Scalable Clinical Decision Support (CDS)

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Few areas of discussion

- Definitions
- What
- Why
- How
- With Whom
- For Whom
- Next Steps

The Electronic Health Record (EHR): More than an electronic folder

- **A systematic collection of patient electronic health information organized to assist the care of patients and groups of patients (like a practice population)**

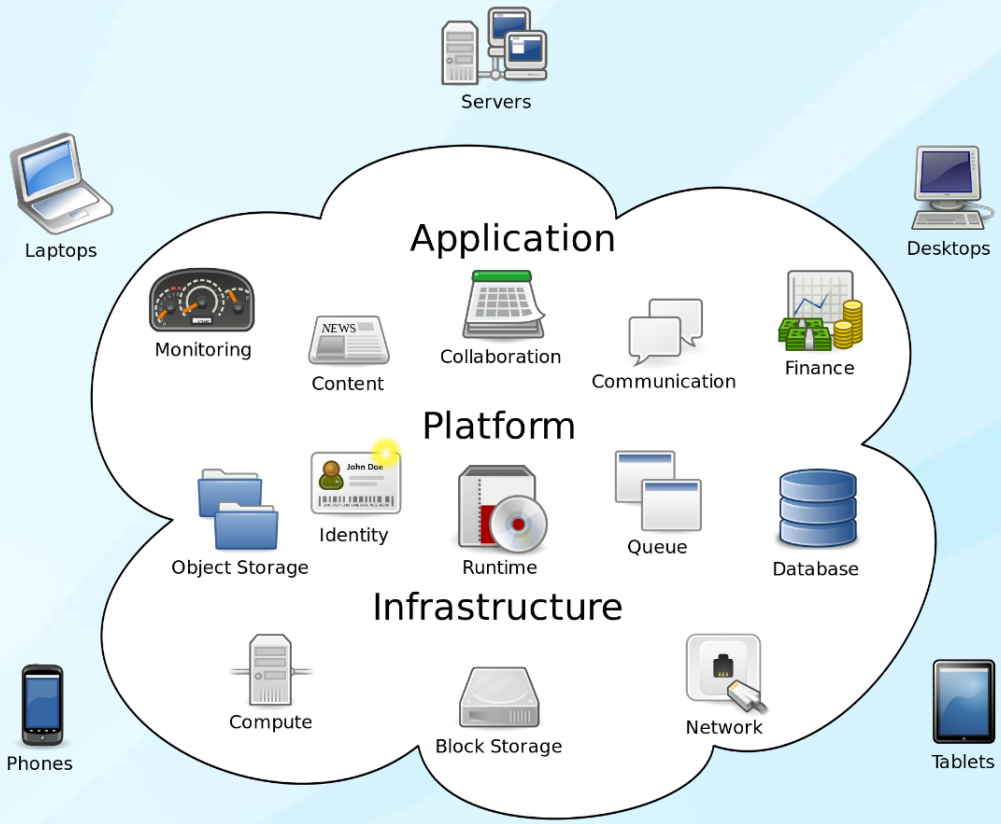
- **Digital formatting makes Information 'Liquid'**
  - Reuse digital elements
  - Trigger warnings and reminders
  - Report Cases
  - Measure quality and safety
  - Share information with patients

CDS Definition

Clinical Decision Support is a process for enhancing health-related decisions and actions with pertinent, organized clinical knowledge and patient information to improve health and healthcare delivery.

Osheroff, Teich, Levick, Saldana, Velasco, Sittig, Rogers, Jenders.
Improving Outcomes with Clinical Decision Support: An Implementers Guide
HIMSS 2012

