

# Evaluating Measures with eCR Now

February 1st, 2022

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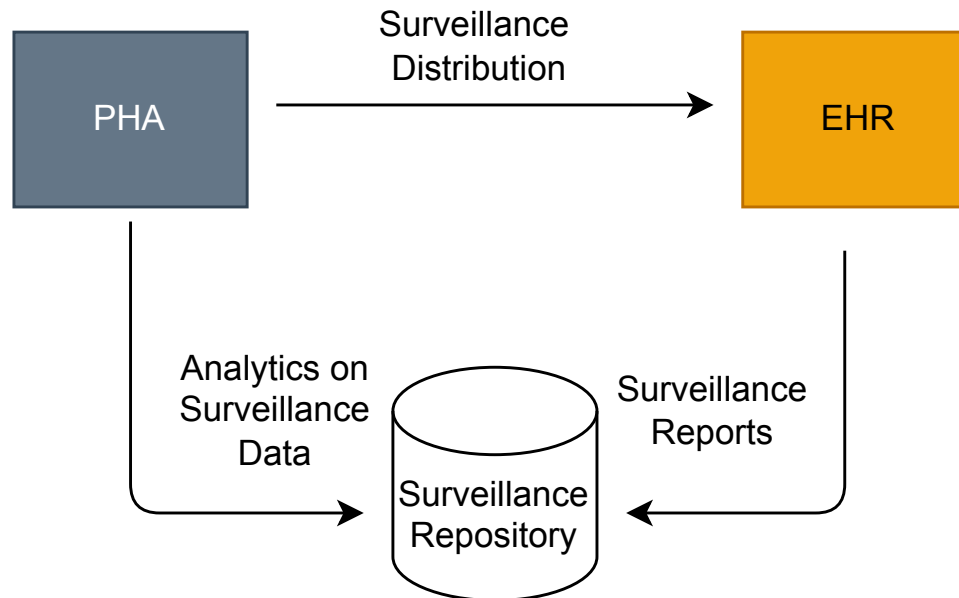
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# Agenda

- Use Case
- Existing Specifications
- Existing Infrastructure
- Implementation Overview
- Technical Changes
- Analytics UI
- Future Work
- End-to-End Demo

# Use Case

- Chronic Disease Surveillance
  - building on eCR (contagious disease surveillance)
- Distribute reporting specifications
- Data submission from sites
- Support analytics activities



# Reporting Specifications

- Clinical Quality Measures
  - <http://hl7.org/fhir/us/cqfmeasures/>
  - eCQMs overlap significantly with chronic surveillance
- Electronic Case Reporting (eCR)
  - <http://build.fhir.org/ig/HL7/case-reporting/>
- MedMorph
  - <https://build.fhir.org/ig/HL7/fhir-medmorph/>
- Other supporting IGs

