services and The Office of the National Coordinator for Health Information Technology

CMS Alliance to Modernize Healthcare
Federally Funded Research and Development Center

An Open Source Electronic Clinical Quality Measure Testing and Certification Tool

Cypress User Guide

Version 5.0

July 25, 2019

Record of Changes

Version	Date	Author / Owner	Description of Change
3.0	August 15, 2016	ONC/CAMH	Version 3.0 for release
3.2	July 27, 2017	CAMH	Version 3.2 for release
4.0	July 27, 2018	CAMH	Version 4.0 for release
5.0	July 25, 2019	MITRE	Version 5.0 for release

About the CMS Alliance to Modernize Healthcare

The Centers for Medicare & Medicaid Services (CMS) sponsors the CMS Alliance to Modernize Healthcare Federally Funded Research and Development Center (the Health FFRDC), the first FFRDC dedicated to strengthening our nation's healthcare system.

The Health FFRDC enables CMS, the Department of Health and Human Services (HHS), and other government entities to access unbiased research, advice, guidance, and analysis to solve complex business, policy, technology, and operational challenges in health mission areas. The FFRDC objectively analyzes long-term health system problems, addresses complex technical questions, and generates creative and cost-effective solutions in strategic areas such as quality of care, new payment models, and business transformation.

Formally established under Federal Acquisition Regulation (FAR) Part 35.017, FFRDCs meet special, long-term research and development needs integral to the mission of the sponsoring agency—work that existing in-house or commercial contractor resources cannot fulfill as effectively. FFRDCs operate in the public interest, free from conflicts of interest, and are managed and/or administered by not-for-profit organizations, universities, or industrial firms as separate operating units.

The Health FFRDC applies a combination of large-scale enterprise systems engineering and specialized health subject matter expertise to achieve the strategic objectives of CMS, HHS, and other government organizations charged with health-related missions. As a trusted, not-for-profit adviser, the Health FFRDC has access, beyond what is allowed in normal contractual relationships, to government and supplier data, including sensitive and proprietary data, and to employees and government facilities and equipment that support health missions.

CMS conducted a competitive acquisition in 2012 and awarded the Health FFRDC contract to The MITRE Corporation (MITRE). MITRE operates the Health FFRDC in partnership with CMS and HHS, and maintains a collaborative alliance of partners from nonprofits, academia, and industry. This alliance provides specialized expertise, health capabilities, and innovative solutions to transform delivery of the nation's healthcare services. Government organizations and other entities have ready access to this network of partners, including RAND Health, the Brookings Institution, and other leading healthcare organizations. This includes select qualified small and disadvantaged business.

The Health FFRDC is open to all CMS and HHS Operating Divisions and Staff Divisions. In addition, government entities outside of CMS and HHS can use the Health FFRDC with permission of CMS, the Health FFRDC's primary sponsor.

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1. Introduction

Cypress™ v5.0 is the rigorous and repeatable testing tool of Electronic Health Records (EHR) and health information technology (IT) modules used in calculating electronic Clinical Quality Measures (eCQM). Cypress v5.0 is the official testing tool for the 2015 EHR Certification program supported by the Office of the National Coordinator for Health Information Technology (ONC). The 2015 Edition final rule, published by the ONC, updates the ONC Health IT Certification Program and includes certification criteria to support electronic clinical quality measurement (eCQM) and reporting across the healthcare ecosystem. The 2015 Edition eCQM certification criteria also support the requirements of the Centers for Medicare & Medicaid Services (CMS) Promoting Interoperability Program and other CMS program requirements.

ONC and CMS developed the Cypress v5.0 User Guide for test proctors who test and certify EHRs and health IT modules at Authorized Testing Labs (ATL). EHR software engineers, quality assurance engineers, and production release engineers may draw on the guide when they use Cypress in a pre-testing mode to understand how their health IT product will perform in an ATL-conducted operational test.

This guide provides instructions on how to use the open source Cypress v5.0 tool (it is assumed the user has downloaded the software). It addresses the requirements and steps for testing health IT products for calculating and reporting eCQMs.

The Cypress tool is freely available for use or adoption by the health IT community, including EHR vendors and testing labs. The open source project website at Project Cypress provides information detailing the set up and configuration of Cypress v5.0 open source software.

2. Cypress Testing Capabilities

To achieve certification pursuant to the most recent 2015 standards, each health IT product must show that it meets four criteria by demonstrating required capabilities specified in the regulation and described in the following subsections. The Cypress v5.0 software verifies four required eCQM capabilities for health IT certification (Capture/Record and Export, Import and Calculate, Electronic Submission, and Data Filtering), as described in the following subsections.

2.1 Capture/Record and Export

Cypress v5.0 supports the requirements for Capture/Record and Export capabilities as follows:

- **Capture/Record –** To be certified in accordance with 45 CFR §170.315(c), the technology must be able to electronically capture/record all of the data identified in the specified procedure necessary to calculate each eCQM. Data required for eCQM exclusions or exceptions must be codified entries. These entries may include specific terms as defined by each eCQM, or may include codified expressions, such as "patient reason," "system reason," or "medical reason."
- **Export –** As provided in 45 CFR §170.315(c)(1), the technology must be able to electronically export a data file formatted in accordance with the Quality Reporting Document Architecture (QRDA) Category I standard that includes all of the data captured for each and every eCQM for which the technology is being certified.

The functionality requirement for Capture/Record and Export specifies that a system user can record and export individual, patient-level eCQM data formatted to the Health Level Seven International (HL7) QRDA Category I Release 5.1 Implementation Guide (IG) at any time the user chooses, for one or multiple patients, without needing developer support. The requirement for Capture/Export is part of the certification criteria necessary to satisfy the 2015 Edition Base EHR definition. The capability to export eCQM data serves two purposes: (1) a provider or health system can view and verify their eCQM results for quality improvement on a near real-time basis, and (2) providers can export their results to multiple programs, such as those run by CMS, states, and private payers.

Figure 1 depicts the basic concept for Capture/Record and Export. The primary purpose of this step is to verify the technology's ability to export data in the proper QRDA Category I format with the proper Quality Data Model (QDM) data elements.

To verify this capability, Cypress produces static patient data for each of the eCQMs that are to be tested and exports the relevant patients. This data is entered into the technology. The technology is then commanded to export the patient test data as a set of QRDA Category I files that contain the proper elements from the QDM for calculating the eCQMs under test. These QRDA files are loaded back into Cypress where they are tested for validity, determining valid QRDA Category I Extensible Markup Language (XML) documents, and correctness, containing only the elements required to calculate the eCQMs.

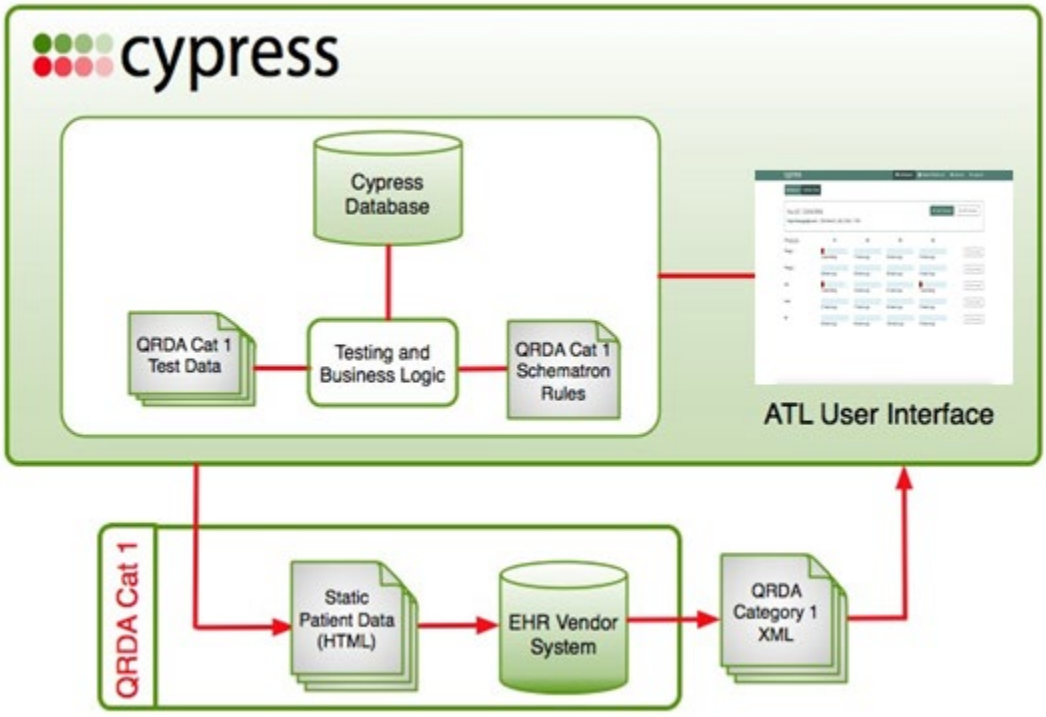


Figure 1. Capture/Record and Export

2.2 Import and Calculate

Cypress v5.0 supports the requirements for Import and Calculate capabilities as follows:

- **Import –** The technology must be able to electronically import a data file formatted in the QRDA Category I format.
- **Calculate –** The technology must be able to electronically calculate each and every clinical quality measure for which it is presented for certification.

A Health IT Module must be capable of demonstrating that it can import data to warrant certification against this criterion using the QRDA Category I IG, even if the module is also certified to provide "capture/record and export" and "report" functions.[1] The requirement ensures that users of certified health IT can import eCQM data formatted to the QRDA Category I standard for one or more patients without needing to request developer support.

[1] From Federal Regulation (80 FR 62650-62651): "First, this functionality could streamline the testing and certification process by importing QRDA Category I files rather than systems needing to manually enter test patient data. Second, the import functionality can promote quality improvement and data sharing between systems by providing systems the ability to import CQM data from other systems in a standardized format."

2.3 Electronic Submission

Cypress v5.0 supports the requirements for Electronic Submission capabilities as follows:

- Electronic Submission enables a user to electronically create a data file in QRDA Category III format for transmission of clinical quality measurement data that can be electronically accepted by CMS.

The criterion for certification of Electronic Submission capabilities supports eCQM reporting using the consensus, industry-based QRDA Category I Release 5.1 and QRDA Category III Release 2.1 IGs. It also supports better alignment with the reporting requirements of CMS programs. The CMS reporting requirements (e.g., use of the CMS QRDA IG) are included as an optional provision within the criterion because not all certified health IT is intended for CMS reporting. The certification to the HL7 QRDA Category I and III standards provides a baseline for interoperability of eCQM data because these standards are consensus based and industry developed. Moreover, the program-agnostic HL7 QRDA standards can support several use cases for exchanging eCQM data.

Figure 2 shows the basic concept for Import, Calculate, and Electronic Submission. These steps provide for automated verification that a health IT product can:

- Import and calculate the eCQM results for the quality measures being certified based on the synthetic patient data that Cypress presents to the technology under test
- Generate a properly formatted summary eCQM report that could be electronically submitted using QRDA Category III format

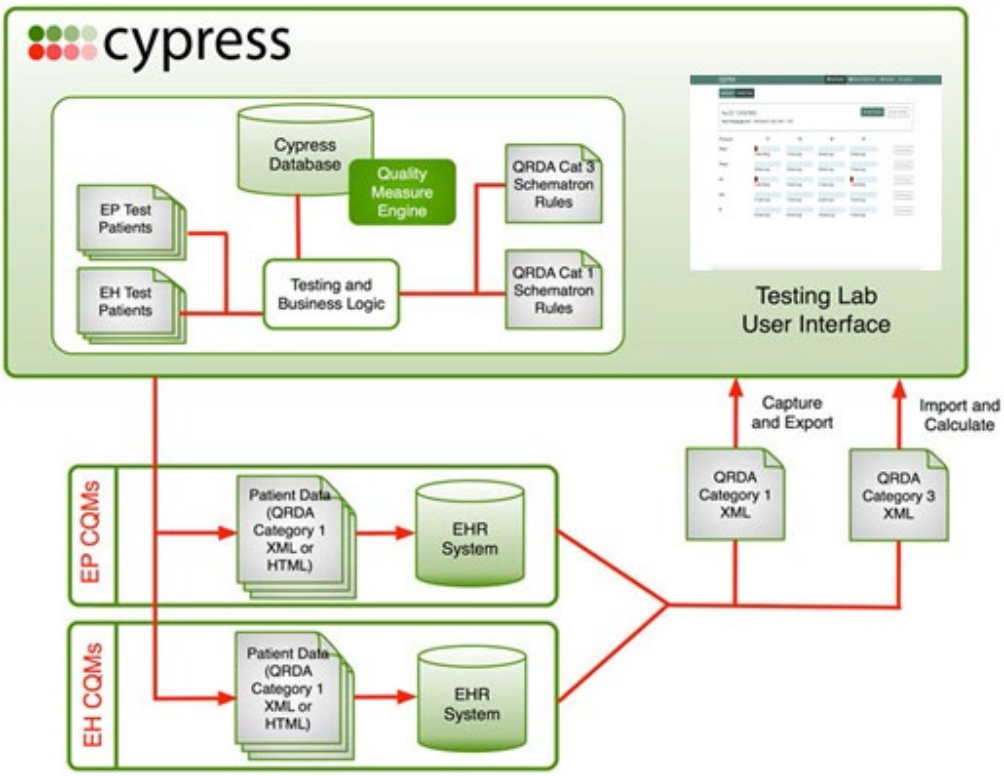


Figure 2. Import, Calculate, and Electronic Submission

2.4 Data Filtering

Cypress v5.0 supports the requirements for Data Filtering capabilities as follows:

- The technology must be able to record data (according to specified standards, where applicable) and filter eCQM results at both patient and aggregate levels.[2]

Filtering individual patient-level and aggregate-level eCQM results by data supports administrative reporting as well as identification of health disparities and gaps in care for patients treated at particular group practice sites or in a given Accountable Care Organization (ACO).

[2] Rule Reference: 2015 Edition Health Information Technology (Health IT) Certification Criteria, Base Electronic Health Record (EHR) Definition, and ONC Health IT Certification Program Modifications Final Rule (The "2015 Edition"): "The filter functionality included in this criterion will allow a provider to make a query for eCQM results using one or a combination of data captured by the certified health IT for quality improvement and quality reporting purposes. It can also aid in the identification of health disparities, enable care quality improvement, and support providers in delivering more effective care to their patient populations. These filters include, but are not limited to, practice site address, patient age, patient sex, and patient problem list."

3. Detailed Description of Cypress Workflow

Figure 3 illustrates the general workflow of a test performed with the Cypress open source software tool and a description of how the test procedure is organized and conducted. The augmentation of the test procedure to include Cypress is based on the ONC-approved and the National Institute of Standards and Technology (NIST)-published procedure for testing the accurate calculation, submission, and degree of correctness of eCQMs.

As shown in Figure 3, the vendor interacts with the vendor system. An ATL test proctor interacts with the Cypress web interface. The test proctor downloads test data from Cypress, which is then sent from Cypress and entered into the vendor system. The vendor returns test results to Cypress, which generates reports reflecting assessment of certification testing.

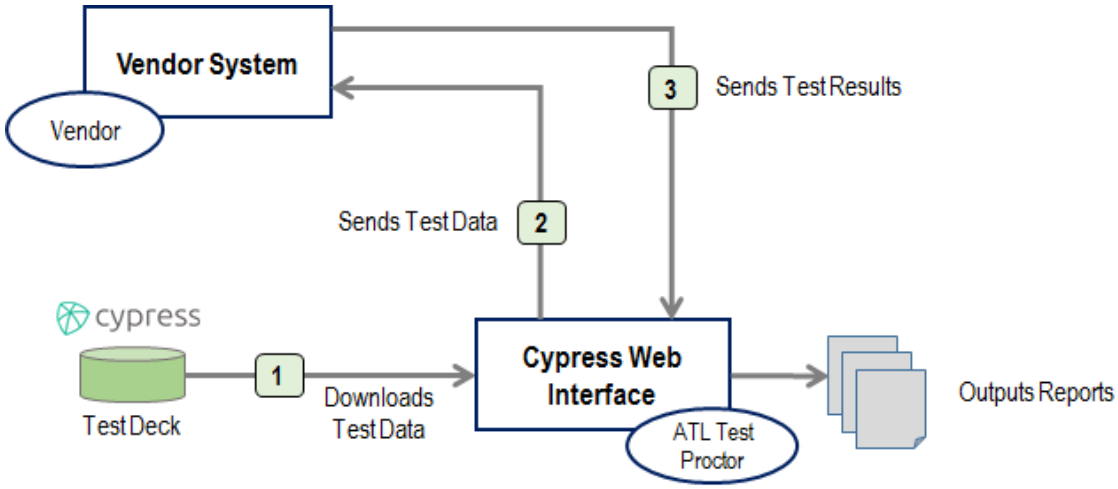


Figure 3. Cypress Workflow in an Authorized Testing Lab

Cypress can perform the following types of tests in support of eCQM certification:

1. XML Data conformance testing of the QRDA Category I standard for individual patient-level data used for eCQM calculation
2. XML Data conformance testing of the QRDA Category III standard for aggregate reporting of eCQM calculation
3. Accuracy calculation testing of the Eligible Professional / Eligible Clinician eCQMs
4. Accuracy calculation testing of the Eligible Hospital / Critical Access Hospital eCQMs

The Cypress website provides a complete description of the Cypress Testing Procedure (available at http://healthit.gov/cypress/resources.html).

The following subsections present a detailed description of Cypress v5.0, from accessing Cypress, overview of administrative functions, preparation for testing, test execution, exit success criteria, and submission to verification.

3.1 Accessing Cypress

To access and download the Cypress Software, go to Project Cypress:

- The Project Cypress site provides several options and detailed instructions for downloading and installing the Cypress software. If the software has not been installed, please follow the Cypress Download Instructions located on the Project Cypress site. This User Guide does not provide instructions for downloading the Cypress software.

After Cypress is downloaded and installed, it is accessible via a URL, bookmark, or icon you created as part of the download/installation process.

Upon accessing the installed instance of Cypress, the Sign In screen should appear. Figure 4 presents a screenshot of the "Sign In" screen. To create an account, select **Sign Up**.

