# Now that MU has solved everything, what's a CMIO to do?

## Evolving beyond the double-edged sword of MU

Richard Schreiber, MD, FACP
Diplomate, Clinical Informatics
Chief Medical Informatics Officer
Holy Spirit Hospital—A Geisinger Affiliate
Camp Hill, PA

AMDIS Physician Computer Connection Symposium
Ojai, California
22 June 2016

HOLY SPIRIT
A GEISINGER AFFILIATE

BEST REGIONAL HOSPITALS U.S.News SOUTH CENTRAL (PA) 2014-15

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# Disclaimers and Disclosures

- I received no funding for this talk
  - Well, ok, maybe a free meal
- I have no conflicts of interest
- My opinions are my own

(Thanks, Jon Handler)

# Holy Spirit—A Geisinger Affiliate

- An affiliate of Geisinger Health System
- 315 licensed beds (including separate LTAC)
  - ~270 acute beds
- Private, Catholic, non-profit
- ~50% of patients covered by medical hospitalists
- ~90% of medical patients attended by hospitalists
  - ~5% by HSH surgical staff
- MU 1 and 2 for 2 years each (2012 – 2015)
  - Medicare and Medicaid

In other words, a fairly typical community hospital

# My talk in one slide

Bad EMR—poor usability—is like pornography; you know it when you see it;

. . . and, admit it, we've all seen lots

Even if meaningful use solved adoption, several tasks remain

- Focus of my talk: Usability
- Won't discuss:
  - Analytics: albeit important
  - Interoperability: sine qua non

# What did MU do for us?

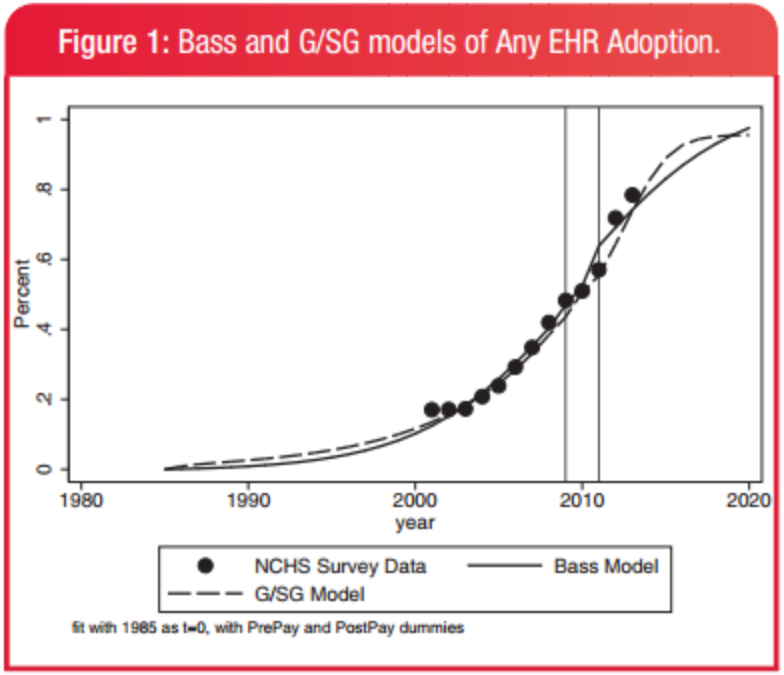
- Boosted adoption—maybe
- No question it was good for business
  - After all, HITECH was a jobs bill
- No question it raised the bar
  - How far? Open to debate
- BUT: at what cost?
- And what was stifled?