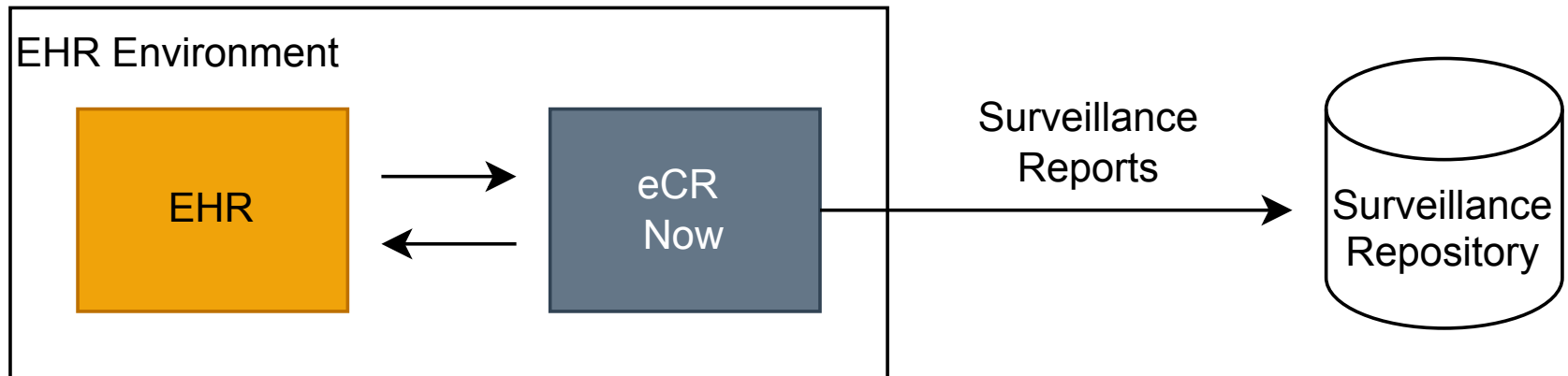
# Data Submission

- Clinical Quality Measures
  - <http://hl7.org/fhir/us/cqfmeasures/>
- Electronic Case Reporting (eCR)
  - <http://build.fhir.org/ig/HL7/case-reporting/>
- Other supporting IGs
- Submitted data can include:
  - Reports on the measure(s)
  - Line-list data about patients

# Existing Infrastructure

## eCR Now App

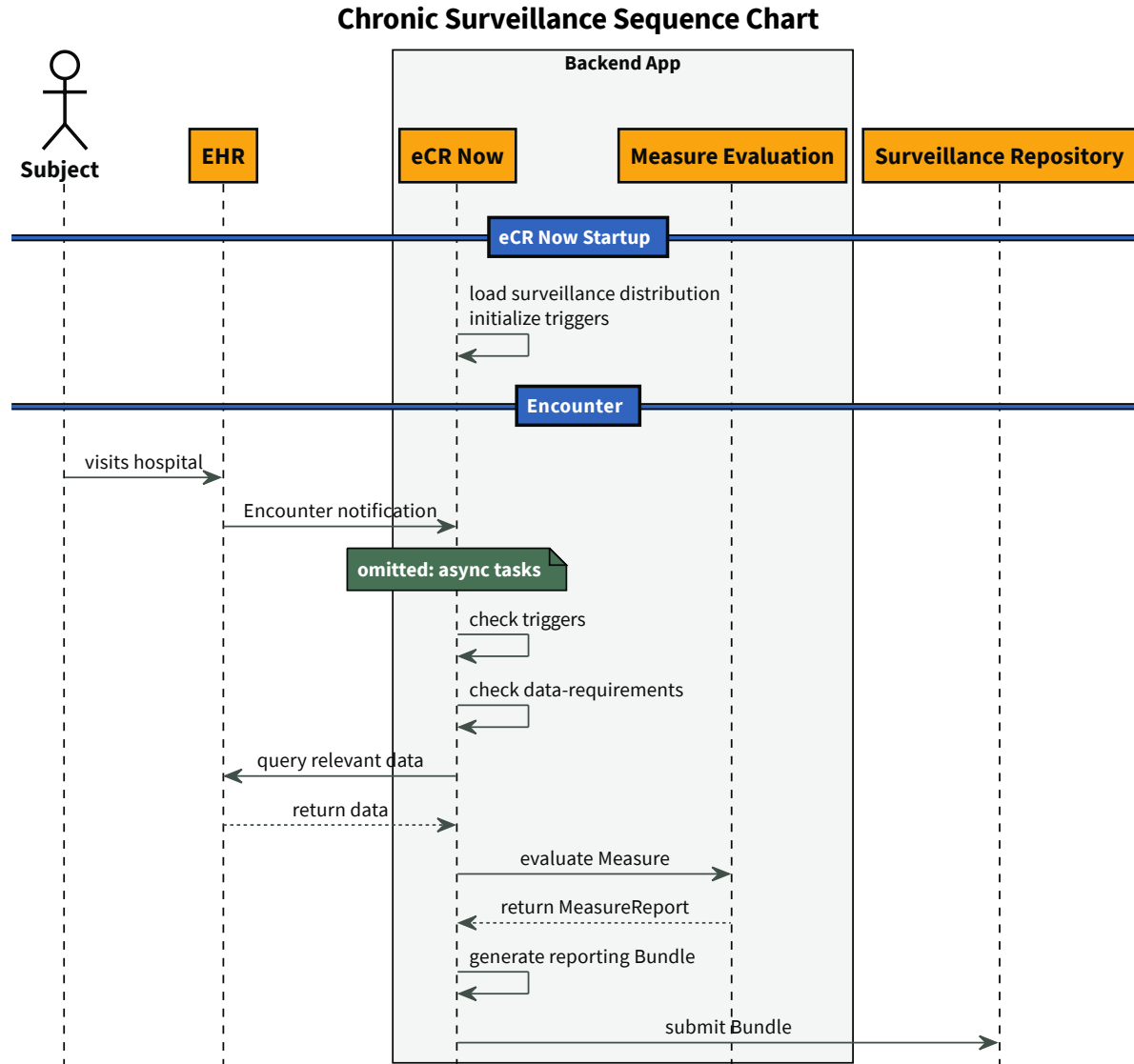
- Adds eCR capabilities to existing EHRs
- Deployed to major EHRs
- Enhanced to support the newly developed chronic surveillance reporting specification