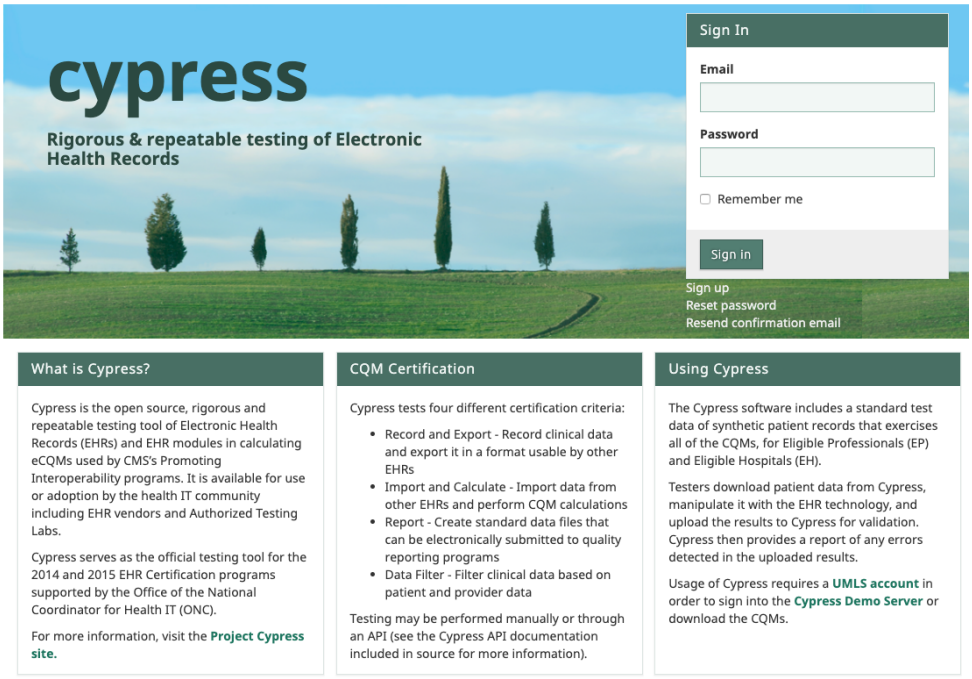


Figure 4. Cypress Sign In Page

- If you have previously set up an account, enter your email and password, and select **Sign In**.
- If you have previously created an account and forgotten your password, select **Reset password**. In the **Forgot your Password?** screen, enter the email address associated with your Cypress account, and select **Send me reset password instructions**. You will be sent a link to reset your password.
- **Sign Up** will bring you to the Sign Up and Terms and Conditions page. Click on the **Terms and Conditions** link on that page. Figure 5 presents a screenshot of the Terms and Conditions page.

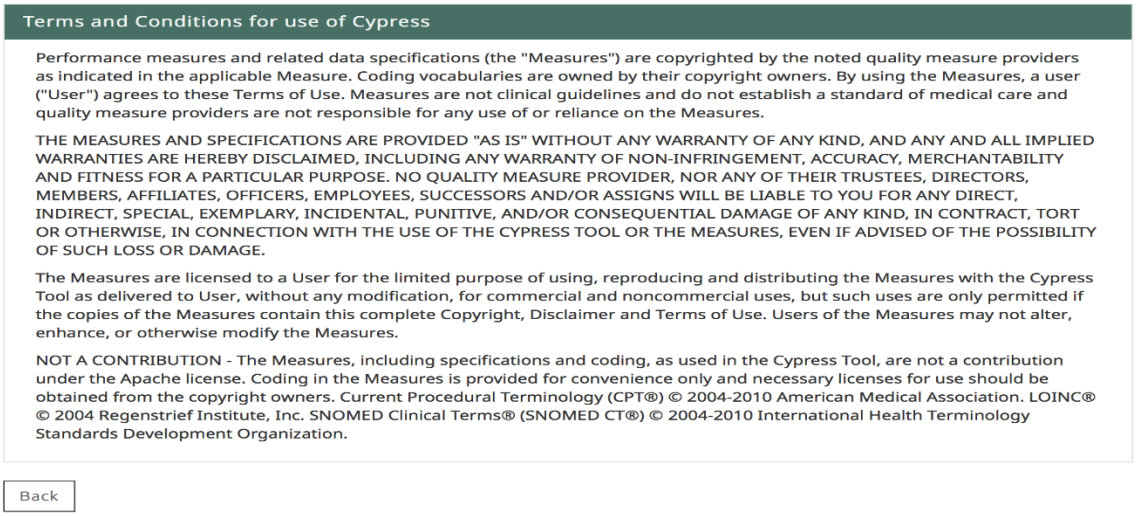


Figure 5. Cypress Terms and Conditions Page

- To **Sign up**, enter your Email, a Password, and then confirm that Password.
- Read the Terms and Conditions, check **I agree to the above Terms and Conditions,** and select **Sign up** to create your Cypress Account as shown in the screenshot of the Cypress Account creation page (Figure 6).

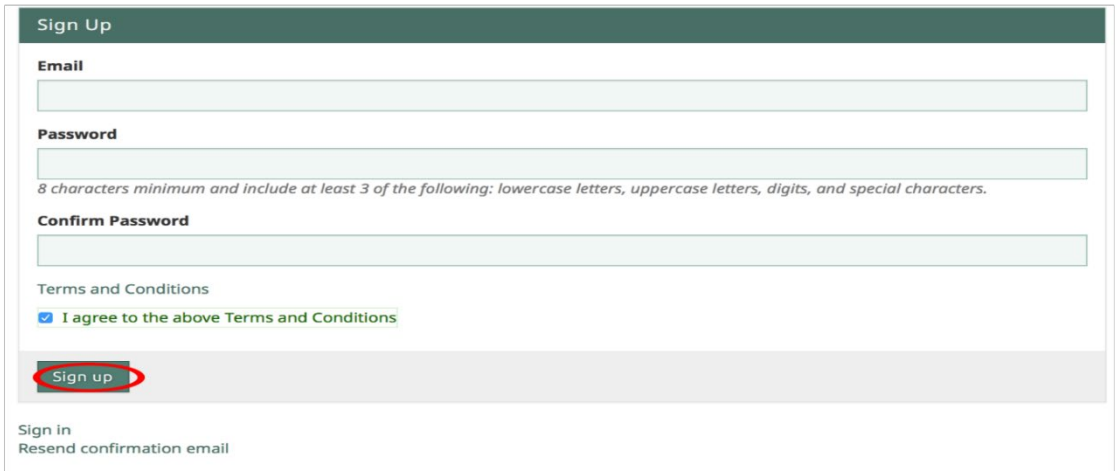


Figure 6. Cypress Account Creation

3.2 Overview of Administrative Functions

Cypress displays the **Dashboard** after you create your account, as shown in Figure 7.

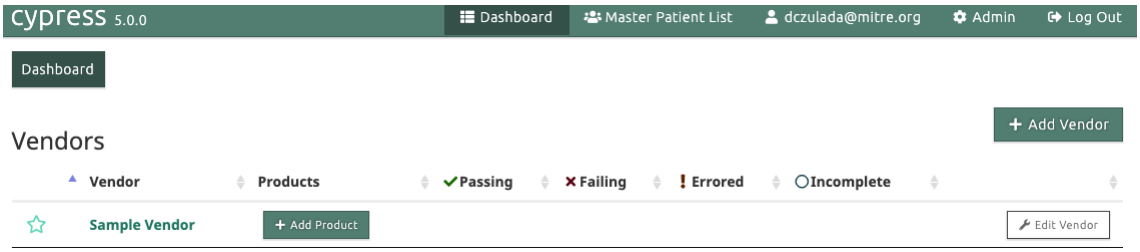


Figure 7. Cypress Dashboard

The Dashboard includes the following Cypress Administrative Functions:

1. Master Patient List – Provides a list of all test data for eCQMs
2. Account – Update a Cypress Account Password
3. Log Out – Log out of the Cypress Application
4. Add Vendor – Add vendor by entering EHR Vendor contact and product information (please refer to "Cypress v5.0 Preparation for Testing," subsection 4.3)
5. Edit EHR Vendor – Edit EHR Vendor contact and product information (please refer to "Cypress v5.0 Preparation for Testing," subsection 4.3)

3.2.1 Master Patient List

Figure 8 presents the Master Patient List page that provides a list of all test data for eCQMs for calendar year 2020 reporting.

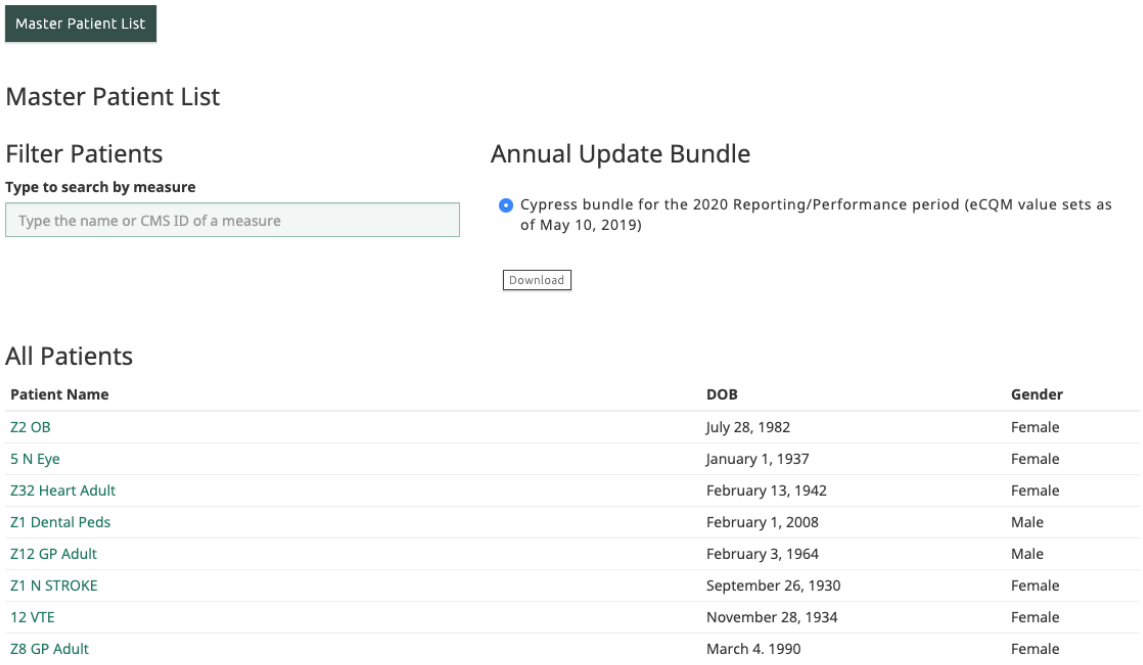


Figure 8. Master Patient List of Test Patients

By selecting the **Filter by Measure** drop-down, you can select a specific measure from a list of patient records that apply to a specific eCQM and eCQM qualifiers. Figure 9 presents an example screenshot of filtering by the measure, CMS2v9 Preventive Care and Screening: Screening for Clinical Depression and Follow-Up Plan Patients.

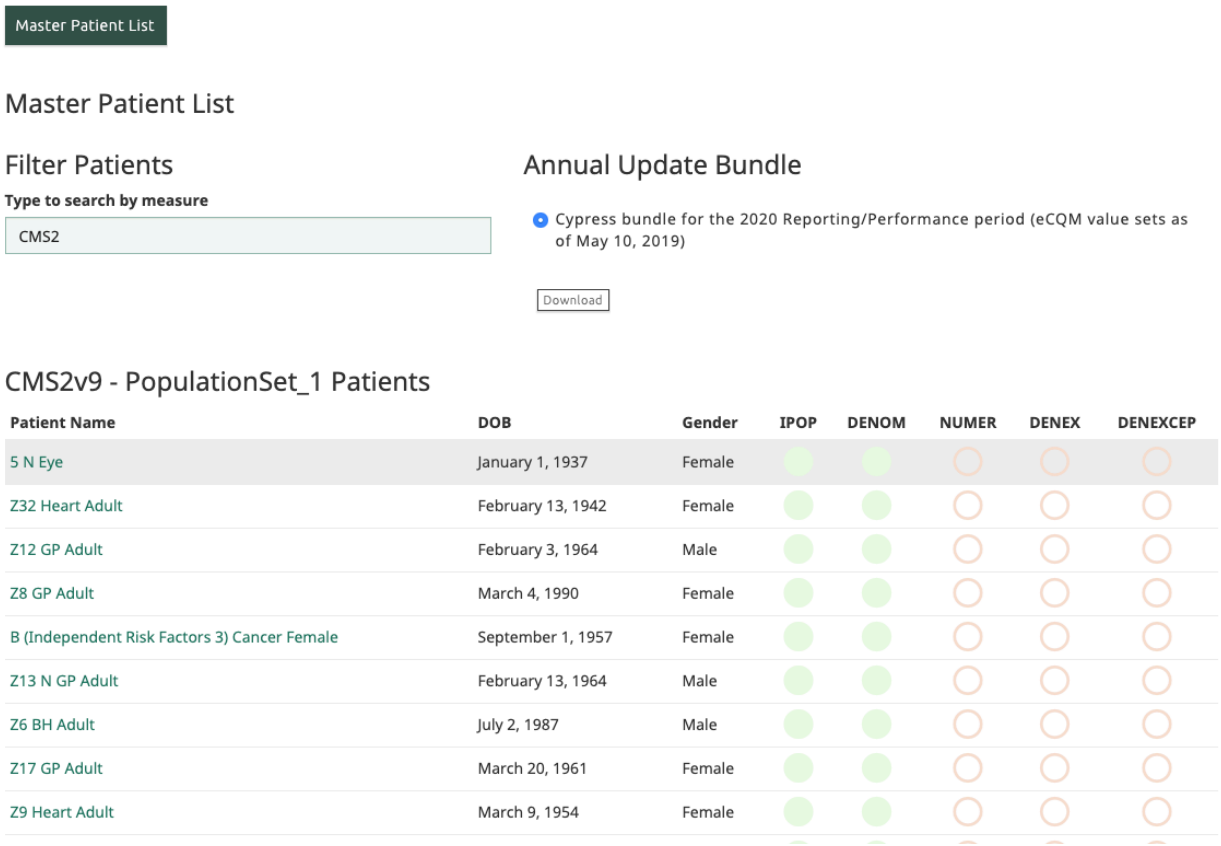


Figure 9. Patients Specific to CMS2v9 Preventive Care and Screening: Screening for Clinical Depression and Follow-Up Plan Patients

If you click on the patient's name in the patient record list, Cypress will display an individual patient record and their eCQM qualifiers as shown in Figure 10.

Figure 10. Patient Test Record Data Requirements and eCQM Qualifiers

3.2.2 Account

If you have previously set up an account, this function allows you to change your Password or delete your account. Figure 11 presents a screenshot of the account password update and delete page.

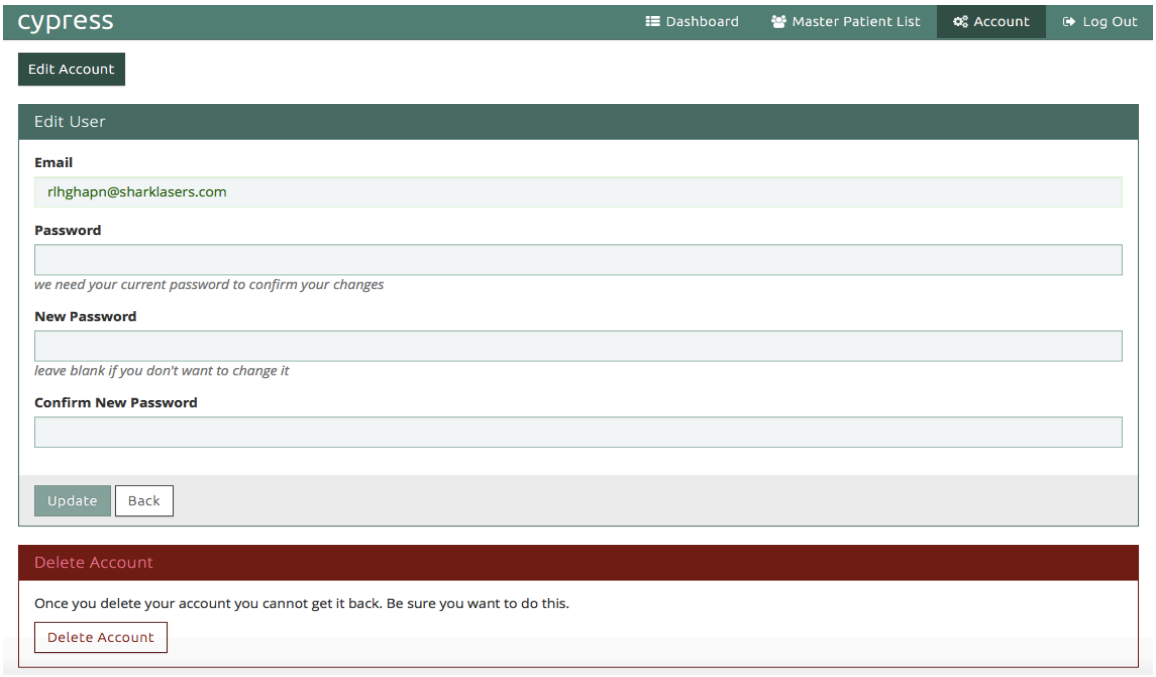


Figure 11. Account Password Update

3.2.3 Log Out

Figure 12 presents a screenshot of the Log Out function that allows a user to return to the Account Sign In (as shown in Figure 4).

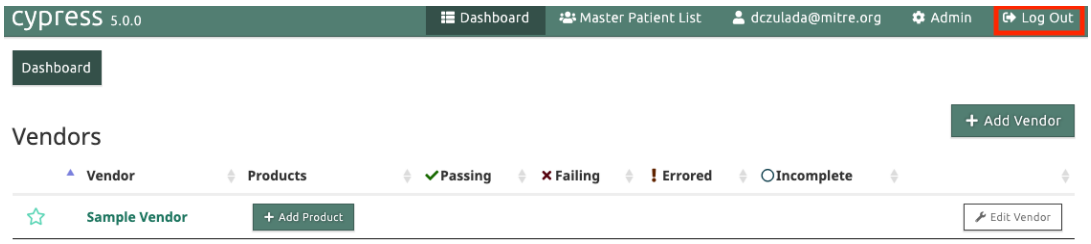


Figure 12. Cypress v5.0 Log Out

3.2.4 Add Vendor

The Add Vendor function allows the user to enter EHR vendor contact and product information (as described in subsection 3.3, Cypress v5.0 Preparation for Testing) as shown in Figure 13.

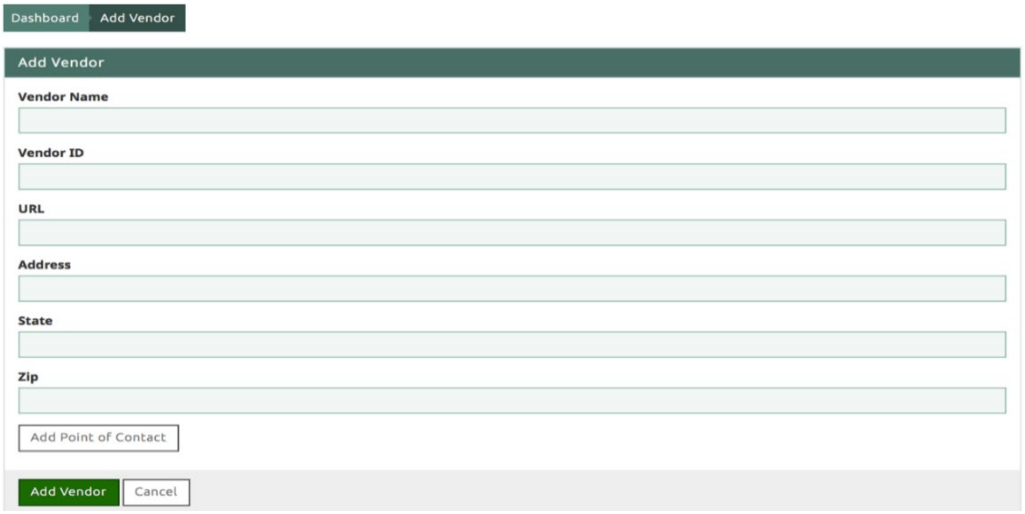


Figure 13. Add Vendor Page

3.2.5 Edit Vendor

The Edit Vendor function allows a user to edit EHR Vendor contact and product information (as described in subsection 3.3, Cypress v5.0 Preparation for Testing) as shown in Figure 14.