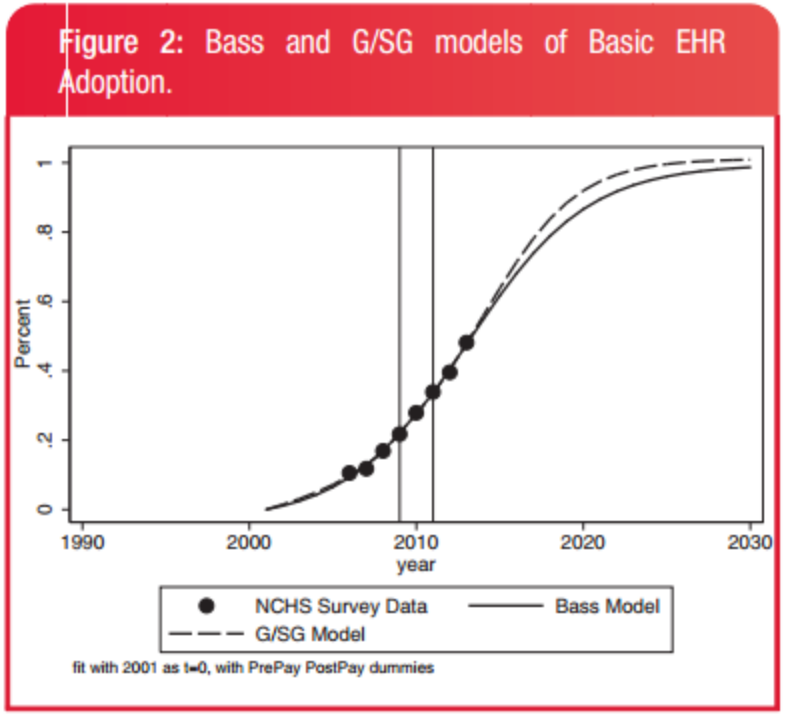
# Double-Edged Sword of MU

| | |
|---|---|
| Increased adoption | ↓ Attention to workflow |
| Incentive payments | ↓ Attention to other projects |
| Focus on process | Lost focus on outcomes |
| Improved safety? | ↑ Need for vigilance<br>Guard against unintended errors |
| Patient engagement? | ↓ Confidence in safety? |

# Meaningful Use

Not clear if it boosted adoption:




". . . the new regulation may have had unintended, negative consequences. One explanation is that the MU requirement for a "certified" EHR may have slowed technological advancements in the field as system vendors invested in compliance rather than research and development."

Mennemeyer ST, et al. JAMIA 2015; July 0:1-6. doi: 10.1093/jamia/ocv103

# Unintended effects of MU

- Reduced patient-clinician interaction
  - Eye-to-eye
  - Time

  Some would say = to paper processes
- Transferred burdensome data entry*
- Lengthened workdays
- Interoperability not improved
  - i.e., communication still hampered

[ * I contend added data entry burden is not just a consequence of MU (e.g., ICD-10)]

JAMIA 2015, Report of the AMIA EHR 2020 Task Force on the Status and Future Direction of EHRs, quoted by Doug Fridsma, AMDIS-PCC June 24, 2015.

# Now what?

- Simplify documentation
- More focused regulation:
  - Increase transparency of EHR functions
  - Encourage innovation
- Improve usability
  - I submit we have a long way to go

JAMIA 2015, Report of the AMIA EHR 2020 Task Force on the Status and Future Direction of EHRs, quoted by Doug Fridsma, AMDIS-PCC June 24, 2015.

# What does usability look like?

- Maximum use of all available tools
- Efficiency of workflows
- Optimization of software to reflect optimal workflows
- Effectiveness and safety of tools
- Efficiency =
  - minimal resource consumption + maximum completeness
- Satisfaction and acceptability

Holman GT, et al. JAMIA 2015; 0:1-10. doi: 10.1093/jamia/ocv107
Staggers N, Rodney M., et al. HIMSS Usability Task Force. 2011.