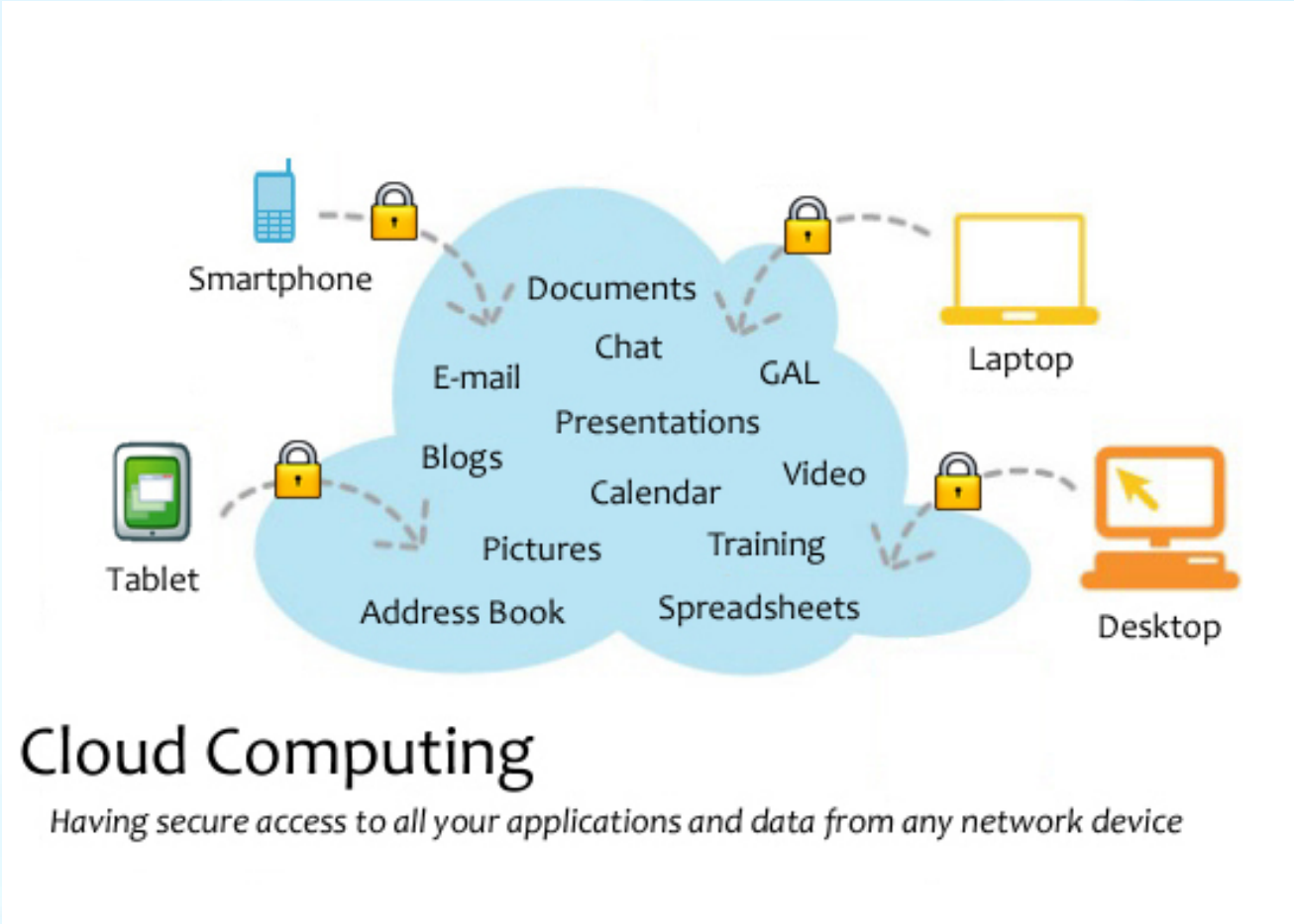
Cloud Computing



Cloud computing

Source: Wikipedia

Cloud Computing



Cloud Computing

Executable?.....Data to Measure

	Data	Logic	Function	Measure
Narrative	**If the patient's creatinine**	**is elevated then avoid metformin.**	Ability to show an alert (on screen or paper)	% of metformin pts w/ high Cr.
Semi-structured	Lab value: creatinine	Clinical scenario: Elevated Cr… Action: avoid metformin	Lab results, medication list (database)	Num: all metformin pts Denom: high Cr & metformin
Abstract	LOINC 2159-2	if cr > 1.2 mg/dL → Tell user "d/c metformin"	CIS with rule evaluation capability, alerting function	NumSet = {med=metformin} DenomSet = {cr > 1.2}
Machine interpretable	select * from labs where ID = 2159-2	If(cr>1.2) → print("d/c metformin);	CPOE with lab, meds and alerting capability.	select count(*) where …

general → specific

knowledge → action

Source: Dr. Middleton

What are we doing?

