FHIR – The Now Standard

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Looking into the future

- Health and healthcare are undergoing more changes and at a faster pace than ever before in history.
- These changes require us to anticipate the standards requirements to address the needs of the future.
- The emphasis must be balanced between creating the standards and supporting the implementation of these standards over a broader set of stakeholders.

Technology – primary driver of change

- Exponential strides in computational speeds, network speeds, connectivity, storage capacity, software, and size
- World Wide Web and the Internet
- Mobile devices and Smart phones
- Wearable sensors and the Internet of Things
- Cloud computing
- 3D Printing

Change in focus

- Shift from “sick” care to health
- Shift from fee for service to value based care
- New emphases
  - Precision Medicine
  - Population Health
  - Patient-Centric EHRS
  - Health Information Exchange
  - National and Global Registries
  - Creation of Big Data

Policy, process, and focus change

- Policies of data sharing and patient-centric EHRs create Big Data with clinical research producing new knowledge.
- New types of data including behavioral, social, economic, genomic, environmental plus clinical.
- Increased focus on patient/consumer
  - Consumer engagement – population health
  - Personalization of care – precision medicine
  - Patient reported data

New Voices …

- Patients, consumers, citizens or what ever we wish to call them are having an influence in health and health care.
- “Googling” has opened the knowledge and understanding of disease for the non-professional to change the communication between physician and patient.
- Shifting care outside traditional settings
- Data collected and analyzed in real time becomes more responsive.
- Patients want to push this data back into their EHR.

New initiatives

- Predictive Analytics
- Clinical Decision Support
- Artificial Intelligence
- Machine Learning
- Virtual and augmented reality

Consequences that impact standards

- Data is new currency
- Data sharing becomes mandatory
- Interoperability is the enabler
  - Semantic
  - Functional
  - Stakeholder
  - Security and privacy

Obvious problems to solve

- Patient matching – universal patient identifiers
- Common language – global acceptance; everybody in; everybody use
- Increased data quality and trust
- Reimbursements should not be the driver
- Reimbursement derived from clinical data capture

The transition

- Today's dominant commercial EHR system are based on technology over 40 years old. Today's systems have not been able to take advantage of new technology.
- Little control over functionality and what is stored.
- Interoperability challenging; must engage all stakeholders

Keeping up

- How do we keep up with changing technology?
  - New concept and role for the EHR
    - EHR's sole function is data in, data out
    - EHR data structure optimized to find the value of any data element as well as to know immediately if that data element has never been collected.
    - All other functionality is external to the EHR but must be interoperable with content
  - Functionality supports a changing technology and accommodates domain preferences.
  - Access to data, as appropriate, is enhanced.

The new EHR

- EHR System becomes an active component of patent care. It drives work flow and the process of care delivery.
- If it can be automated, automate it. Take humans out of the loop.
- Increased use of Clinical Decision Support
- Movement to the cloud

