

Future of Interoperability

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In collaboration with



Key Themes for Interoperability - KP

- The necessity of preserving both machine readability and human readability through interoperability
- The future of person-centric interoperability
- The role of interoperability in support of collaboration for research
- The role of interoperability in support of collaboration for care

Vision of Interoperability: Intermountain Healthcare

- Develop a new healthcare IT ecosystem
- Data modeling to ensure compatibility
- Platform-independent services such as FHIR profiles and resources
- A marketplace or “App Store” for the distribution of interoperable, shareable clinical applications.
- Data relevancy: integrating the right data at the right time

The Future Ecosystem

- Standards are defined that enable “truly” interoperable systems using standards based services
- Old and new EHR vendors:
 - Support standards based services (HL7 FHIR®)
 - Support SMART® applications
- Thousands of people develop software that runs on truly interoperable platforms
 - Open source, academics, and for profit developers
 - Apps, including clinical decision support algorithms, are for sale in a vendor neutral app store
 - Apps can be certified as HSPC compliant
 - Platform vendors certify apps as safe for use in their platform

The Future Ecosystem (2)

- People buy a patient data platform
 - Includes auditing, security, authorization, patient selection, etc.
 - May include some core apps: order entry, results review, notification, etc.
- People buy the apps they need
- There is also a marketplace for sharing knowledge, especially protocols, workflows, order sets, ontologies
- Patients receive better care at a lower cost because lower cost higher quality apps are available as driven by market forces

What If There Is No Model?

Site #1

Dry Weight: **70** **kg**

Site #2

Weight: **70** **kg**

- Dry
- Wet
- Ideal

Too Many Ways To Say The Same Thing...

- A single name/code and value
 - *Dry Weight* is **70 kg**

- Combination of two names/codes and values
 - *Weight* is **70 kg**
 - *Weight type* is **dry**

Relational Database Implications

Patient Identifier	Date and Time	Observation Type	Observation Value	Units
12345678	7/4/2005	Dry Weight	70	kg
912345678	7/19/2005	Current Weight	73	kg

Patient Identifier	Date and Time	Observation Type	Weight type	Observation Value	Units
12345678	7/4/2005	Weight	Dry	70	kg
91234567	7/19/200	Weight	Current	73	kg

9

9

89

5

How would you calculate the desired weight loss during the hospital stay?

Evolution of Clinical Modeling & FHIR Profiling

- **Clinical Element Models (CEM)**
 - Curated by Stan Huff at Intermountain
 - 6500+ semantically-complete, explicitly constrained data entities
 - <http://www.clinicalelement.com/>
- **HL7 CIMI – emerging international standard modeling effort**
 - Led by Stan Huff and many others
- **HSPC - Healthcare Services Platform Coalition**
 - Intermountain + LSU Health + Veterans Administration + others
 - Truly interoperable clinical data services
- **Argonauts**
 - Vendor group to fund speed up SMART and FHIR
 - HL7 FHIR Core + Argonaut Profiles + OAuth2