- We are providing executable files through a web service to the EMRs
- Automated Clinical Decision Support Service (ACDS)
- This is housed in NCHHSTP and has been C&Aed and is ready to go
- Multitude of partners for phase 1 and phase 2 of the project

Participating Networks/Health Centers Phase 1 & 2

Health Center Controlled Network	State	Health Center
Alliance of Chicago Community Health Services Centricity (GE Health)	IL	Howard Brown Health Center
	IL	Near North Health Service Corporation
Health Center Network of New York (HCNNY) Centricity (GE Health)	NY	Anthony L. Jordan Health Center
	NY	Open Door Family Medical Center, Inc.

Participating Networks/Health Centers Phase 3

Health Center Controlled Network	State	Health Center
Ohio Shared Information Services (OSIS) NextGen		
	CA	Northeastern Rural Health Clinics
	OH	Fairfield Community Health Center
Oregon Community Health Information Network (OCHIN) Epic		
	OR	Outside In, Portland

Why Cloud?

- Primarily because of lessons learnt along the way mainly from phase 1 of the project
- All three EHRs participating in phase 1 had unique technical architecture and capabilities, same vendor
- Structured data capture through provider action is difficult; privacy concerns
- Hard wired Knowledge management of CDS engine is impractical
- Local 5 “Rights” implementation

So In phase 2…

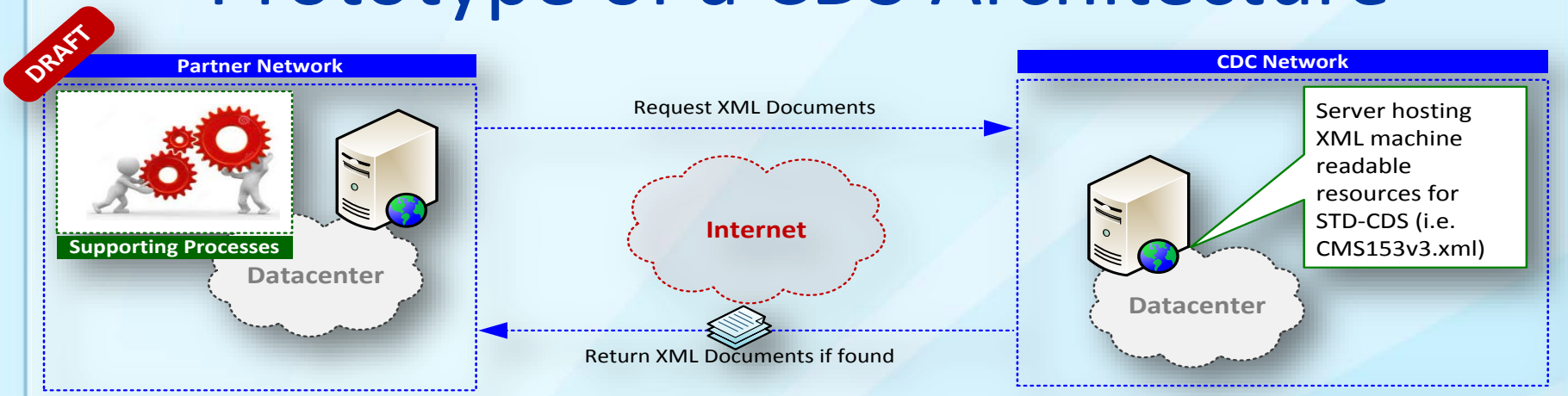
- We tried pilot testing of web-based clinical decision support service for managing clinical knowledge using cloud (Lite)
- Hence, phase 2 sought to
  - Convert guidelines to executable logic
  - develop and test connectivity to a web based clinical decision support (CDS) service with an EMR system
  - assess the exchange of knowledge from the 'cloud' based CDS service
  - capture lessons to guide expansion to more practice sites and EMR platforms (Phase 3 with Epic and NextGen)

How we are doing it?