# What does usability look like?

Too often, clinicians must *adapt*

- There is no standard workflow
- Task sequences depend on:
  - EMR which impacts the clinician
  - it's desirable for clinician to impact EMR

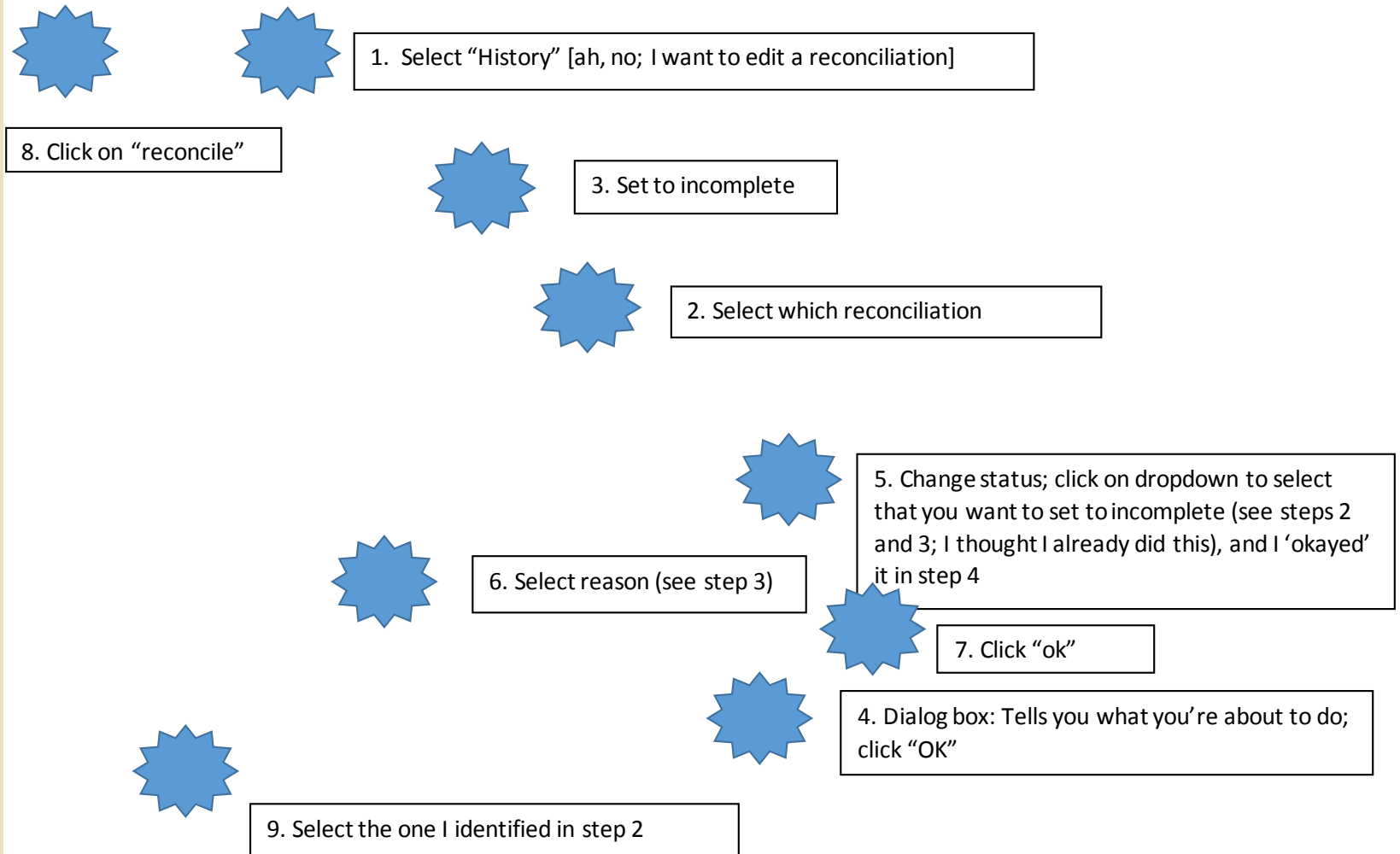
Holman GT, et al. JAMIA 2015; 0:1-10. doi: 10.1093/jamia/ocv107.