# Implementation Overview

- Measures as reporting specification
  - Overlaps with existing reporting requirements
- Chronic surveillance reporting distribution
  - eCSD (working name)
  - extends eRSD
  - PlanDefinition for workflow
- Extend eICR to submit MeasureReports
- Enhance eCR Now to support measures

# Sequence Diagram





# Technical Updates

- Distribution
  - Measures
- Data submission
  - MeasureReports
  - Surveillance data elements
- eCR Now changes
  - Triggering
  - Measure evaluation
- Measure content
  - Surveillance data elements

# Distribution

- Profile of eRSD PlanDef/Bundle extended to allow Measures
- Two types of Measures
  - Cohort Measures (demographic data only)
  - Proportion Measures (can include line-list data)

# Distribution Bundle

```
{
  "resourceType": "Bundle",
  "entry": [ {
    "resource": {
      "resourceType": "Measure",
      "url": "http://hl7.org/fhir/us/chronic-ds/Measure/SeenPatient"
      // snip
    },
    {
      "resource": {
        "resourceType": "PlanDefinition",
        "url": "http://hl7.org/fhir/us/chronic-ds/PlanDefinition/ChronicDSSeenPatients"
        // snip
      },
      // snip
    }
  ]
}
```

# PlanDefinition Action

```
<action id="evaluate-measure">
  <description value="This action represents the evaluation of the measure."/>
  <textEquivalent value="Evaluate measure"/>
  <code>
    <coding>
      <system value="http://hl7.org/fhir/us/medmorph/CodeSystem/us-ph-plandefinition-actions"/>
      <code value="evaluate-measure"/>
    </coding>
  </code>
  <input id="patient">
    <type value="Patient"/>
    <profile value="http://hl7.org/fhir/us/core/StructureDefinition/us-core-patient"/>
  </input>
  <!-- snip -->
  <output id="measurereport">
    <type value="MeasureReport"/>
    <profile value="http://hl7.org/fhir/MeasureReport"/>
  </output>
  <relatedAction>
    <actionId value="report-ds"/>
    <relationship value="before-start"/>
  </relatedAction>
  <definitionCanonical value = "http://hl7.org/fhir/us/chronic-ds/Measure/SeenPatients"/>
</action>
```

