Redwood Mednet Conference

Interoperability: Past, Present and Future

David McCallie Jr. MD
SVP Medical Informatics
Cerner

Agenda

- ONC – Recent activity around Interoperability
  - ONC 10 year Vision for Interoperable Healthcare
  - JASON Report
- SMART on FHIR – a new kind of Interoperability
- Summary – the future of HIE?

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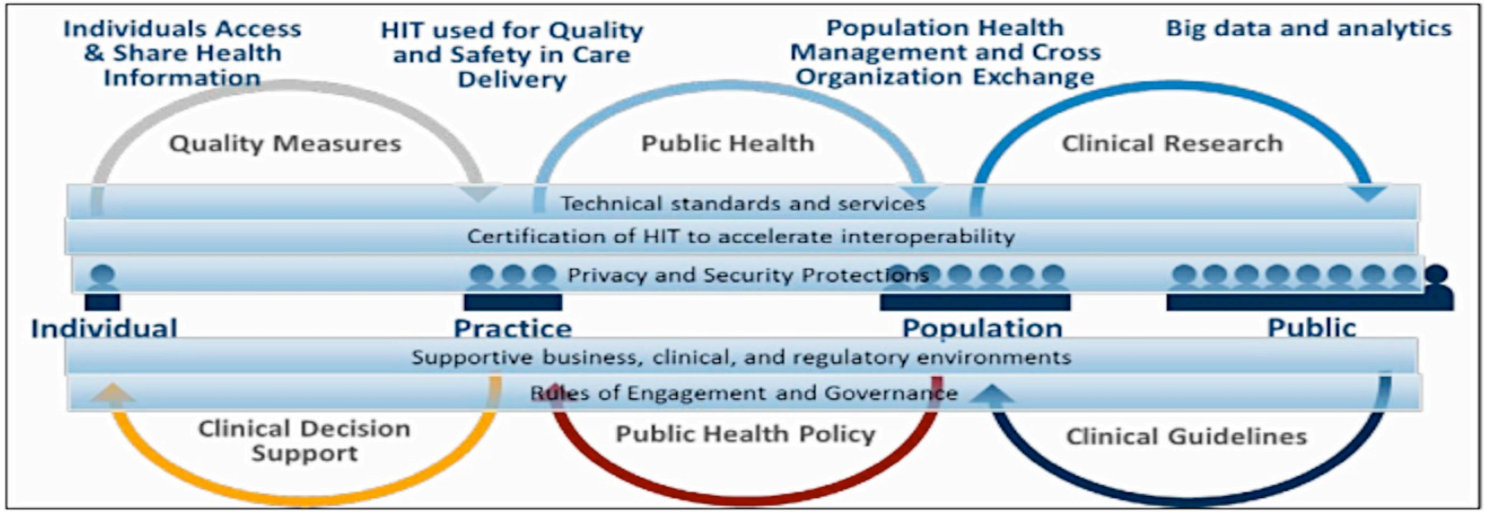
ONC report: 10-Year Vision to … Interoperable HIT

- New “10-year vision” issued in June 2014
- Karen DeSalvo’s first major policy as ONC head
- Does it reflect a shift in priorities for ONC?
- Certification becomes more important than MU Incentives?



http://www.healthit.gov/sites/default/files/ONC10yearInteroperabilityConceptPaper.pdf

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ONC 10 Year Vision: Guiding Principles

- Build on existing infrastructure
- Diversity – one size does not fit all
- Empower individuals (consumers/patients)
- Leverage market forces
- Maintain modularity and flexibility
- Support differential rates of adoption and advancement
- Focus on creating value for patients and providers
- Protect privacy and security

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ONC Vision: 3 Year Agenda

"Send, Receive, Find, and Use Health Information to Improve Health Care Quality"

- Examples:
  - Consumers look up immunization histories as needed
  - PCP -> Specialist "closed loop" referral information flow
  - Hospitals automatically send DSUM to PCP on discharge
  - Electronic sharing of lab results with providers and with consumers.
    - *Results trended over time, linked to healthcare decisions*

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ONC Vision: 6 Year Agenda

“Use Information to Improve Health Care Quality, at Lower Cost”

- Examples:
  - Consumers regularly provide health info to providers
  - Consumers integrate their health data into mHealth apps and tools
  - PCPs can monitor and manage a population of diabetic patients, based on integrated info from multiple sources
  - Bi-directional connections between MD and Public Health

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ONC Vision: 10 Year Agenda

“The Learning Health Care System”

- Examples:
  - PCPs can optimize medications based on patient’s genetic information, environmental profiles, and comparative effectiveness research
  - Consumers manage and share personal health data across multiple devices and services
  - MDs, patients, public health, and researchers can contribute and share and learn from health data without exposing PHI

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The JASON Report

- The JASONS = Secretive group of top scientists
  - Commissioned to solve problems for government agencies
  - Like PCAST groups, but more secretive
- **"A Robust Health Data Infrastructure"**
  - Commissioned by AHRQ
  - Karen DeSalvo released it and references it frequently
  - Joint Policy / Standards Workgroup evaluation underway

http://healthit.gov/sites/default/files/ptp13-700hhs_white.pdf

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JASON Recommendations

- Very dismissive of current (MU1 & MU2) efforts
- Urges shift to “atomic” data, rather than “marked up documents”
- Require EHR vendors to expose “public” data-level APIs
  - Also require vendors to support search, indexing, semantic interchange and vocabulary translation
- Give the patient more control over uses of the data s/he “owns.”
  - Pre-defined common access patterns (“privacy bundles”) for easy selection
- Design the system for research uses, not just clinical care
  - But don’t let patients exclude sensitive data (!)
- Focus on “Apps” rather than monolithic solutions
- **… And define it all in 12 months, in time for MU 3**

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Late breaking news… Karen DeSalvo on JASON

- A national health information exchange infrastructure **will cost U.S. citizens each from $1.50 to $2 per year,** Karen DeSalvo … estimated Friday. That cost, which amounts to around $450-$650 million, should be paid by taxpayers and not health care providers, she said.
- "That's just for the pipes," DeSalvo said.
- "EHR adoption and meaningful use are always biting at our heels," she said. "Our policymaking has been push, push, push, but … the return on investment hasn't materialized for people on the front line. **We're feeling intense pressure**. We have to show some return on investment for folks."
- Interoperability, she said, "is a way to bring all these problems together. **It's so solvable**." When consumer, provider and employer demands for access to information pull the interoperability agenda forward, the pushing will be easier.
- **A group of experts she met with recently** reassured her this was possible. "They feel the timing is right," she said, "that we can solve this particularly thorny issue of interoperability."

