CMS Presents Quality Measurement using Health Level Seven® (HL7) Fast Healthcare Interoperability Resources (FHIR®) 101 Webinar Transcript

February 2021

Speaker	Transcript
Amira Elhagmusa	**Slide 1 - Title Slide** My name is Amira Elhagmusa with ESAC, Inc and Battelle. Thank you for joining this webinar titled "Introducing HL7 FHIR for Implementers". Today's session will be presented by Shanna Hartman from CMS and Michael Holck with the ESAC, Inc. We will take a few minutes and review Administrative notes today. Today's meeting is being recorded and attendees are muted. If you'd like to ask a question, please use the Q&A box on the right-hand side of your screen. We will review questions at the end. After this session, a feedback form will pop up. Please take a few minutes and tell us how we did. We appreciate your feedback. Now, I'd like to turn it over to Shanna Hartman to provide an overview. Thank you.
Shanna Hartman	**Slide 2 - Agenda** Thanks Amira and thanks everyone for joining our session today. The agenda topics for today's session are: • Reviewing components of an electronic clinical quality measure. • Fast Healthcare Interoperability Resources specification, introduction, and walk through. • The use of profiles and implementation guides. • Quality improvement or QI-Core and mappings from the Quality Data Model. • The quality measure IG. • The data exchange for quality measures. • An Introduction to FHIR operations and an update on our current activities.

Speaker	Transcript
	Slide 3 - Components of an eCQM This slide here shows the building blocks or parts of an eCQM that contain the data model or what to look for in the patient's medical record to capture and report. The expression logic, or how to calculate the results of the data captured in order to measure that the right care was provided. And the structure, which includes the metadata, numerator, denominator, exclusions, and exceptions. **Slide 4 - FHIR Standards for Quality Measurement** Here we have a representation of the changes to the components of eCQM specifications with the move to FHIR. In the top left, you can see that the current specifications contain the Quality Data Model, the Clinical Quality Language for logic, and the Health Quality Measure Format. With the move to FHIR, QI-Core replaces Quality Data Model for the clinical data. FHIR measures replace the Health Quality Measure Format for the eCQM structure and the CQL logic would remain the same. Below that is a representation of the changes to the eCQM reporting. Again, the QI-Core profiles would replace QDM. The FHIR measure report individual and summary would replace the currently used QRDA I and III. And the goal is to align quality measurement standards for eCQM development and reporting to both be using FHIR. And now I will turn the presentation over to Michael Holck to go through a FHIR walk through for electronic clinical quality measurements.
Michael Holck	**Slide 5 - What is FHIR?** Thank you, Shanna. Good afternoon. I'm Michael Holck with ESAC. And so, we'll talk a little bit about FHIR and measure reporting within FHIR. So, first question is what is FHIR? Certainly, if you've been to any medical health IT symposiums or seminars recently, you've heard an awful lot of talk about FHIR. It's everywhere. FHIR stands for Fast Healthcare Interoperability Resources and it is a next generation standards framework that was created by HL7. And it was designed to provide an interoperable platform for healthcare data exchange. So FHIR defines a common way to structure health data, known as resources and we'll look at that in more detail as we go through this presentation. And it also defines the automated data exchange through application programming interfaces or API's. One of the benefits of FHIR is that it uses the latest web development technologies, which makes it very developer friendly. If you have developers who've done any kind of web development, including RESTful APIs, then learning FHIR is actually fairly straightforward for them. **Slide 6 - FHIR Versions** So, there are several versions of FHIR, even more than are shown on this slide, but FHIR STU 3, which was released in 2017. Was the first version of FHIR to contain the clinical reasoning module and the clinical reasoning module is what introduced the measure and measure report resources that are necessary for doing quality reporting. And as such, STU 3 was the basis for the initial eCQM conversion and for the Data Exchange (for) Quality Measures and Quality Measure IGs. FHIR R4 was released in December of 2018, and it was the first