# What gets in our way

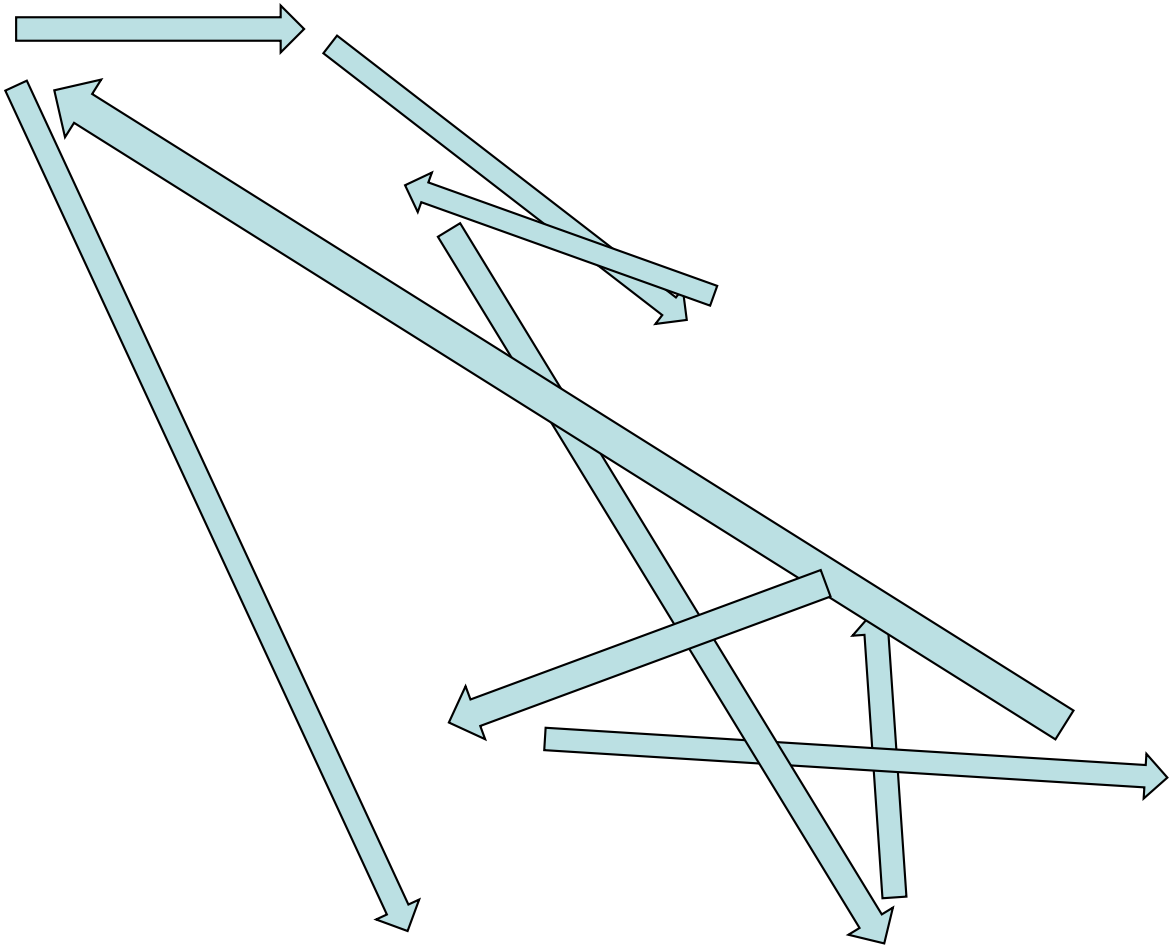
- Standards, or lack thereof:
  - "The wonderful thing about standards is that there are so many of them."
  - "Standards are like toothbrushes—everyone has one, but no one wants to use yours."

# Usability, or lack thereof

Example of updating a closed medication reconciliation:



# Poor usability



# Poor Usability

- How do you say “ok”?
  - Ok
  - Close
  - Accept
  - Save
  - Accept and save
  - “X”
  - Submit
  - Select
  - Check the box

# Poor Usability

- And where?
  - Lower right
  - Lower left
  - Lower middle
  - Middle right
  - Middle left
  - Middle center
  - Upper left
  - Far left, somewhere
  - And I don’t see it at all!