# Submission

- Document including MeasureReport
  - Optionally, line-list data

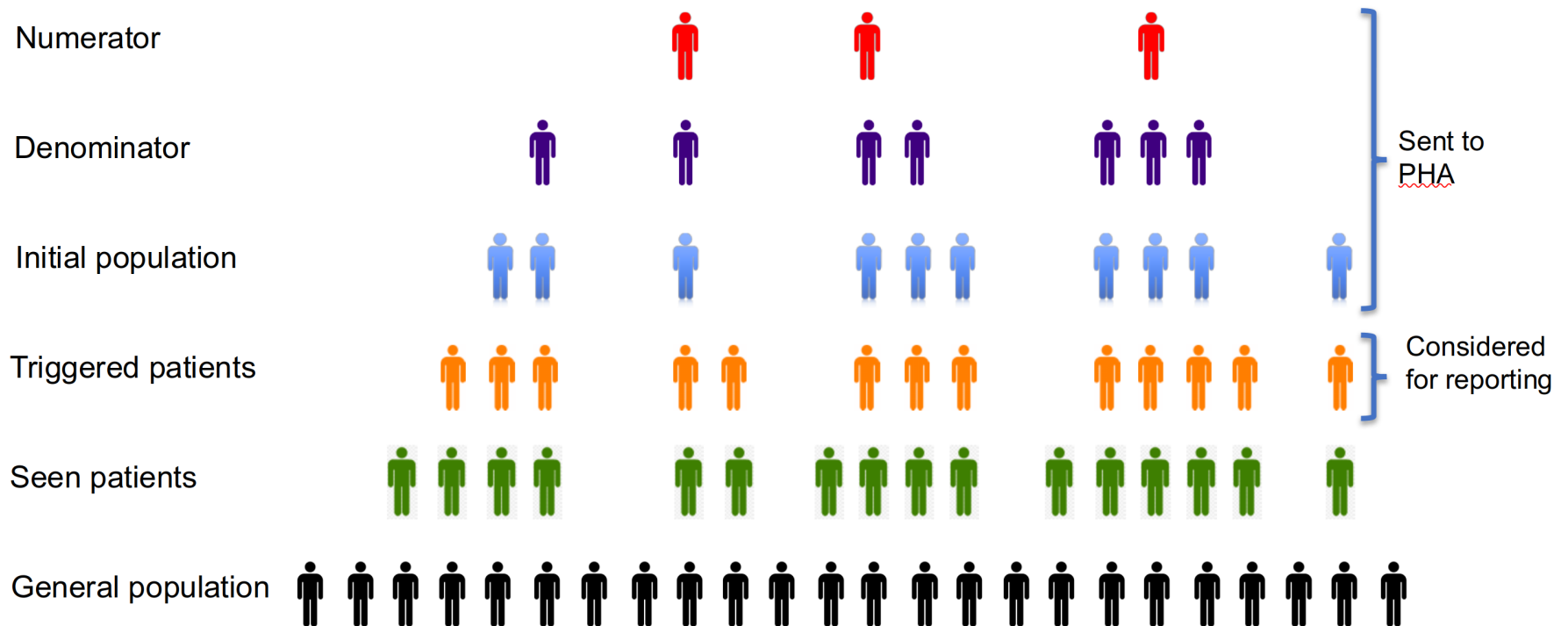
```
{
  "resourceType": "Bundle",
  "type": "document",
  "entry": [ {
    "resource": {
      "resourceType": "Composition"
      // line-list data
    },
    "resource": {
      "resourceType": "MeasureReport"
      // evaluation results
    }
  } ]
}
```

# Triggering

- Cohort Measures
  - Summary/Demographic data only
  - Triggered every encounter
- Proportion Measures
  - Can include line-list data
  - Triggered only for relevant population
- Triggering criteria defined in the distribution