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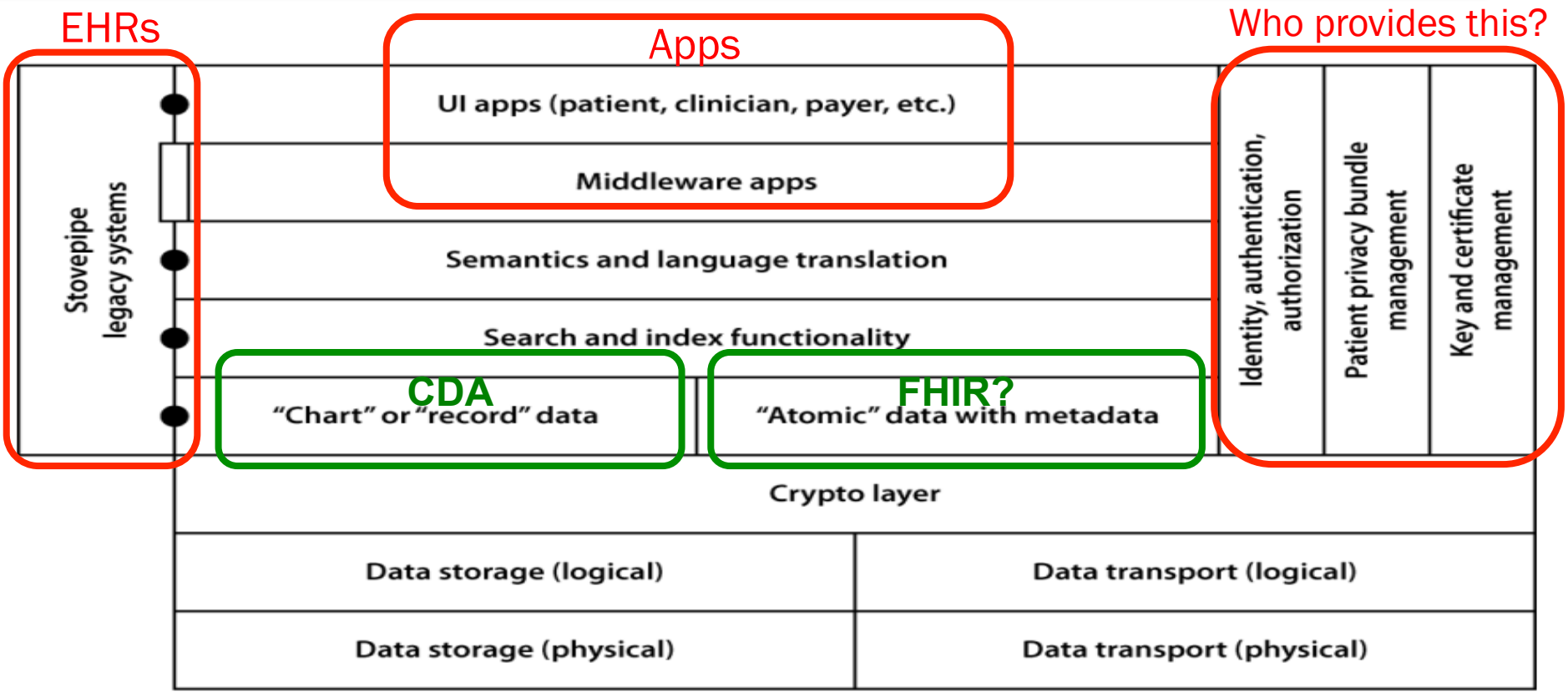
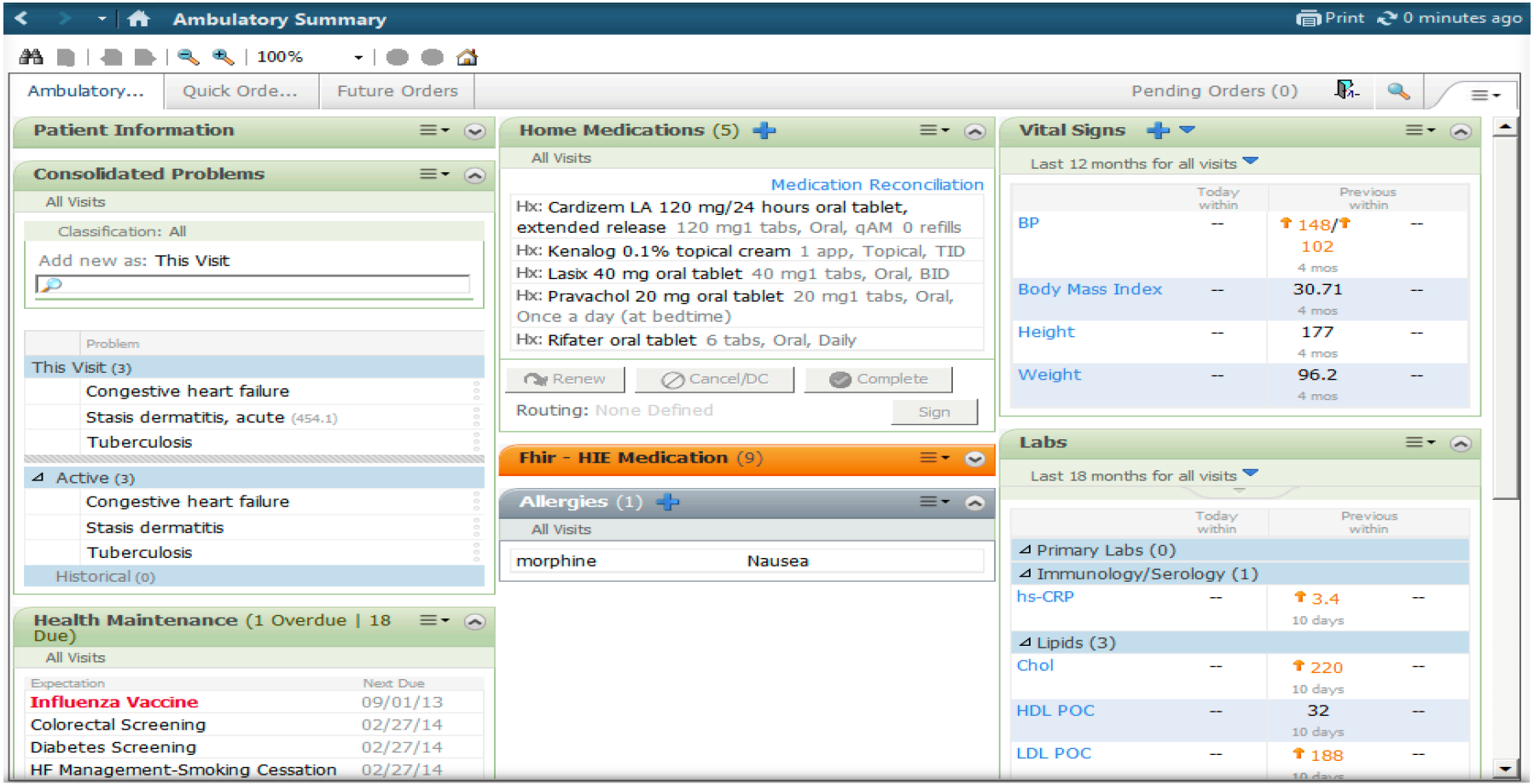
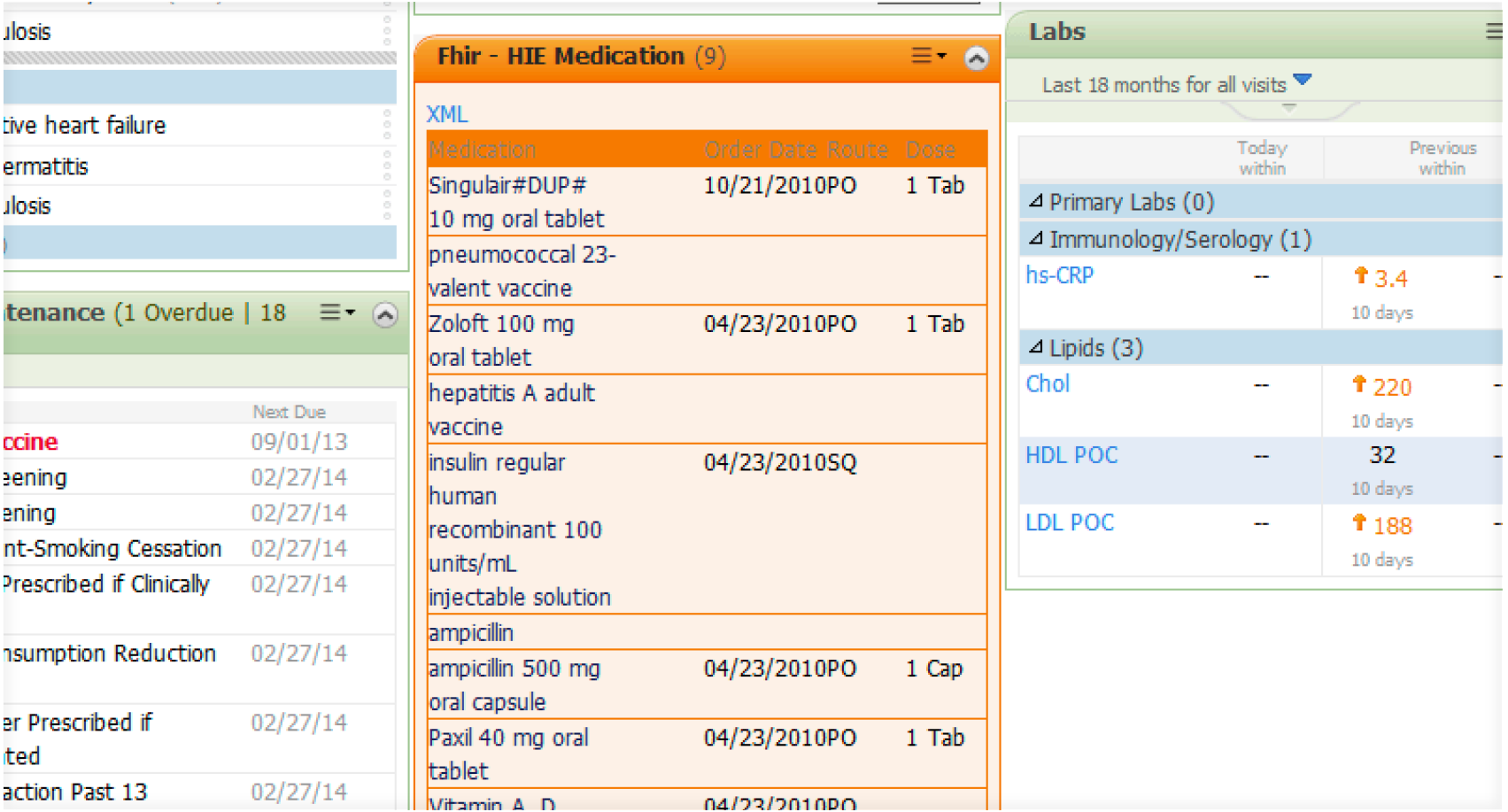
JASON “Software Architecture”



Example: Granular Access to local HIE (using FHIR)



Example: Granular Access to local HIE (using FHIR)



