

Public Health Automated Case Event Reporting (PACER) Platform for Sexually Transmitted Infections (STI) using FHIR

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Background

STI cases make up the majority of reportable conditions, but current state eCR has its drawbacks

- Retrieving information is labor-intensive
- Medical data is stored in various forms
- Timing of reporting and clinical data may be inconsistent
- Lack of precision in communicating what needs to be captured exists
- While ELR has been increasing in adoption, it is limited to lab test results (missing other clinical information)

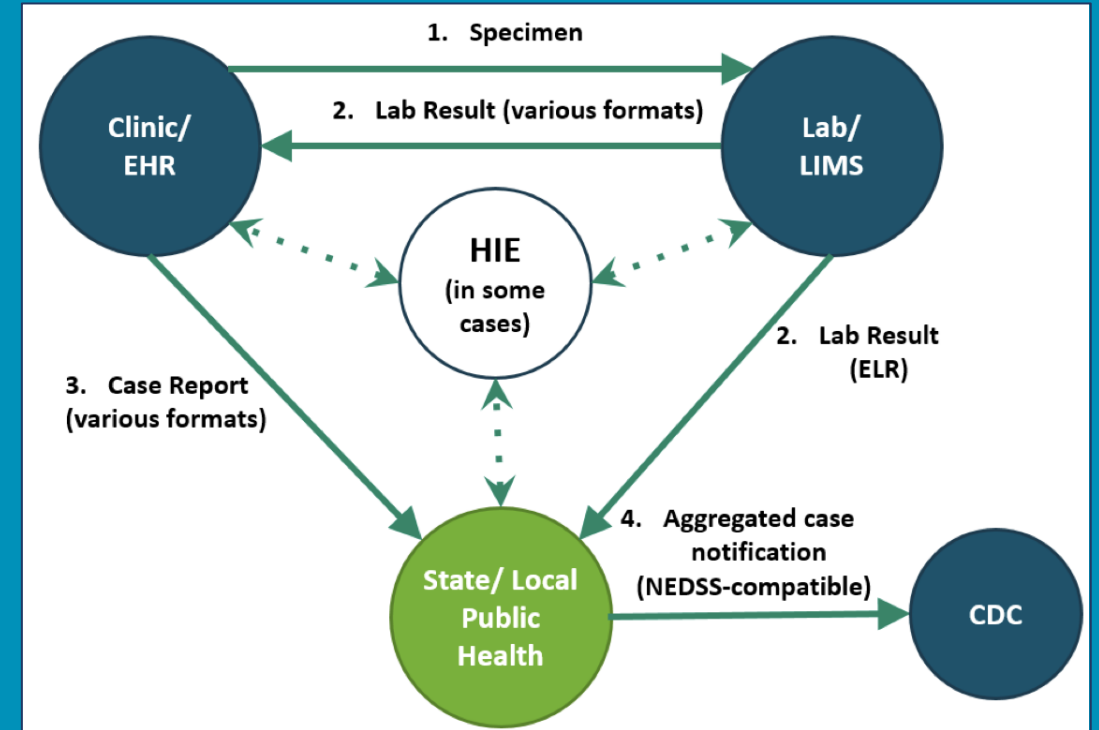


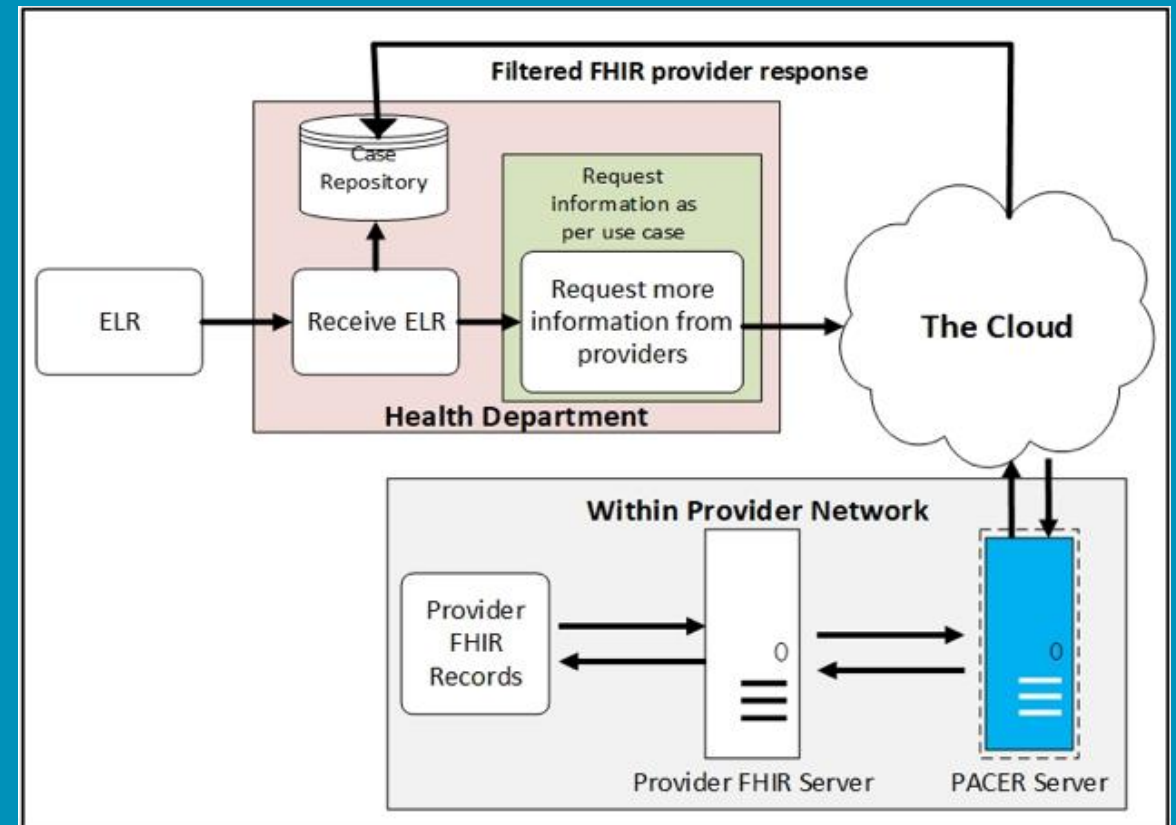
Figure 1 from Advanced Electronic Case Reporting of Sexually Transmitted Infections, https://www.phii.org/sites/default/files/resource/pdfs/ECRofSTIGuidance_v3%20%281%29.pdf