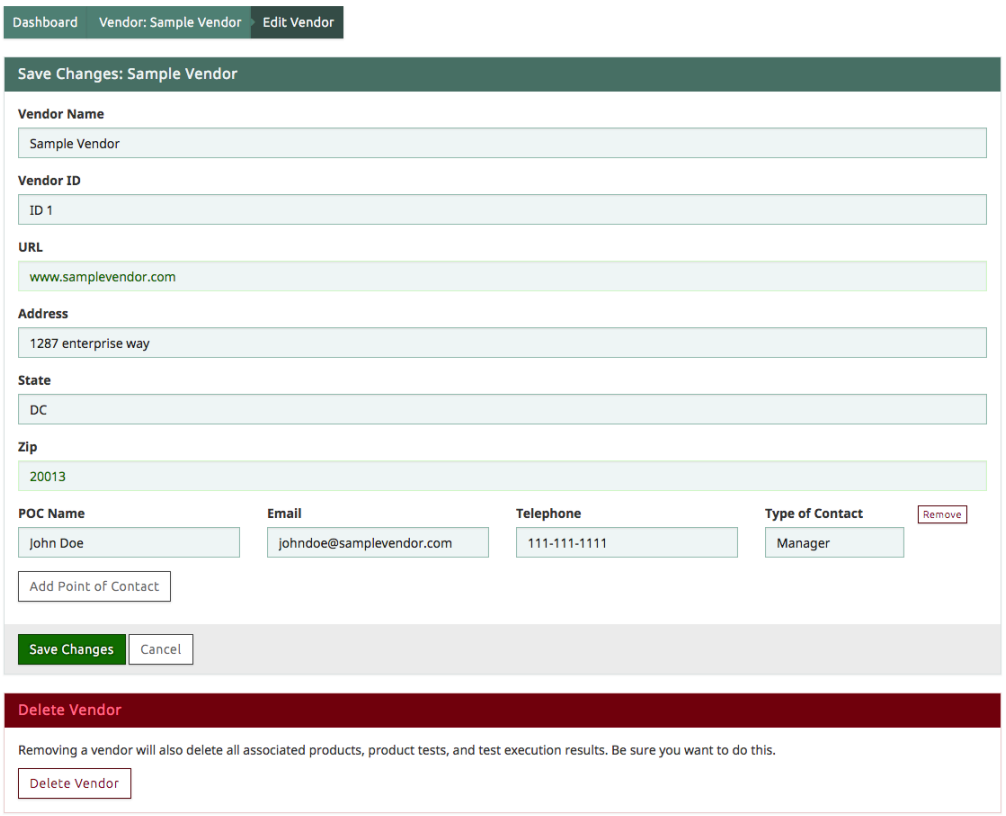


Figure 14. Edit Vendor Page

3.3 Cypress v5.0 Preparation for Testing

Add Vendor Information

- Once you have created an account, you can begin testing by adding a Vendor and Contact Information.
- Select **Add Vendor** from the Dashboard as shown in Figure 15.

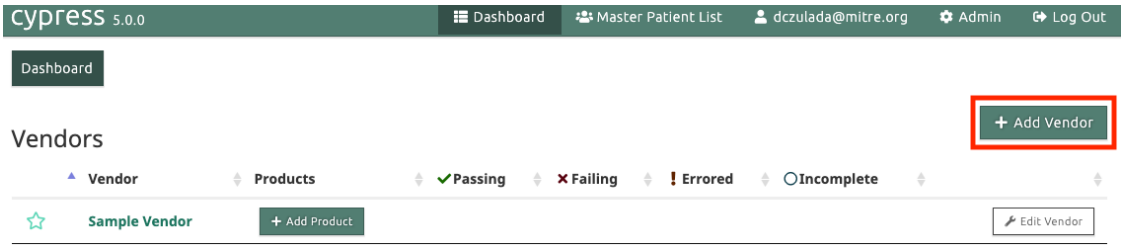


Figure 15. Dashboard Select Add Vendor

- After selecting **Add Vendor**, the **Create Vendor** information will be displayed as shown in Figure 16.
- Complete the fields listed under Create Vendor and select **Create Vendor**.

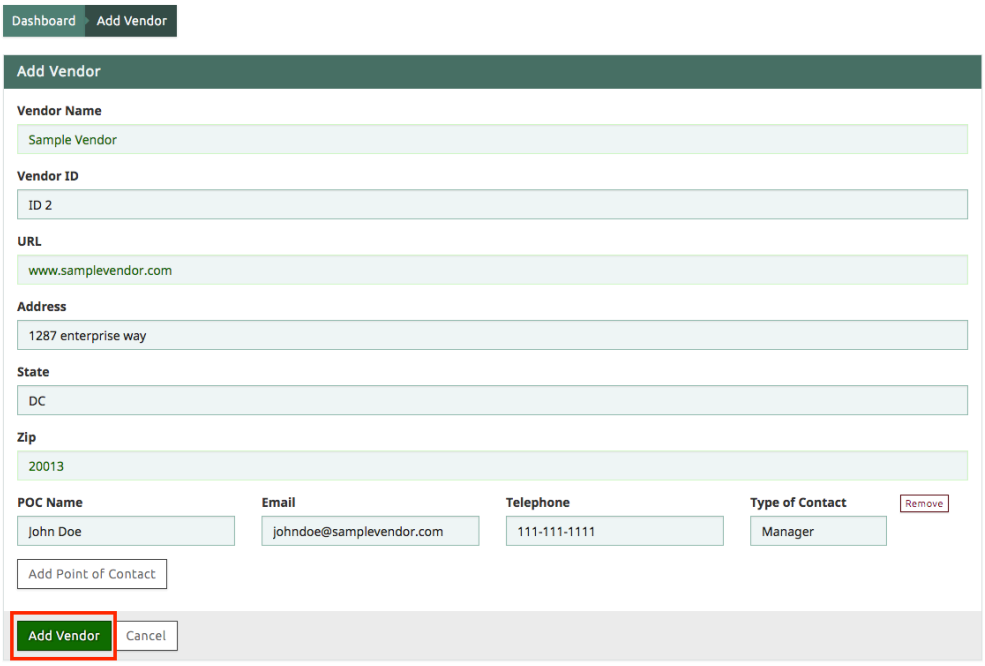


Figure 16. Create Vendor Page

Enter Product Information

- The next step is to enter Product Information. Begin by clicking the Vendor name displayed on the Dashboard as shown in Figure 17.

Figure 17. Dashboard with New Vendor Created

- Next, click **Add Product**, as shown in Figure 18, to begin entering vendor product information.

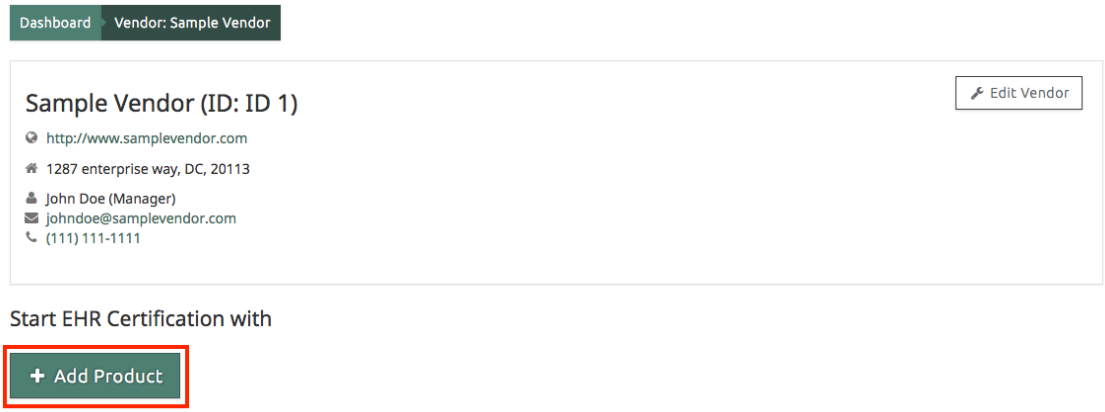


Figure 18. Vendor Product Information Page

- On the **Vendor Add Product** page, presented in Figure 19:
  - Enter Product information (Name, Version, and Description). Examples would be product version number, the name and version of any optional modules installed in the product at the time of the test, and the operating system.
  - For Certification Types, a product must, at a minimum, certify to either the C1 test or the C2 test. To indicate which tests are being certified, check the box selecting from the following options:
    - C1 Test – Record and Export
    - C2 Test – Import and Calculate
    - C3 Test – Data Submission
    - C4 Test – Data Filtering
  - For Records Options, note that Randomize Records and Duplicate Records have already been pre-checked because these options are recommended for the most robust testing (although they can be unselected, if needed)
  - For Annual Update Bundle, you must select which bundle of eCQMs you are certifying for:

- Cypress bundle for the 2020 Reporting/Performance period (eCQM value sets as of May 10, 2019)

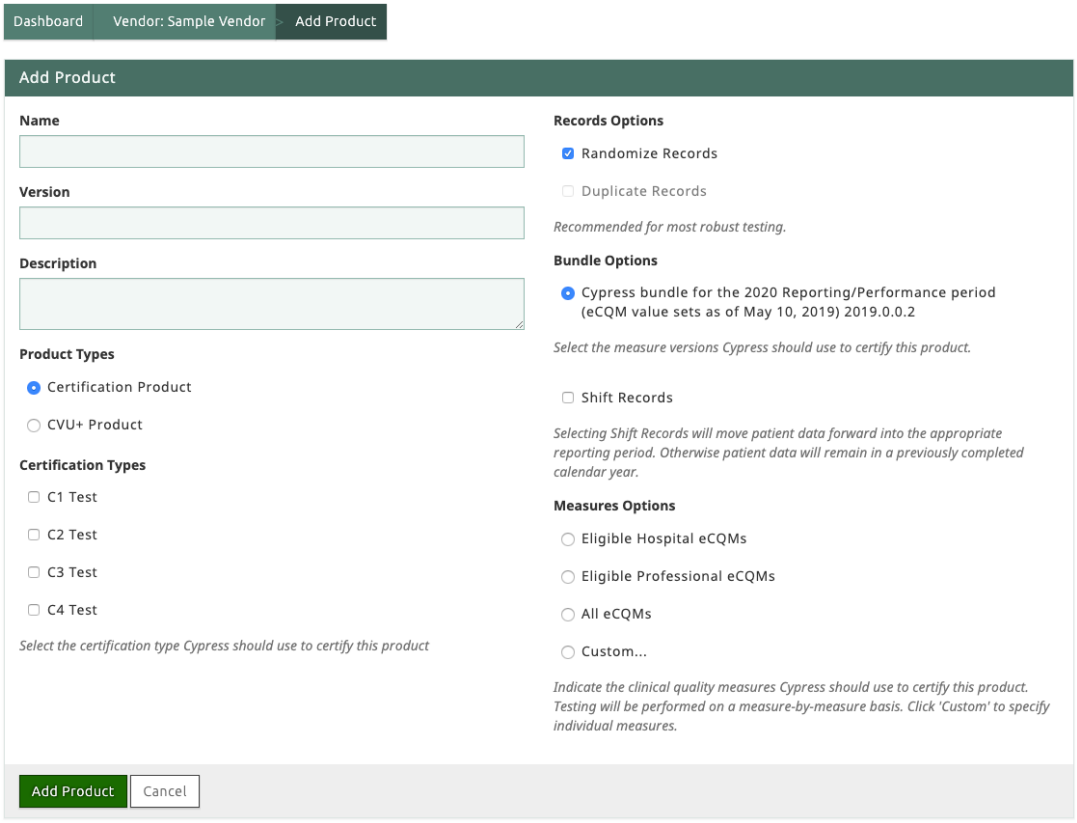


Figure 19. Vendor Add Product Page

- The Vendor Add Product page also has a section entitled "Measures Options" that must be completed before adding a product. For Measures Options, you must indicate the clinical quality measures (i.e., select one option) Cypress should use to certify this product, as shown in Figure 20. The options are:
  - Eligible Hospital eCQMs
  - Eligible Provider eCQMs
  - All eCQMs
  - Custom. Selecting "Custom" allows you to specify any individual measures Cypress should use to certify this product. Figure 21 presents a screenshot of the option for "Custom".

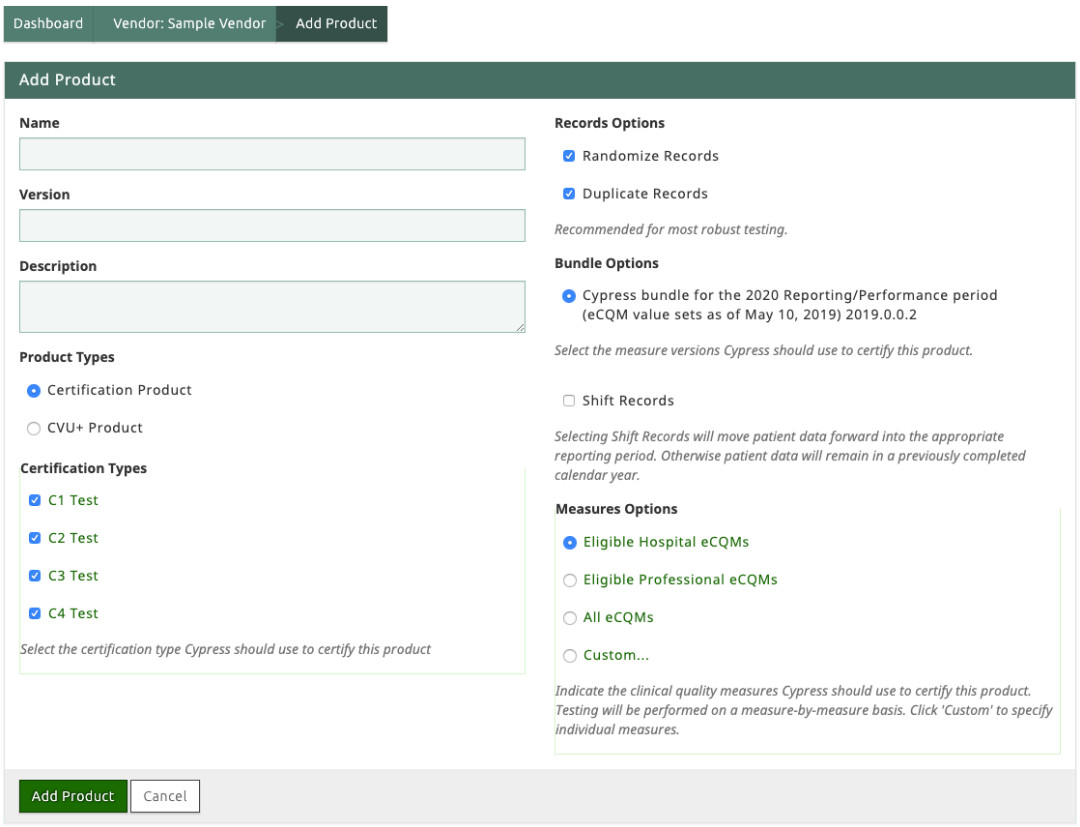


Figure 20. Eligible Hospital eCQMs Measure Selection

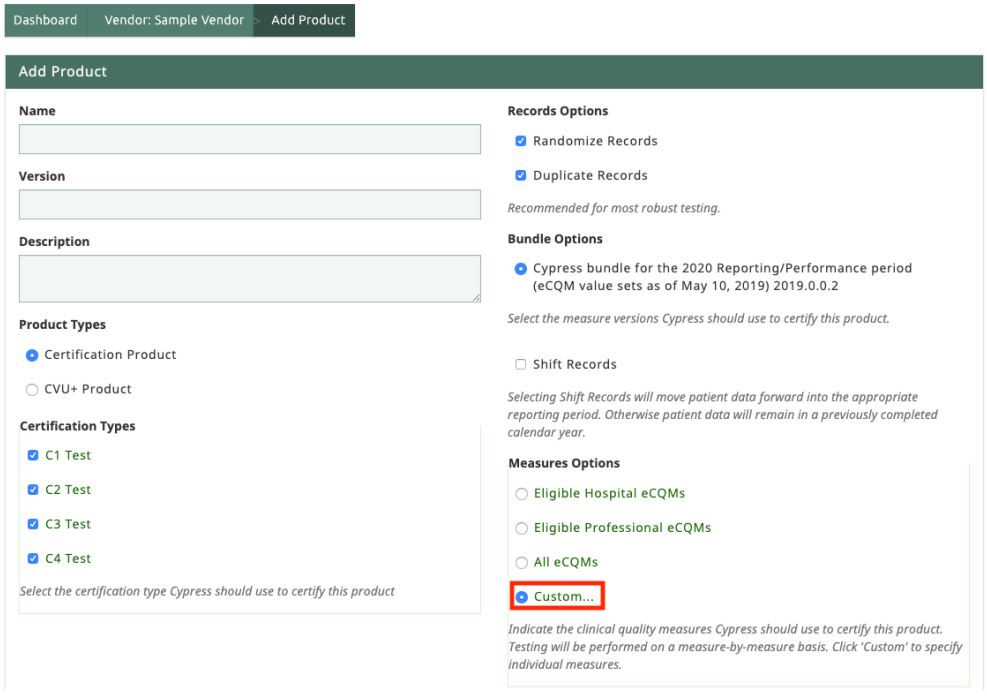


Figure 21. Vendor Add Product, "Custom" Measures Option

- Please note that testing will be performed on a measure-by-measure basis.
- Once all of the information has been entered on the Vendor Add Product page, select **Add Product**, as shown in Figure 22.