Speaker	Transcript
	version to contain normative resources and we'll talk later about the maturity model in FHIR and what a normative resource is. FHIR R4 is also the current version that's being used for converting test eCQMs and was the version that was named in the ONC Interoperability and Information Blocking final regulation that was published in March of 2020. FHIR R4B is a potential interim release that's currently in planning with some critical changes to R4. R5 will be the next major release and is potentially up for ballot in 2021 which would include some new enhancements and profiles. For those not familiar with HL7 and how they do balloting, their balloting process is their formal process for releasing the information to the community and soliciting feedback. So, anybody can comment on it, make suggestions, ask questions, and then those are all voted on and potentially put into the specification. **Slide 7 - How is FHIR Used?** So how is FHIR used? When you first go into the specification, and we will do that in a little bit, you'll see that it is organized in five levels for easy navigation. Levels one and two, which are Foundation and Implementation, give implementers the basis for exchanging data. So, define some of the spec and some of the exchange mechanisms. Levels three and four are used to represent the data we would use in the eCQMs, the Administration has patient, practitioner, organization, and then the Record in Exchange has all of the clinical kinds of data procedures encounters diagnostics that you would want to include. Level five provides the structure for eCQMs and reporting so level five is the Clinical Reasoning module that introduced that measure and measure report resource needed for quality reporting. **Slide 8 - Why use FHIR for Quality Measurement?** So why use FHIR for quality measurement? One is it aligns with other clinical data sharing efforts. FHIR was designed for the interoperable exchange of healthcare data across a wide variety of use cases and quality measurement certainly is one of those use cases. And many people are already implementing FHIR for a variety of other exchange use cases already. It provides a standardized approach and a specification that promotes sharing between systems and applications. And FHIR does improve the flexibility and extensive ability to meet multiple use cases without compromising the base specification. And when we look at the FHIR specification, I'll try to point out that again, but basically FHIR was designed to be very extensible, and they used the 20/80 rule. So, 20% of the requirements that meet 80% of the use cases is what the base specification is designed for. But then there are ways for implementers to constrain that further for their given use cases. **Slide 9 - Walkthrough of FHIR** So, we'll do a walkthrough of the FHIR spec just briefly. We don't have time to go into a lot of detail, of course, but I'm going to jump into the spec. That is the URL there for the specification. These slides will be provided after this discussion so you'll be able to go to these URLs and look at things yourself.

Speaker	Transcript
	Slides 10-13 – FHIR Specification Walkthrough So, let me jump out real quick. I'm gonna jump into the specification. So, when you go to that URL, you will always come up to the latest release of FHIR. And as I mentioned before, Release 4 is the current release. If you've never been to the spec before they do have a "First time here?" with executive summary, developer's, clinical, and architect's introductions. Those are pretty good reads if you're new to FHIR. They're kind of role-based introductions to the FHIR specification. You can see those same categories we talked about earlier, the five different levels. And then at the top, this yellow banner is telling you that this is the current published version, and it does have a link to all published versions. So, if you want to go look at all the different versions of FHIR, you can see all the past versions. You can see the current and you can even see the R5 work that is going on. So, this is work in progress. This is going to change. So, this is, but if you're interested in just seeing what's going on, that's where you can go to see that. So, I mentioned that FHIR defines the data exchange through resources. And so FHIR R4 actually contains 145 resources for the exchange of healthcare information and they display them in a couple of different ways. The "Categorized" is again going back to the levels. So, there's the "Foundation;" there's the "Base;" there's the clinical financial for payer type information and then specialized and that's where you find measure and measure report that we'll talk about more in this presentation. You can also browse them, excuse me, alphabetically. If you know a resource you're looking for, of course alphabetical is the easiest way to find it. You can jump directly to it. And it's also displayed by maturity and so FHIR does define a maturity model. And level zero is the least mature. So, these are the resources that are new and newly introduced. Work groups meet to define these resources and come up with the best first version of them. And then they're given out to the community to get feedback and as they get feedback and as they get implemented, they move up this maturity level until eventually they make it to the top maturity level which is level five. And you'll notice these resources have an "N" next to them. That stands for normative. So, normative content is the most mature resources within the specification. The normative resources are very mature. They've been balloted multiple times. They've been implemented in multiple systems in multiple countries. And so, they are very likely to have any kind of substantive changes. However, if they do change at all, they are guaranteed to change in a way that will not break existing implementations. So, let's go look at a resource. I'm going to pick Encounter. Whenever you pick a resource, it will take you to the page for that resource. The first section is always Scope and Usage and that is a very useful section to understand what this resource is for, the kind of information that it is used to exchange. And if you're trying to figure out how to exchange particular information, this is how you can do it, as well by going through the resources you think might be the right ones. Go read the Scope and Usage and see if that matches. Let me come down to the resource content. We can see the resource. We can see all the attributes of this resource and there are quite a few of them. And then in addition, we also see the cardinality for each of the attributes. For