JASON Impact: **Could "public" FHIR APIs become part of MU3?**

- Karen DeSalvo has made many references to JASON
- New HITPC/HITSC joint workgroup was created to address
  - Stakeholder hearings occurring soon (vendors, researchers, etc)
  - NwHIN PowerTeam will likely recommend rapid adoption of FHIR
- Numerous S&I Framework Projects have moved to FHIR
  - BlueButton+ Pull uses FHIR
  - Data Access Framework (DAF) now recommending FHIR + IHE
  - Structured Data Capture (SDC) has migrated to FHIR
- Lots of community, SDO, and vendor interest in FHIR
  - Stan Huff's multi-vendor Healthcare Services Platform Coalition (HSPC) is actively profiling FHIR for SMART Platform and other SOA uses
  - IHE PCC and QED mapping to FHIR is underway

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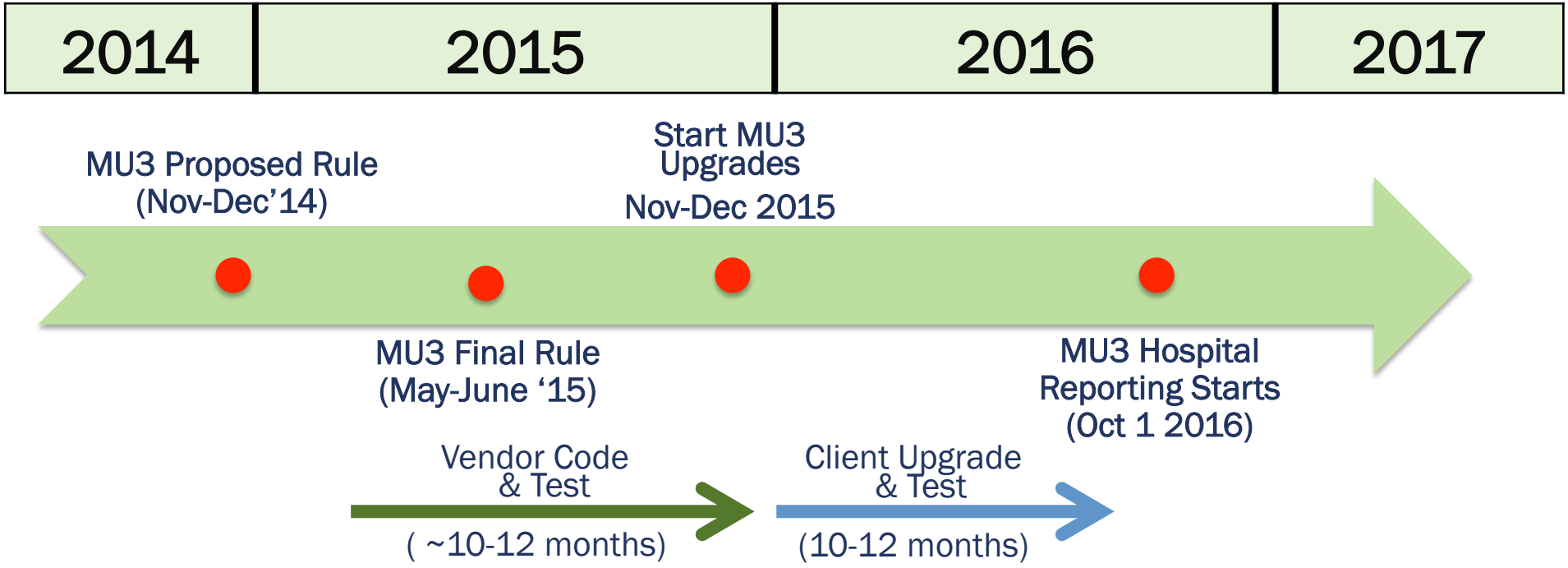
Is there enough time to do something different?



OR should 2017 Edition Certification be delayed?

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A New Kind of Interoperability Challenge

"EHRs are becoming commodity platforms. The winner will be the EHR vendor that provides the *best platform for innovation* – the *most open* and *most extensible* platform."

-- CEO of a major IDN

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The Vision

An App Store for innovative clinical apps that can “plug and play” inside any compliant EHR

SMART™

“Substitutable Medical Applications and Reusable Technology”

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Will the EHR become an “Open Platform?”

- Modern EHRs as platform - responsible for:
  - User and patient management
  - Core transactional services (orders, documentation, PAMI, etc.)
  - Workflow
  - Legal record
- Use “edge extensions” to complete functionality
  - App extensions that plug in to the clinical workflow
  - No single vendor can supply every needed function
  - Tap the innovation of single-minded App vendors
- “App Store” model is now well-understood
  - Many vendors have proprietary APIs for extensions
  - Emergence of robust app market will require standards-based APIs?

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SMART on FHIR®© – Open Platform Architecture

SOA Orchestration

mHealth

OAuth

FHIR® REST API

Clinical Element Models & FHIR Data Profiles

SMART™ Web Apps

Trusted App Registry

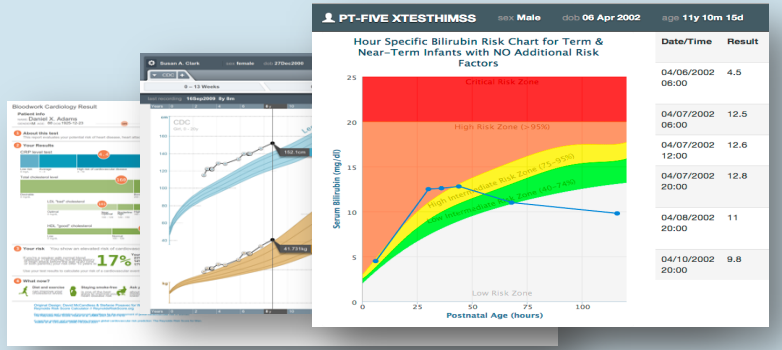
Children's Hospital Boston

Intermountain Healthcare

visualdx

"polyglot" Health Through Understanding

HARVARD MEDICAL SCHOOL



http://smartplatforms.org/smart-on-fhir/

Exhibiting Health IT Systems

Cerner — Booth# 6965

Intermountain Healthcare — Booth# 3903

HARRIS — Booth# 1164

hp — Booth# 1949

1) FHIR – ReSTful API

- FHIR = Fast Health Interoperability Resource
  - Draft HL7 Standard for Trial Use
  - “The good parts of HL7, without the cruft?”

- ReSTful API
  - ReST = *Re*presentational *S*tate *T*ransfer –> Basis of HTTP
  - Resource-oriented rather than RPC (nouns > verbs)
  - Easy for developers to understand and use

- FHIR Resources
  - Well-defined, simple snippets of data that capture core clinical entities
  - Resources are the “objects” in a network of URI reference links
  - Patient, Encounter, Problem, Observation, Medication, etc…

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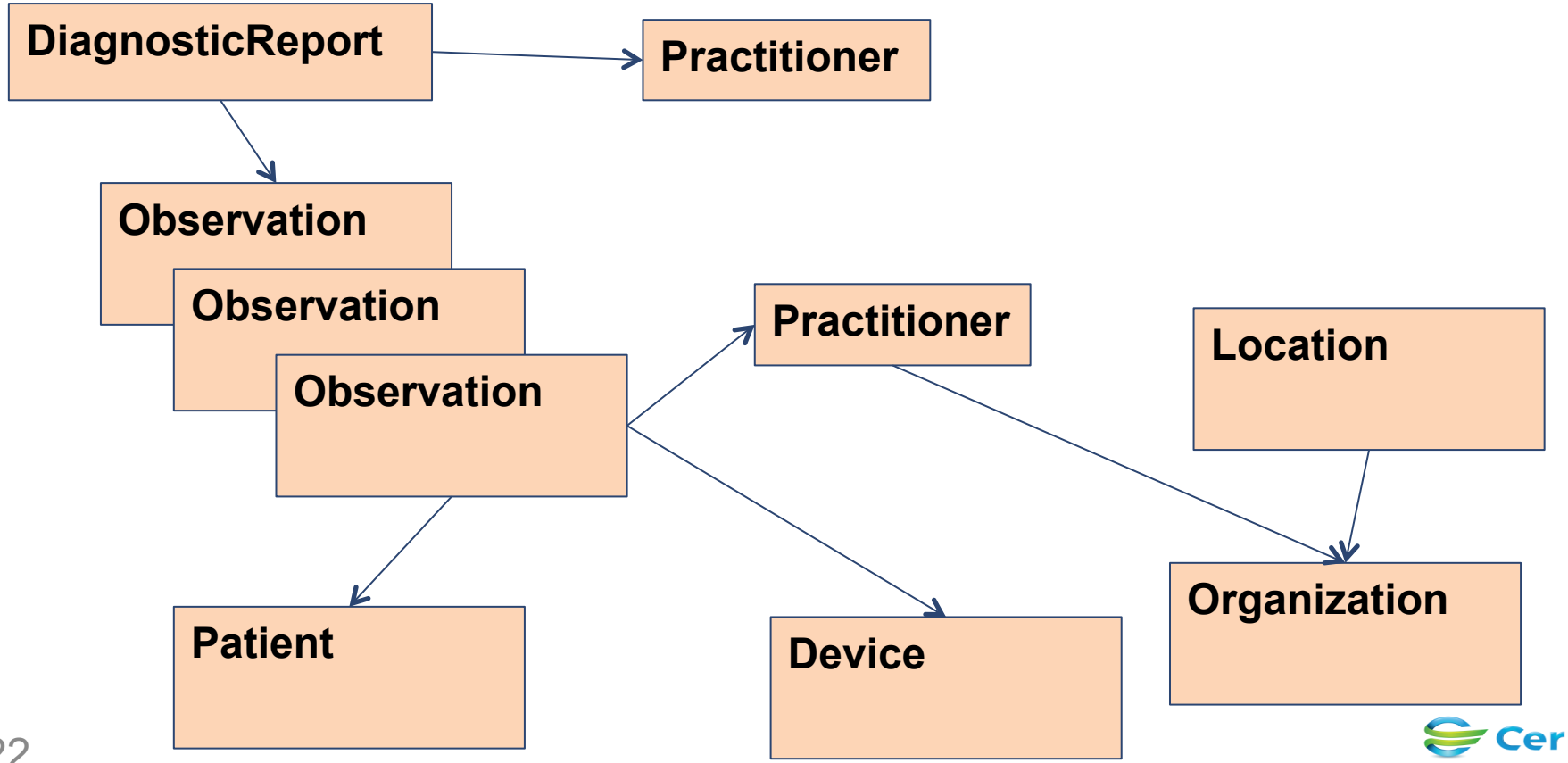
Growing Set of FHIR Resource Types