# Poor Usability

- Where do I find the data I want (e.g., lab result)?
  - Header (if critical, makes sense)
  - On the lab page (obviously!)
  - After I click on the lab name (hidden)
  - After I click on the lab name, and then on the result flag (doubly hidden)
  - After I click on the lab name, and then on the result flag, and then on * (Yikes!)
  - And sometimes I don't see it at all!

# Poor Usability: BP

120/80

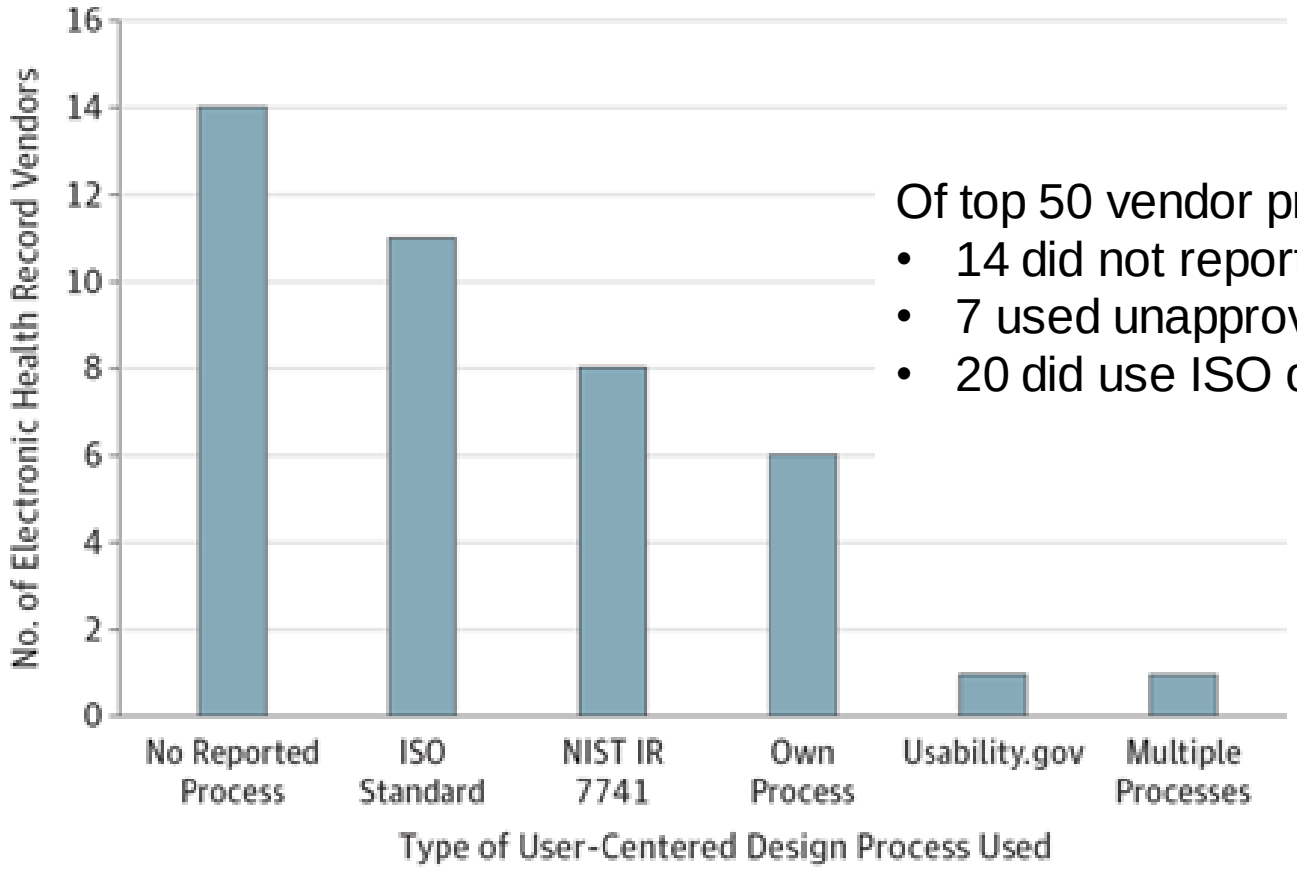
Sys 120
Dias 80

120-80

120
80

| | |
|---|---|
| Diastolic | 80 |
| Pulse | 65 |
| Respirations | 16 |
| Systolic | 120 |
| Temperature | 37 |

