Reducing Clinician Burden: Cardiovascular Procedure Reporting at Duke

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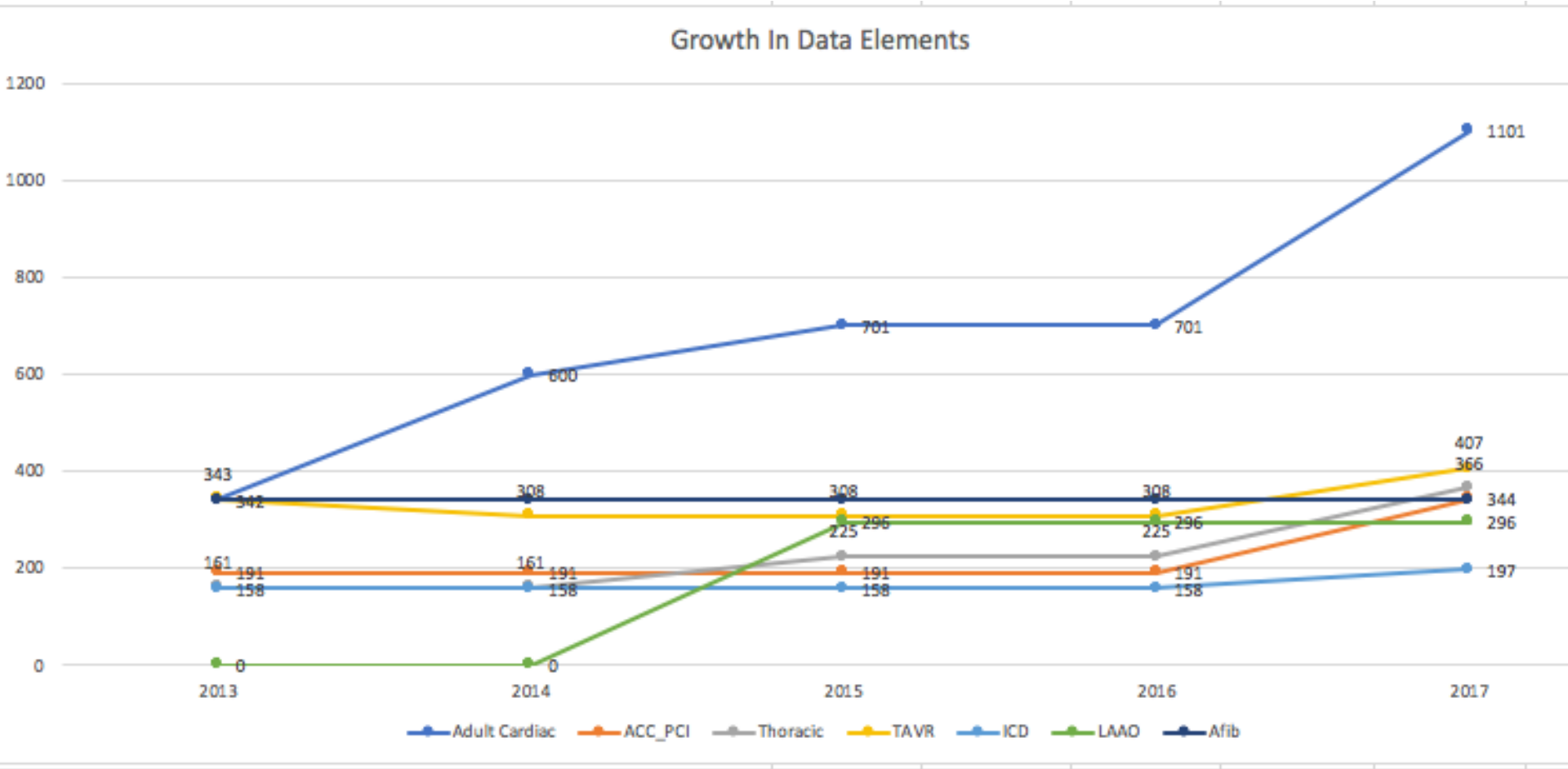
Where Did Duke Start?

- Computers in medicine … dating to 1960's
  - Eugene Stead – "*Computerized Textbook of Medicine*"
- Homegrown systems for cardiac cath (PCI, EP, CABG), echo, nuclear cards, cardiac MR
  - Culture of structured reporting (depended on fellows)
  - Expensive fiefdoms, could not keep up with demand
- → Perfect storm ~2008: limited EHR data, rising costs, fewer fellows, more registries, need to share data, greater focus on quality…
  - $500m – 1b per annum for ACC NCDR Registries

Registry Data Collection Growing



1st Principles – Structured Reporting

- Team-based data capture …
- Integrated into workflow …
- Context specific user interfaces …
- Clinicians to the "top of the license"

  = industrial engineering
- Data per intended use case (registries)
- Data persistence (within, across encounters)
- Data views compiled by the computer

  = Reducing Clinician Burden!