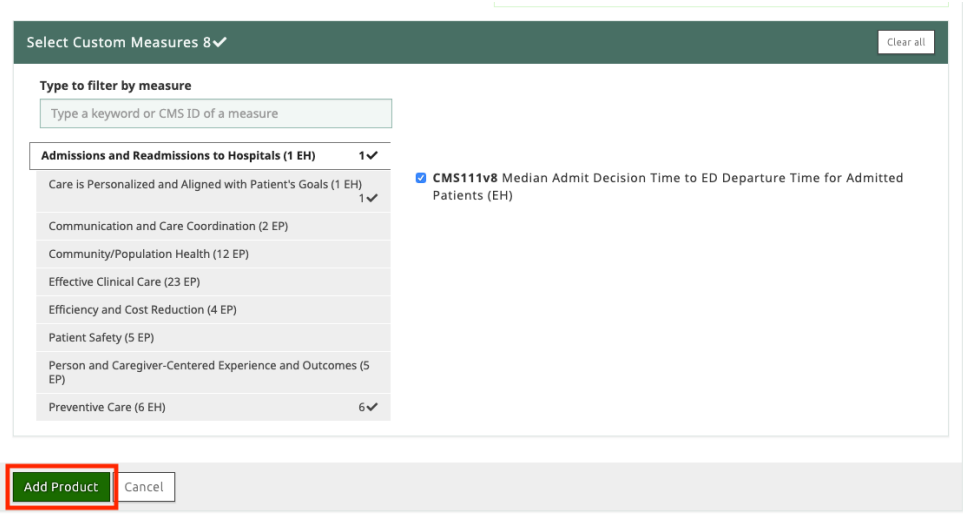


Figure 22. Vendor Add Product page, Select "Add Product"

- The Vendor and Product will now display on the Dashboard.
- Select the product name under Products to begin defining tests for the product as shown in Figure 23.

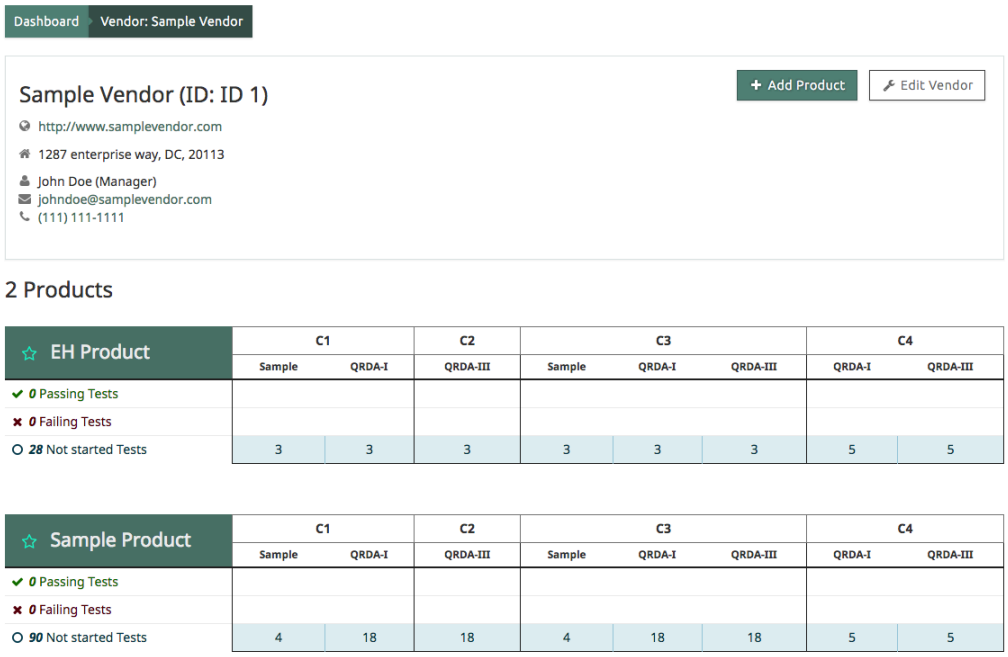


Figure 23. Dashboard Displaying a Vendor with Two Products Added

3.4 Test Execution

Background

This process evaluates the capability of the health IT system under test (SUT) to electronically generate the proper eCQM artifacts for the eCQMs being certified.

The Test Proctor provides the Cypress v5.0 Test Data for the clinical quality measures for which the technology will be tested in the format selected by the EHR vendor.

Depending on the test, the vendor manually inputs or electronically downloads the patient test data from Cypress that is used to test their technology.

- Selecting C1 certification along with C2, C3, and C4 will provide the vendor with the following certification test options that allow a Test Proctor to examine the eCQMs implemented in their technology:
  - C1-C3 Record Sample tests, which will have only four predetermined measures for testing of C1 and C3 certifications. This tab validates the technology for C1 and C3 certifications by entering specified patient data for four measures. Certifiers will download a QRDA zip file of patients, which is uploaded into their technology and re-uploaded into Cypress.
  - C1-C3 (QRDA-I), which will contain measures (based on your selection of all eCQMs or Custom for either hospitals or professionals). This tab will test the technology's ability to record and export (C1) and submit (C3) measure-based data.
  - C2-C3 (QRDA-III), which tests the technology's ability to import and calculate (C2) and submit (C3) measure-based data. Certifiers will submit XML patient files exported from their technology to verify calculation and submission of reporting.
  - C4 (QRDA-I and QRDA-III), which test the technology's ability to filter patient records.

This process enables you to test the product based on the Certification Types and Measures Options you selected when you created the product.

3.4.1 Automated Measure Test Execution

C1 as well as a C2, C3, or C4 certification type all require automated measure test execution. Figure 24 shows C1 and C2 certification types selected for all hospital eCQMs with randomized and duplicate records to be included in the test data files created by Cypress. Products certifying to C2 criteria in addition to C1 will create a product that has a limited number of C1 record sample test measures, automated C1 measure test, and any other certification tests created.

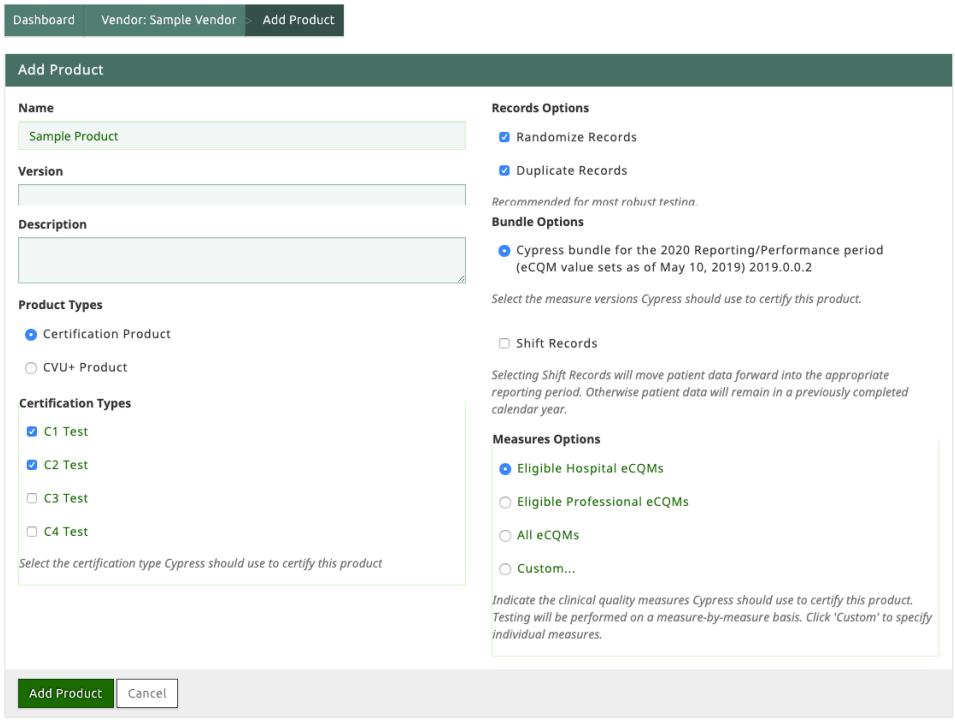


Figure 24. C1-C2 Automated Entry Certification

Figure 25 shows the result of adding the C1-C2 certification.

Figure 25. Add Product for Automated Entry of Measure Data

To select a measure for testing, click on the product name shown in Figure 26.

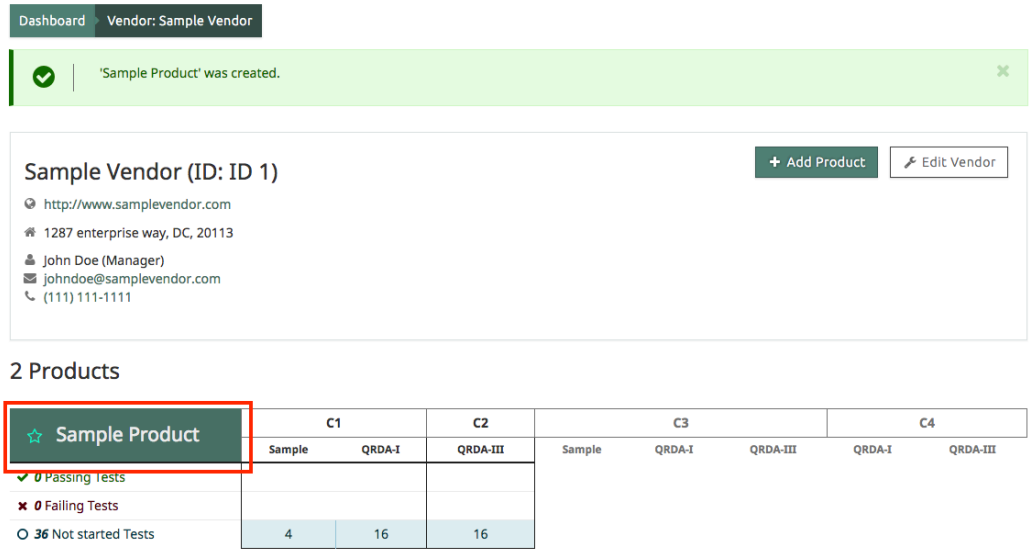


Figure 26. Selecting A Product to Test

Figure 27 shows the certification tests created for C1-C2 Hospital measures. Note the tab for record sample that contains only four measures as well as tabs for C1 all Hospital and C2 certifications. The first Record Sample Test validates the technology for C1 certification by entering specified patient data for those identified measures. The second tab, C1 (QRDA-I), tests the technology's ability to record and export (C1), while the third tab, C2 (QRDA-III) tests the technology's ability to import and calculate (C2). Two sections appear, side by side, toward the top of the page: Product Status and Download Full Test Deck. On the left side of the page is the Product Status section that provides, for each Certification Type (based on the Measures Options you selected), a quick summary of the test cases that have passed, failed, and not yet started. On the right side of the page is a section entitled Download Full Test Deck. This download contains a folder for each measure selected for this product. These folders contain XML documents for each patient associated with that measure.

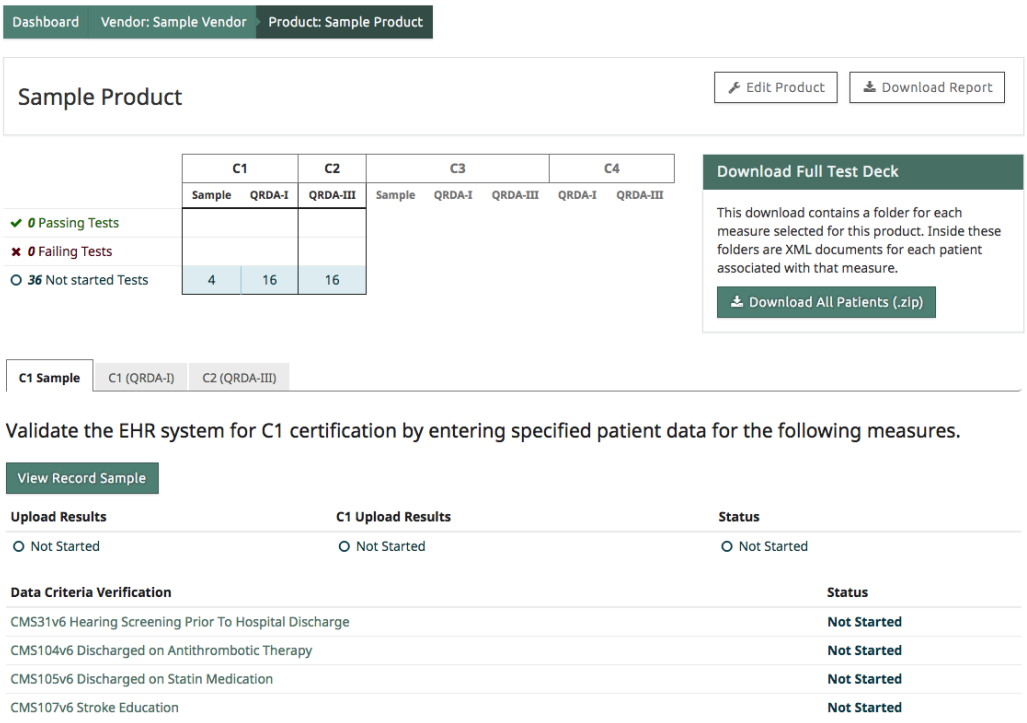


Figure 27. Showing C1 Record Sample, C1 Automated, and C2 Product Measures

To execute a Test for C1 (QRDA-1), select that tab and select the desired measure to begin testing, using either the Upload Link (if you already have your zip file ready for upload), or click on the Measure Name to download a test file to upload for C1 Certification testing as shown in Figure 28. The upload button will display a file selection dialogue box to select your file. The Measure Name Link will take you to the screen shown in Figure 29.

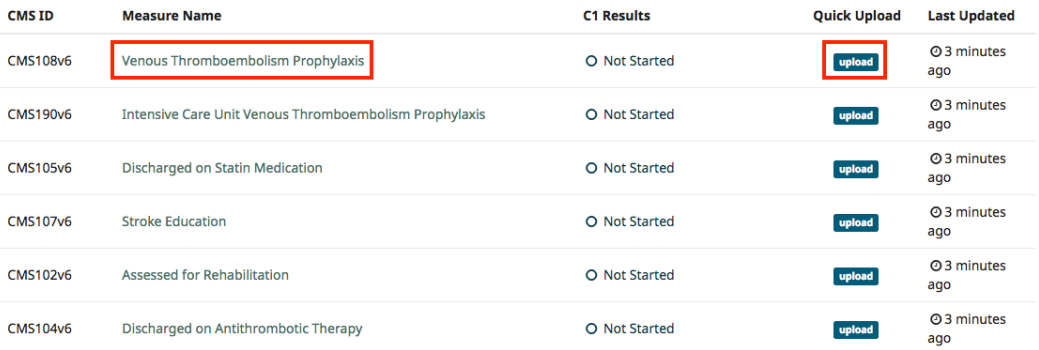


Figure 28. Product Measure Upload or Measure Name Selection

Once you have selected the Measure Name you want to test, Cypress displays the test page for that individual measure (e.g., CMS108v6) as shown in Figure 29.

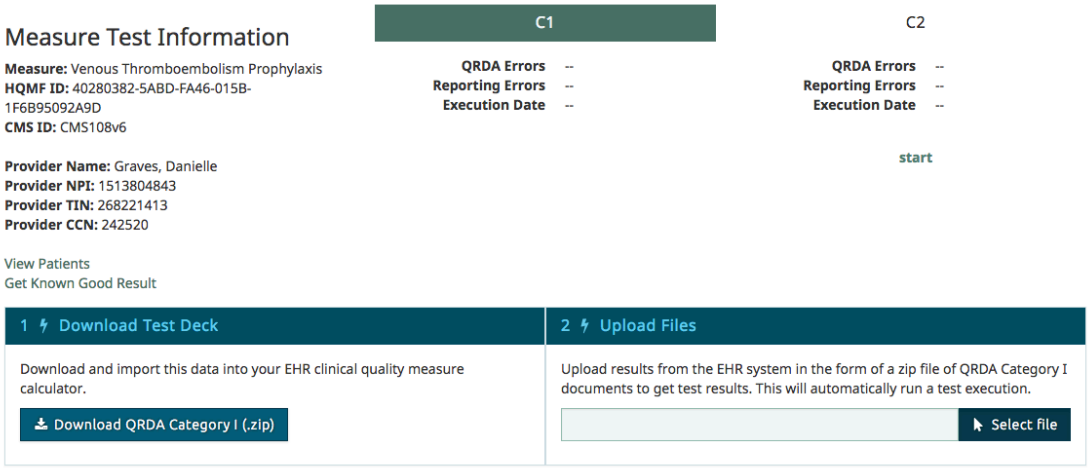


Figure 29. Individual Measure Test Page

- Patient test data for the selected eCQMs of the specified test must be downloaded in the format required for the test.
- Click the **Download QRDA Category I (.zip)** button to download the test data for that selected eCQM. The downloaded zip file will contain duplicate and randomized patient records that your technology should correct for the uploaded portion of the test. The downloaded patient record test data will be contained in a zip file. Figure 30 shows an example filename entry.

Figure 30. Zip File of Patient Test Data for Selected eCQM

- If you click the **View Patients** link (shown in Figure 29), you will see a listing of the patients for that specific measure.
- Click **Get Known Good Results** link to download a zip file of patients that will pass the measure test you are planning to conduct as shown in Figure 31.

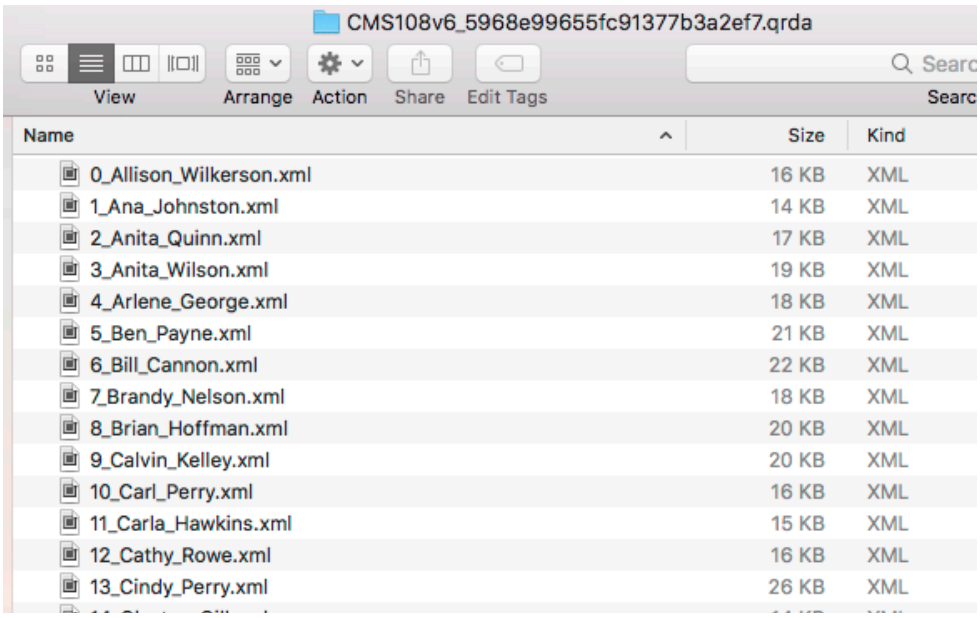


Figure 31. Listing of Zip File of XML Patient Test Data for Testing Selected eCQM

- Select a single patient record and open the XML from the zip file listing to view the information. Figure 32 presents an example screenshot.