The scope changes

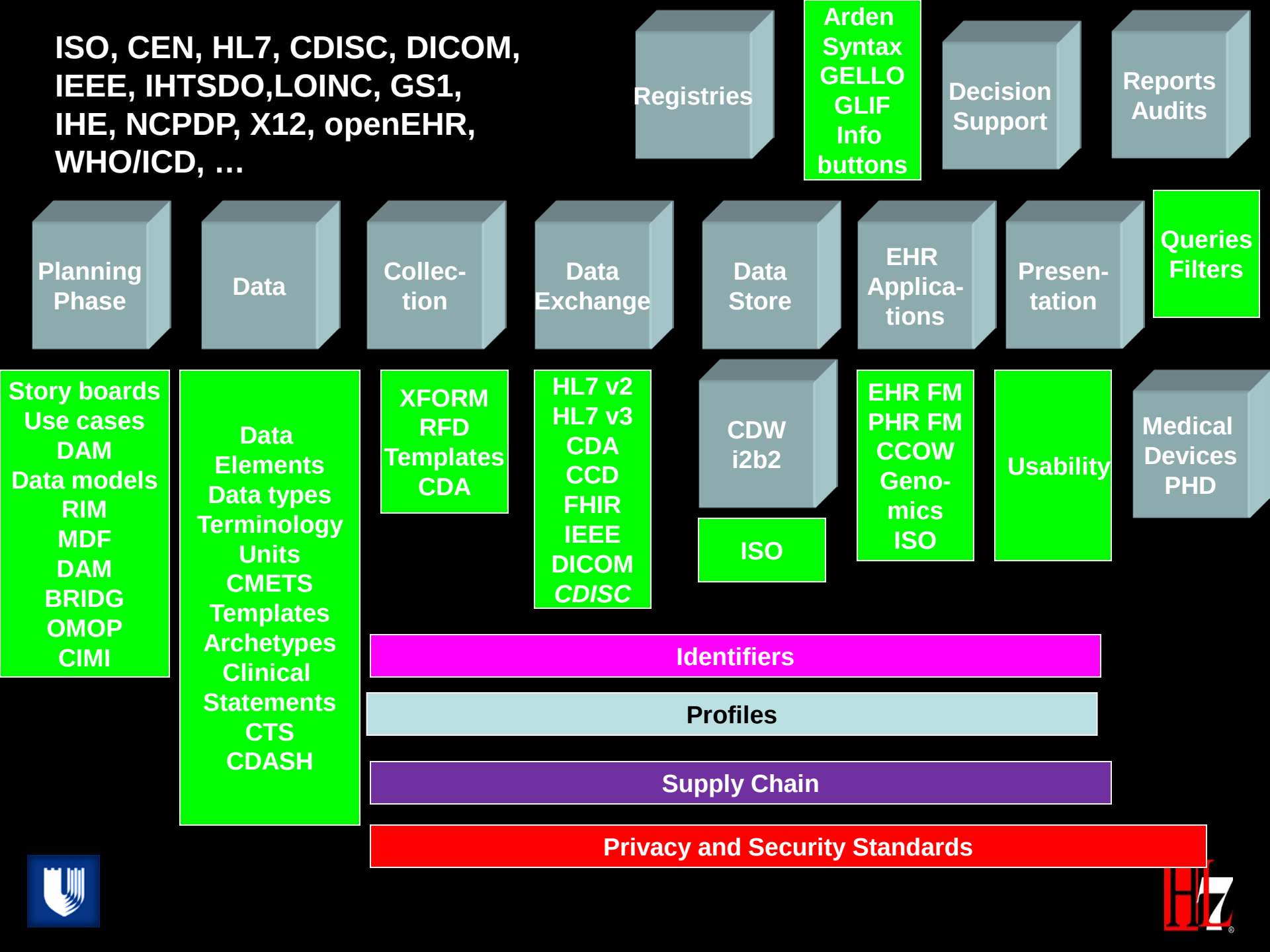
- As movement to ubiquitous EHRs becomes the norm, data sharing became goal.
  - Interoperability became the Holy Grail
    - Data interchange standards
    - Common data representation
  - Patient-centric EHRs
  - Health Information Exchanges
- Predictive analytics should guide business decisions
- Major impact on workflow
  - Making decisions on data from elsewhere?

Consequences of change

- Focus on behavioral health – good health habits - nutrition, exercise, no smoking, responsible drinking, safe driving, etc.
- Except for a few major academic health centers, most hospitals will become much smaller or disappear. They will be replaced by small Emergency Centers.
- Operational IT systems will have to accommodate rapid change.

National Initiatives

- Initiatives
  - All of Us/Population Health
  - Precision Medicine
  - Big Data to Knowledge
  - Consumer engagement
- Requirements
  - Data liquidity
  - Directed data sharing
  - Health data standards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Registries
Arden Syntax GELLO GLIF Info buttons
Decision Support
Reports Audits
Planning Phase
Data
Collec-tion
Data Exchange
Data Store
EHR Applica-tions
Presen-tation
Queries Filters
Story boards Use cases DAM Data models RIM MDF DAM BRIDG OMOP CIMI
Data Elements Data types Terminology Units CMETS Templates Archetypes Clinical Statements CTS CDASH
XFORM RFD Templates CDA
HL7 v2 HL7 v3 CDA CCD FHIR IEEE DICOM CDISC
CDW i2b2
ISO
EHR FM PHR FM CCOW Geno-mics ISO
Usability
Medical Devices PHD
Identifiers
Profiles
Supply Chain
Privacy and Security Standards

Enabling standards

- HL7 FHIR ®
- SMART ®
- CDS Hooks

What is FHIR?