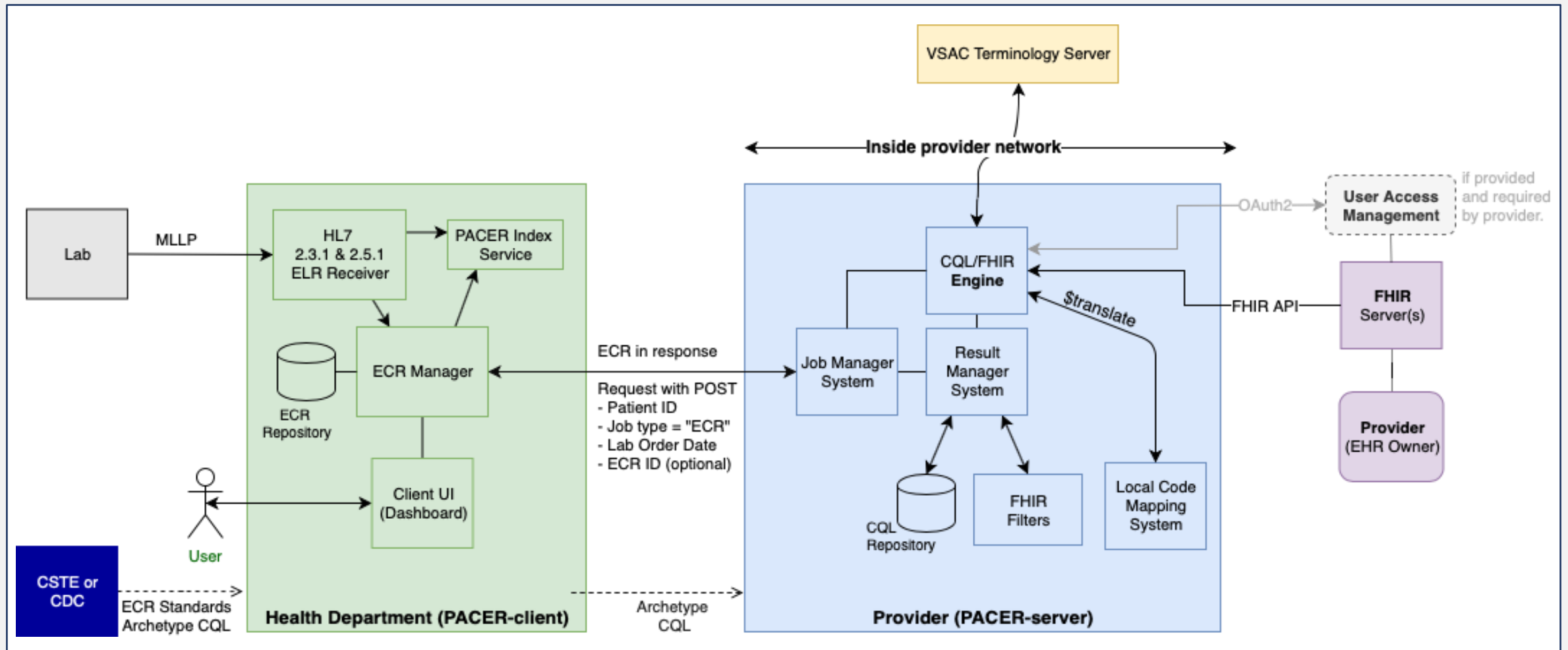
Goal

Build a platform that can

- Retrieve reportable conditions using standard interoperability standard (FHIR)
- Utilize the timeliness of ELR
- Automate case reporting that can be augmented.
- Reconfigure clinical case definitions (CQL)
- Provide privacy control (FHIRFilter)



Architecture



CQL-based FHIR Query

- Clinical Quality Language Scripts
 - High-level, human readable language for standardizing complex medical definitions
- Define custom codeset definitions
- Reference global valueset definitions
 - Uses valueset/\$expand operation
- Uses a fhir connector to connect queries to FHIR API.

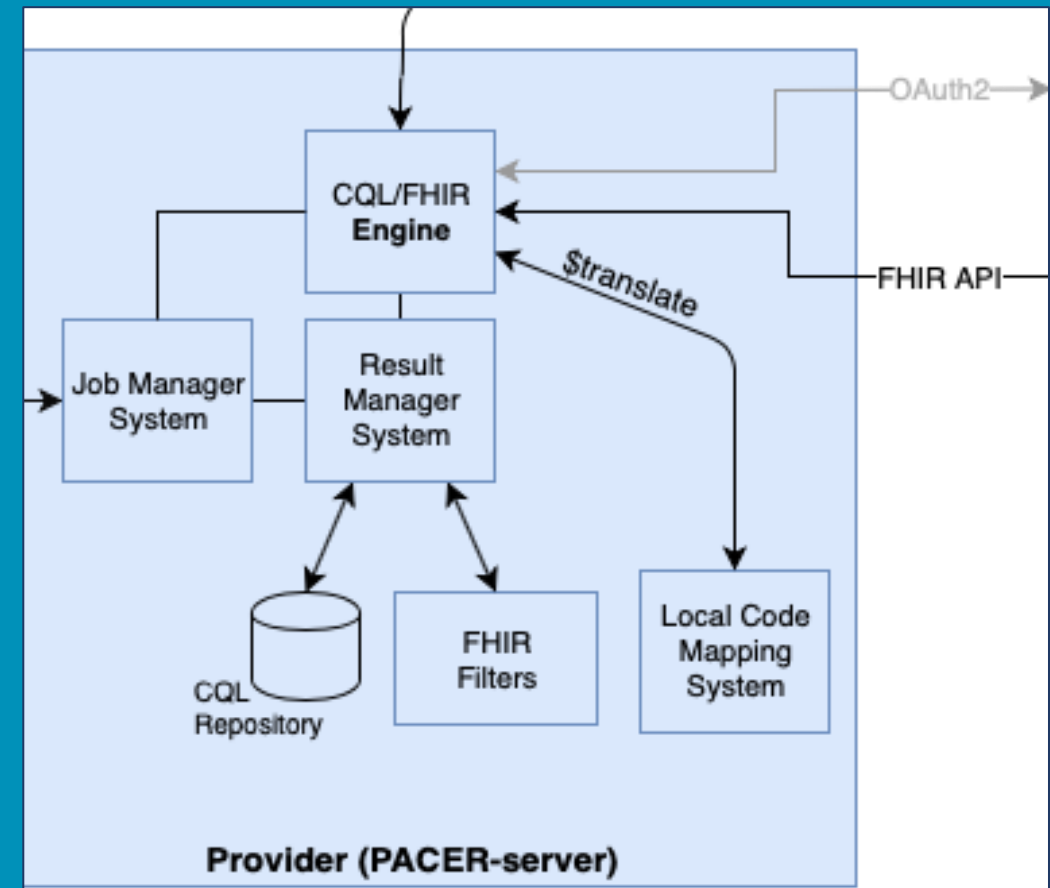
```
define "Pt": [Patient]
define "Chlamydia Diagnosis": [Condition: Code in "Chlamydia_Codes"]
define "Gonorrhea Diagnosis": [Condition: Code in "Gonorrhea_Codes"]
define "All Diagnosis": "Chlamydia Diagnosis" union "Gonorrhea Diagnosis"
define "19.Patient.ID": "Pt".identifier[0].value
define "20A.Patient.Name.given": "Pt".name[0].given[0]
define "20B.Patient.Name.family": "Pt".name[0].family
define "24.Patient.Street_Address": "Pt".address[0]
define "25.Patient.Birth_Date": "Pt".birthDate[0].value
define "26.Patient.Sex": "Pt".gender[0].value
define "30.Patient.Preferred_Language": "Pt".communication.language
define "38.Condition.Date_Of_Onset": "All Diagnosis".onset.value
define "39.Observation.Symptoms": [Condition: Code in "Sti Symptoms"]
define "42.Condition.Diagnosis": "All Diagnosis"

define "Encounter.idFromCondition": "42.Condition.Diagnosis"
define "ChlamydiaEncounters": [Encounter] Encounter
  with "42.Condition.Diagnosis" ChlamydiaDiagnosis
  such that exists (
    (Encounter.diagnosis.condition.reference) ref
    where EndsWith(ref, '/' + ChlamydiaDiagnosis.id)
  )
return Encounter
sort by period.start.value
```