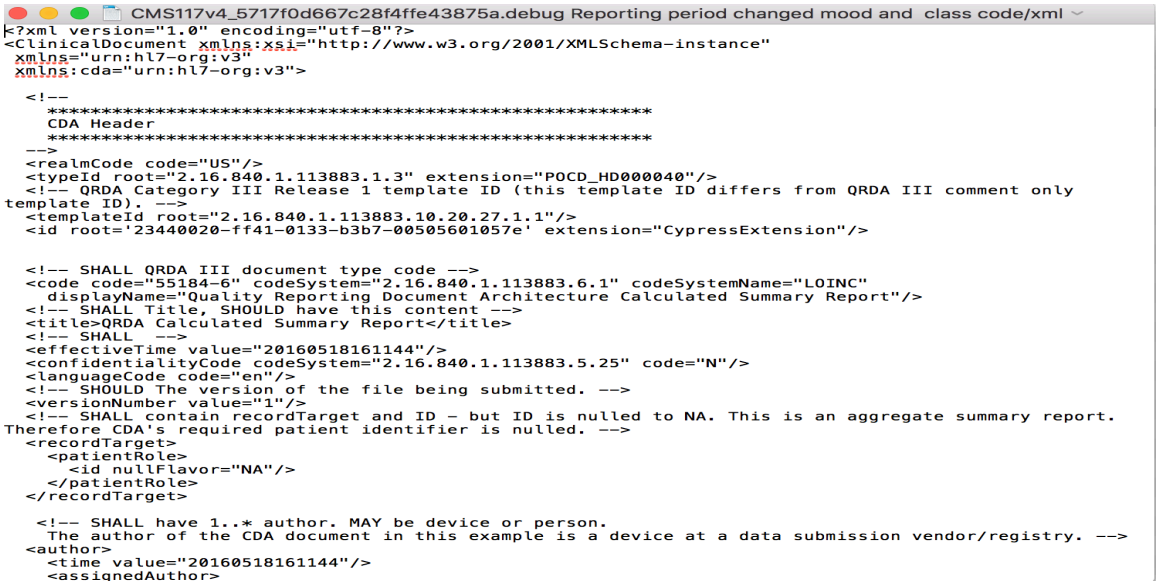


Figure 32. Patient XML File for C2 Test

- Once the technology has generated the test results in the QRDA Category I format, the results are uploaded from that individual measure's test page under the Upload files section. For C2 and C3 testing, this upload would occur in QRDA Category III format.
- Click on **Select file** as shown in Figure 33, browse to the QRDA Category I file you want to upload, and click **Choose**.

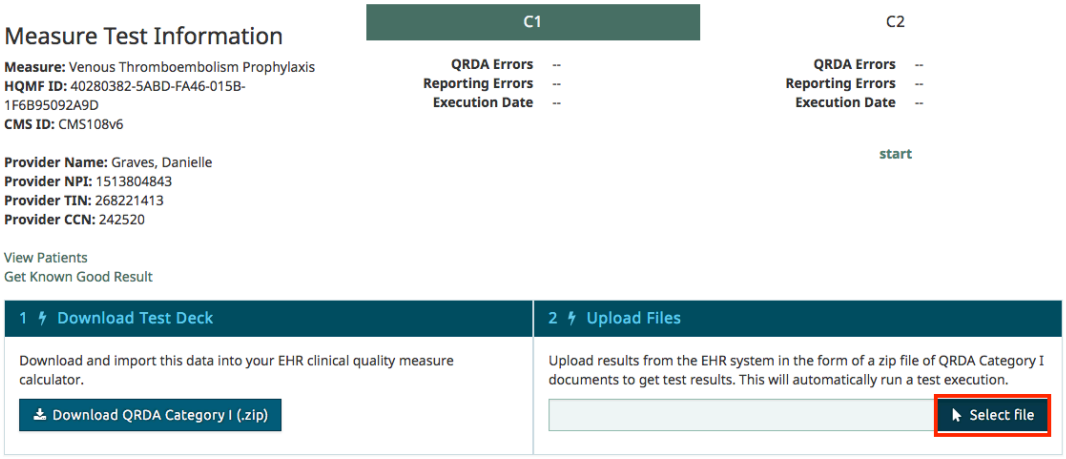


Figure 33. Upload Test Execution Results

- The Test Proctor will then validate that the proper eCQM artifacts in QRDA Category I file format for the test being performed are electronically generated by the health IT SUT.
- Validation results will then be displayed in the Dashboard for that specific vendor's product as shown in Figure 34.

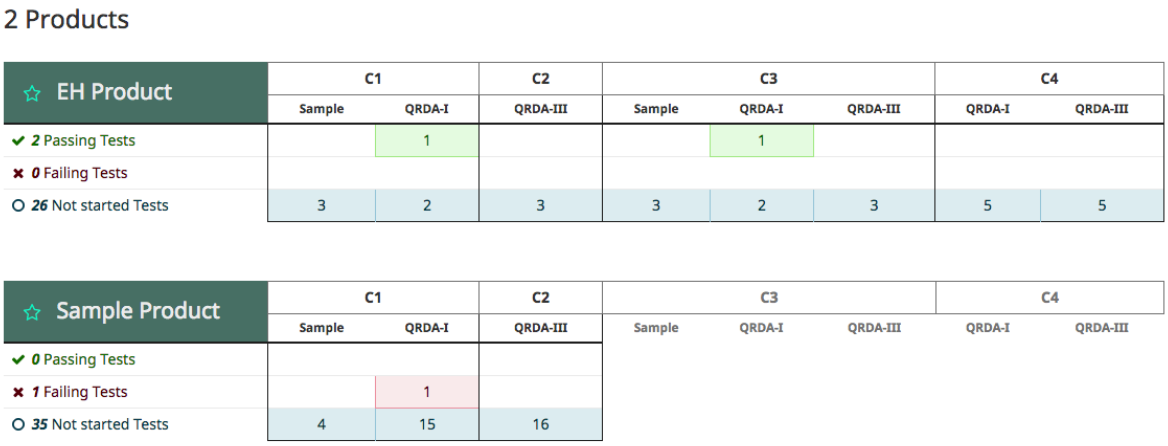


Figure 34. Example of Test Execution Summary Results

3.4.2 Record Sample Test

To begin record sample testing (and validate the technology for C1 certification by entering specified patient data for specific measures), select the Record Sample Test tab and then select **View Test** as shown in Figure 35.

Figure 35. Record Sample Test, Select "View Test"

As shown in Figure 36, this action will bring you to the Record Sample Checklist test page, which displays the status of each test on the right margin (i.e., Not Started, Passing, or Failing). The Record Sample Checklist page also displays a summary of each test and allows the user to check off (and save) a test when it has been completed.

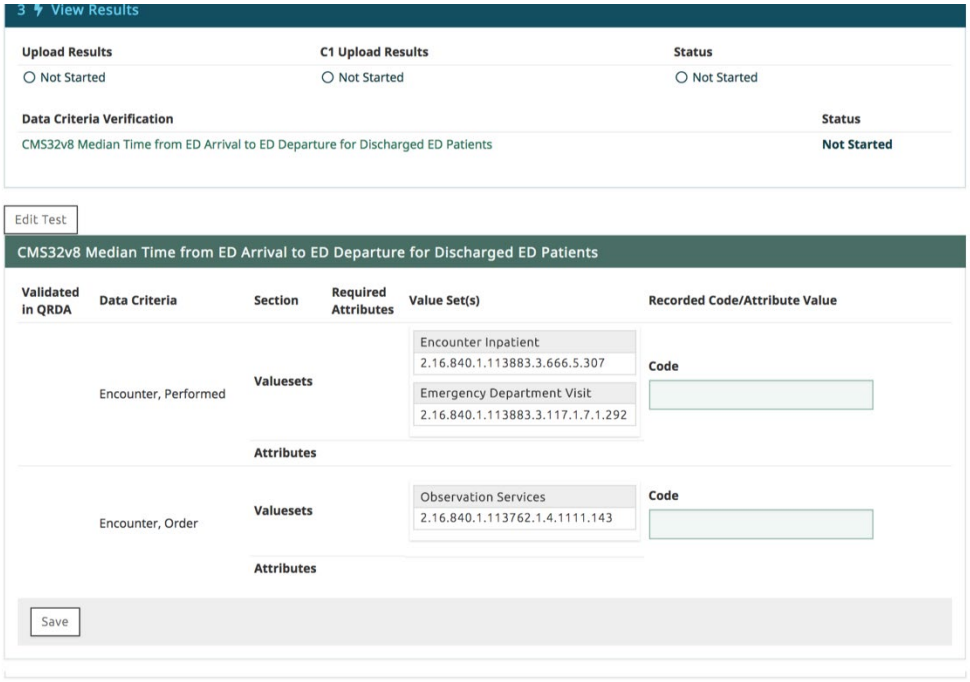


Figure 36. Record Sample Page

When choosing a code to demonstrate entry of a Record Sample data criteria, click on the allowable value sets to view a listing of valid codes as shown in Figure 37. Clicking on the allowable value sets will open a window displaying all the codes in the value sets as shown in Figure 38. The list is searchable, allowing a user to find an appropriate code for entry.

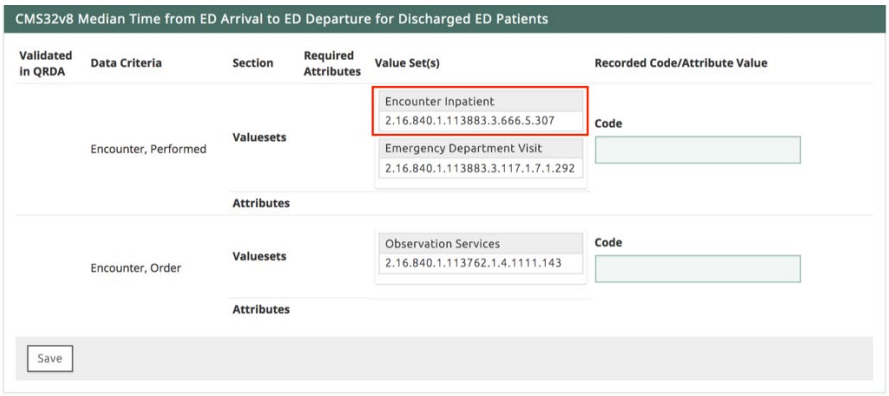


Figure 37. View Listing of Valid Codes

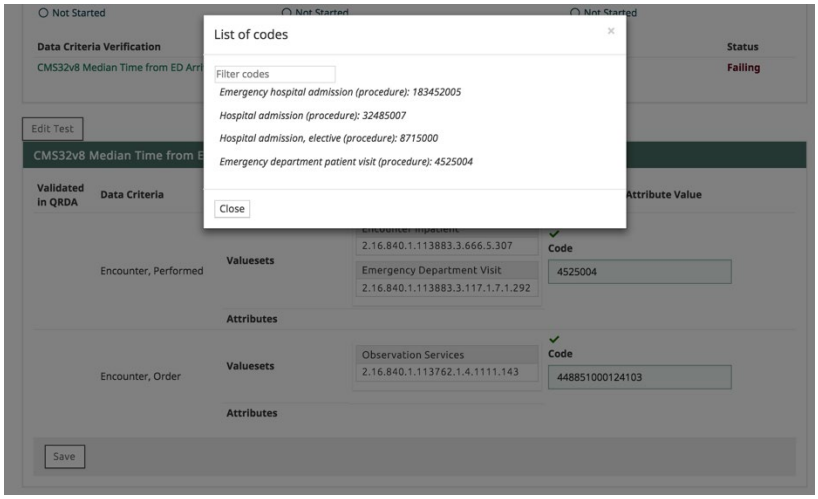


Figure 38. Search for Valid Codes

Completing and saving a test, as shown in Figure 39, will then refresh the page and provide an updated status description for that specific test.

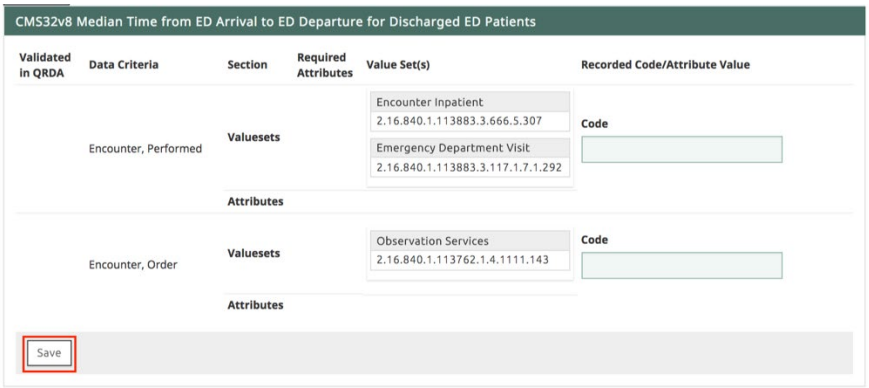


Figure 39. Complete and Save a Test

When all of your manual test measure entries are correct and have a completed checkmark, the select button will be enabled to allow upload of your XML files (zipped into a single file) into Cypress for certification as shown in Figure 40.

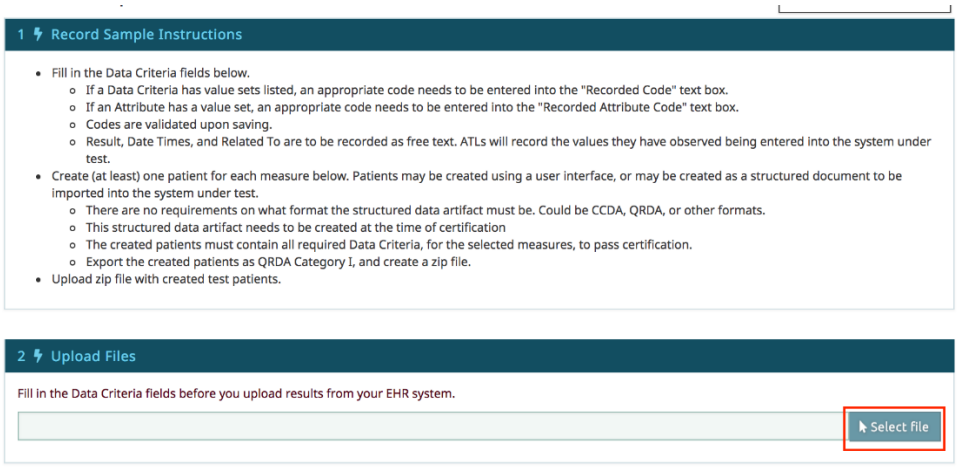


Figure 40. Select File to Upload

3.4.3 CQM Filtering Test

The filter functionality included in this criterion allows a provider to query for eCQM results using one or a combination of data captured by the certified health IT for quality improvement and quality reporting purposes. It can also help identify health disparities, enable care quality improvement, and support providers in delivering more effective care to their patient populations. This certification criterion requires that a Health IT Module be capable of recording data (according to specified standards, where applicable) and filtering eCQM results at both patient and aggregate levels. These filters include, but are not limited to, practice site address, patient age, patient sex, and patient problem list.

- To begin eCQM filtering testing, click the C4 (QRDA-I and QRDA-III) Filtering Test tab, and click **start** on the Category I or Category III filtering criteria you are interested in testing, as shown in Figure 41.

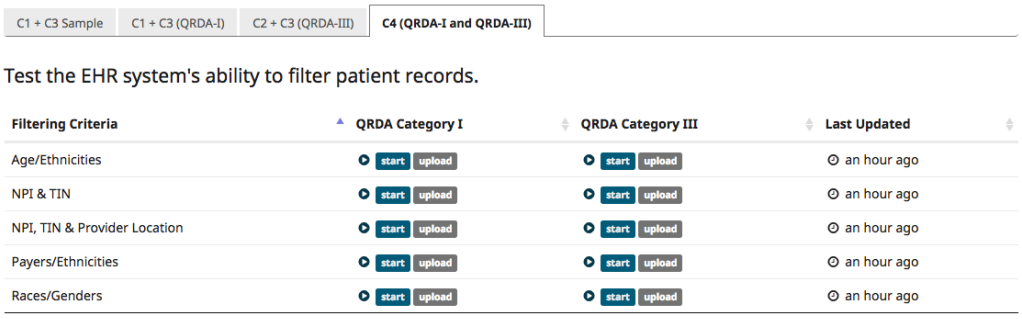


Figure 41. Select a Category I or Category III to Test

- In this example, the Category I test page for Median Time from ED Arrival to ED Departure for Discharged ED Patients will be displayed as shown in Figure 42.

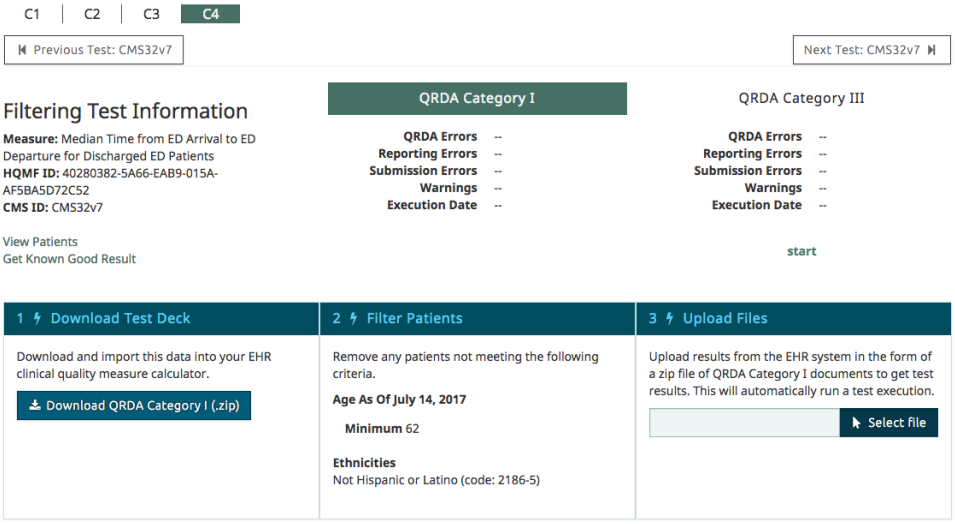


Figure 42. Category I Test Page for Median Time from ED Arrival to ED Departure for Discharged ED Patients

- Patient test data for the specified test must be downloaded in the format required for the test. This step, and those following, adhere to the same process as the steps outlined in the *Measure Tests* section, and will not be repeated here.

3.5 Test Execution Success Criteria

The criteria to determine a successful test outcome depend on whether the health IT product is being certified against the EP eCQMs or the EH eCQMs. The criteria for test execution success are as follows:

- **For EP eCQMs**, a successful test outcome is one in which the following conditions are true:
  1. There were no XML validation errors in either the QRDA Category I submitted data or the QRDA Category III submitted data.
  2. All of the eCQM results calculated and submitted by the health IT SUT exactly match the values that Cypress v4.0 was expecting.
- **For EH eCQMs**, a successful test outcome is one in which the following conditions are true:
  1. There were no XML validation errors in either the QRDA Category I submitted data or the QRDA Category III submitted data.
  2. All of the eCQM results calculated and submitted by the health IT SUT for discrete measures exactly match the values that Cypress v5.0 was expecting.
  3. The eCQM results calculated and submitted by the health IT SUT for continuous variable tests are within a defined delta of the value that Cypress v5.0 was expecting.