AdverseReaction
Alert
AllergyIntolerance
(Binary)
CarePlan
Composition
ConceptMap (informative)
Condition
Conformance
Device
DeviceObservationReport
DiagnosticOrder
DiagnosticReport
DocumentReference
DocumentManifest
Encounter
FamilyHistory
Group
ImagingStudy
Immunization
List
Location
Media
Medication
MedicationAdministration
MedicationDispense
MedicationPrescription
MedicationStatement
MessageHeader
Observation
OperationOutcome
Order
OrderResponse
Organization
Other
Patient
Practitioner
Procedure
Profile
Provenance

Resources form a network of data linked by URLs



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2) FHIR Profiles

- FHIR Profiles are used to constrain a Resource
  - Cardinality of attributes
  - Value Sets for coded attributes (nomenclature)
  - Structure of “composed” resources (e.g. Blood Pressure)
  - Extensions to resources (80/20 rule)

- KEY: FHIR Profiles enable “plug and play”
  - “Semantic interoperability *by contract*” rather than by “RIM”
  - FHIR Resources can be algorithmically *validated* against a Profile

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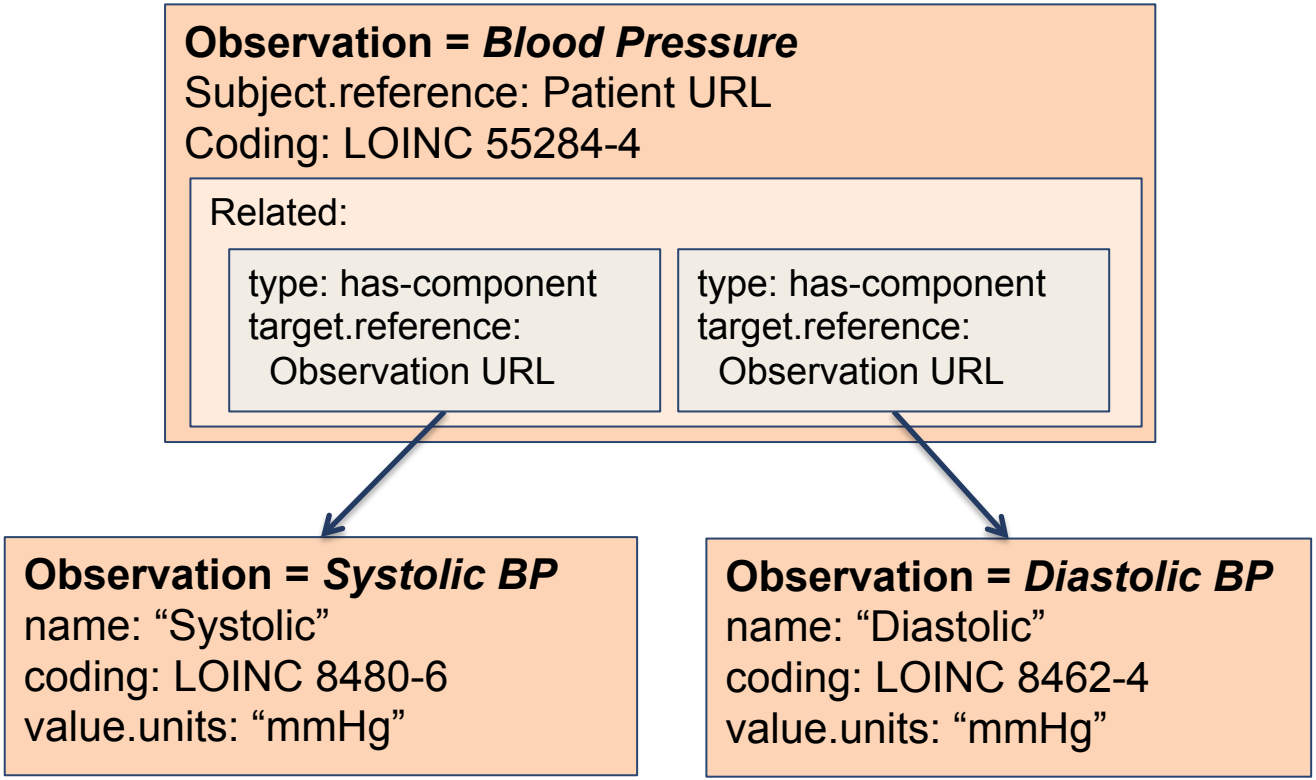
Profile for “Blood pressure”



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Profiles for SMART on FHIR

- Widespread adoption of profiles for *SMART on FHIR*?

- Clinical Element Models (CEM and CIMI)
  - Curated by Stan Huff at Intermountain
  - 6500+ semantically-complete, explicitly constrained data entities
  - HSPC - Healthcare Services Platform Coalition (lead by Intermountain)
  - http://www.clinicalelement.com/

- Plan: Convert CEMs into FHIR Profiles
  - Create a “catalog” of standard EHR resources
  - Multi-vendor effort – with vendor-neutral profiles
  - Each vendor will map profile codes to their internal codes
  - SMART apps will use these profiles

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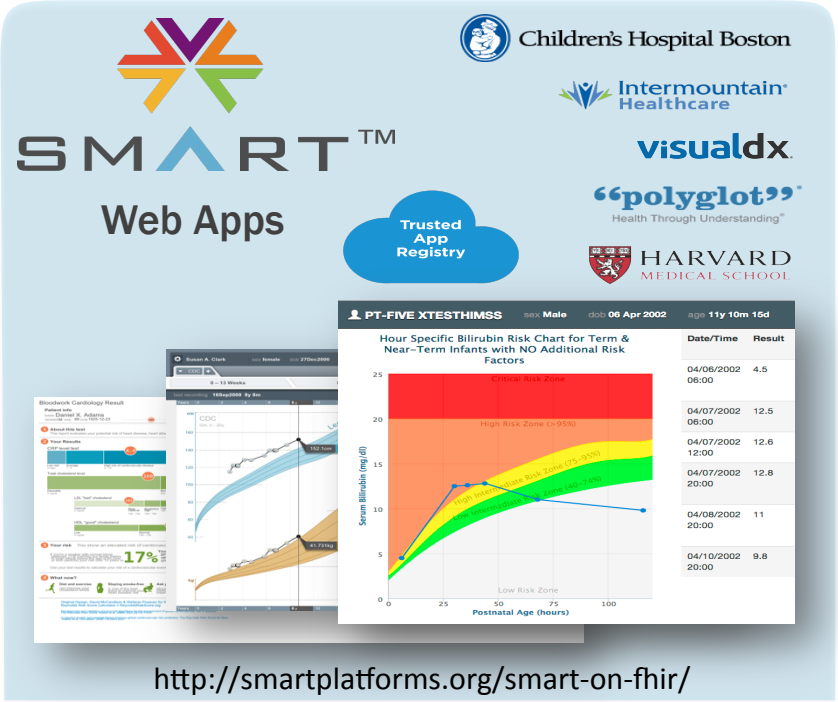
3) SMART Platform – WebApp Specifications