Local Code Mapping - Translate

- Facilitates the standardization of code systems at CQL level
- Maintains the quality of eCR output over different provider systems by using the same CQL definitions.
- Providers can load local mapping CSV files.
- Uses standard FHIR translate operation – can be easily integrated with any existing translate service.



Privacy Control – FHIR Filters

- Provider can configure the FHIR filters to redact resources
- Filters can be constructed in either resource level and/or data elements level within the resources.
- Filters are written in the same JSON structure of FHIR. Thus, they can be written for any FHIR version that the provider has

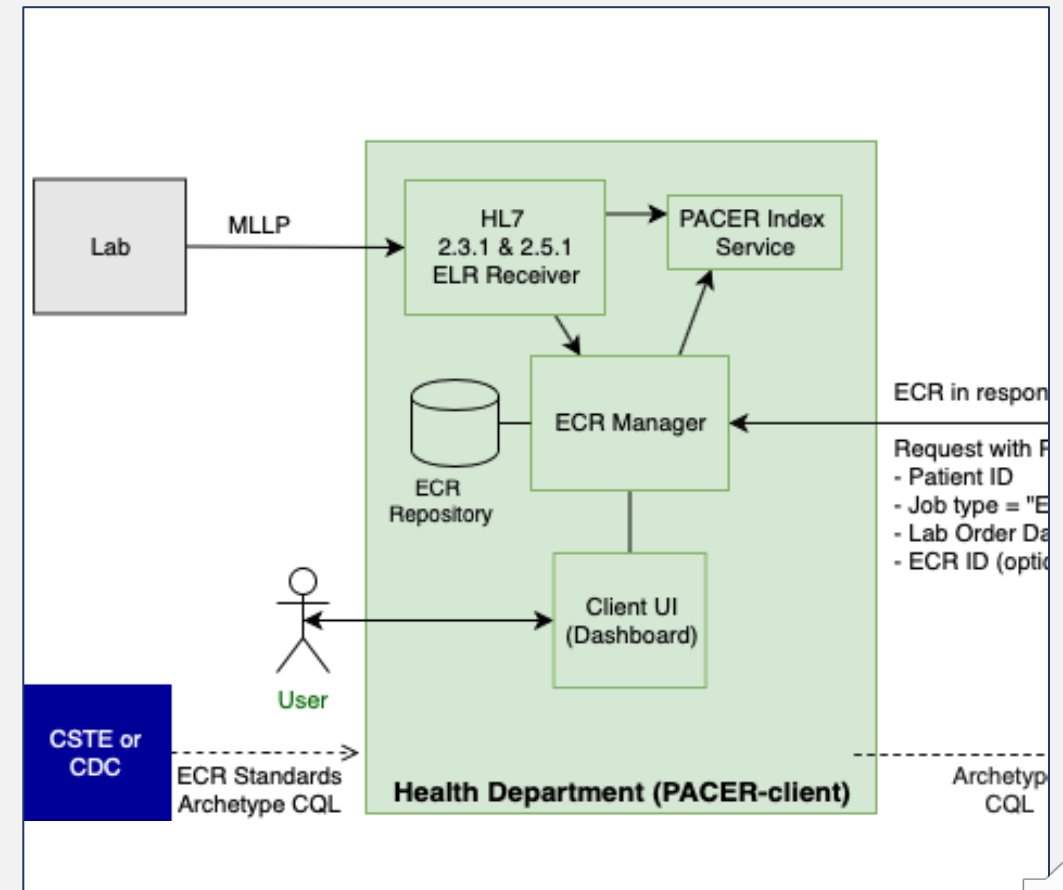
Filter Example

```
{
  "id": "1",
  "profileName": "Remove_Heart_Problem",
  "entryToRemove": [
    {
      "resourceType": "Condition",
      "code": {
        "coding": [
          {
            "system": "http://hl7.org/fhir/sid/icd-9-cm",
            "code": "428.0"
          }
        ]
      }
    }
  ]
}
```