- Based on a set of modular components called “Resources”
  - Resources refer to each other using URLs
  - Small discrete units of exchange with defined behaviour and meaning
  - Have known identity and behaviour
  - Extensions permit adding data not part of core
- Resources are combined into “Profiles” to solve clinical and administrative problems in a practical way.
  - Parties exchanging data define the specific way they want to use resources and their relations using Profiles.
  - Profiles are the framework for defining services.
- Exchange resources between systems
  - Using a RESTful API (e.g. web approach)
  - As a Bundle of resources (messages, documents)
- Positives
  - Service driven
  - Modify components with changing need
  - Portability of components by moving program code with the data

REST

- Representational state transfer – an architecture for how to connect systems
- Outcomes
  - Simple stable interfaces
  - High performance (scalability)
  - Portability
  - Reliability
  - Easy to debug

REST Operations

- Create – create a new instance of data
- Read – get the content od an instance of data
- Update – change the content of an instance of data
- Delete – remove the instance of data

CRUD

Resources

- Resources are:
  - Small logically discrete units of exchange
  - Defined behavior and meaning
  - Known identity and location
  - Smallest unit of transaction

  - In v2 world, sort of like segments
  - In v3 world, sort of like CMETS

Extensions

- FHIR has a standard framework for extensions
- Every FHIR element can be extended
- Every extension has
  - Reference to a computable definition
  - Value - from a set of known types

Profiles

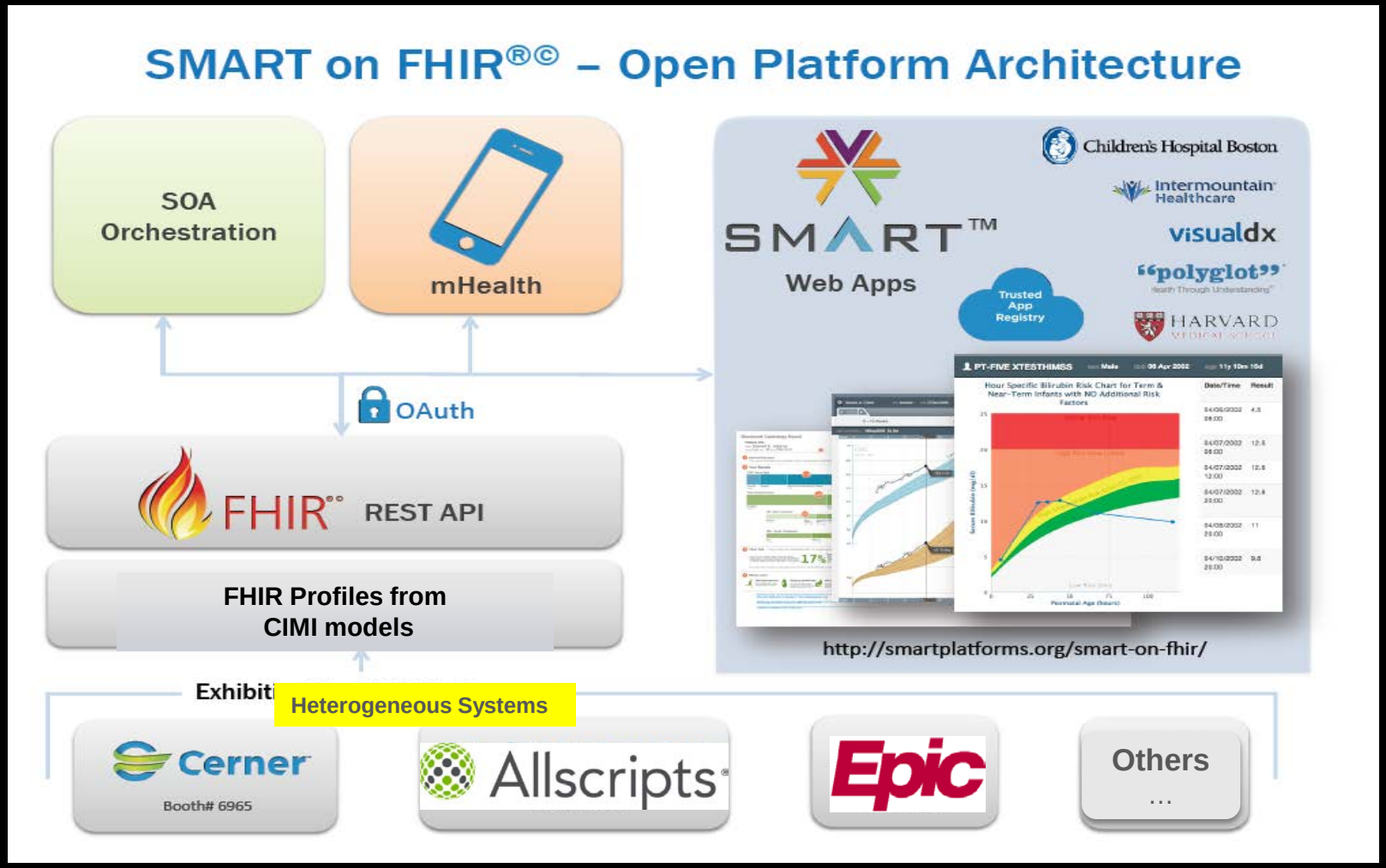
- Document constraints and extensions on one or more resources
- Subsumes template, implementation profile, detailed clinical model, etc
- Defines the collection of resources to accomplish a given task such as register a patient