For both types of technologies, it is acceptable to have XML validation *warnings* generated by the Cypress validation process. These warnings do not constitute a test failure; however, the Test Proctor should review the warnings generated and record any relevant observations about the reasons for the warnings.

Cypress groups failed test cases into three categories: (1) QRDA errors associated with logic and improper use of the QRDA standard, (2) reporting errors associated with errors in the calculation and aggregation of measure data for reporting purposes, and (3) submission errors associated with improper logic and formatting for submitting measure data to CMS. In addition to errors, Cypress will flag and report on warnings that indicate non-conformance with the CMS Implementation Guide (and associated schematron validation). Note, for health IT products not certifying for reporting (C3), non-conformance with the HL7 QRDA Implementation Guide will be treated as warnings. Figure 43 provides an example of measure test failure results.

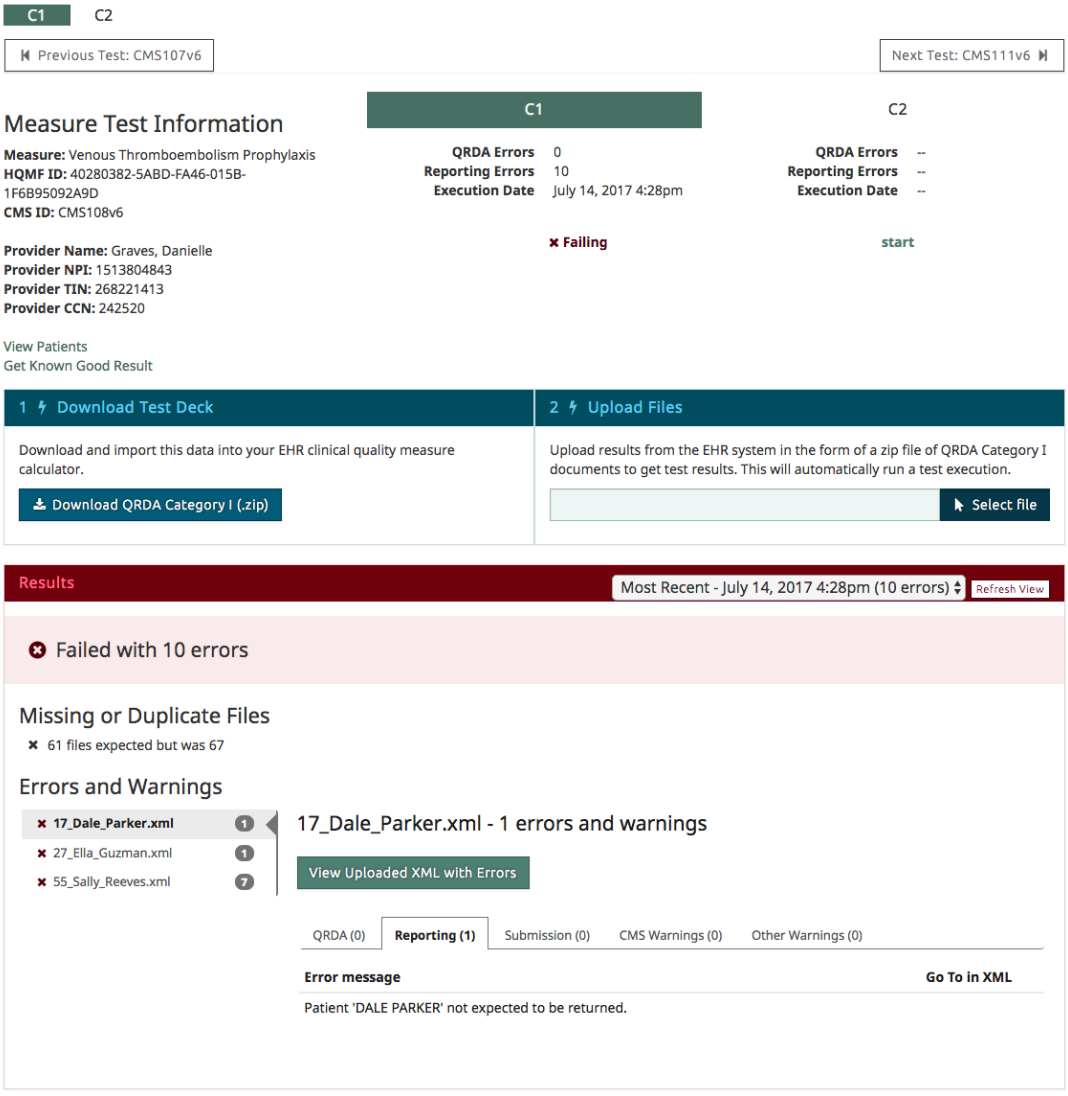


Figure 43. Measure Test Failure Messages

3.6 Submit

Electronically Submit Generated eCQM Artifacts

This functionality allows evaluation of the capability to electronically submit (a) calculated quality measures in accordance with the standard and implementation specifications, and (b) exported patient data sufficient to allow external calculation as follows:

- The Test Proctor commands the health IT SUT to generate and electronically submit the patient-level export in the QRDA Category I format for the clinical quality measures being tested.
- The Test Proctor commands the health IT SUT to generate and electronically submit an aggregate report in the QRDA Category III format of the clinical quality measures calculated in the test.
- The Test Proctor validates that the calculated clinical quality measures are submitted in accordance with the QRDA Category III standard and implementation specifications by uploading the QRDA Category III XML via the Cypress v5.0 User Interface and the Cypress-supplied XML Schema validation.
- The Test Proctor validates that the exported patient-level eCQM data are submitted in accordance with the QRDA Category I standard and implementation specifications by uploading the QRDA Category I XML via the Cypress v5.0 User Interface and the Cypress-supplied XML Schema validation.

3.7 Verify

Verify Electronic and Accurate Generation of Clinical Quality Measure Artifacts

This functionality allows evaluation of the capability to electronically and accurately generate eCQM artifacts appropriate for each phase of the test procedure as follows:

- After the Test Proctor validates the submission of the QRDA Category III, the Test Proctor evaluates and displays the accuracy of the submitted clinical quality measure results via the Cypress v5.0 User Interface.
- The Test Proctor generates a test artifact bundle containing all test data used for this test execution, all products generated and submitted by the health IT SUT, and any other additional notes or information that the Test Proctor deems relevant into a single archive file that is cryptographically signed.

3.8 Cypress Validation Utility + Calculation Check (CVU+)

This functionality integrates the existing Cypress Validation Utility into Cypress with the following enhancements to align with the CMS submission systems:

- Developer generated test patients – A vendor can supplement Cypress test patients with their own test patients to increase eCQM logic/code coverage.
- Code System Preference – A vendor can choose preferences for the code systems to be used in test patients.

- Multi-Measure Tests – A vendor can test calculations with a single test deck across multiple measures.
- Enhanced CMS Implementation Guide validations – CVU+ verifies Implementation Guide constraints that are not validated by schematron.

3.8.1 Developer generated test patients

After following the instructions in subsection 3.3, Cypress v5.0 Preparation for Testing, to add a vendor, a user can manage a set of 'Vendor Patients' for use with CVU+ tests created for that vendor. This set of 'Vendor Patients' can be managed by selecting Vendor Patients from the Vendor Page as shown in Figure 44.

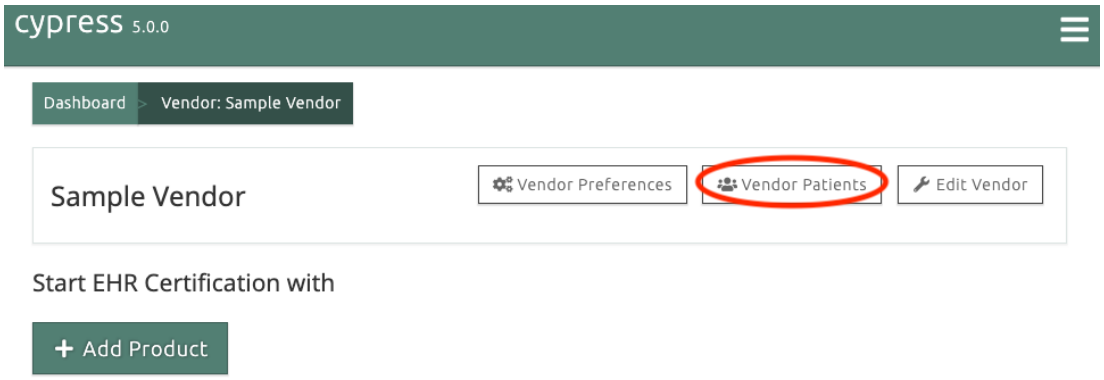


Figure 44. Vendor Page Select Vendor Patients

From the Vendor Patient page, you can add Vendor Patients by selecting **Import Patients** from the Vendor Patients page as shown in Figure 45.

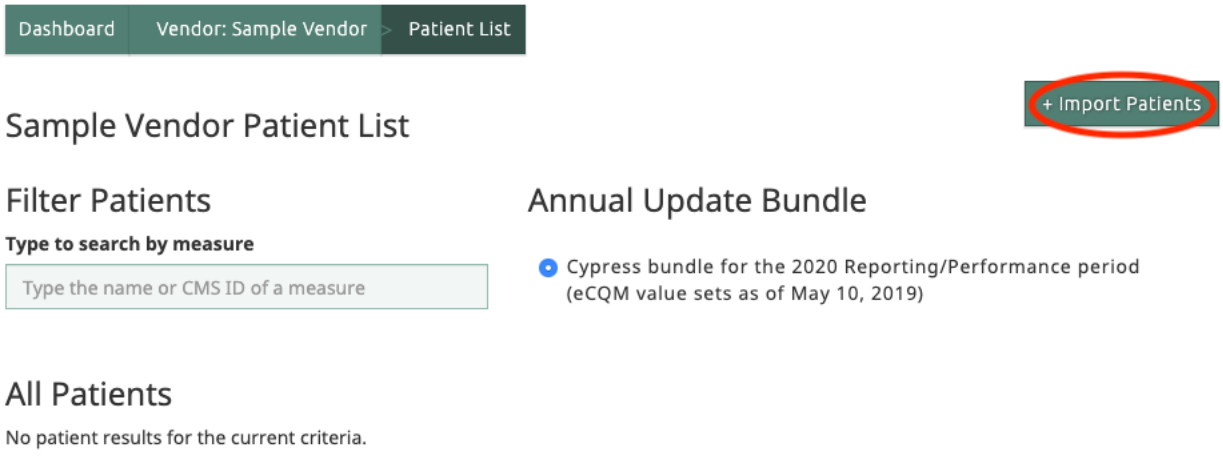


Figure 45. Import Patients

From the **Import Patients** page, you can **select** the bundle you would like to upload the Vendor Patients into (e.g., Cypress Bundle for 2020 Reporting/Performance period). Select **Choose File** on the **Import Patients** page to select a .zip file of QRDA documents to upload. After a .zip file

of QRDA documents is chosen, select **Import Patients** to start the import process as shown in Figure 46.

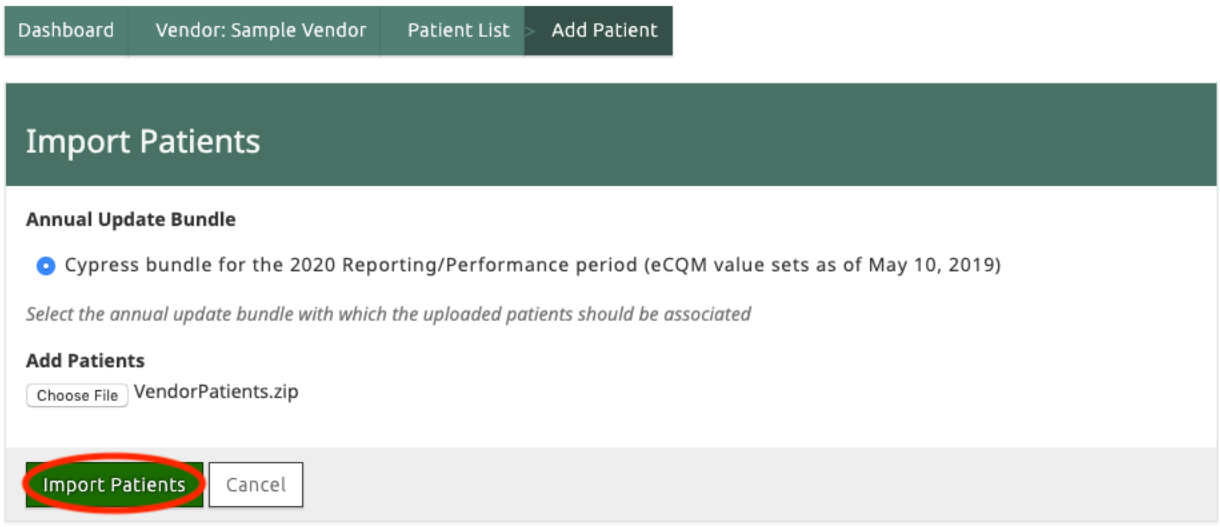


Figure 46. Import Vendor Patients

After the import process has completed you will be redirected back to the **Vendor Patients** page where you will be able to view a listing of the imported patients shown in Figure 47. The **Vendor Patients** page has all of functionally as the **Master Patient List**. This functionality is described in subsection 3.2.1, Master Patient List.

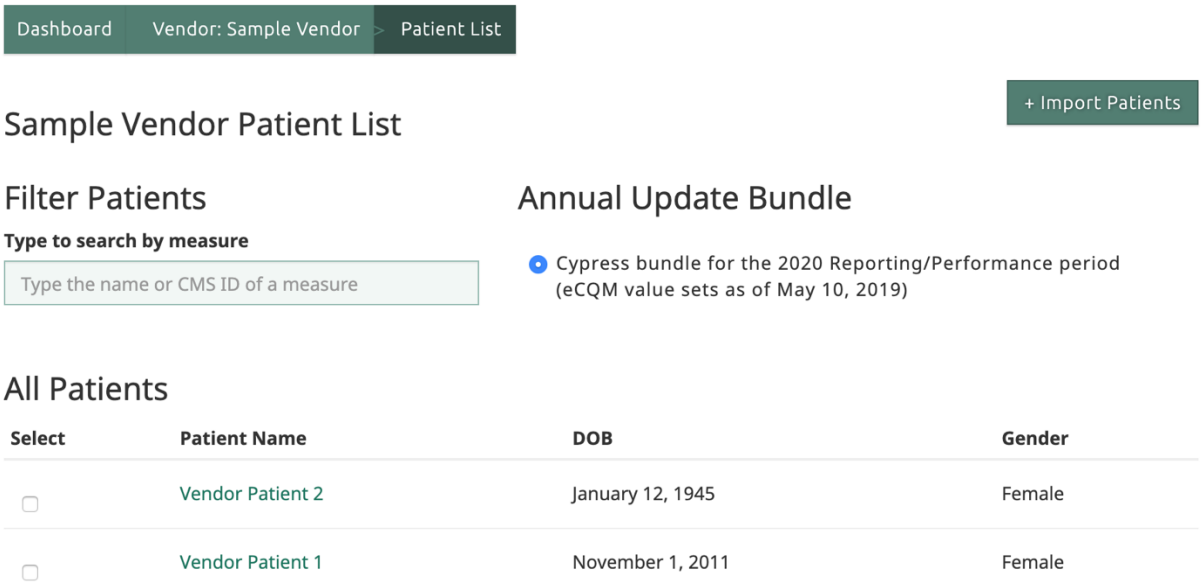


Figure 47. Listing of Imported Vendor Patients

From the **Vendor Patients** page, you can also delete patients you would no longer like to use in test generation. Deleting patients is accomplished by selecting the **checkboxes** to the left of the patients you would like removed and selecting **Delete Selected Patients** when it appears at the bottom of the page. This is shown in Figure 48. Note that a confirmation action is required to complete the any deletion actions.

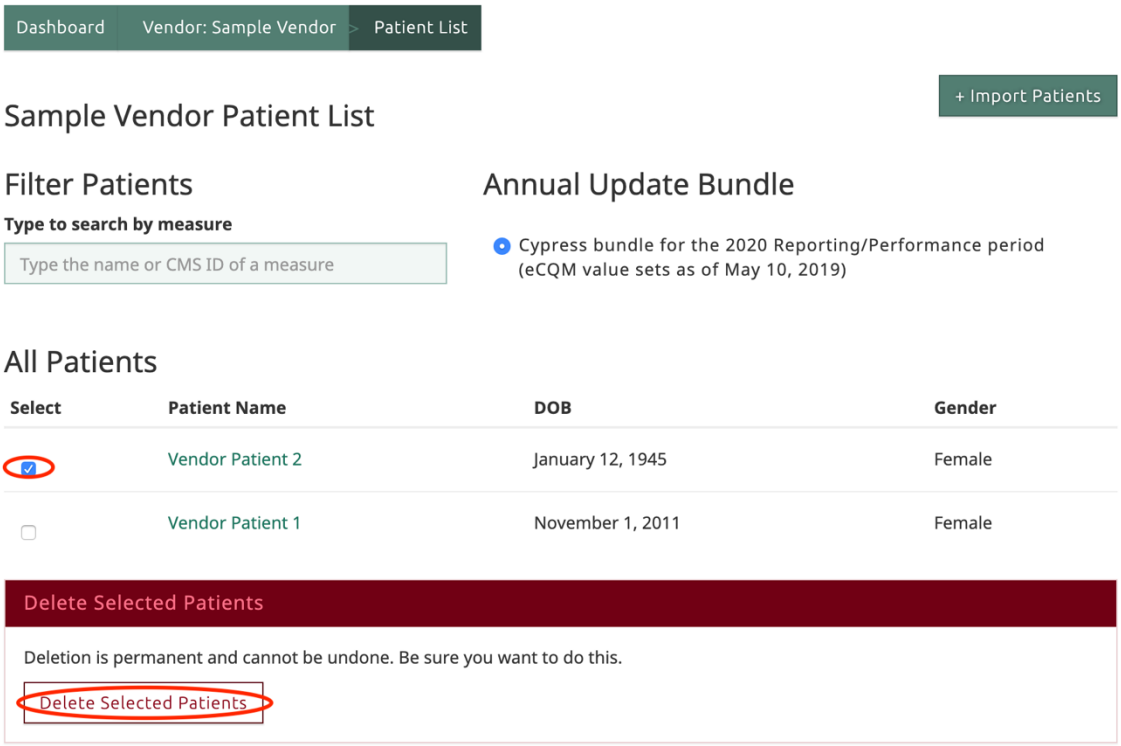


Figure 48. Delete Selected Patients

3.8.2 Code System Preference

After following the instruction subsection 3.3, Cypress v5.0 Preparation for Testing, to add a vendor, a user can manage code system preferences for use with CVU+ tests created for that vendor. These code system preferences will be used when selecting the codes to be included in generated test patients. Code system preference can be managed by selecting **Vendor Preference** from the **Vendor Page** as shown in Figure 49.