- "Substitutable Medical Apps"
  - Kohane/Mandl – NEJM (2009)
  - SHARP Grant from ONC
- SMART App == Web App
  - HTML5 + JavaScript
  - Remote or embedded in EHR
  - URL passes patient context & FHIR links
- Data Access
  - FHIR Data Services
  - (Initial design used W3C RDF)
- OAuth2 for security



http://smartplatforms.org/smart-on-fhir/

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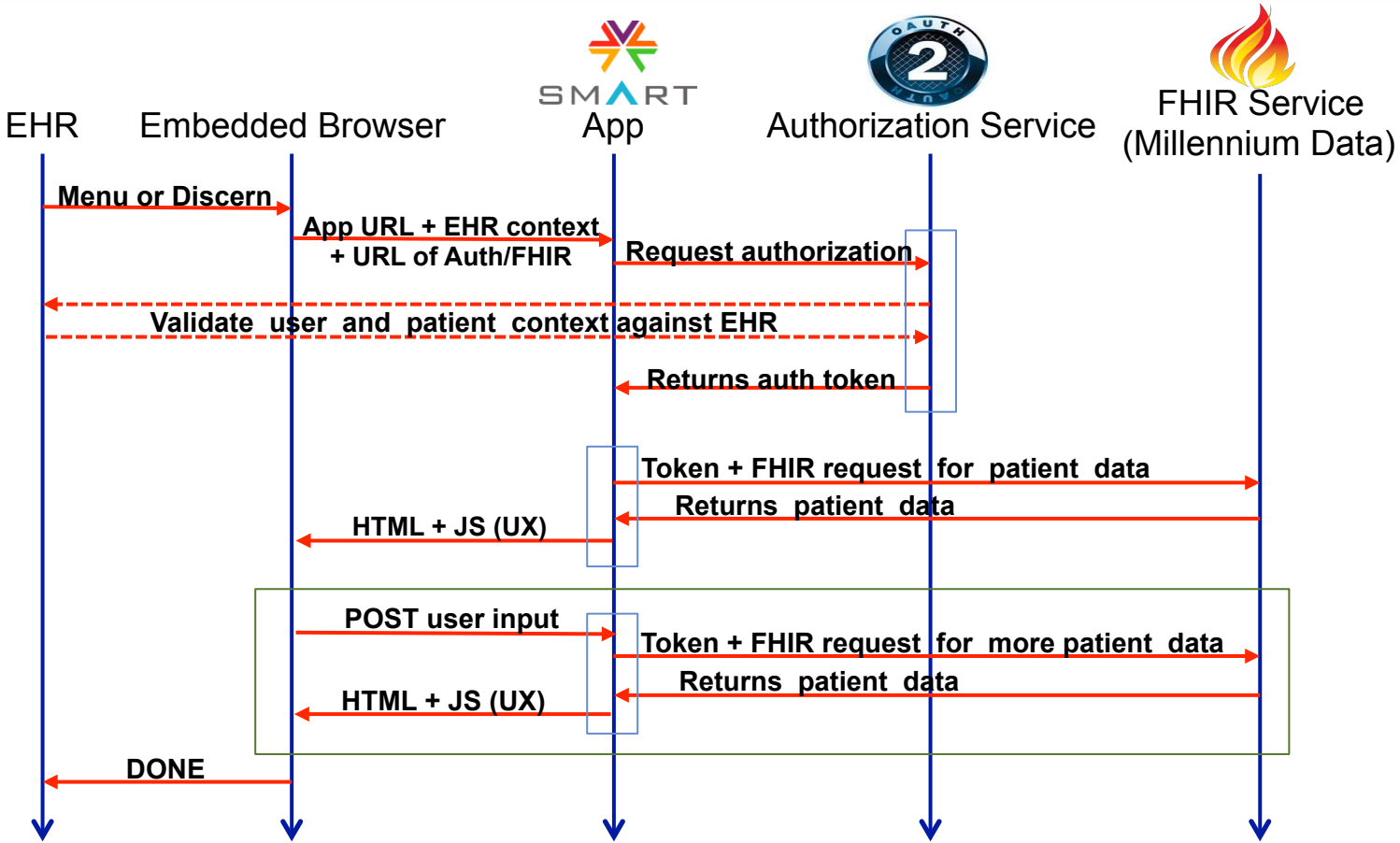
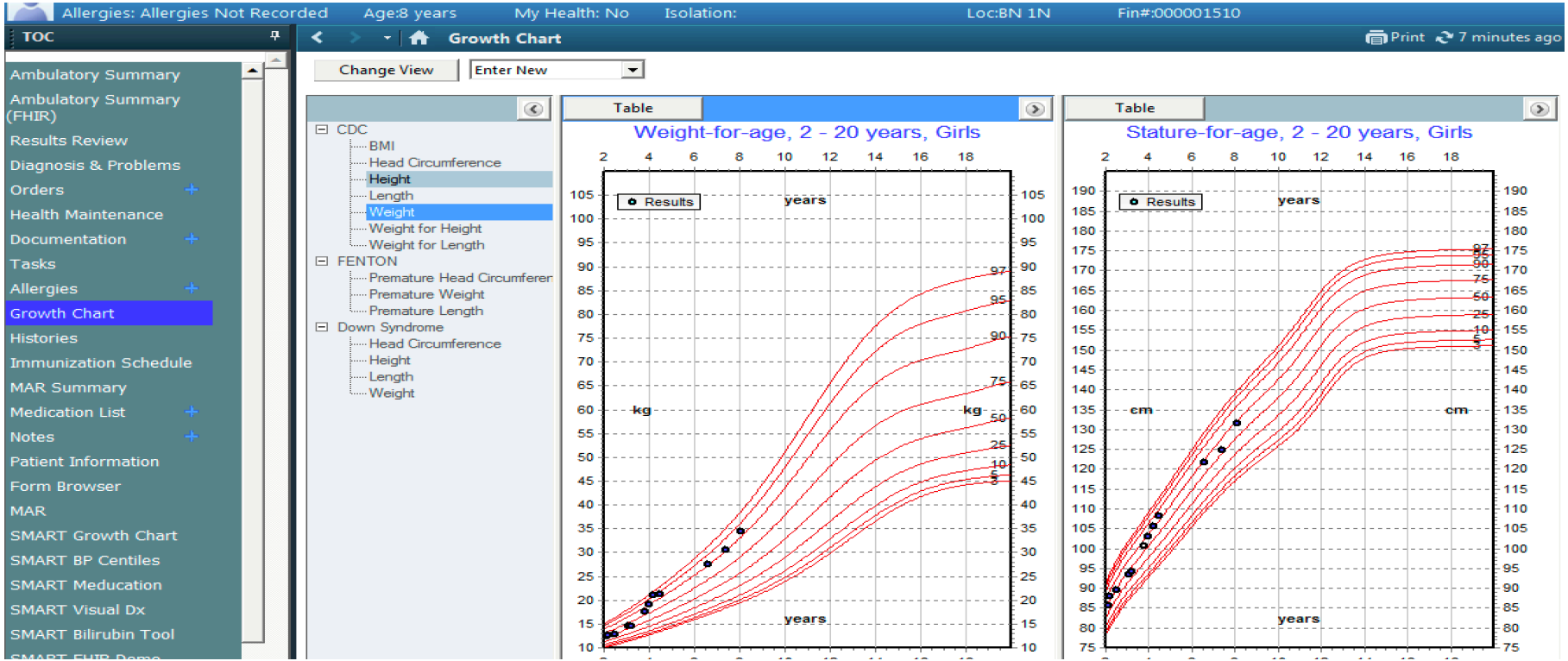
App Invocation – Sequence Diagram