# Vendors and Usability




Of top 50 vendor products:

- 14 did not report UCD process
- 7 used unapproved processes
- 20 did use ISO or .gov UCD

ISO: International Organization of Standardization usability processes; NIST IR 7741: national Institute of Standards and Technology guide to improve usability of EHRs; Usability.gov: Federal government usability practices

Ratwani RM, Benda NC, Hettinger AZ, Fairbanks RJ. JAMA. 2015; Sept 8 414(10):1070-1071.

# Vendors and Usability

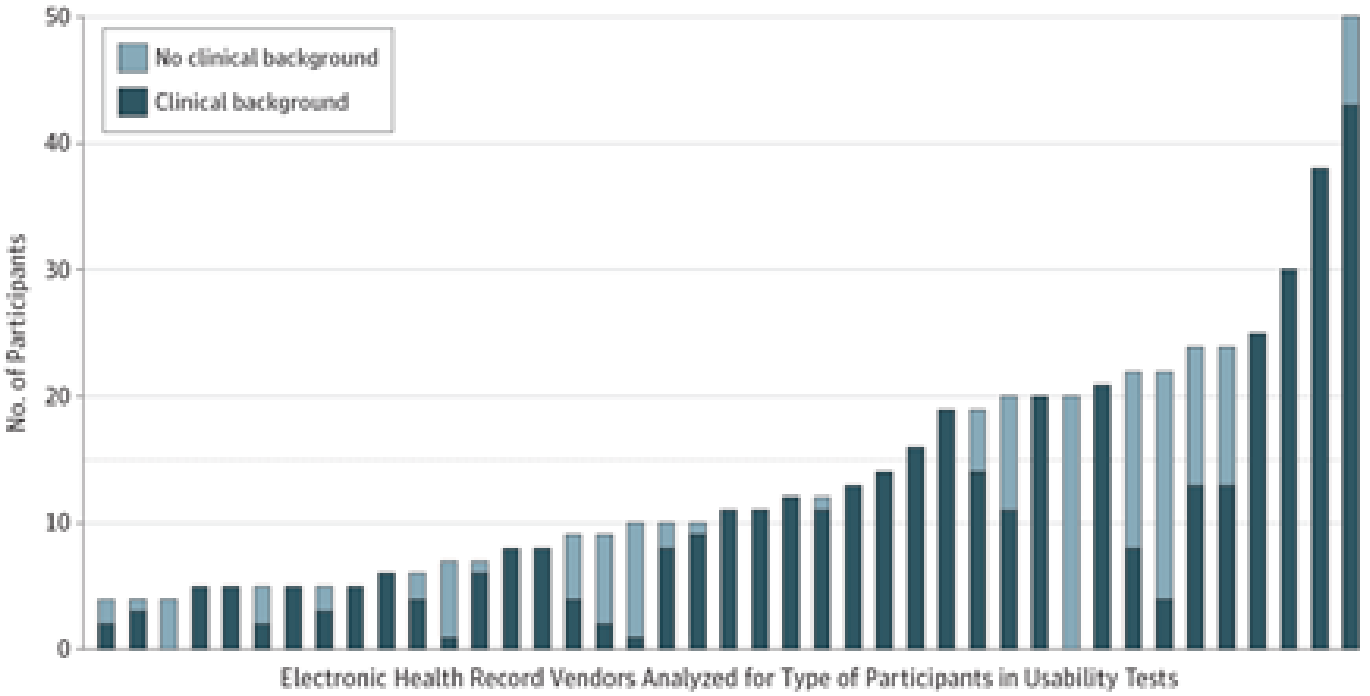



Figure 2. Type of Participants used by EHR Vendors for Usability Tests

Note that even when approved UCD processes employed, the users were not always “clinical” as recommended by NIST, and strongly encouraged by all informatics societies.