FHIR: Core Resources Span Key EMR Data

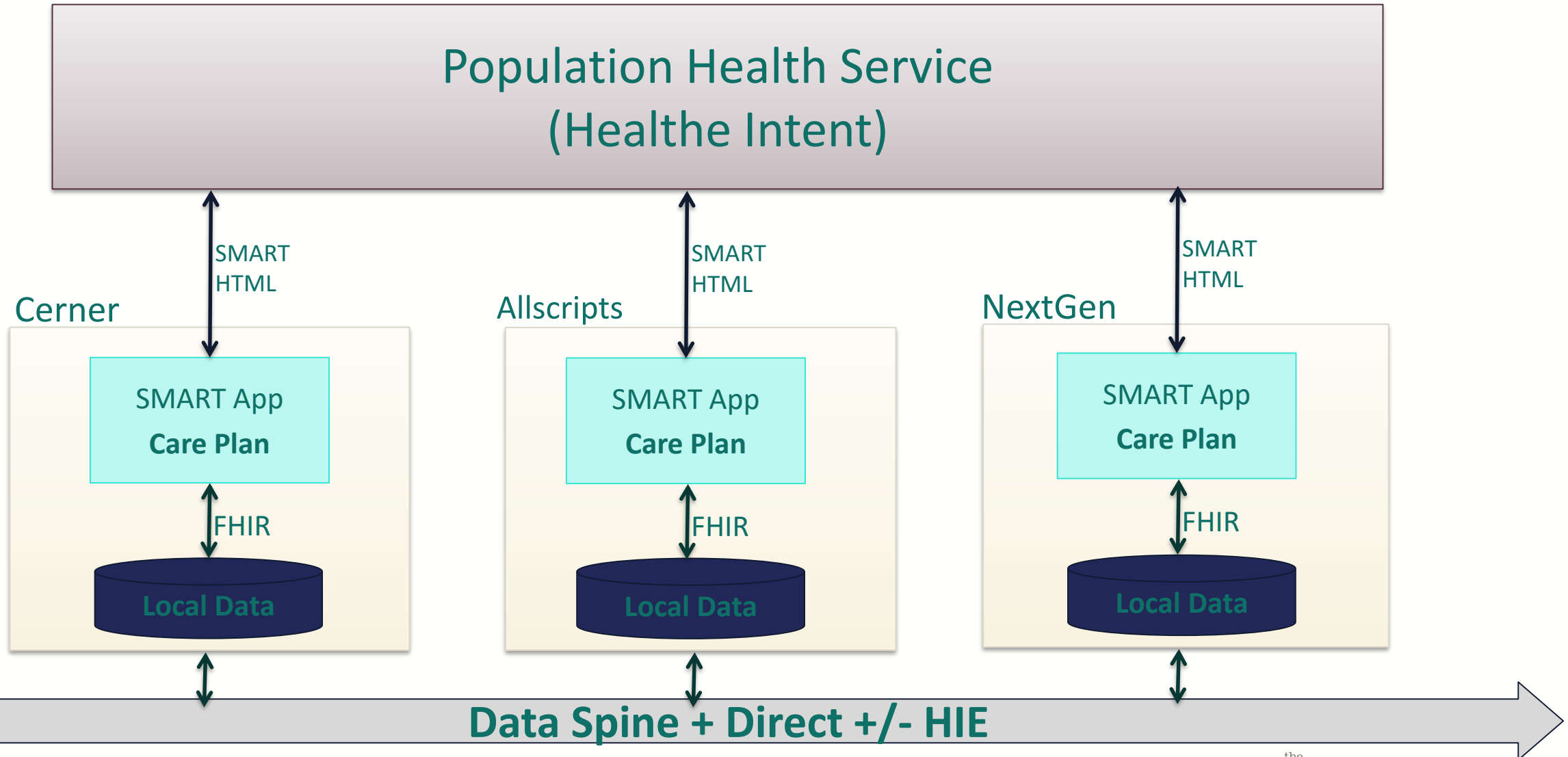
AdverseReaction
Alert
AllergyIntolerance
CarePlan
Composition
ConceptMap
Condition
Conformance
Device
DeviceObservationReport
DiagnosticOrder
DiagnosticReport
DocumentReference
DocumentManifest
Encounter
FamilyHistory

Group
ImagingStudy
Immunization
ImmunizationRecommendation
List
Location
Media
Medication
MedicationAdministration
MedicationDispense
MedicationPrescription
MedicationStatement
MessageHeader
Observation
OperationOutcome
Order

OrderResponse
Organization
Other
Patient
Practitioner
Procedure
Profile
Provenance
Query
Questionnaire
RelatedPerson
SecurityEvent
Specimen
Substance
Supply
ValueSet