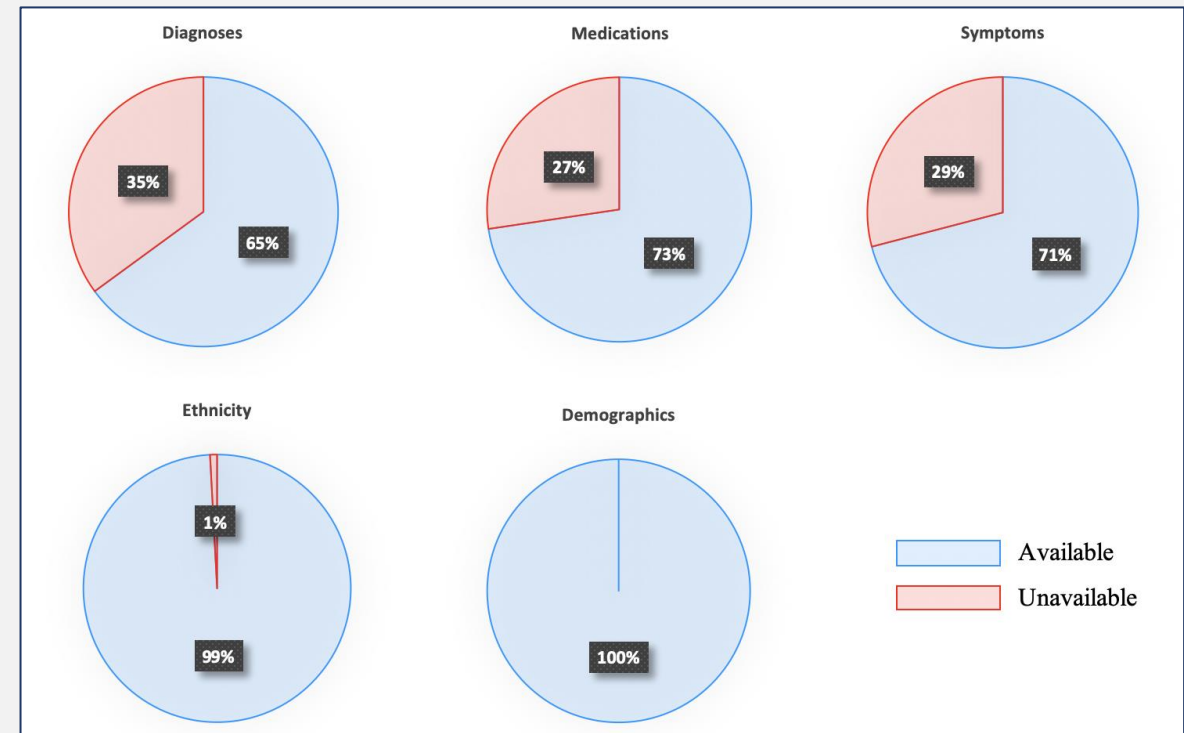
ELR Triggered

- Automatic case generation occurs when new ELR messages are received.
- Initial eCR is created from ELR, then a ECR request is triggered to PACER-server in the provider network.
- PACER index service provides the PACER-server endpoint based on the lab order provider information in the ELR message.



Result

- Phase I: Integration testing with Regenstrief HIE
- Phase 2: Pilot testing with Medical University of South Carolina (MUSC).
 - With 8 weeks of laboratory data, 117 patients identified as STI patients
 - Captured diagnoses, medications, and symptoms data that would not be available from ELR itself.



Public GitHub Repositories

- Apache 2.0 Open Sources
- PACER-server: <https://github.com/gt-health/PACER>
- PACER-client: <https://github.com/gt-health/PACER-client>
 - All service components are available in this repository as sub-modules
- FHIRFilter: <https://github.com/gt-health/fhirfilter>



Questions

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