- Deliver an HL7 XML encoded document (executable guidelines) to partners using standard internet protocols

eMeasure Title	Chlamydia Screening for Women
eMeasure Identifier (Measure Authoring Tool)	153
NQF Number	0033
eMeasure Version number	3
GUID	c9930664-be3d-4ffe-ae4a-5cf4933ecb89
Measurement Period	January 1, 20xx through December 31, 20xx
Measure Steward	National Committee for Quality Assurance
Measure Developer	National Committee for Quality Assurance
Endorsed By	National Quality Forum
Description	Percentage of women 16-24 years of age who were identified as sexually active and who had at least one test for chlamydia during the measurement period.
Copyright	Physician Performance Measure (Measures) and related data specifications were developed by the National Committee for Quality Assurance (NCQA). The Measures are copyrighted but can be reproduced and distributed, without modification, for noncommercial purposes (eg, use by healthcare providers in connection with their practices). Commercial use is defined as the sale, licensing, or distribution of the Measures for commercial gain, or incorporation of the Measures into a product or service that is sold, licensed or distributed for commercial gain. Commercial use of the Measures requires a license agreement between the user and NCQA. NCQA is not responsible for any use of the Measures. (c) 2008 -2014 National Committee for Quality Assurance. All Rights Reserved. Limited proprietary coding is contained in the Measure specifications for user convenience. Users of proprietary code sets should obtain all necessary licenses from the owners of the code sets. NCQA disclaims all liability for use or accuracy of any CPT or other codes contained in the specifications. CPT(R) contained in the Measure specifications is copyright 2004-2013 American Medical Association. LOINC(R) copyright 2004-2013 Regenstrief Institute, Inc. This material contains SNOMED Clinical Terms(R) (SNOMED CT[R]) copyright 2004-2013 International Health Terminology Standards Development Organisation. ICD-10 copyright 2013 World Health Organization. All Rights Reserved.
Disclaimer	These performance Measures are not clinical guidelines and do not establish a standard of medical care, and have not been tested for all potential applications. THE MEASURES AND SPECIFICATIONS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND. Due to technical limitations, registered trademarks are indicated by (R) or [R] and unregistered trademarks are indicated by (TM) or [TM].
Measure Scoring	Proportion
Measure Type	Process
Stratification	Report a total score, and each of the following strata: Stratum 1: Patients age 16-20 Stratum 2: Patients age 21-24
Risk Adjustment	None
Rate Aggregation	None
Rationale	Chlamydia trachomatis is the most common sexually transmitted bacterial infection in the U.S., resulting in over 2.8

Prototype of a CDS Architecture



- Internal triggers are identified and executed within a health center network
- The EHR network connects via the internet to request one or more machine readable documents from the web/cloud based system
- Requests and results are written to a log file
- EHR consumes the XML documents for further processing