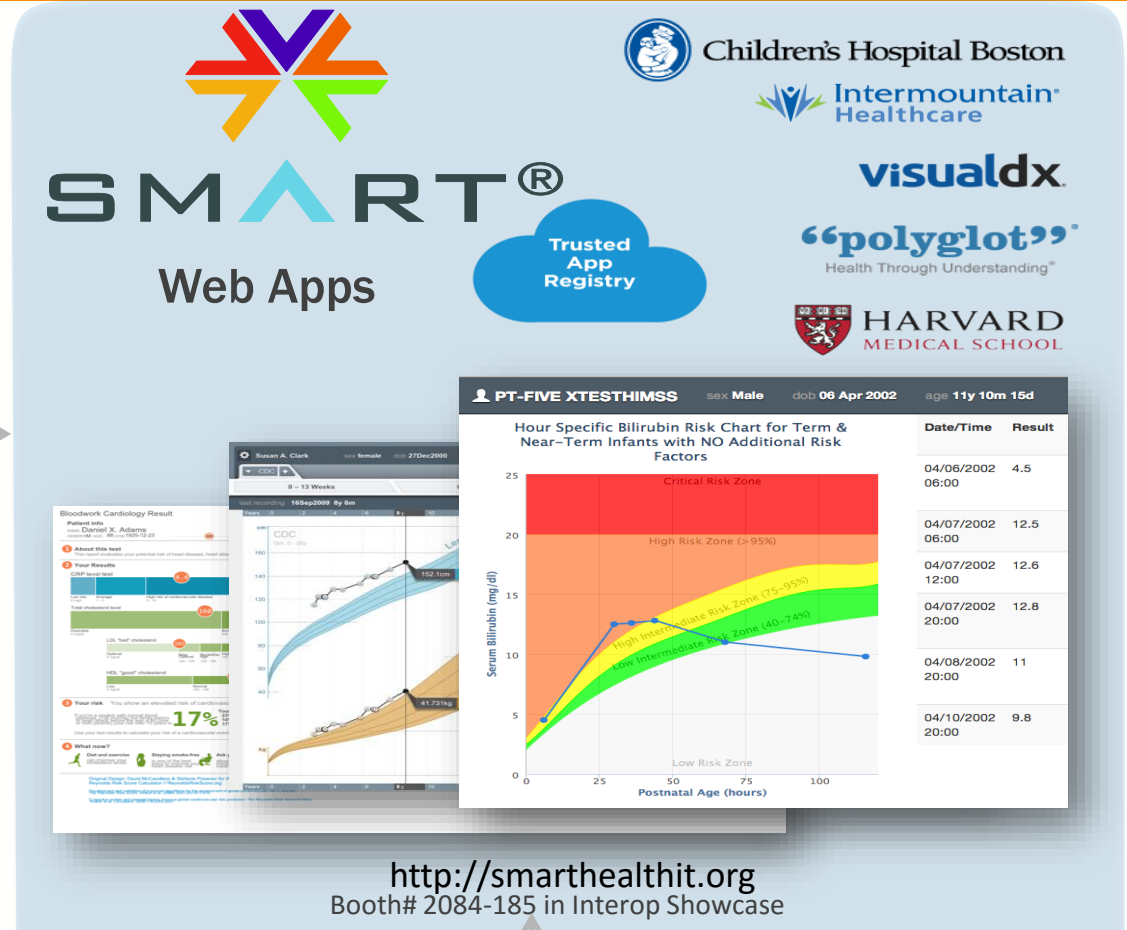
SMART Apps for Care Plan Integration



SMART[®] on FHIR[®] – Open Platform Architecture – HIMSS 2015



SMART[®]
Mobile Apps



SMART[®]
Web Apps

Trusted App Registry

Children's Hospital Boston
Intermountain Healthcare
visualdx
"polyglot"
Health Through Understanding
HARVARD MEDICAL SCHOOL

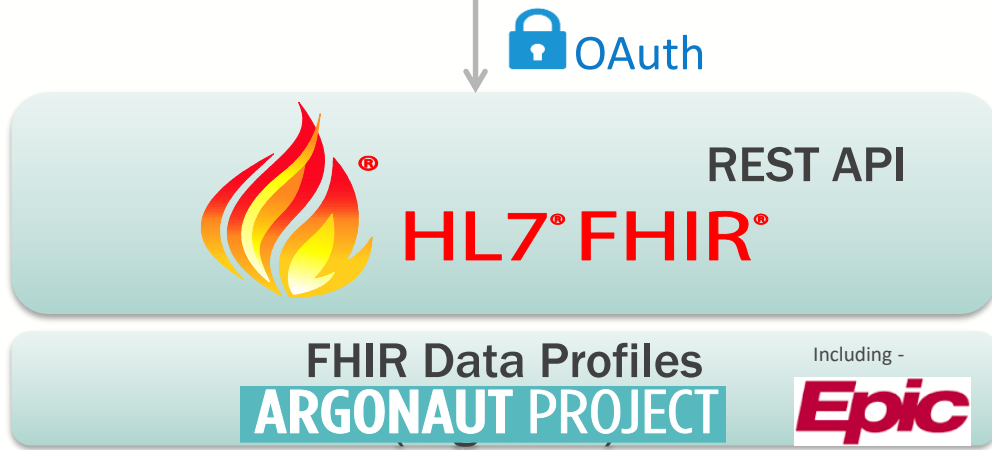
PT-FIVE XTESTHIMSS sex Male dob 06 Apr 2002 age 11y 10m 15d

Hour Specific Bilirubin Risk Chart for Term & Near-Term Infants with NO Additional Risk Factors

Date/Time	Result
04/06/2002 06:00	4.5
04/07/2002 06:00	12.5
04/07/2002 12:00	12.6
04/07/2002 20:00	12.8
04/08/2002 11 20:00	11
04/10/2002 9.8 20:00	9.8