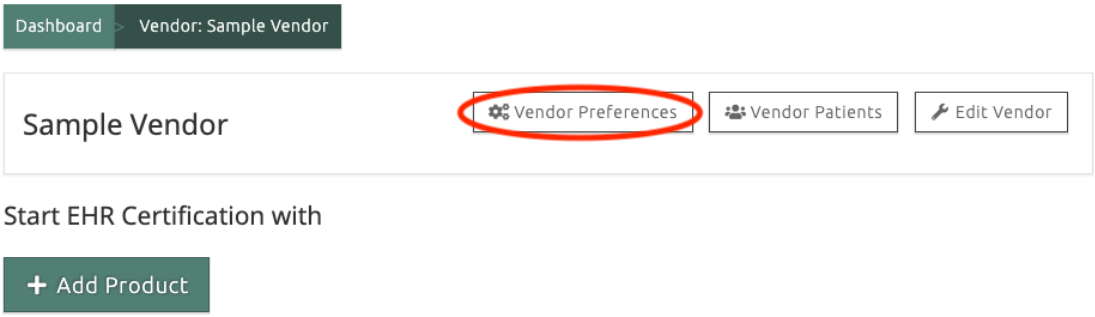


Figure 49. Vendor Preferences

On the **Vendor Preferences** page you can reorder the list of code systems available for each Quality Data Model data type. For example, the Adverse Event data types uses codes from the RXNORM and SNOMEDCT code systems. You can indicate RXNORM as your preferred code system by clicking and dragging the handle on the left side of the code system name and moving it to the top of the list as shown in Figure 50. By prioritizing RXNORM over SNOMEDCT, when a test patient has both RXNORM and SNOMEDCT codes available, only the RXNORM code will be exported in the QRDA document. After re-ordering a code system, you will need to select **Save** at the bottom of the page.

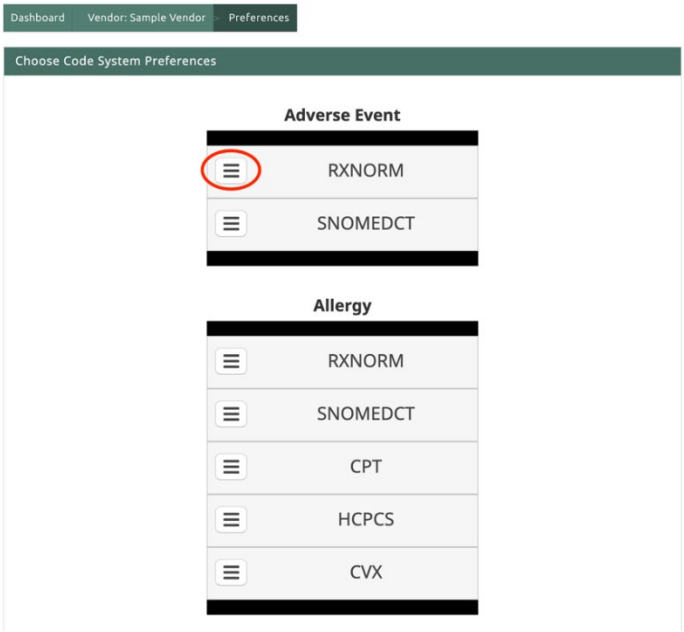


Figure 50. Ordering Code Systems

3.8.3 Creating CVU+ Tests

After following the instruction in subsection 3.3, Cypress v5.0 Preparation for Testing, to add a vendor, and following the instructions in 3.8.1, Developer Generated Patients and 3.8.2, Code System Preference, a user can create a CVU+ test to test calculations with a single test deck across multiple measures and test the ability to report QRDA documents to CMS submission systems. This test can be created by selecting Add Product from the Vendor Page as shown in Figure 51.

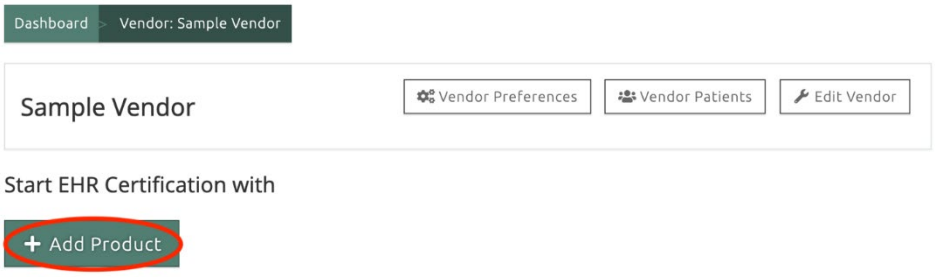


Figure 51. Add CVU+ Product

The main difference between creating a test for certification and creating a test for CVU+ is that you will need to select the CVU+ Product radio button highlighted in Figure 52 and you will have the option of selecting Include bundle patients (which will include test patients from the Cypress Bundle in the generated test decks), and the option of selecting Include vendor patient (which will include test patients uploaded following the steps in subsection 3.8.1, Developer Generated Patients). Additionally, CVU+ test do not require the selection of C1, C2, C3, or C4 certification criteria (as CVU+ is not a certification test).

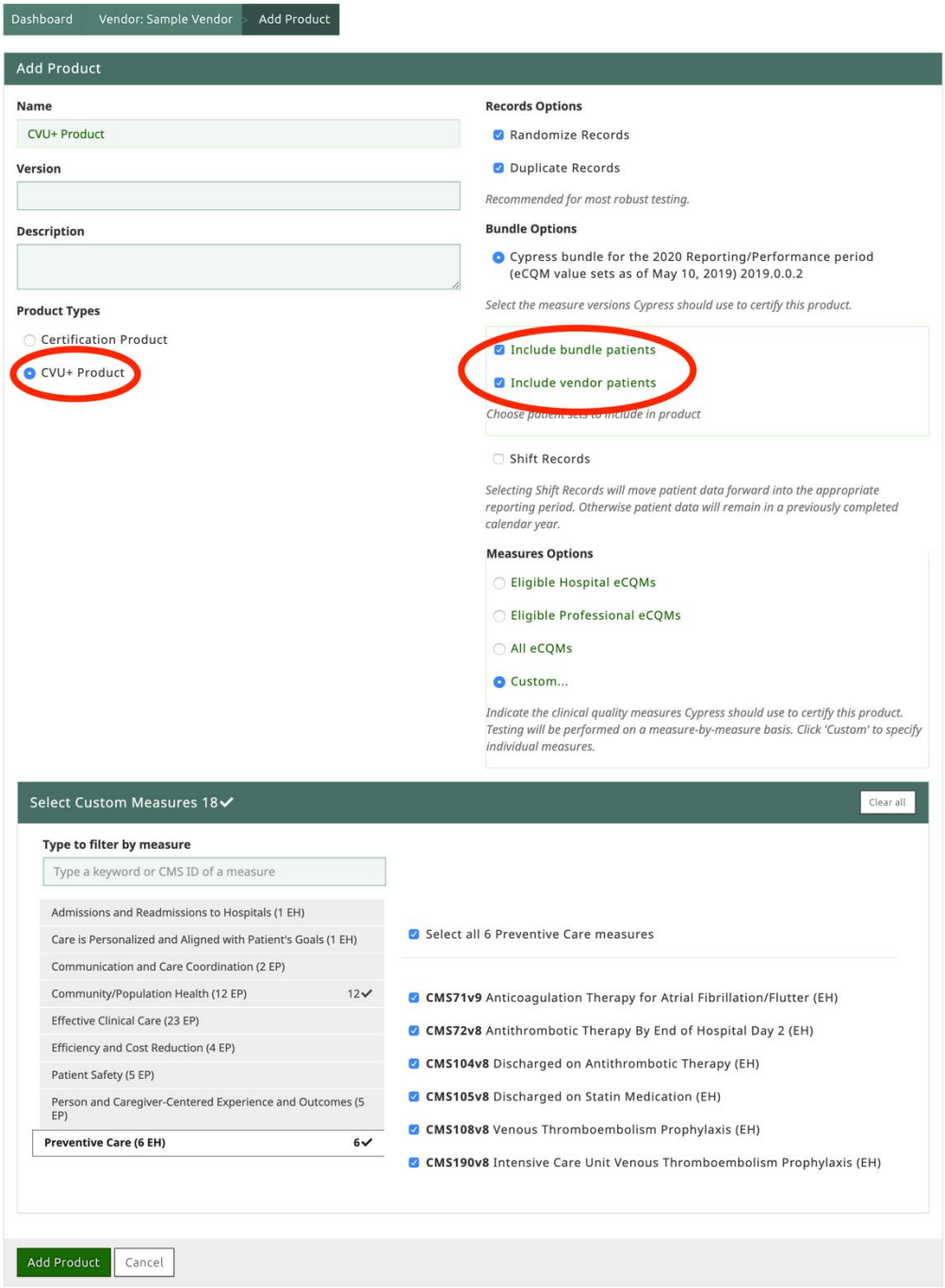


Figure 52. Creating a CVU+ Product

Once the CVU+ product is created, a user will be redirected to a CVU+ product page shown in Figure 53. This product page will list the Multi-Measure Tests for testing calculations with a single test deck across multiple measures, and CMS Program Tests for testing reporting requirement for CMS submission systems.

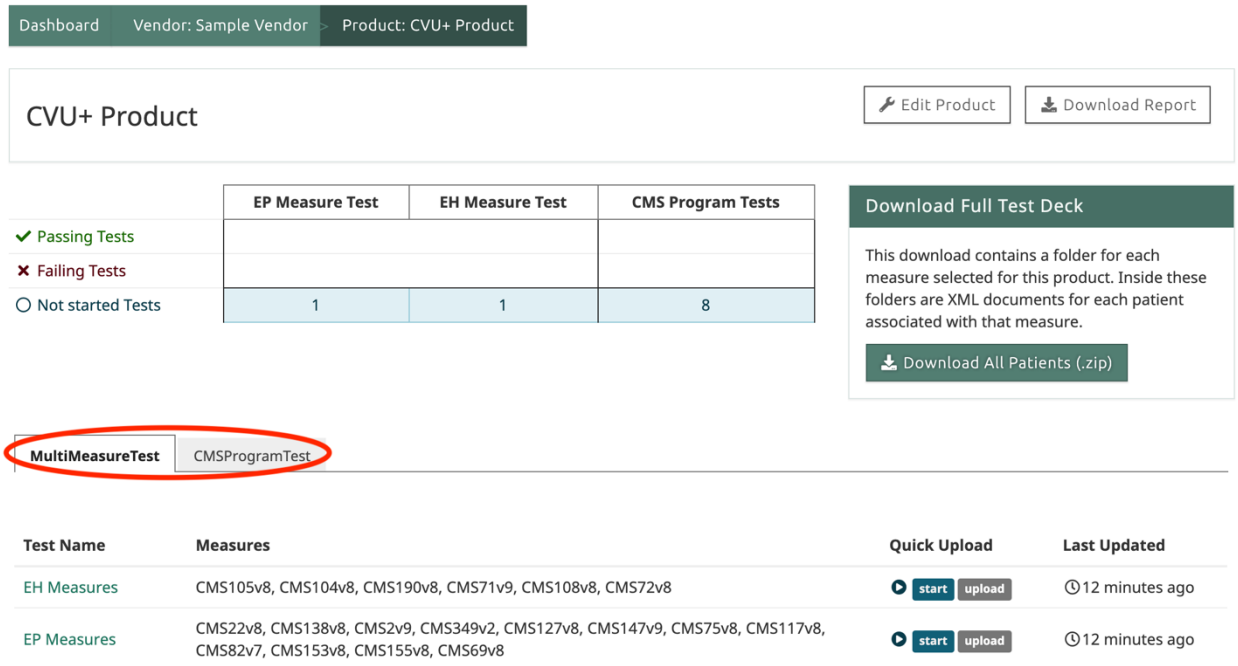


Figure 53. CVU+ Product Page

3.8.3.1 Multi-Measure Tests

When a **CVU+ Product** is created, Cypress will generate (at most) two Multi-Measure Tests. Cypress will generate one Multi-Measure Test for all of the Eligible Hospital/Critical Hospital eCQMs and Cypress will generate one Multi-Measure Test for all of the Eligible Professional / Eligible Clinician eCQMs. Both **EP Measures** and **EH Measures** tests require you to download a test deck of QRDA Category I patients and import the test deck into your system. The **EP Measures** test will only require you to upload a single QRDA Category III file that reports the calculations for all of the EP/EC measure. The **EH Measures** test will only require you to upload a single zip file of QRDA Category I files for the patients being reported. Error messages that result from the upload will be displayed in the same manner as the single measure tests in Figure 43.

3.8.3.2 CMS Program Tests

When a **CVU+ Product** is created, Cypress will generate a test for each appropriate CMS program shown in Figure 54. If EH measures are selected, Cypress will generate a test for the following programs:

- Hospital Quality Reporting for the Promoting Interoperability Program (HQR_PI)
- Hospital Quality Reporting for the Inpatient Quality Reporting Program (HQR_IQR)

- Hospital Quality Reporting for the Promoting Interoperability Program and the Inpatient Quality Reporting Program (HQR_PI_IQR)
- Hospital Quality Reporting for Inpatient Quality Reporting Program voluntary submissions (HQR_IQR_VOL)

If EP/EC measures are selected, Cypress will generate a test for the following programs:

- CPC+ (CPCPLUS)
- MIPS Individual (MIPS_INDIV)
- MIPS Group (MIPS_GROUP)
- MIPS Virtual Group (MIPS_VIRTUALGROUP)

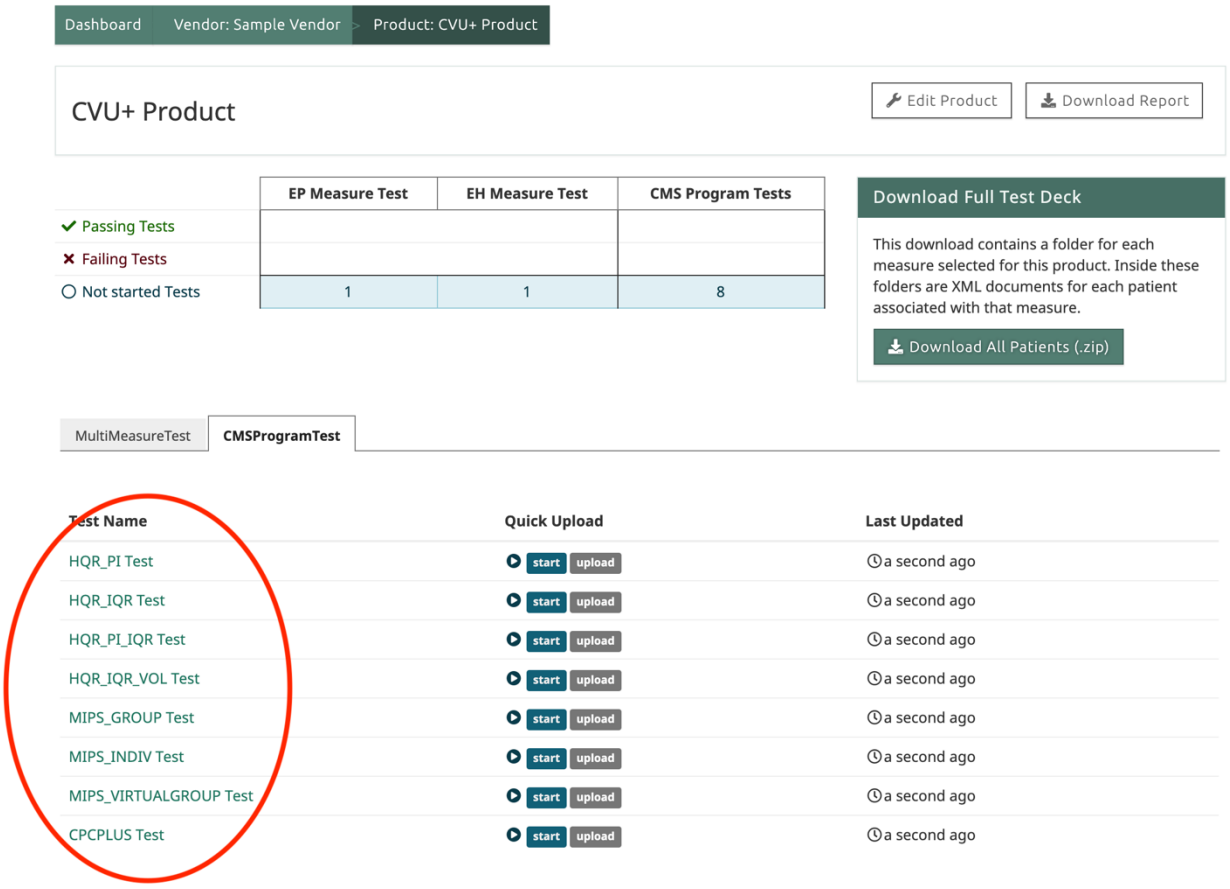


Figure 54. CMS Program Tests

CMS Program Tests follow a similar workflow as the C1 Record Sample Tests described in subsection 3.4.2. Clicking in the CMS Program Test name (shown in Figure 55) will take you to a test page for the specific program shown in Figure 56.