Speaker	Transcript
	those that are not familiar with cardinality, the first number in the cardinality tells you if it is optional or required. So, if it is zero, that means that that element is not required but can be there. And if it is a one on the first number, that means it is a required element, it must be there. The second number tells you how many instances of that element you can have. So, for example, status. Here is a one-to-one cardinality. That means it is required and you can only have one. Identifier is a zero to many cardinality here, which means it is not required, and you can have more than one. You can have as many as you want. Now one of the things you'll notice when you go through the FHIR specification is that not too many things are one to one. In fact, most of the cardinality start with zero. That is because the base spec is designed to be flexible and extensible. They didn't want to constrain it too tightly to make it so that it didn't work for different use cases. You can, however, as an implementer, profile, and we'll talk about that in more detail in a bit, but you can profile it basically where you can add constraints to it. So, you can require a certain fields if you think they're required for your use case. You can change the cardinality in some cases and you can even add additional elements if they're missing, if necessary. You'll also notice that each element has a type, and all of those are links so you can go drive down into them to see what those types really are. Some of them are primitive types, some of them are complex types. Four types that are code or coding or quotable concept. Those are all terminology concepts. So, they will map to a value set. On the right we see descriptions and for certain things like status, which is a code, we can see the actual code values that are allowed in status. It won't always list all the codes in the description if there are too many of them, but it will always have a link to the value set that that is bound to. And if you click on that link, you can go see what all the code values are that are acceptable. And then it also has this binding to tell you how strong that binding to that value set is. So, for instance on status, the Encounter status is a required binding. So, you can't, you have to use these codes. You can't use anything else. But if you look at things like type for Encounter, it's a codable concept as an Encounter type value set, but it is example. So, it's just saying these are some example type of codes, you might want to use for this field, but you can use others. **Slide 14 - HL7 FHIR Standards for Quality** Okay, let me jump back to the presentation. So, this is just what we already went over, it's just in the slides for completeness later if people download this slide presentation. They can see it. So, Resources versus Profiles. Resources are the basic building block of the FHIR specification and what we just looked at. It defines how data is structured and exchanged. And as I've mentioned, they're intended to be very generic to fit a wide range of use cases. Profiles are resources that have been modified to meet a specific use case. So, if you have a specific use case where you want to restrict or extend the API's, the resources, or the terminology, you can. You can indicate required elements that cardinality that I showed earlier. If there are things that are optional in the base spec, you can make them required in your profile if you wish. You can set the 'must support'