<http://smarthealthit.org>
Booth# 2084-185 in Interop Showcase

OAuth



REST API
HL7[®] FHIR[®]

FHIR Data Profiles
ARGONAUT PROJECT Including - **Epic**

Supporting Health IT Systems

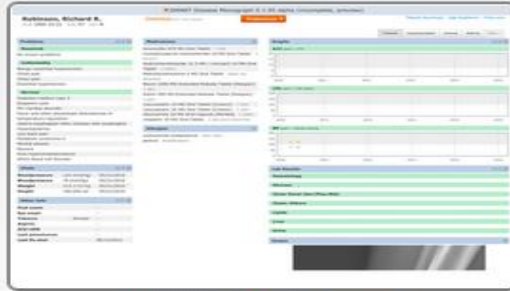


Cerner **athenahealth** **Department of Veterans Affairs Systems Made Simple** **HSPC Healthcare Services Platform Consortium** **Duke Medicine** *Your system here*

SMART on FHIR “App Gallery” – more than 25 apps (so far)



Diabetes Monograph



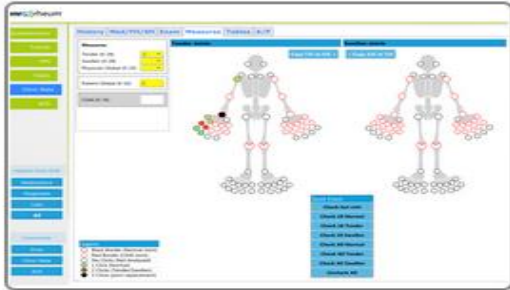
Disease Monograph



Duke PillBox



BMJ Content Discovery



EnR | Rheum



Growth Chart



Health Ally



Cardiac Risk



Healthwise Patient Engagement Solution



MPR Monitor




Medication RS



Crimson Care Management

Intermountain: SMART Neonatal Bilirubin Alerts

 **DEMORA, CARRIE**
 Allergies: Allergies Not Recorded


 DOB:11/21/2005
 Age:8 years My Health: No

 Dose Wt:
 Isolation:

 Sex:Female
 Loc:BN 1N


 MRN:00001008
 Fin#:000001510

 Attending:STRINGFIELD, STEVE

 **SMART Bilirubin Tool**

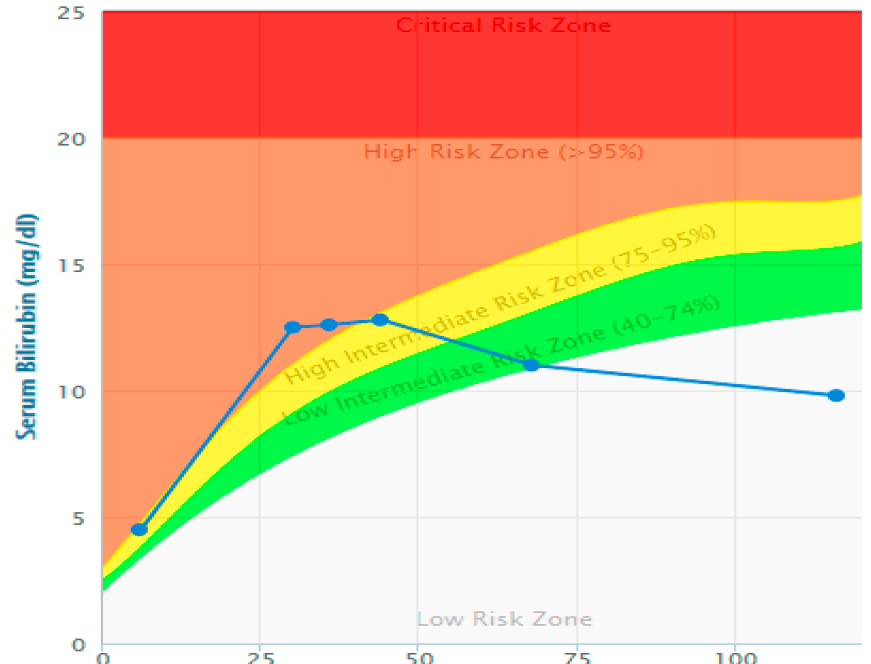
 Print 0 minutes ago

CARRIE DEMORA sex **Female** dob **21 Nov 2005** age **8y 3m 6d**



- Ambulatory Summary
- Ambulatory Summary (FHIR)
- Results Review
- Diagnosis & Problems
- Orders +
- Health Maintenance
- Documentation +
- Tasks
- Allergies +
- Growth Chart
- Histories
- Immunization Schedule
- MAR Summary
- Medication List +
- Notes +
- Patient Information
- Form Browser
- MAR
- SMART Growth Chart
- SMART BP Centiles
- SMART Medication
- SMART Visual Dx
- SMART Bilirubin Tool
- SMART FHIR Demo
- Intake and Output +