PowerChart – Built-in Growth Chart



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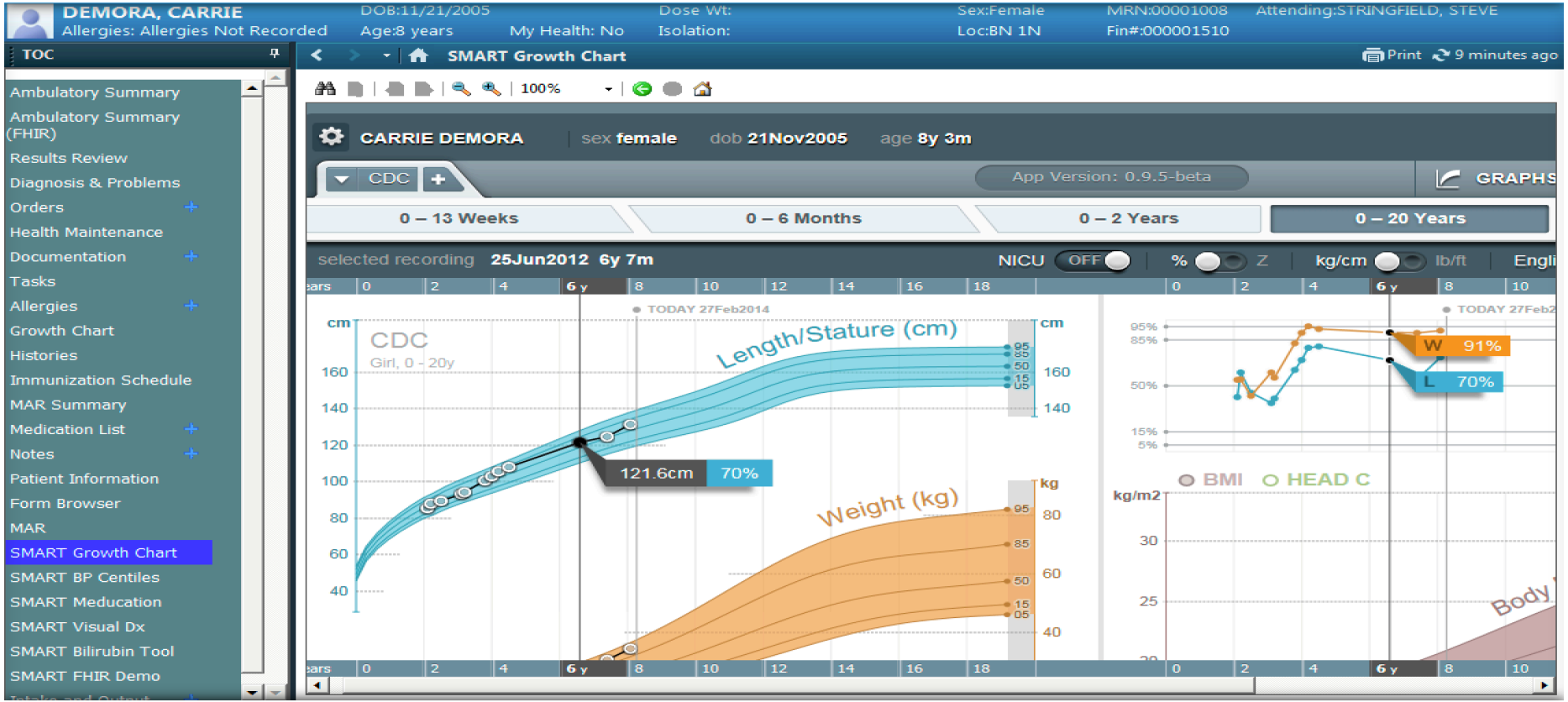
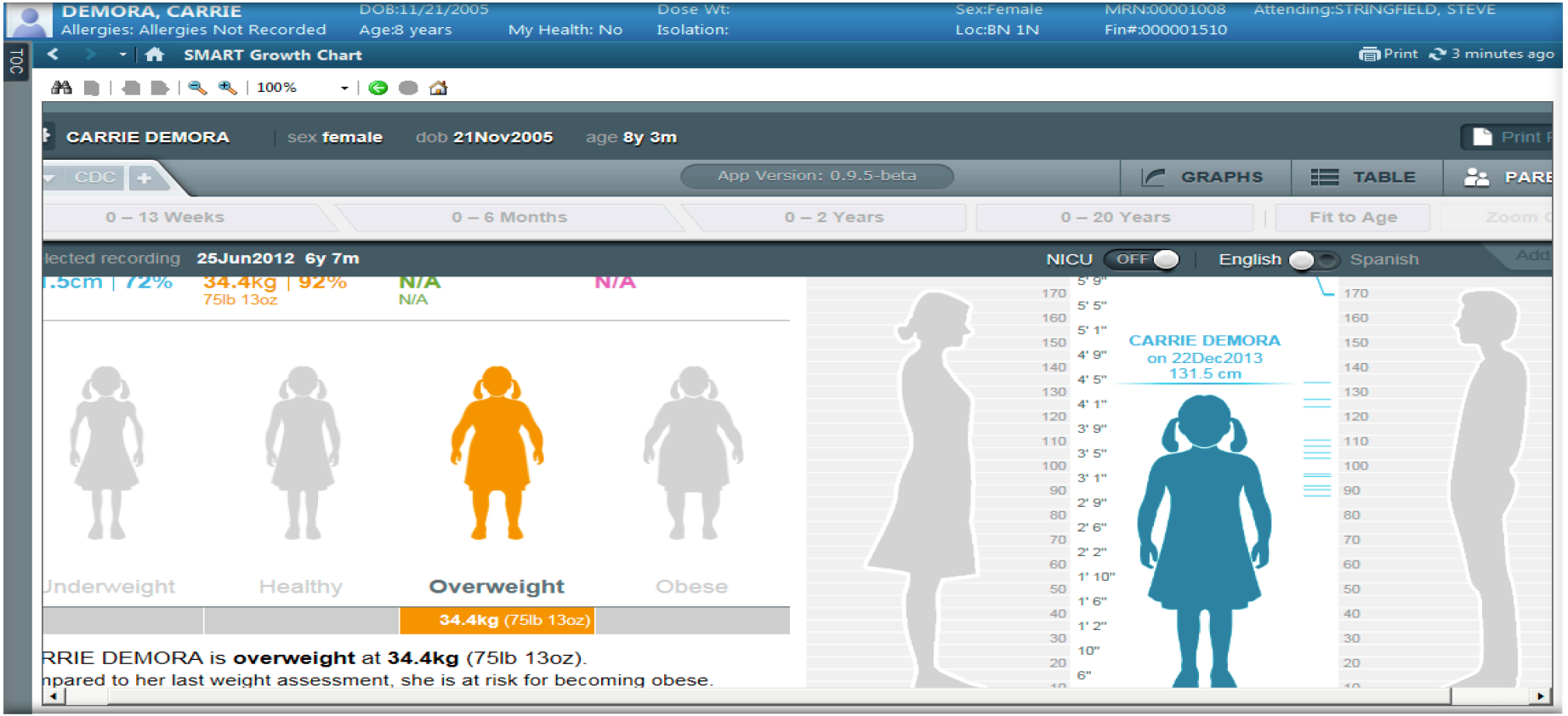
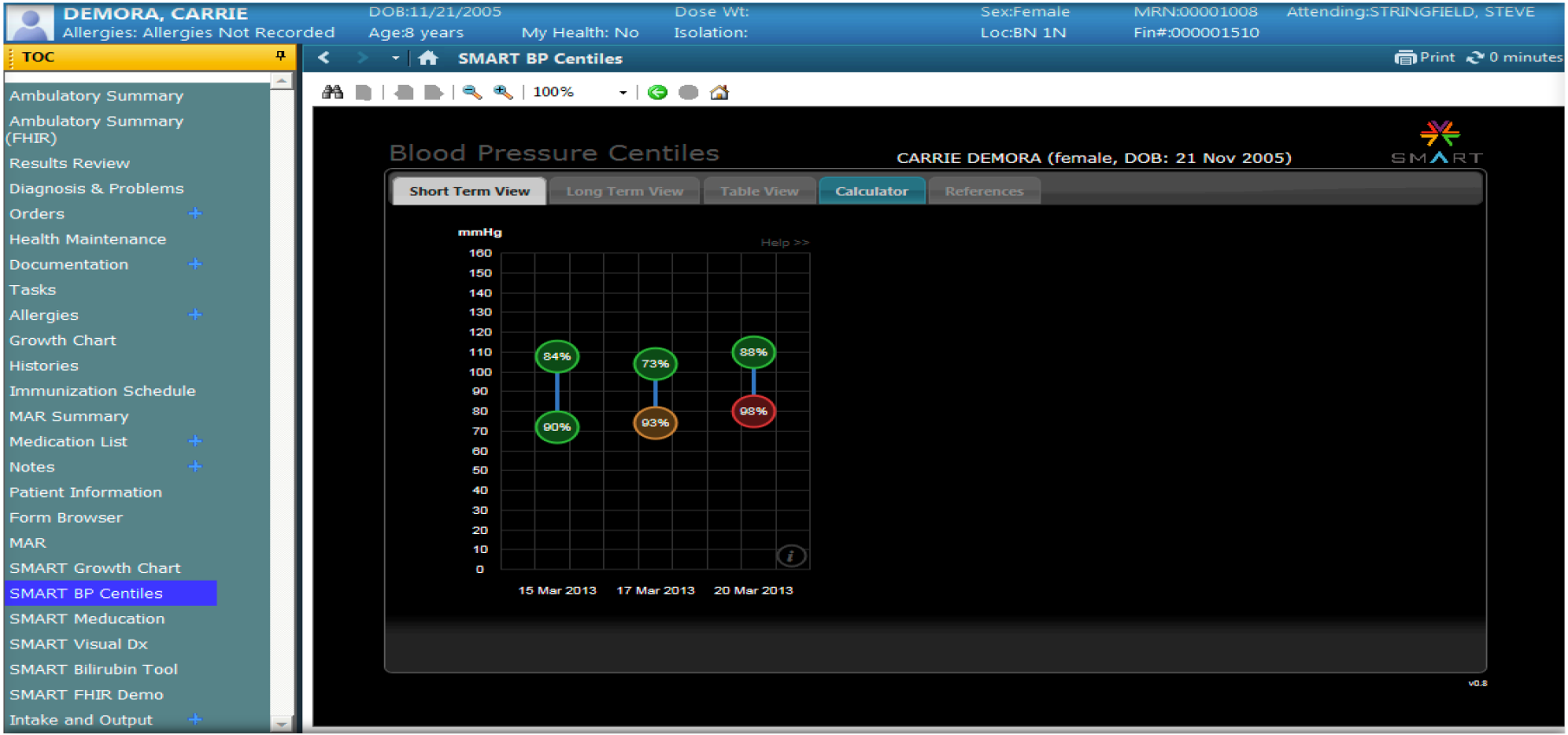
PowerChart – SMART Growth Chart