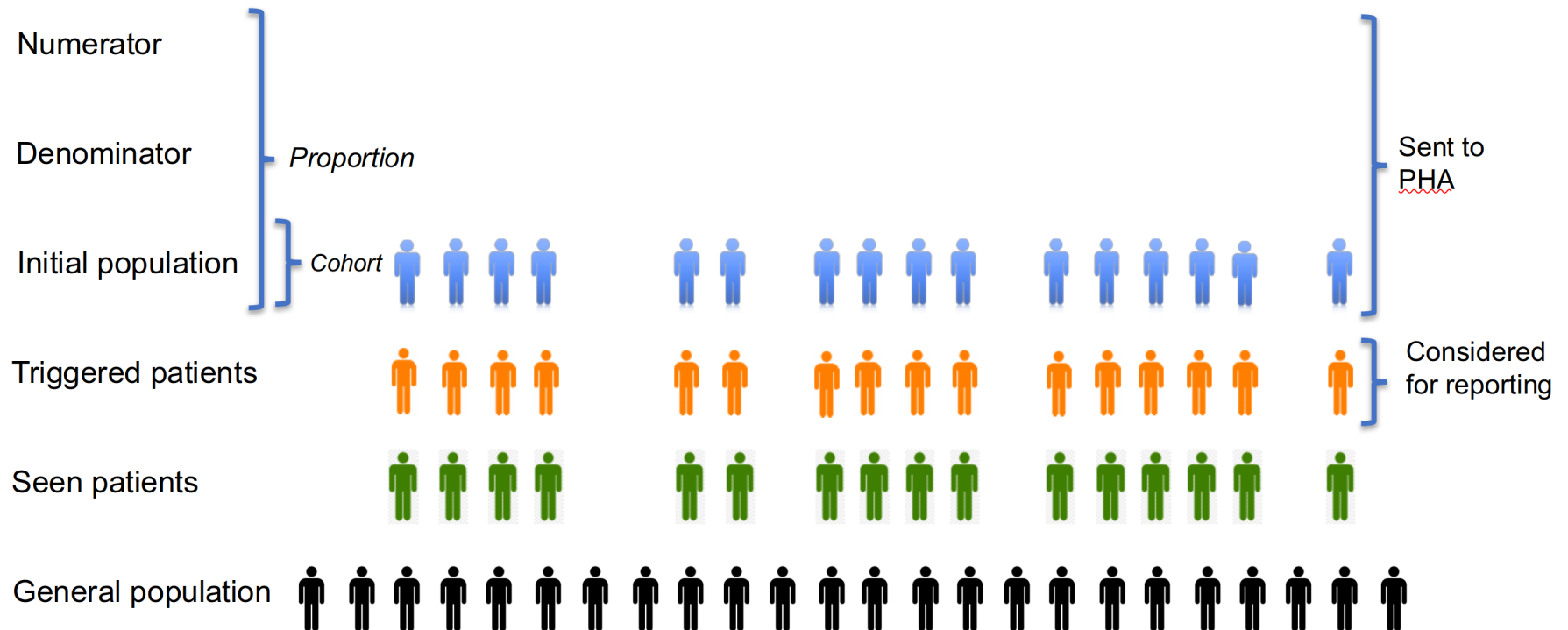
# Proportion Triggering / Reporting

## Surveillance Reporting Process (122 & 165)



# Cohort Triggering / Reporting

## Surveillance Reporting Process (seen patients)





# Evaluation

- Current \$evaluate-measure assumes all data and content on same server
- eCR Now collects the data ahead of time
- eCR Now maintains the distribution Bundle