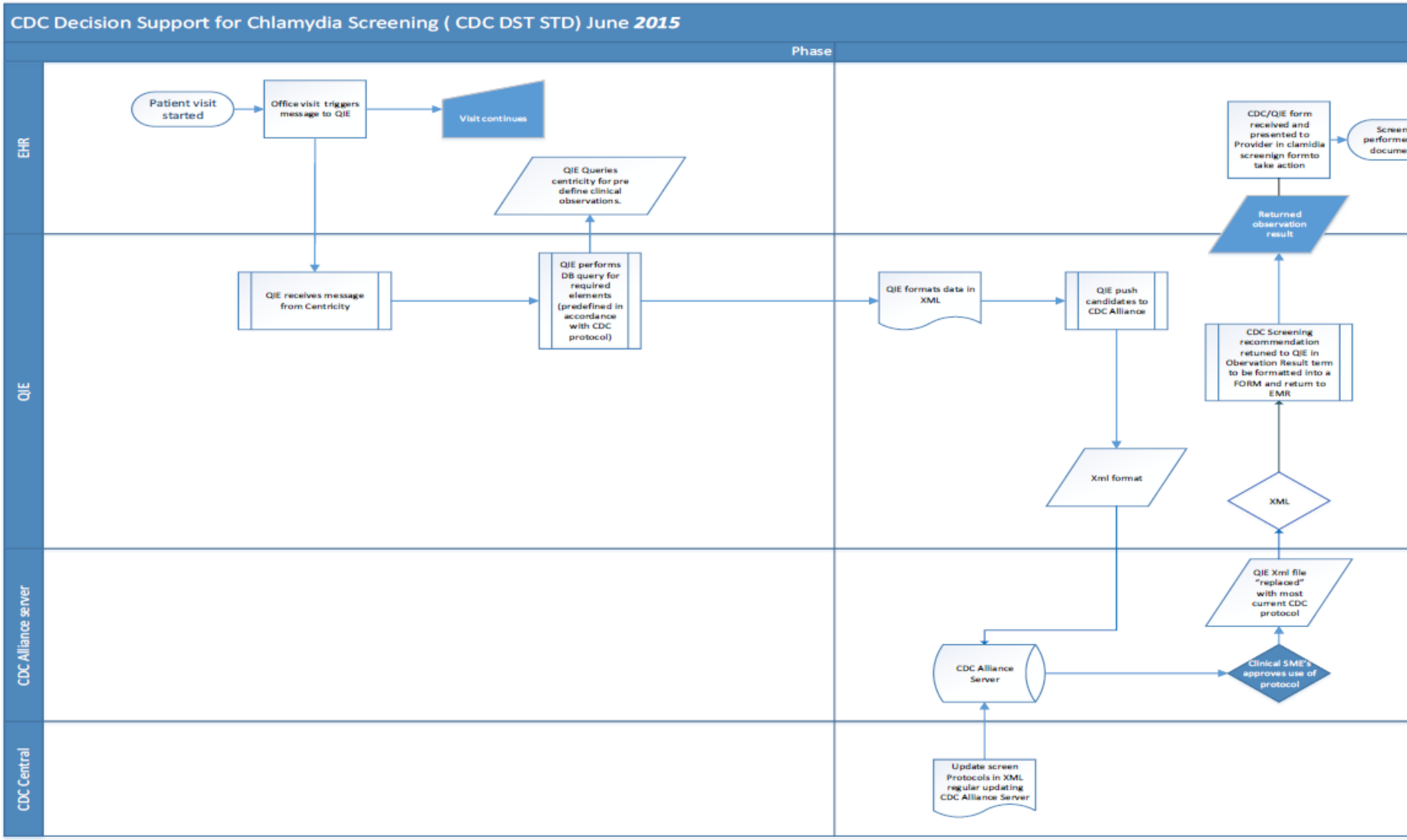
Sample Log

Log4NetApplicationLog.log - Notepad

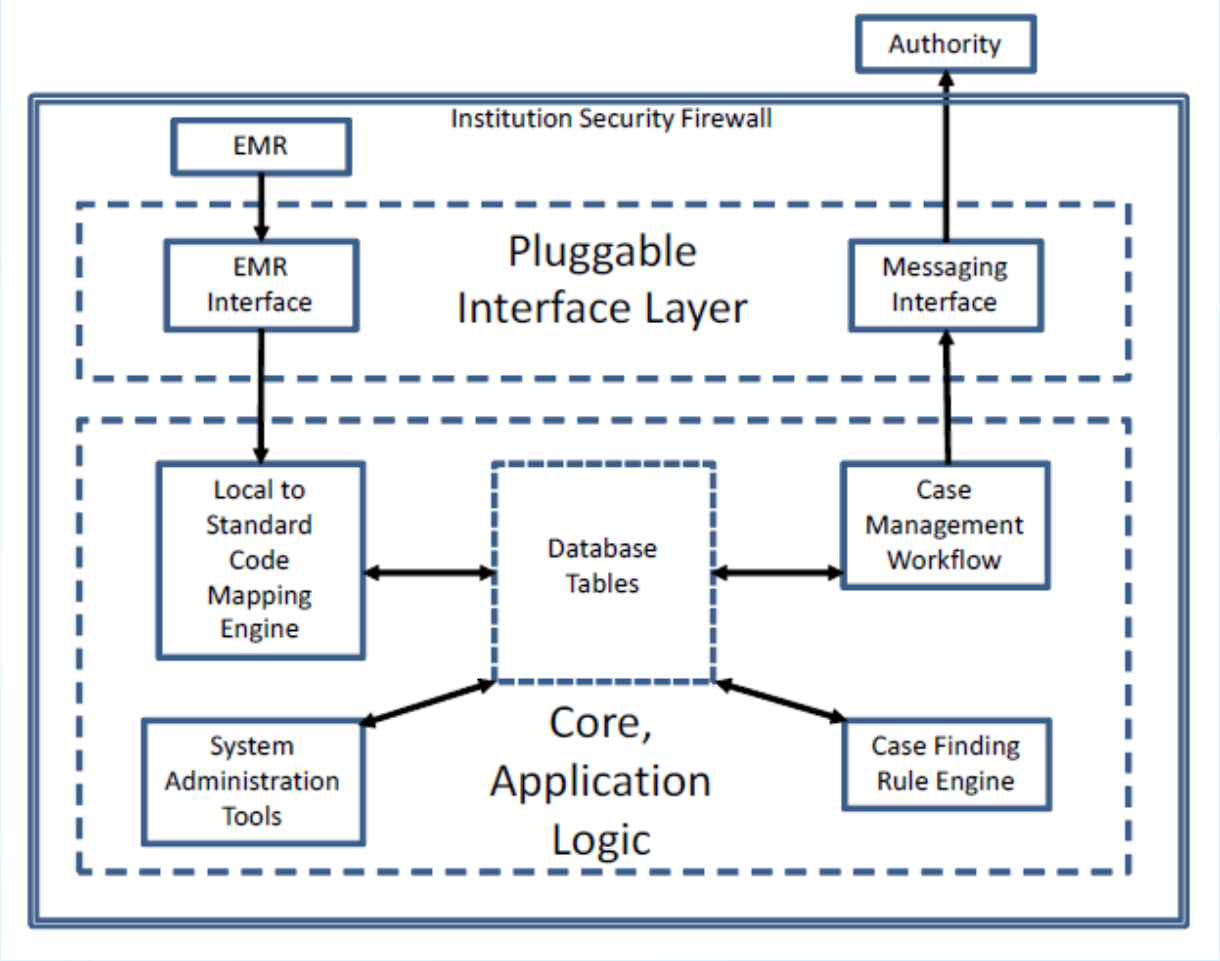
File Edit Format View Help

```
2014-12-10 08:03:28,118 [1] INFO  Gov.Cdc.Nchhstp.Std.Cds.Program [] - ==========
2014-12-10 08:03:28,153 [1] INFO  Gov.Cdc.Nchhstp.Std.Cds.Program [] -  The Centers for Disease Control and Prevention, Office of the Director, Informatics Office
2014-12-10 08:03:28,153 [1] INFO  Gov.Cdc.Nchhstp.Std.Cds.Program [] - ----------
2014-12-10 08:03:28,154 [1] INFO  Gov.Cdc.Nchhstp.Std.Cds.Program [] -
2014-12-10 08:03:28,154 [1] INFO  Gov.Cdc.Nchhstp.Std.Cds.Program [] -
2014-12-10 08:03:28,154 [1] INFO  Gov.Cdc.Nchhstp.Std.Cds.Program [] -
2014-12-10 08:03:28,154 [1] INFO  Gov.Cdc.Nchhstp.Std.Cds.Program [] -
2014-12-10 08:03:28,154 [1] INFO  Gov.Cdc.Nchhstp.Std.Cds.Program [] -
2014-12-10 08:03:28,155 [1] INFO  Gov.Cdc.Nchhstp.Std.Cds.Program [] -
2014-12-10 08:03:28,155 [1] INFO  Gov.Cdc.Nchhstp.Std.Cds.Program [] - ----------
2014-12-10 08:03:28,157 [1] INFO  Gov.Cdc.Nchhstp.Std.Cds.Program [] - STD - Clinical Decision Support Service
2014-12-10 08:03:28,157 [1] INFO  Gov.Cdc.Nchhstp.Std.Cds.Program [] - STD-CDS.exe Version: 0.9.0.0
2014-12-10 08:03:28,161 [1] INFO  Gov.Cdc.Nchhstp.Std.Cds.Program [] - ==========
2014-12-10 08:03:28,162 [1] INFO  Gov.Cdc.Nchhstp.Std.Cds.Program [] - Process Started on: 12/10/2014 08:03:28 Thread Id: 1