Ratwani RM, Benda NC, Hettinger AZ, Fairbanks RJ. JAMA. 2015; Sept 8 414(10):1070-1071.

# SMART on FHIR

- SMART on FHIR http://smarthealthit.org/smart-on-fhir
- Substitutable medical application reusable technologies
- Fast Healthcare Interoperability Resources
  - Now a draft HL-7i standard
- Uses RESTful APIs
  - Representational State Transfer
    - Retrieve a resource
    - Fetch data
    - Execute a query
    - Respond with matching resources

# SMART on FHIR

- Basic web services
  - Create POST
    - Create a resource on the server
  - Read GET
    - Retrieve a resource
  - Update PUT
    - Change the state of a resource
  - Delete DELETE
    - Remove a resource

# SMART on FHIR

Example 1:

A patient has data in more than one EMR. One stores height and weight in a flowsheet (data table), and BMI as a calculated value in another table (relational data base). The other EMR stores data in an object oriented data base; that is, all three variables are stored together as an object.

The patient goes to a third location: how will all the data be collated?

# SMART on FHIR

Resolution:

- Both EMRs allow “calls” (information requests) from the third EMR
- All three use same SMART application
- Sending EMRs supply their data via FHIR resources that “don’t care” about format
  - Because they’re using standard HTML
  - “clean, granular data” using XML and JSON
- Receiving EMR collates all data
  - Appropriate to its formatting

# SMART on FHIR, Arden Syntax

Example 2: The "curly braces problem"

Decision support helps guide clinicians to make correct choices, given information specific to individual patients; but lots of variables. Does this patient have adequate prophylaxis against venous thromboembolic disease? One EMR queries an order for "sequential compression devices"; the other looks for nurse's documentation stating "SCDs applied" [what's inside the curly braces, much like quotation marks]. These are not data base objects or variables, they are "natural language".

How can this same clinical decision support be used in different EMRs?

# SMART on FHIR, Arden Syntax

Solution:

- Construct CDS using FHIR
- Call resources (standard HTML) that "don't care" what's in the curly braces
- Data elements represented by FHIR resources
  - "Some data elements were complex and required linked resources to represent fully (e.g., bacteriologic reports) but were still representable in FHIR"

Jenders RA. AMIA 2014 Annual Symposium. 2014;1438

# EXTREME

"What makes an EHR "open" or interoperable?

EXTREME use cases

- Extract
- Transmit
- Exchange
- Move
- Embed

Sittig DF, Wright AJ. Am Med Inform Assoc. 2015; Sept 22 5:1099-1101.

Table 1: The EXtract, TRansmit, Exchange, Move, Embed (EXTREME) use cases with requirements for an open, or interoperable, EHR