SMART ®

- SMART = “Substitutional Medical Applications and Reusable Technology”
- A SMART App is a Web App
  - HTML5 + JavaScript
  - Typically embedded in EHR
  - EHR Data Access is via FHIR
- Supports smart-phone and patient controlled apps

SMART ®

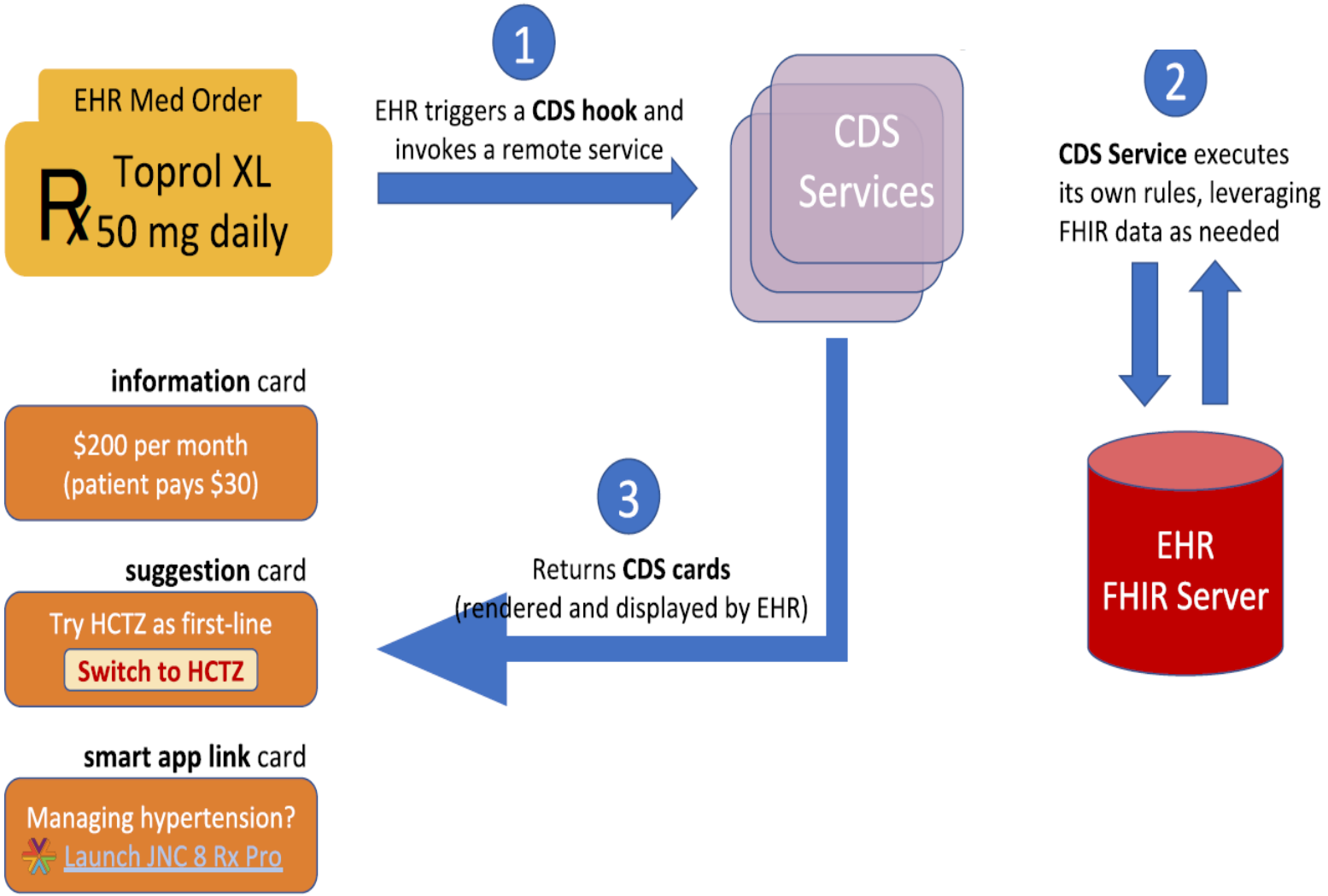
- Enables vendors to create apps that seamlessly and securely run across healthcare systems
- Defines a health data layer that builds on FHIR and resource definitions
- Applies set of profiles used to express meds, problems, labs and other clinical data
- Patients, clinicians, others can draw on library of apps to improve clinical care , research, and public health