# Current \$evaluate-measure

Use	Name	Cardinality	Type	Binding	Documentation
IN	periodStart	1..1	date		The start of the measurement period. In keeping with the semantics of the date parameter used in the FHIR search operation, the period will start at the beginning of the period implied by the supplied timestamp. E.g. a value of 2014 would set the period start to be 2014-01-01T00:00:00 inclusive
IN	periodEnd	1..1	date		The end of the measurement period. The period will end at the end of the period implied by the supplied timestamp. E.g. a value of 2014 would set the period end to be 2014-12-31T23:59:59 inclusive
IN	measure	0..1	string (reference)		The measure to evaluate. This parameter is only required when the operation is invoked on the resource type, it is not used when invoking the operation on a Measure instance
IN	reportType	0..1	code		The type of measure report: subject, subject-list, or population. If not specified, a default value of subject will be used if the subject parameter is supplied, otherwise, population will be used
IN	subject	0..1	string (reference)		Subject for which the measure will be calculated. If not specified, the measure will be calculated for all subjects that meet the requirements of the measure. If specified, the measure will only be calculated for the referenced subject(s)
IN	practitioner	0..1	string (reference)		Practitioner for which the measure will be calculated. If specified, the measure will be calculated only for subjects that have a primary relationship to the identified practitioner
IN	lastReceivedOn	0..1	dateTime		The date the results of this measure were last received. This parameter is only valid for patient-level reports and is used to indicate when the last time a result for this patient was received. This information can be used to limit the set of resources returned for a patient-level report
OUT	return	1..1	MeasureReport		The results of the measure calculation. See the MeasureReport resource for a complete description of the output of this operation. Note that implementations may choose to return a MeasureReport with a status of pending to indicate that the report is still being generated. In this case, the client can use a polling method to continually request the MeasureReport until the status is updated to complete

# CPG Library \$evaluate

Use	Name	Cardinality	Type	Binding	Documentation
IN	library	0..1	<a href="#">canonical</a>		The canonical url (with optional version) of the library to be evaluated. This parameter is only used when the operation is invoked at the type level.
IN	subject	0..1	<a href="#">string</a> ( <a href="#">reference</a> )		Subject for which the library will be evaluated. This corresponds to the context in which the library will be evaluated and is represented as a relative FHIR id (e.g. Patient/123), which establishes both the context and context value for the evaluation
IN	expression	0..*	<a href="#">string</a>		Expression(s) to be evaluated. If no expression names are provided, the operation evaluates all public expression definitions in the library.
IN	parameters	0..1	<a href="#">Parameters</a>		Any input parameters for the library. Parameters defined in this input will be bound by name to parameters defined in the CQL library (or referenced libraries). Parameter types are mapped to CQL as specified in the Using CQL section of this implementation guide. If a parameter appears more than once in the input Parameters resource, it is represented with a List in the input CQL. If a parameter has parts, it is represented as a Tuple in the input CQL.
IN	useServerData	0..1	<a href="#">boolean</a>		Whether to use data from the server performing the evaluation. If this parameter is true (the default), then the operation will use data first from any bundles provided as parameters (through the data and prefetch parameters), second data from the server performing the operation, and third, data from the dataEndpoint parameter (if provided). If this parameter is false, the operation will use data first from the bundles provided in the data or prefetch parameters, and second from the dataEndpoint parameter (if provided).
IN	data	0..1	<a href="#">Bundle</a>		Data to be made available to the library evaluation. This parameter is exclusive with the prefetchData parameter (i.e. either provide all data as a single bundle, or provide data using multiple bundles with prefetch descriptions).

IN	dataEndpoint	0..1	<a href="#">Endpoint</a>		An endpoint to use to access data referenced by retrieve operations in the library. If provided, this endpoint is used after the data or prefetchData bundles, and the server, if the useServerData parameter is true.
IN	contentEndpoint	0..1	<a href="#">Endpoint</a>		An endpoint to use to access content (i.e. libraries) referenced by the library. If no content endpoint is supplied, the evaluation will attempt to retrieve content from the server on which the operation is being performed.

# Extended \$evaluate-measure

```
public interface MeasureProcessor<MeasureReportT, EndpointT, BundleT> {  
    /**  
     * Evaluates a Measure according to the specifications defined in the FHIR  
     * Clinical Reasoning Module and the CQFMeasures IG.  
     *  
     * @param url The canonical url of the Measure to evaluate  
     * @param periodStart The start of the Measure period  
     * @param periodEnd The end of the Measure period  
     * @param reportType The type of report to generate  
     * @param subject The subject Id to evaluate  
     * @param practitioner The practitioner Id to evaluate  
     * @param lastReceivedOn The date the report was last generated  
     * @param contentEndpoint The endpoint to use for Measure content  
     * @param terminologyEndpoint The endpoint to use for Terminology content  
     * @param dataEndpoint The endpoint to use for clinical data. NOTE:  
     * Mutually exclusive with the additionalData  
     * parameter  
     * @param additionalData A Bundle of clinical data to use during the  
     * evaluation.  
     * @return The completed Measure report.  
     */  
}
```