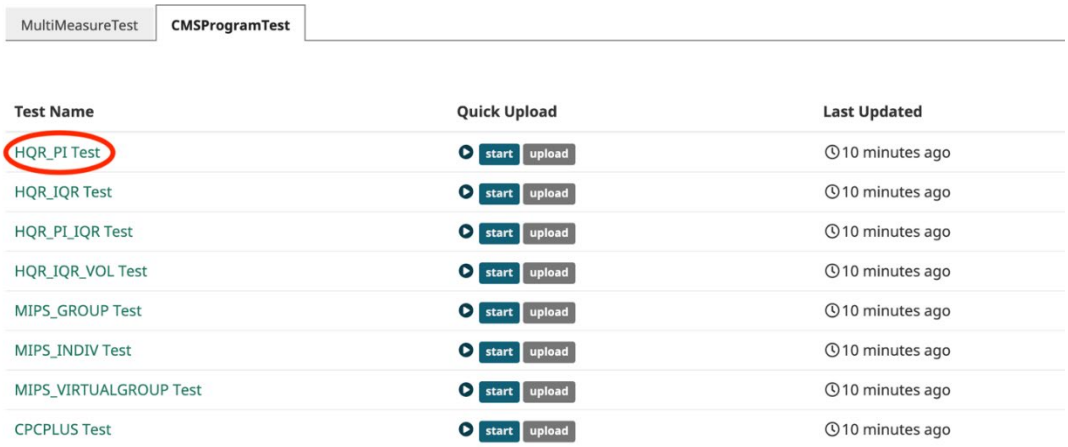


Figure 55. Select CMS Program Test

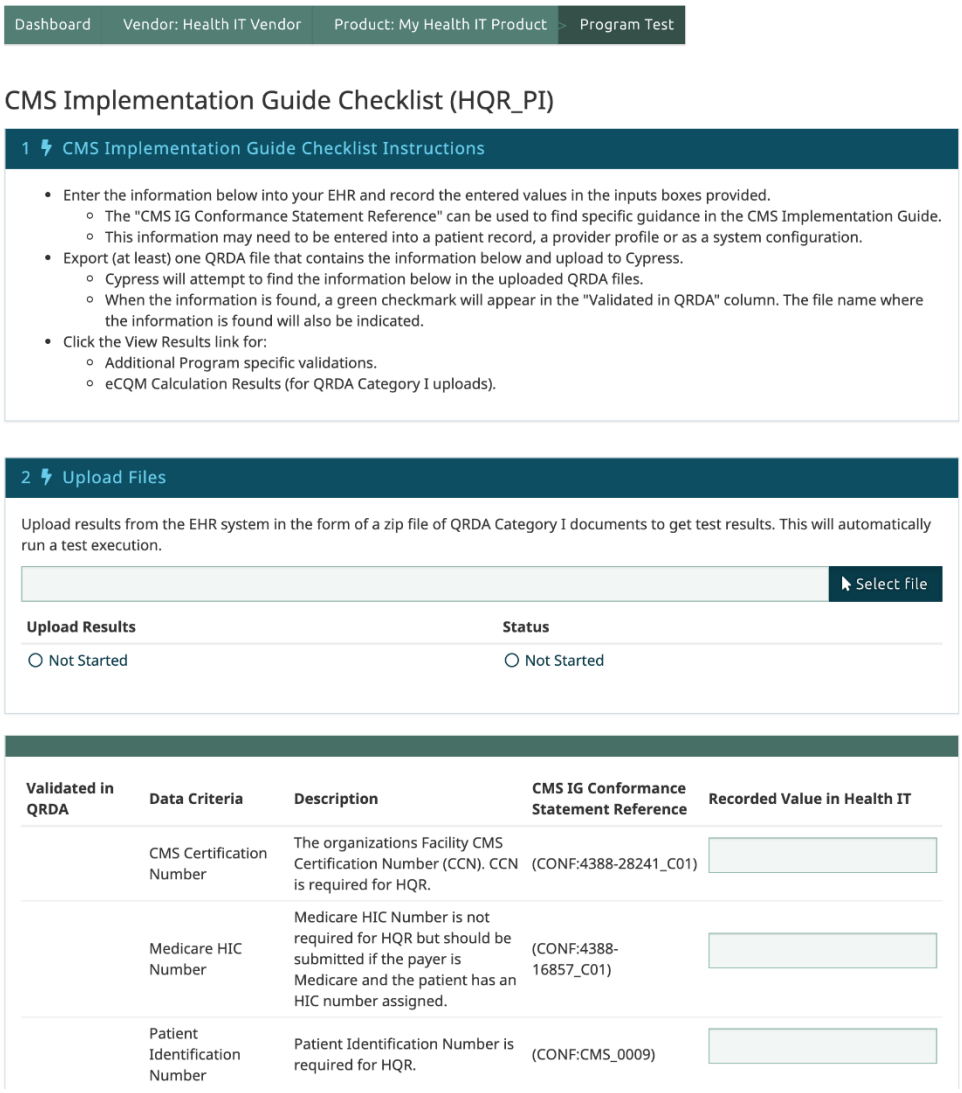
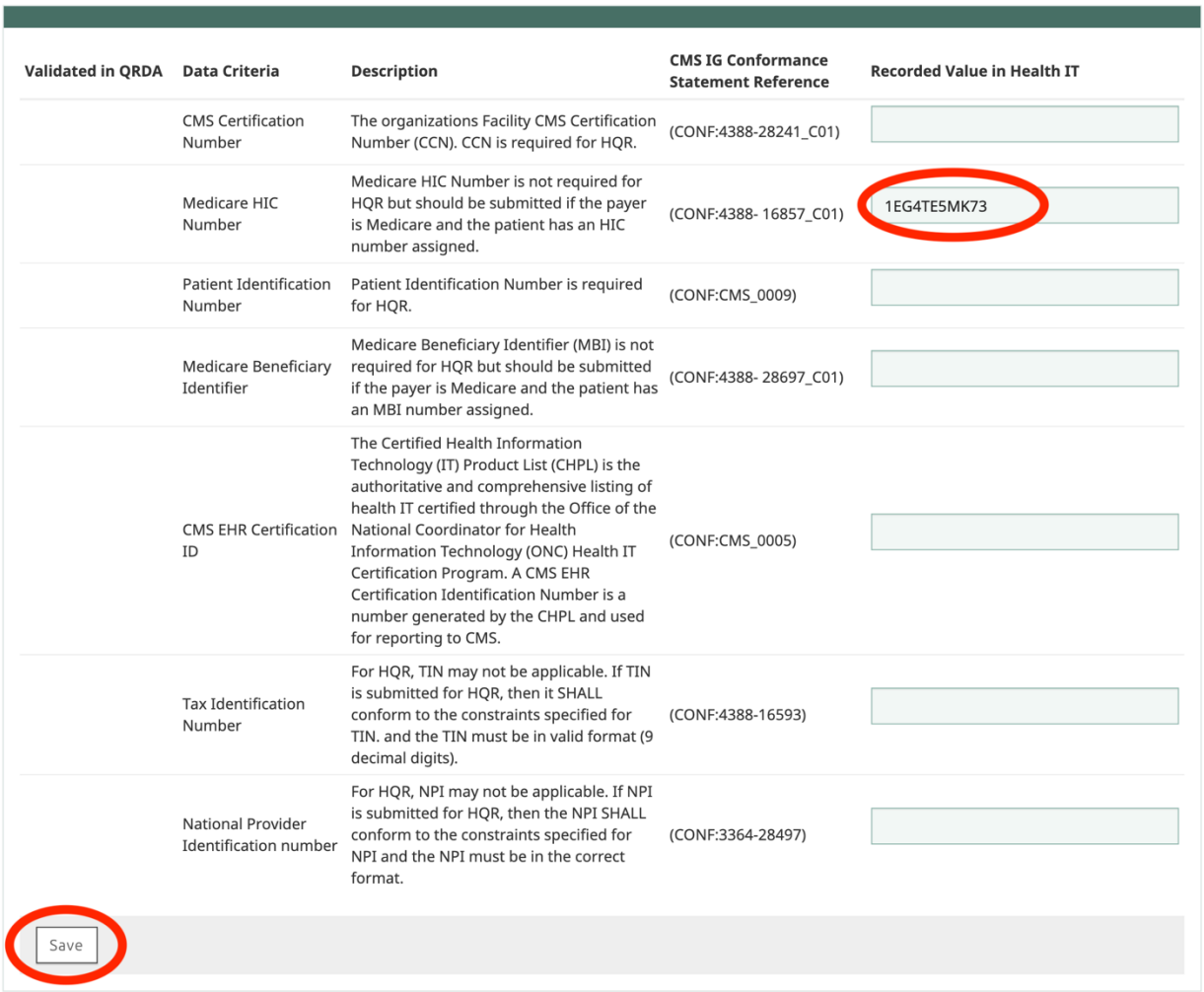


Figure 56. CMS Program Test

Similar to the C1 Record Sample test, prior to running the CMS Program Test, you are required to fill out an entry form of information to capture in your EHR. The required information is specified in the CMS Implementation Guides for QRDA Category I and QRDA Category III. The specific conformance statement reference can be used to find the specific references in the appropriate CMS Implementation Guide. For example, HQR_PR requires that a system be able to report a patient's Medicare HIC Number.

For example, you can demonstrate capturing this information by assigning a Medicare HIC Number of 1EG4TESMK73 to a test patient in your EHR system. Use the input form in Cypress to track the information that you have entered into your EHR. After entering all of the required information, **Save** the form shown in Figure 57. (Note that the example has only captured one of the seven required fields.)



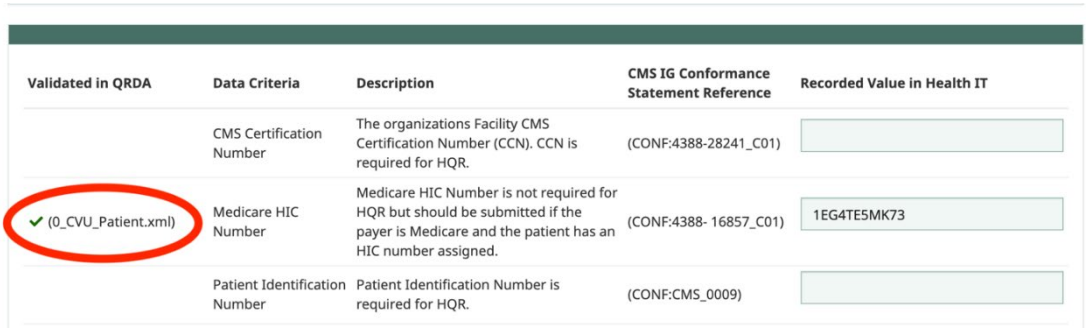
Validated in QRDA	Data Criteria	Description	CMS IG Conformance Statement Reference	Recorded Value in Health IT
	CMS Certification Number	The organizations Facility CMS Certification Number (CCN). CCN is required for HQR.	(CONF:4388-28241_C01)	
	Medicare HIC Number	Medicare HIC Number is not required for HQR but should be submitted if the payer is Medicare and the patient has an HIC number assigned.	(CONF:4388- 16857_C01)	1EG4TE5MK73
	Patient Identification Number	Patient Identification Number is required for HQR.	(CONF:CMS_0009)	
	Medicare Beneficiary Identifier	Medicare Beneficiary Identifier (MBI) is not required for HQR but should be submitted if the payer is Medicare and the patient has an MBI number assigned.	(CONF:4388- 28697_C01)	
	CMS EHR Certification ID	The Certified Health Information Technology (IT) Product List (CHPL) is the authoritative and comprehensive listing of health IT certified through the Office of the National Coordinator for Health Information Technology (ONC) Health IT Certification Program. A CMS EHR Certification Identification Number is a number generated by the CHPL and used for reporting to CMS.	(CONF:CMS_0005)	
	Tax Identification Number	For HQR, TIN may not be applicable. If TIN is submitted for HQR, then it SHALL conform to the constraints specified for TIN. and the TIN must be in valid format (9 decimal digits).	(CONF:4388-16593)	
	National Provider Identification number	For HQR, NPI may not be applicable. If NPI is submitted for HQR, then the NPI SHALL conform to the constraints specified for NPI and the NPI must be in the correct format.	(CONF:3364-28497)	

Save

Figure 57. Capture CMS-Specific Information

After saving, upload a .zip file with QRDA documents you created (in your EHR) with the information specified in the form (Note that the information does not need to be in a single QRDA document). Once the .zip file is uploaded, Cypress will verify that the expected information can be found in the uploaded QRDA files. When Cypress finds the required data

criteria, a checkmark will indicate the data criteria has been found with a note indicating which file that file was found in. For example, in Figure 58 the Medicare HIC Number was found in the file 0_CVU_Patient.xml.



Validated in QRDA	Data Criteria	Description	CMS IG Conformance Statement Reference	Recorded Value in Health IT
	CMS Certification Number	The organizations Facility CMS Certification Number (CCN). CCN is required for HQR.	(CONF:4388-28241_C01)	
✔ (0_CVU_Patient.xml)	Medicare HIC Number	Medicare HIC Number is not required for HQR but should be submitted if the payer is Medicare and the patient has an HIC number assigned.	(CONF:4388- 16857_C01)	1EG4TE5MK73
	Patient Identification Number	Patient Identification Number is required for HQR.	(CONF:CMS_0009)	

Figure 58. Verifying CMS Specific Information

In addition to finding the required data, Cypress preforms additional validations described in the CMS Implementation Guide, as well as performs measure calculation for the uploaded QRDA Category I documents. The results of these validations and calculations can be found by selecting **View Results** in Figure 59.

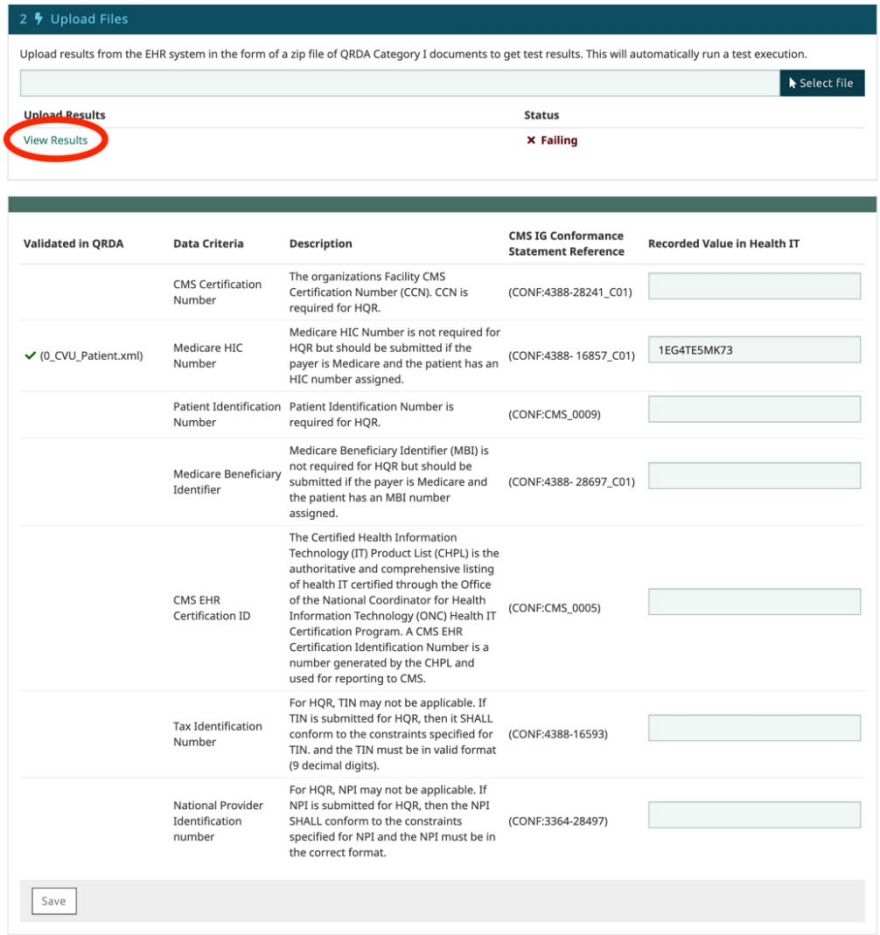


Figure 59. View Results and Calculation for CMS Program Test

On the **View Results** page you can view the validation errors for the uploaded documents and view the measure calculations for the uploaded documents. Figure 60 shows validation error and measure calculations.

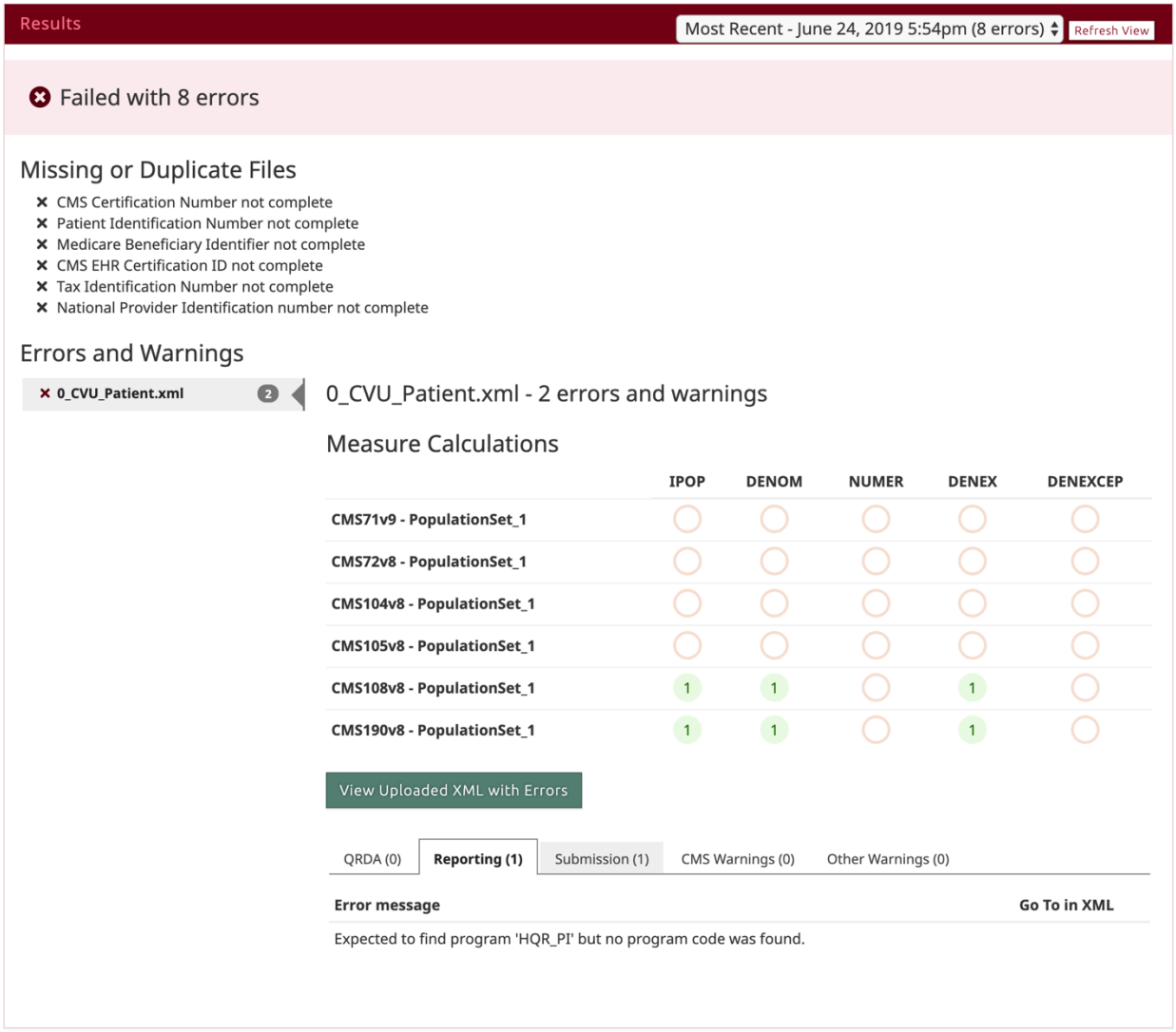


Figure 60. Validation Results and Measure Calculation

Acronyms

Acronym	Definition
ACO	Accountable Care Organization
ATL	Authorized Testing Lab
CMS	Centers for Medicare & Medicaid Services
CQM	Clinical Quality Measure
eCQM	Electronic Clinical Quality Measure
EH	Eligible Hospital
EHR	Electronic Health Record
EP	Eligible Professional
FFRDC	Federally Funded Research and Development Center
HEALTH FFRDC	CMS Alliance to Modernize Healthcare
HHS	Department of Health and Human Services
HL7	Health Level Seven International
HTML	Hypertext Markup Language
IG	Implementation Guide
IT	Information Technology
NIST	National Institute of Standards and Technology
ONC	Office of the National Coordinator for Health Information Technology
QDM	Quality Data Model
QRDA	Quality Reporting Document Architecture
SUT	System Under Test
XML	Extensible Markup Language