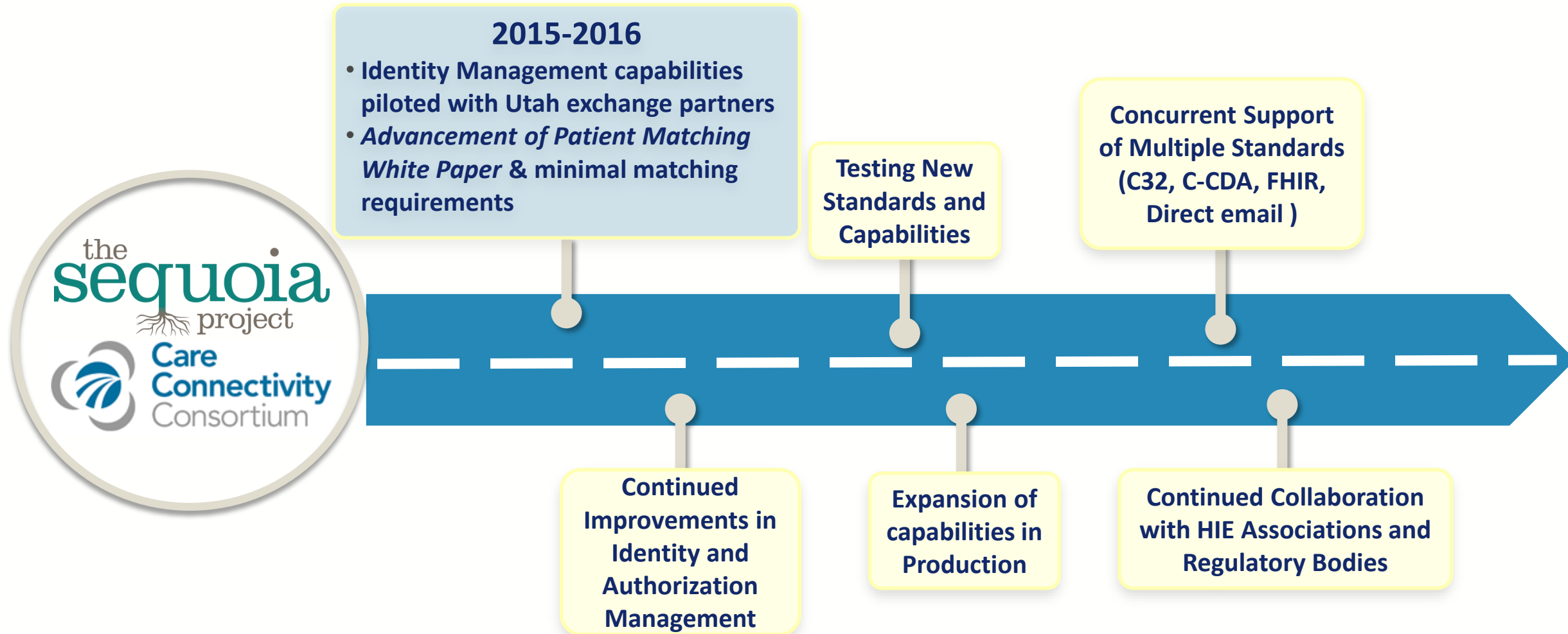
Hour Specific Bilirubin Risk Chart for Term & Near-Term Infants with NO Additional Risk Factors



Date/Time	Result	Age (Hrs)	Value:Test	Risk Zone
11/21/2005 06:00	4.5	6.00	Bili Meter	High Intermediate Risk Zone (75-95%)
11/22/2005 06:00	12.5	30.00	Bili Meter	High Risk Zone (>95%)
11/22/2005 12:00	12.6	36.00	Bili Meter	High Risk Zone (>95%)
11/22/2005 20:00	12.8	44.00	Bili Meter	High Intermediate Risk Zone (75-95%)
11/23/2005 20:00	11	68.00	Bili Meter	Low Intermediate Risk Zone (40-74%)
11/25/2005 20:00	9.8	116.00	Bili Meter	Low Risk Zone (<40%)

The Road Ahead: Priorities for 2016 and Beyond

We continue to pursue learning and innovation to support advancements in HIE and interoperability on a broad scale.





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