// snip

# Integration into eCR Now

- eCR Now action
- Spring Measure/CQL module

```
public class EvaluateMeasure extends BsaAction {

    @Autowired private R4MeasureProcessor measureProcessor;

    @Override
    public BsaActionStatus process(KarProcessingData data, EhrQueryService ehrService) {

        Bundle additionalData = data.getInputResourcesAsBundle();
        Endpoint endpoint =
            new Endpoint()
                .setAddress(data.getKar().getKarPath())
                .setConnectionType(new Coding().setCode(Constants.HL7_FHIR_FILES));

        // Evaluate Measure by passing the required parameters
        // Set up and evaluate the measure.
        MeasureReport result =
            measureProcessor.evaluateMeasure(
                measureUri,
                periodStart,
                periodEnd,
                "subject",
                patientId,
                null, // practitioner
                null, // received on
                endpoint, // Library Bundle
                endpoint, // Terminology Bundle
                null, // Endpoint for data
                additionalData); // Data Bundle
    }
}
```

# Content

- Measures based on CMS 122 and CMS 165

```
library ControllingBloodPressureFHIR version '9.0.000'

// snip

parameter "Measurement Period" Interval<DateTime>
  default Interval[@2019-01-01T00:00:00.0-06:00, @2019-12-31T23:59:59.999-06:00]

context Patient

define "SDE Ethnicity":
  SDE."SDE Ethnicity"

define "SDE Sex":
  SDE."SDE Sex"

define "SDE Age":
  SurveillanceDataElements."Age"

define "SDE Age Group":
  SurveillanceDataElements."Age Group"

define "SDE State of Residence":
  SurveillanceDataElements."State of Residence"

define "SDE Postal Code of Residence":
  SurveillanceDataElements."Postal Code of Residence"

define "SDE Food Insecurity Risk Status":
  SurveillanceDataElements."Food Insecurity Risk Status"
```