Speaker	Transcript
	flag and when we jump into the QI-Core IG, I will show you what that looks like and what that means a bit more. You can in the cases where value sets are not required in the base spec, you can specify a value set for an attribute. And typically, profiles are published through an IG or an implementation guide and we will look at some actual implementation guides in a bit. So, when we start with the base spec of FHIR, if we want to constrain it a little bit. We can add a profile. And that's what US Core did. So, for US Realm specific profiles sharing data within the US, they decided there were some constraints. They wanted to add to the base specifications. Some elements they wanted to make required, some additional elements they wanted to add. So, they created a US Core profile that further constrained the spec. For quality improvement, it was done again. They took, they started with US Core and constrained it even further. So, they said, well, we like what US courted but there are a few other things that are specific to quality reporting, are useful things that we would like to constrain further. And so, QI-Core was built on top of US Core to constrain it even further and we'll look at the QI-Core profiles in a bit. And then, of course, you can keep going on that. Right? So, if there are very specific use cases within quality reporting and you want to constrain the QI-Core profile even further, you can create your own profile and take it even further. **Slide 15 - FHIR Clinical Reasoning Module** The FHIR clinical reasoning module, which was introduced with STU3, gave us the FHIR measure resource, which defines an eCQM metadata in structure. And this is further defined in the quality measure implementation guide and we'll take a quick look at that later. The FHIR MeasureReport resource gives us the actual reporting of the measure and includes an individual report, which is very similar to QRDA I, a subject list report, a summary report, which is very similar to QRDA III, and a data collection report. And these are further defined in the DEQM or Data Exchange for Quality Measure IG, which we'll also look at in a bit. **Slide 16 - Implementation Guides for Quality Measurement** So, these three implementation guides are very useful for quality measurement and quality reporting. The first is QI-Core, which is the model IG using profiles based on US Core and then the base FHIR resources and are used for eCQM quality reporting and clinical decision support. The Quality Measure IG specifies how easy terms are structured and it's based on the FHIR measure resource and we'll, we're going to look at all three of these IGs in a bit. And then the DEQM is how quality data is to be exchanged. So, this is based on the FHIR MeasureReport resource as well as some other exchange mechanisms that can be used. **Slide 17 - Using QI-Core** QI-Core was balloted in September of 2019, last. And that was where it was updated to the latest release FHIR R4. That is the URL to the latest version of the QI-Core IG and it also includes a mapping of QDM, the Quality Data Model to QI-

Speaker	Transcript
	Core. So, if you have a current measure in Quality Data Model and you're wanting to try to pilot it in FHIR using QI-Core, that mapping section can be incredibly useful and we'll look at that as well. QI-Core also enables a simplified view that may be used by authors to write expressions called QUICK. But we're not going to go into any real detail on that today. That will be included in future sessions. **Slides 18-20 - QI-Core Implementation Guide Walkthrough** So, let me real quick, jump over to the QI-Core Implementation Guide. So, this is the Implementation Guide here. It has a bunch of content and how to read this guide and some summary about eCQMs. If we go to the QI-Core profiles, we can see what resources were profiled as a part of QI-Core. On the right-hand side, we see the base resources from FHIR that were used in the middle for the ones that were constrained by US Core. There's a link to go see what US Core did to that specific resource. And then on the left-hand side are the QI-Core versions of all of those resources. Since we looked at Encounter in the base spec, let's go look at Encounter in the QI-Core profile. There are two views given that you, that are useful. The first one is this differential view. And this just shows what's different in this profile for this resource. What has changed. So, these are, these are the things that have been profiled as part of QI-Core. These are extensions that were added. So, these are fields that weren't in the base resource that they thought would be useful for quality reporting. So you can add your own fields if there's a good reason to do so. And then we can see like class was originally optional in the base spec. Well now it's been set to be mandatory with the cardinality of one, one to one. We can see things like priority now has a binding to a SNOMED CT priority code value set. So, you can specify value sets for coded attributes as well. I mentioned earlier that you can also set 'must support' flags in your profiles. That's what these "S's" are with the red box around them. What that means is, that doesn't mean that it's mandatory, that's only decided by cardinality. But it means that this is an important element in this resource. And if it's there, if it's provided too, you have to be able to support it. So, if a system is saying they are conformant to the QI-Core profile, these are the elements they have to support. The other view is the snapshot view, which just shows you the entire resource now as it's been constrained both the original base spec, the US Core spec, as well as the QI-Core, all of it together in one view. So, you can see it's grown a bit. I also mentioned that there's the QDM to QI-Core mapping in the QI-Core IG. So, if you have a current measure in QDM and you want to try to port it to QI-Core or FHIR, this mapping can be quite useful. So, all of the datatypes from QDM are in this content pane along the right here. And if I go look at say Encounter Performed, we can see that from the QDM data type Encounter Performed maps to the QI-Core Encounter Resource. And then you can also see some additional comments off to the side that are useful that you might want to consider constraining the status to these. And then you can see all of the different attributes of the QDM datatype, and what the recommended mapping into QI-Core is. And it also get some comments and guidance off to the right-hand side