| EXTREME use cases | Requirements |
|---|---|
| An organization can securely *extract* patient records while maintaining granularity of structured data. | • Secure login and role-based access controls<br>• Structured data importable programmatically into another database (unstructured formats; e.g., PDF, do not suffice)<br>• Audits of extracted records<br>• Sufficient metadata included in the extract to ensure interpretability (e.g., units and normal ranges for lab results)<br>• Freely-available data dictionary indicates where data are stored and what they mean |
| An authorized user can *transmit* all or a portion of a patient record to another clinician who uses a different EHR or to a Personal Health Record of the patient's choosing without losing the existing structured data.[13] | • Data selection methods that allow users to identify which data to include or exclude<br>• Standard method to structure data (e.g., Consolidated-Clinical Document Architecture (C-CDA)) or portions thereof (e.g., Digital Imaging and Communications in Medicine (DICOM),[14] ePrescribing[15])<br>• Standard methods used to describe the meaning of the data (i.e., controlled clinical vocabulary used) Note: conversion of structured data to an unstructured format (e.g., Portable Document Format (PDF) would not meet these requirements) |
| An organization in a distributed/decentralized health information *exchange* can accept programmatic requests for copies of a patient record from an external EHR and return records in a standard format.[16] | • EHR infrastructure capable of responding to queries 24 h/day, 7 days/week[17]<br>• Record-locator service functionality available and in use<br>• Standard method used to structure data (e.g., C-CDA)<br>• Sending EHR's data dictionary available to receiving EHR<br>• "Internet robustness principle" respected (be liberal in what you accept and conservative in what you send) |
| An organization can *move* all its patient records to a new EHR. | • Standard method in which to structure key clinical data (e.g., laboratory results, medications, problems, admission history) provided (e.g., Health Level Seven (HL7) v2.x or v3)<br>• Data dictionary used to define clinical and administrative data<br>• Existing metadata (e.g., timestamps, source, and authors) preserved in the new system<br>• Transaction history of data items (e.g., renewals and dose changes for a medication) preserved |
| An organization can *embed* encapsulated functionality within their EHR using an Application Programming Interface (API). Goals: access specific data items, manipulate them, and then store a new value. | • External applications have "read" and "write" access to clinical and administrative data, including metadata from the EHR (e.g., using the Substitutable Medical Applications, Reusable Technologies (SMART) app platform[18] or HL7's Fast Healthcare Interoperability Resources (FHIR) services[19])<br>• Programmatic method to embed external applications (either code or presentation; i.e., an embedded web application; e.g., Cerner's mPages.[20]) with which the user can interact via the EHR's user interface without re-compiling the existing EHR's codebase<br>• Appropriate support and maintenance to ensure that encapsulated functionality will continue to work and meet user needs following system configuration changes or upgrades<br>• Health Insurance Portability and Accountability Act of 1996 (HIPAA)-compliant protection of newly created data item(s) (e.g., only accessible to authorized users and backed-up with all other patient data) like all other patient-related data |

# Smarter EMRs

- Improve CDS
  - Only use high quality evidence
  - Define the proper triggers
    - Maintain sensitivity
    - Improve specificity (too many false +)
  - Concerted effort to reduce alert fatigue
- Incorporate more clinical prediction rules (Ottawa Ankle, TIMI, Wells)

McGinn T. JMIR Med Inform. 2016;4(2):e16, 1-8.

# Smarter EMRs

- Incorporate shared decision-making
- Incorporate bundled sets automatically (no action by clinician)
  - Tied to guideline-directed therapy
    - e.g., appropriate antibiotics based on dx
- Create automated documentation
  - e.g., patient education

McGinn T. JMIR Med Inform. 2016;4(2):e16, 1-8.

# CMIO v. 1 - 4

- Version 1: liaison, translator, physician representative
- Version 2: Adoption advocate
- Version 3: MU subject matter expert
- Version 4:
  - Usability activist
  - Innovation
  - Visionary (be 6 – 12 months ahead)
  - More central role in leadership

See also: Kannry, et al. The Chief Clinical Informatics Officer (CCIO). ACI. 2016;7:143-176.

# CONCLUSIONS

MU, HITECH, PPACA, and SGR

v

MACRA, MIPs, ACO, PCMH, ACI, APM

- CMIOs have a job to do sort out the alphabet soup

Usability remains at the core of effective EHRs to achieve the above

- Who knows this best than CMIOs?

# CONCLUSIONS

- SMART on FHIR
  - I posit as the “wave of the present” and near future
    - Obviously not perfect
    - May pave way for improved
      - Communication
      - Interoperability
      - Reduction in “information blocking”
      - Promotion of use of APIs
        - » and patient involvement perhaps

# Questions and Discussion

It is the first responsibility of every citizen to question authority.

- Benjamin Franklin
(1706 - 1790)

# Now that MU has solved everything, what's a CMIO to do?

## Evolving beyond the double-edged sword of MU

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**rschreiber@geisinger.edu**

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