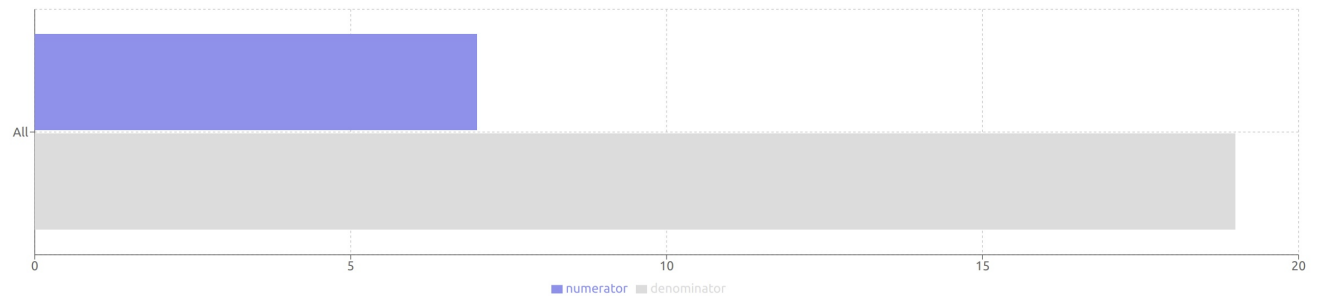
# Analytics UI

## Chronic Disease Analytics UI

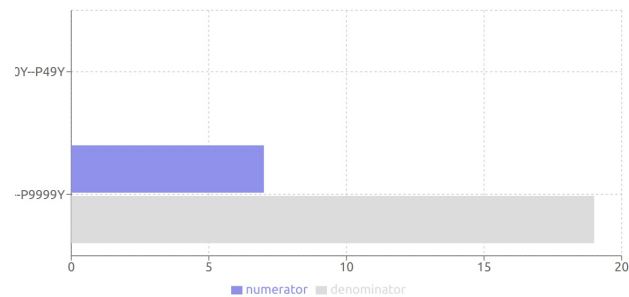
### Diabetes

Total Patients: 19

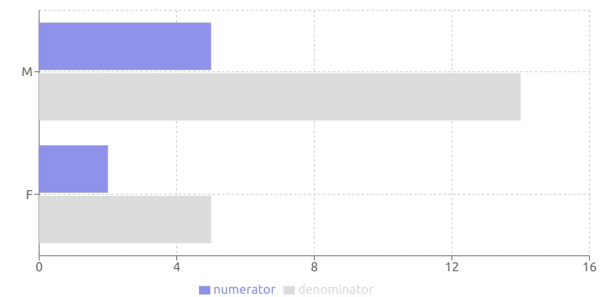
#### All Data



#### Age Data



#### Gender Data



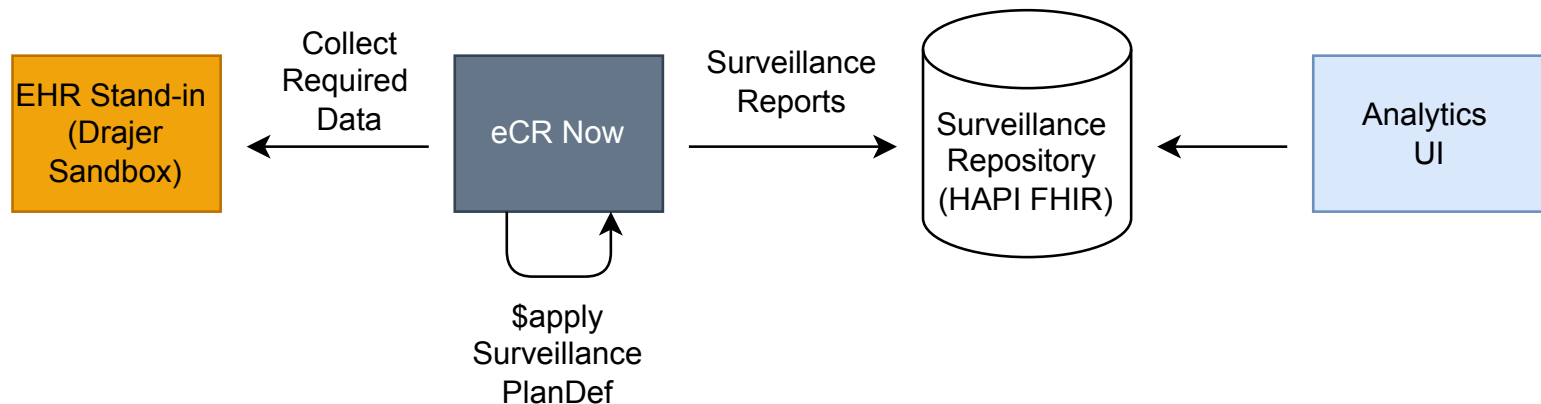
# Future Work

- Formalize IG
- Batch submission
- Support for FHIRPath-based measures



# End-to-end demo

- Diabetes eCSD as scenario
  - Accelerated for the sake of the demo
- Drajer sandbox as EHR
- Encounter event via Postman
- eCR Now posts eICR/eCSR Bundle to surveillance repo
- PoC Analytics App as UI



# Acknowledgements

- John Loonsk (APHL)
- Nagesh Bashyam et al. (Drajer)
- Sandra Jackson et al. (CDC)
- Sarah Gaunt (Lantana) / Adam Stevenson (Alphora)
- Josh Reynolds (Alphora)

**Q & A**