Speaker	Transcript
	here, as well. So again, if you're trying to convert a QDM measure to QI-Core, this is very, very useful. **Slide 21 - Quality Measure IG** Okay, jump back to the presentation. This is, again, just what we talked about. The Quality Measure IG defines a standardized approach for how to represent eCQM content. It describes the required metadata. It provides guidance for how to use CQL with FHIR measures. CQL being the Clinical Quality Language. It defines the parameters, the use of terminology, measure population descriptions. It has a few profiles that define requirements for various measure scoring types, such as continuous variable proportion. And it includes examples of eCQMs libraries and value sets. **Slide 22 - Quality Measure IG Walkthrough** So, I'll jump there real quick, as well. So, this is the Quality Measure IG. Again, the beginning just has the summary, how to read this guide. If we see eCQM, you can see how to format an eCQM using the measure resource in FHIR section on using CQL. There are also examples so, you can go in and look at actual measures that have been written in FHIR, the measure resource as it exists, and how its defined in FHIR. And then, of course, it's also got the profiles for the scoring types. **Slide 23 - DEQM IG** The Data Exchange for Quality Measures or DEQM IG, specifies the framework for exchanging quality measure data - data exchange individual measure reports, summary measure reports. It also specifies some profiles and extensions that are necessary for data exchange and reporting and to find some operations for exchanging and evaluating measures. **Slide 24 - DEQM IG Walkthrough** So, I'll jump to that one real quick. This is the Data Exchange for Quality Measures IG. Again, very similar format to all the IGs. This one has the framework for data exchange, individual reporting, summary reporting. It has some example use cases, FHIR artifacts with the profiles, and extensions terminology to use. And then again, for those who are trying to implement it as examples, so, it's useful to go in and be able to see the examples. And so, these are examples of different ways to exchange data, including measure reports. So, you can actually go look at some completed measure reports in FHIR. **Slide 25 – Converting eCQMs to FHIR** So, converting eCQMs to FHIR. CMS began converting QDM-based eCQMs to FHIR in spring of 2019. And again, that was using the STU 3 version of FHIR that gave the first versions of clinical reasoning module. The CMS program measures continue to be tested at HL7 Connectathons. There are three Connectathons every year. I think on the next slide, we'll talk about what they are, but that is a very useful thing if you're wanting to get your hands dirty into doing eCQMs and FHIR. Going to the Connectathons is a great way to do it, people bring their measures, we put them through all the tooling. We put them into an actual FHIR

Speaker	Transcript
	server and test them. Identify any issues that are all the experts are there to answer all the questions you might have. The Measure Authoring Tool, MAT, and Bonnie have been updated with FHIR functionality. Those will be the official authoring and testing tools for the eCQMs. And we've created a measure repository for work in progress eCQMs and example expressions. So, that URL there is a GitHub repository that has all of the work in progress eCQMs. So, if you're looking for other examples outside of what you find in the IGs, you can always go there as well. **Slides 26-27 - FHIR Operations** FHIR operations. FHIR does have specifications to describe how health data should be structured for exchange. Operations in FHIR describe the interactions that are used to exchange the data. All resources have the basic operations of CRUD, the Create, Read, Update, Delete, which enables the storage, the search, and the retrieval of those resources. But systems can also describe their own general operations for resources, which are displayed as an action preceded by a dollar sign on when you're calling it as a RESTful API, such as the $evaluate-measure operation, which is defined for the measure resource. And that's what would actually invoke a measure evaluation for a given measure. So, Clinical Reasoning defines the evaluate-measure operation that allows a client system to request that a particular quality measure be evaluated. It takes a variety of input parameters; periodStart, periodEnd and are definitely required, you have to tell the period. The measure that you're evaluating is required. That's not a parameter so much as the resource name. And then you can also specify the type of report, and we talked earlier about that there's the individual, the subject list, the summary, and the data requirements. And then the output is a MeasureReport Resource. Some other operations that are used in quality reporting, and these are defined in that Data Exchange for Quality Measures IG in more detail, are the collect-data, which is a request to collect data for a measure. So, this is if the, if a system doesn't want to do measure evaluation on its own, but another system wants to do measure evaluation for them and needs the data. They can call collect-data for a given measure and it will know that for this measure, it requires patience and counters conditions with these value sets and send the required data to that system. Submit-data is the opposite. You know, the collect-data is the pull, submit-data is the push scenario of that. It's the submission of data of interest for a measure. And then the data requirements operation on a measure allows you to just see what is the data required for this measure. So, it will return the parameters and required data for a measure, the resources, the value sets needed to evaluate that measure. **Slide 28 - eCQM Reference Implementation** There is an eCQM reference implementation. For FHIR, there are a lot of reference implementations. If you are in the FHIR spec, you can actually find links to several reference implementations for FHIR that are used to test the specification. And implementers can use that to test systems against known results. The eCQM Reference Implementation is used in the Connectathons for