2014-12-10 08:03:28,162 [1] INFO  Gov.Cdc.Nchhstp.Std.Cds.Program [] - Site Key: 3ead38dc-1eb8-4a02-bfba-d214ef7ef4eb
2014-12-10 08:03:28,162 [1] INFO  Gov.Cdc.Nchhstp.Std.Cds.Program [] - Auto Update: True
2014-12-10 08:03:28,168 [1] DEBUG Gov.Cdc.Nchhstp.Std.Cds.Utils [] - Directory Created: D:\STD-CDS\data
2014-12-10 08:03:28,313 [1] INFO  Gov.Cdc.Nchhstp.Std.Cds.Program [] - CDS Service Status: NEW VERSION  :: URL: http://ajdv-nifm-web2.cdc.gov/STD-CDS/service/CdsXmlService?resource=CMS153v3
2014-12-10 08:03:28,339 [1] INFO  Gov.Cdc.Nchhstp.Std.Cds.Program [] - CDS Service Status: NEW VERSION  :: URL: http://ajdv-nifm-web2.cdc.gov/STD-CDS/service/CdsXmlService?resource=CMS75v3
2014-12-10 08:03:28,363 [1] INFO  Gov.Cdc.Nchhstp.Std.Cds.Program [] - CDS Service Status: NEW VERSION  :: URL: http://ajdv-nifm-web2.cdc.gov/STD-CDS/service/CdsXmlService?resource=CMS75v3
2014-12-10 08:03:28,386 [1] ERROR Gov.Cdc.Nchhstp.Std.Cds.Program [] - CDS Service Status: URL: http://ajdv-nifm-web2.cdc.gov/STD-CDS/service/CdsXmlService?resource=xCMS75v3.xml :: MESSAGE
2014-12-10 08:03:28,390 [1] INFO  Gov.Cdc.Nchhstp.Std.Cds.Program [] - ServiceUpdate URL: http://ajdv-nifm-web2.cdc.gov/STD-CDS/service/AutoUpdateService?siteKey=3ead38dc-1eb8-4a02-bfba-d21
2014-12-10 08:03:28,401 [1] INFO  Gov.Cdc.Nchhstp.Std.Cds.Program [] - ServiceUpdate Status: No changes found - Version: (0.9.0.0) is upto date
2014-12-10 08:03:28,402 [1] INFO  Gov.Cdc.Nchhstp.Std.Cds.Program [] - Process Ended on: 12/10/2014 08:03:28 Thread Id: 1
```