Source: Stan Huff and others

CDS Hooks

- CDS Services
  - Provides a service that is invoked by the EHR via a hook
  - Evaluates its own logic using FHIR data
  - Returns decision support via cards



Source: Jos Mandel

Apple Health Records API owes much to FHIR standard

By
Greg Slabodkin

Published
June 11 2018, 7:15am EDT

More in
FHIR
Data sharing
Interoperability
Medical apps
Hospitals and clinics
Patient engagement

Print Reprint

Apple's new Health Records API—offered to developers to help them create apps for better disease management, medication tracking and nutrition planning—would not be possible without HL7's Fast Healthcare Interoperability Resources standard.

So said Jason Morely, software engineer on the Apple health team, during the company's 2018 Worldwide Developers Conference held last week in San Jose. At the event, the company announced the availability of the Health Records API, enabling developers to access healthcare data and "work with it," resulting in the creation of apps that empower

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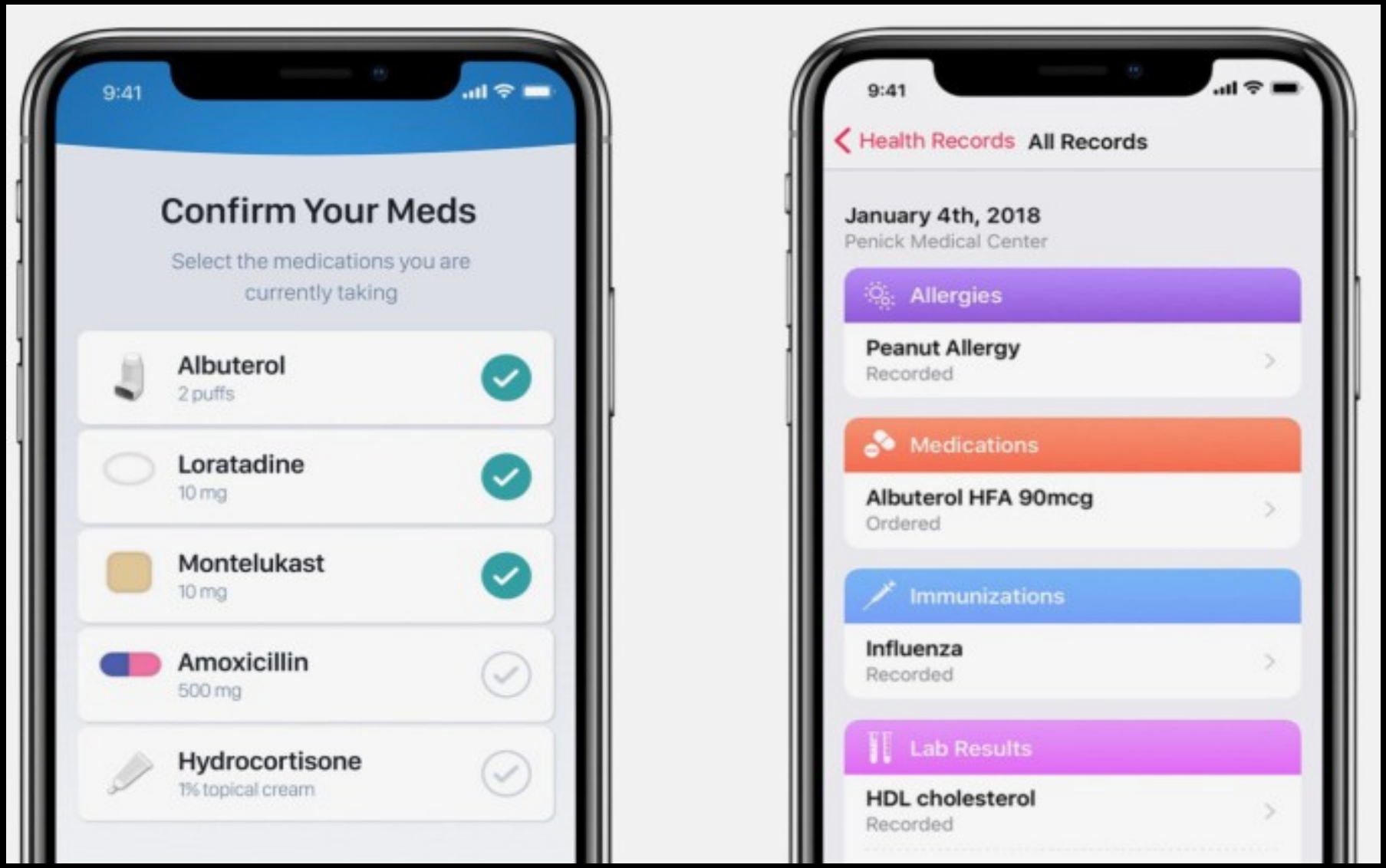
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Confirm Your Meds
Select the medications you are currently taking
Albuterol
2 puffs
Loratadine
10 mg
Montelukast
10 mg
Amoxicillin
500 mg
Hydrocortisone
1% topical cream
9:41
Health Records
All Records
January 4th, 2018
Penick Medical Center
Allergies
Peanut Allergy
Recorded
Medications
Albuterol HFA 90mcg
Ordered
Immunizations
Influenza
Recorded
Lab Results
HDL cholesterol
Recorded