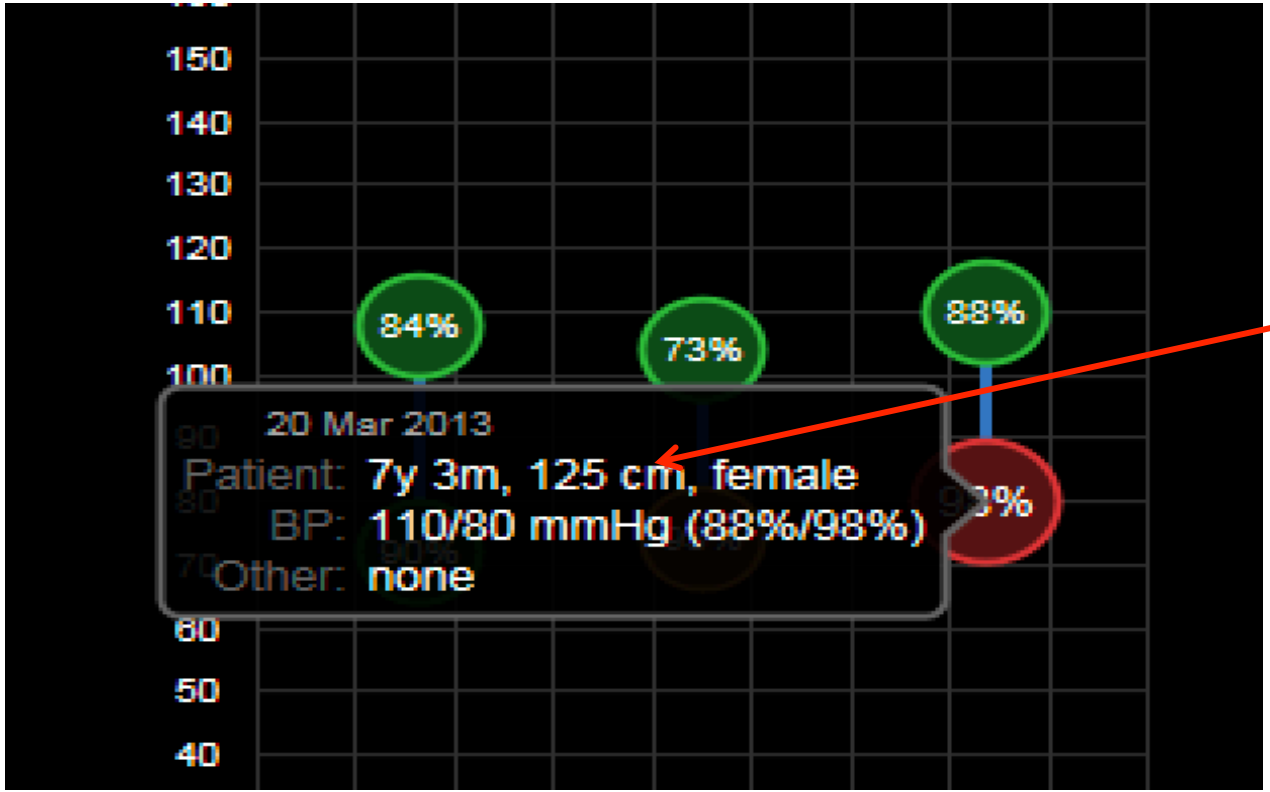
SMART Growth Chart – Parent's View



SMART Pediatric BP Centiles (Boston Children's)



SMART BP Centiles – Detail View



Range of normal adjusted for age and height

SMART Neonatal Bilirubin Alerts - Intermountain

DEMORA, CARRIE | DOB:11/21/2005 | Dose Wt: | Sex:Female | MRN:00001008 | Attending:STRINGFIELD, STEVE
Allergies: Allergies Not Recorded | Age:8 years | My Health: No | Isolation: | Loc:BN 1N | Fin#:000001510

TOC

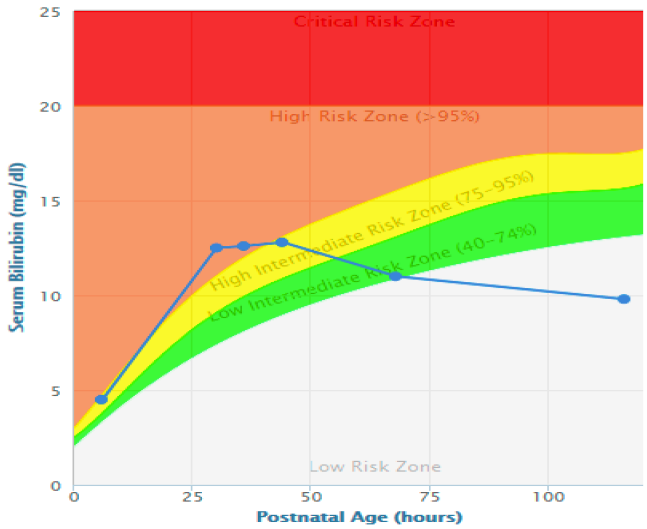
- Ambulatory Summary
- Ambulatory Summary (FHIR)
- Results Review
- Diagnosis & Problems
- Orders +
- Health Maintenance
- Documentation +
- Tasks
- Allergies +
- Growth Chart
- Histories
- Immunization Schedule
- MAR Summary
- Medication List +
- Notes +
- Patient Information
- Form Browser
- MAR
-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

SMART Bilirubin Tool — Print — 0 minutes ago — 100%

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

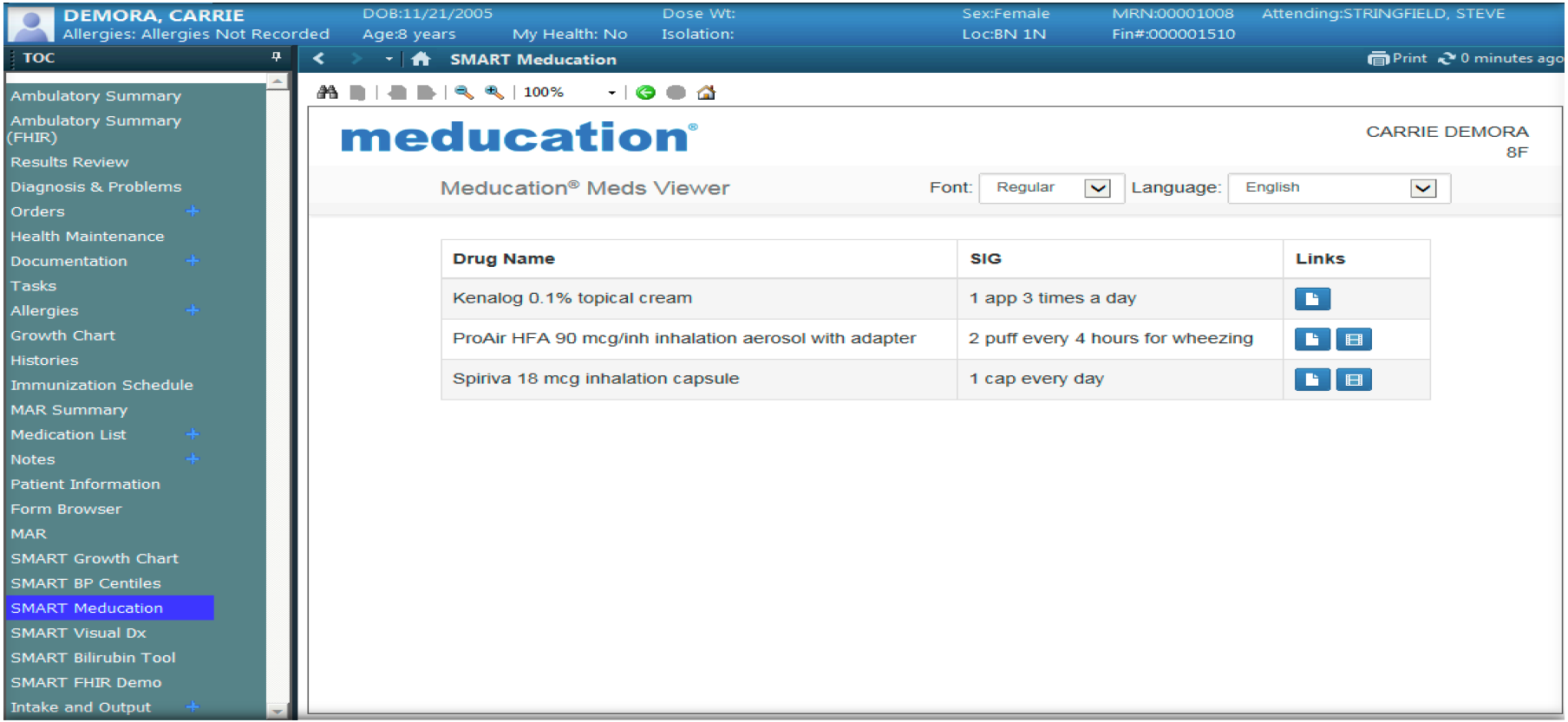
Intermountain Healthcare

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%)

SMART – Meducation Drug Leaflets (Polyglot)



Meducation - Korean

Print

Kenalog 0.1% topical cream

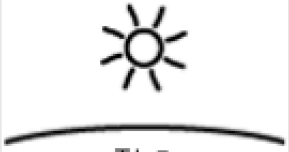
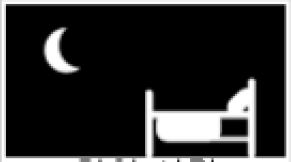
약을 복용하는 방법

하루에 세번 약을 바르십시요.