OF_Rev (00000002)AttachmentA.pdf - Adobe Acrobat Pro
View Window Help
1 / 1 89.1% Tools



Architecture within



Source: ESP

Chlamydia Prevention

Example of a Female patient ages 16-24 that has had a Chlamydia test in the last

year. NOTE:

Two different sections for decision support:

1. Built into the form (Chlamydia Test Status)
2. Using the 'new' Qvera/CDC clinical decision support tool (CDC Recommendation)

Chlamydia Prevention DOB: 12/11/1991 Patient Age: 23 Years Old

Chlamydia on Problem List

No Active Chlamydia Diagnosis on Problem List

Problems

Chlamydia Testing ☐ add to note

Genital/Urine: Negative (06/19/2014)
Rectal:
Pharyngeal:
Sexually Active: Yes (10/10/2013)

Risk Alert

Chlamydia Test Status: Test Done in Past Year ?

CDC Recommendation: No Chlamydia Test Due ?

Age 11-25 Years & Sexually Active

Discussion with Patient

Yes (10/10/2013)

Sexually active: ○ Yes ○ No

Patient underwent STD prevention counseling. (11/13/2014)

11/13/2014

☐ education/counseling performed

☐ testing not done today

Follow-Up Instructions

☐ return to clinic in ____ ○ day(s) ○ week(s) ○ month(s)

☐ schedule an appointment for reviewing lab results

☐ clinic to call the patient with lab results and instructions

☐ other instructions (please specify in Comments)

Comments:

Sexual Risk Assessment | Problems | Orders | Chlamydia Guidelines

Example of a Female patient ages 16-24 that has NOT had a Chlamydia test in the last year.