FHIR Foundation

- Purpose – to support the adoption and implementation of HL7® FHIR ® worldwide
  - Argonaut
  - Da Vinci
  - Transcelerate
  - Devices on FHIR
  - DIGITizE
  - Gemini

Overwhelmed?

- Clinicians make informed decisions about 10% of the time. Missing data, dirty data, confusing knowledge, changing knowledge, conflicting literature, past teachings, personal experiences all contribute.
- The amount of data now available for decision making far exceed the ability of a human to make those informed decisions.
- Humans repeat errors.

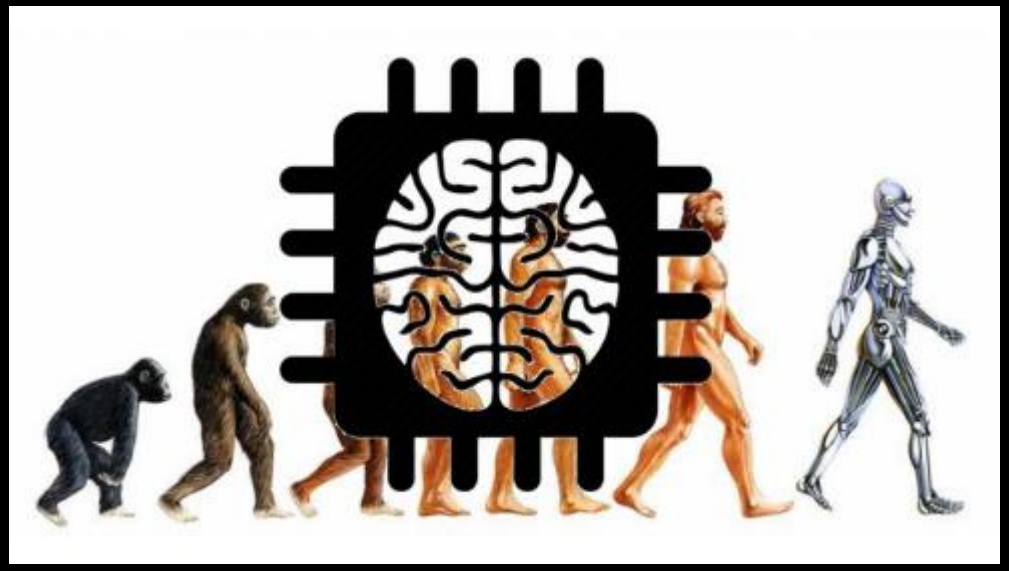
The Second Machine Age

- Machine Learning
- Deep Learning
- Artificial Intelligence
- Cognitive Computing

- Everybody's doing it
  - Google
  - Apple
  - Amazon
  - IBM
  - Microsoft
  - Others

IBM

Robots



Sophia

The art of the future possible

- The volume of data, the variety of data types, the increasing wealth of knowledge, and the ability to track disease and co-morbidities from start to finish will overpower the ability of humans to make informed decision about health and health care.
- Computers will not only become the decision makers but will carry out the decisions directly.
- The role of the human clinician will change to being an interface between computers and patients, and that may only be a temporary step.
- Humans will be replaced.

Thank you!