Apply medicine three times a day.

매번 소량의 약을 사용하십시요.

Use a small amount of the medicine each time.

			
아침	정오	저녁	취침 시간
✔	✔	✔	

이약에 관하여 의문점이 있으면,의사나 간호사 또는 약사한테 물어 보십시요.

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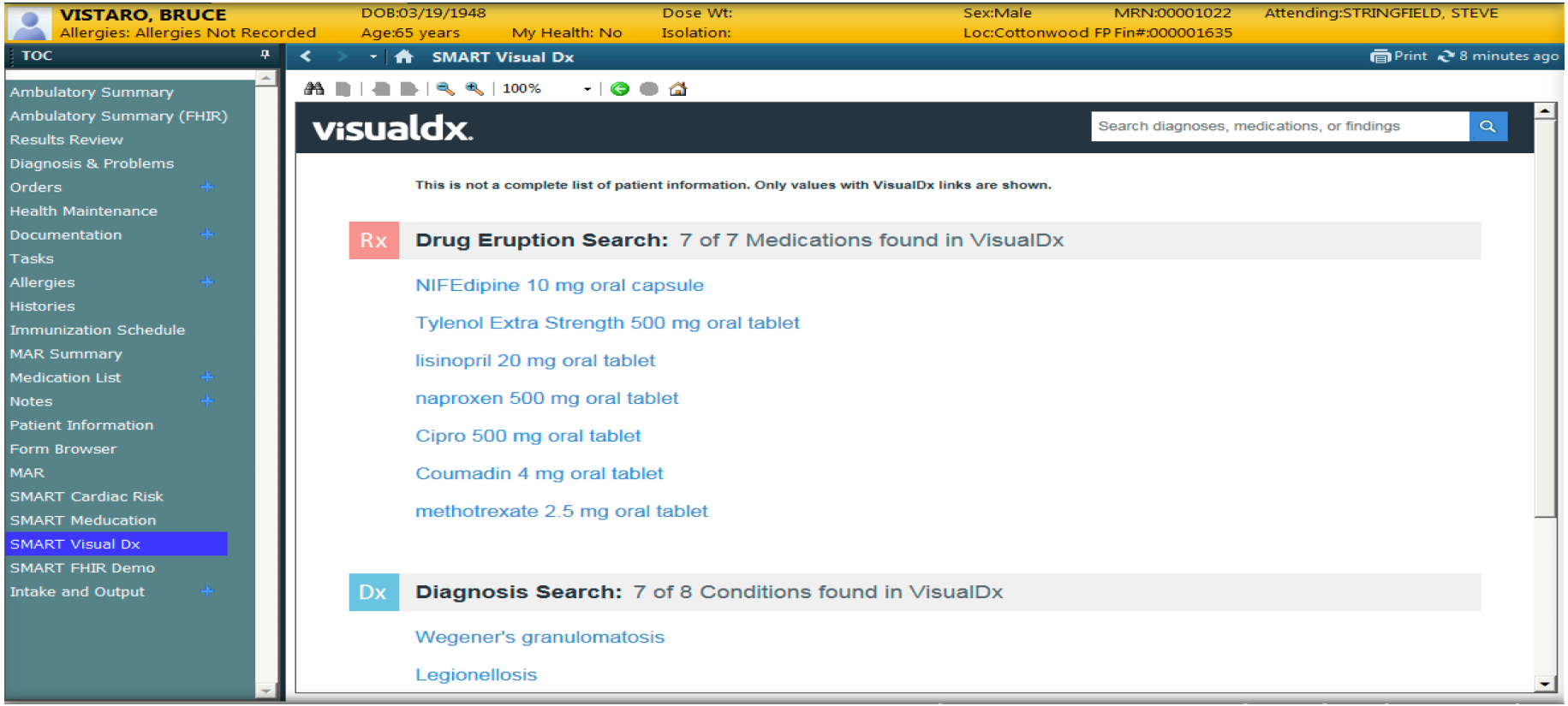
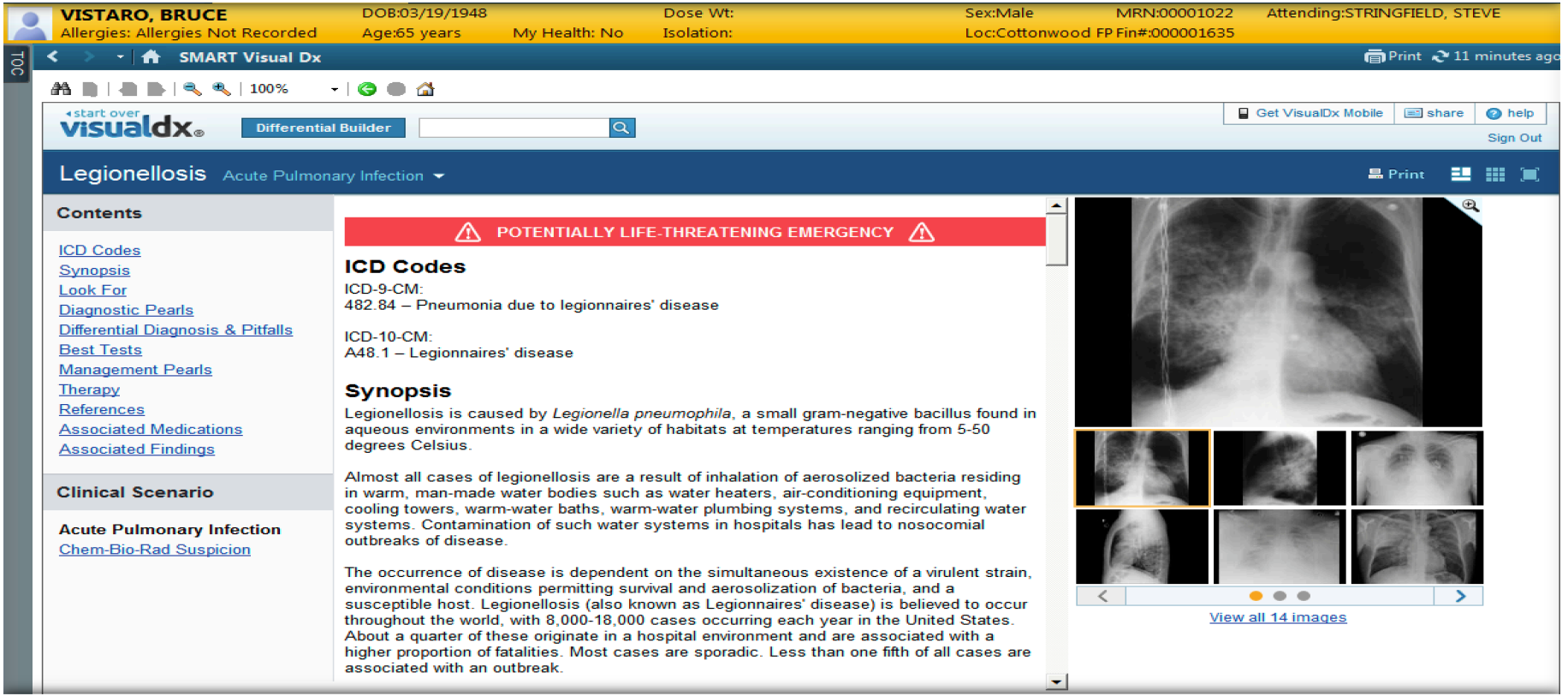
SMART Wrapper around VisualDX



VisualDX - Detail



What kind of Apps are likely to appear?

- Decision support
  - Complex or evolving logic
  - Specialized visualization
- Patient -- Provider data sharing
  - Simultaneous provider's view & patient view
- mHealth / mobile apps
  - Connecting consumer apps to their EHR data!
  - Apple's HealthKit?
- Integration of external data into EHR workflow
  - Population Health – bilateral data flow
  - HIE integration (JASON vision)
- National scale services
  - Prior Authorization
  - Structured Data Capture – more powerful than RFD
  - Genomics (Smarter ordering, PGX, etc.)

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