Chlamydia Prevention | DOB: 12/11/1991 | Patient Age: 23 Years Old

Chlamydia on Problem List

No Active Chlamydia Diagnosis on Problem List

Problems

Chlamydia Testing ☐ *add to note*

Genital/Urine:
Rectal:
Pharyngeal:
Sexually Active: Yes (10/10/2013)

Risk Alert

Chlamydia Test Status: No Chlamydia Test in Past Year ?

CDC Recommendation: Chlamydia Screening Due ?

Age 11-25 Years & Sexually Active

Discussion with Patient

Yes (10/10/2013)

Sexually active: ○ Yes ○ No

Patient underwent STD prevention counseling. (11/13/2014)

11/13/2014

☐ education/counseling performed

☐ testing not done today

Follow-Up Instructions

☐ return to clinic in ____ ○ day(s) ○ week(s) ○ month(s)

☐ clinic to call the patient with lab results and instructions

☐ schedule an appointment for reviewing lab results

☐ other instructions (please specify in Comments)

Comments:

Sexual Risk Assessment | Problems | Orders | Chlamydia Guidelines

v1.01 - version date: 04/22/2015

Alliance of Chicago Community Health Services, L3C

Example of a patient where the Qvera/CDC CDS has not yet fully completed. It typically takes between 15-30 Seconds to return results.

What will be seen if the form is 'pulled in on the fly' for patients that are not female and between 16-24

Chlamydia Prevention | DOB: 07/07/1980 | Patient Age: 34 Years Old

Chlamydia on Problem List

No Active Chlamydia Diagnosis on Problem List

Problems

Chlamydia Testing ☐ *add to note*

Genital/Urine:
Rectal:
Pharyngeal:
Sexually Active: Yes (02/15/2015)

Risk Alert

Chlamydia Test Status: No Chlamydia Test in Past Year ?

CDC Recommendation: No Chlamydia Test Due ?

Discussion with Patient

Yes (02/15/2015)

Sexually active: ○ Yes ○ No

02/15/2015 ☐ education/counseling performed

testing not done - no rationale (02/15/2015) ☐ testing not done today

Follow-Up Instructions

☐ return to clinic in ____ ○ day(s) ○ week(s) ○ month(s)

☐ schedule an appointment for reviewing lab results

☐ clinic to call the patient with lab results and instructions

☐ other instructions (please specify in Comments)

Comments:

Sexual Risk Assessment | Problems | Orders | Chlamydia Guidelines

What are the benefits?

- Programs could identify what they would like to convert into executable files
- Manage changes to them from a centralized location: at the same time reaping the benefits of localized 5R friendly implementation
- Hopefully can talk to many different EMR systems at once (standards lacking but workarounds possible)
- Opportunity for innovation

Public Health Decision Support

Public Health Population Centric

- Surveillance
- Health Education and Promotion
- Interventions
- Vulnerable Populations

Case Reporting, Population Health

Public Health Resources

- Guidelines
- Public health expertise (Epidemiology)
- Policies
- Baseline

HIT Resources

- EHRs
- CPOE
- CDS
- Lab Systems

Healthcare Patient Centric

- Screening
- Diagnosis
- Treatment
- Follow Up
- Referrals

Outbreak Investigation, Situational Awareness

Identifying High Risk Populations, Case Management

Modified Source:
Dr. Seth Foldy

Next Steps

- Complete phase 3
- Evaluate technical and process parameters
- Make ACDS real cloud friendly (Learning Hour on 26th May 11 AM)
- Convert our STD treatment guidelines into executable files (Co Ag Proposal is out)
- Find a partner like AWS or Azure or someone similar to work with us.

Acknowledgements

- All our community and clinical partners
- Max Mirabito and Thom Sukalac
- Hillard Weinstock and Gail Bolan
- GE Health
- Qvera
- Dr. Blackford Middleton

Questions

ACCORDING TO THIS, THE PLANET EARTH WAS ONCE POPULATED BY HUMANS, THEN IN 2012...
...THEY ALL MOVED TO THE CLOUD.