Speaker	Transcript
	testing the actual measures that people are developing and it has the evaluate-measure and the ability to generate the measure reports, as well as the submission of the data exchange for measures. **Slide 29 - CQF Ruler** That reference implementation is called CQF Ruler. It's a reference implementation of the FHIR server built on top of the HAPI FHIR Reference Implementation that also includes the Clinical Reasoning module. Again, reference implementations are used to test the IGs. CQF Ruler includes the CQL-to-ELM expression logic module logical model translator and the measure evaluation service. So CQL is how the measure is originally written. When it gets translated to ELM, that's kind of doing, the making sure that it's a valid syntax and valid measure. And then the ELM is an XML format that is a very computable format for implementers who want to try to go off and implement that measure. It gives very distinct clauses for what resources you need to retrieve, with what value sets they need to be filtered by, and how they get ended or together based on the logic of the CQL. And then the measure evaluation service means that it can actually take that ELM against the measure now and actually go do the full evaluation and generate the measure report. CQF Ruler is an open-source Java implementation and it's at that URL there. There is a quick start guide that has been developed to help aid setup. So, if you want to try to set up CQF Ruler on your own systems to use for your own testing, you can, and that quick start guide will walk you through how to do that. **Slide 30 - Tools for Implementers** The tools that are available for implementers, this CQL to ELM translator we talked about a little bit is in the reference implementation, but it is an open source, as well, that is available at that URL from GitHub. There's also a JavaScript CQL Execution Engine. So that would be the engine that does the evaluation of a measure. Then that one's in JavaScript. And then there's also a Java version of the CQL Execution Engine. All of which are available in GitHub. So that shows you how to actually do a measure evaluation, you can use those engines themselves or you can use them as a reference to figure out how to write your own evaluation engine if you want it. **Slide 31 - Current Activities** Current activities, CMS is still doing conversion of 2020 CMS program measures to FHIR. Its ongoing using MAT on FHIR. There will be some ballots and updates to the IGs. DEQM was balloted September of 2020 and they are now applying the updates. So again, balloting, they go out to the community, they ask for feedback, and then they go through all that feedback and decide what are the things that are compelling and do should be changed, and then they go and apply all those updates.

Speaker	Transcript
	The Quality Measure IG will be going up for ballot in May of 2021, again. QI-Core based on US Core has a planned update for Fall of 2021. And I had mentioned the HL7 Connectathons, they're held three times per year. One's in January. In fact, last January, CMS hosted themselves at their site, CMS January 2020 Connectathon. We've already had the January 2021 Connectathon for HL7 but there will be another one in May and September. And if you are going to the CMS Quality Conference March 2nd through 3rd, there will be a poster related to eCQMs as well. **Slide 32 - Thank You!** Thank you for your time today. Implementers can access links to the IGs, training, and all other resources related to eCQMs on the Electronic Clinical Quality Improvement Resource Center, eCQI RC. That is kind of a one stop shop for all information about an eCQMs. And if you have any comments or questions, you're always welcome to email to FHIR@esacinc.com and somebody will respond or at least point you in the right direction. **Slide 33 - Resources** And then these are just the links throughout the presentation. There were a lot of links. So, this is all the links. And again, these slides will be made available on the eCQI Resource Center after this talk.
Amira Elhagmusa	I'd like to thank everyone for joining us today. We hope you enjoyed the discussion as much as we did. Look for slides and the recording from this presentation on the eCQI Resource Center after review. As a reminder, that will be a post event survey, please take a few minutes and share your feedback. Thanks again and have a great day.