ARRA HITECH HIT Committee: Standards for Interoperability

- Clinical Operations is recommending standards for interoperability **between entities**, *not* within an entity
- Recommended standards should *not* apply to internal data capture, storage or uses – only to **external representation and data exchange** between entities
- Content should be able to be represented in the specified vocabularies and exchanged in the specified standards at **the boundary** between entities, regardless of how it is managed internally
  - Many methods may potentially be used to achieve interoperability standards, e.g., mapping, external services, or native data capture

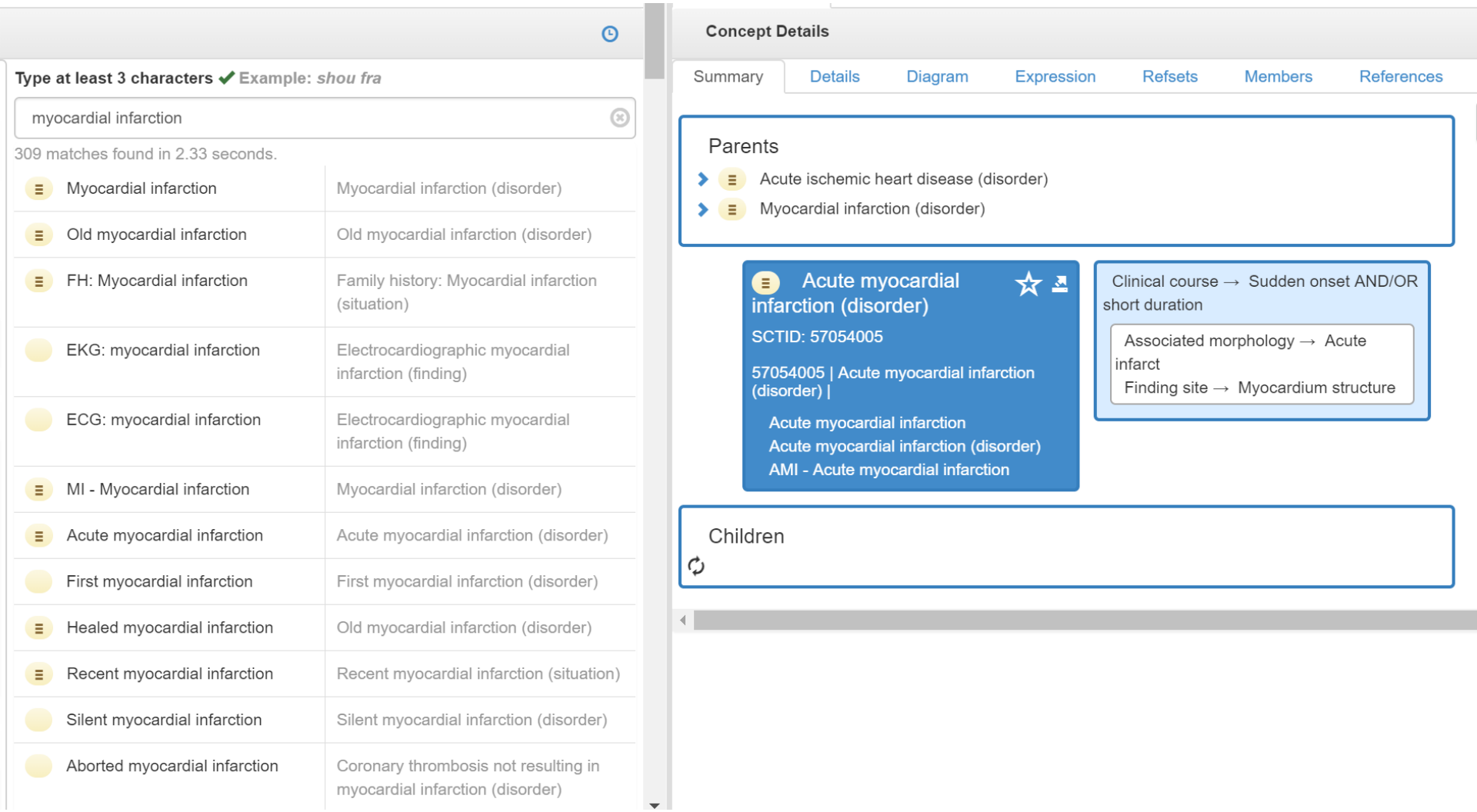
Search Term: myocardial infarction

SNOMED-CT

Returns 308 matches in 2.33 seconds

Term defined by pathologic, anatomic relationships (ontology)

No clinical definition



Problems with Boundary-Based Interoperability

- Duke participates in ~20 CV registries
  - ETL, ETL, ETL, ETL, ETL every time data moved
- (Lack of) vocabulary specificity
  - E.g., ICD-10, SNOMED-CT
- (Lack of) clinical vocabulary
  - EHR (text-based) documentation lacks discipline to capture information per se, as well as information as data

How Registries Solve the Data Capture Problem

Home > NCDR > Registries > Hospital Registries > CathPCI Registry

NCDR CathPCI Registry®

Standardized NCDR data elements and processes

- Patient demographics for diagnostic coronary angiography and percutaneous coronary intervention (PCI) procedures
- Patient history/risk factors, cath lab visit indications and coronary lesion information
- Provider and facility characteristics
- PCI Indications, lesion information, intracoronary device utilization and intra/post-procedure events
- 30-day and 1-year follow-up information on patients who had PCI

The registry supports a variety of data entry and submission options including certified third-party vendors and secure web-based entry. Data collection options

https://cvquality.acc.org/NCDR-Home/registries/hospital-registries/cathpci-registry

The Four Tenets of Data Capture

- Capture data once, use many times
  - concepts: data standards, persistence, liquidity
- Point of care data collection using a team-based approach, with user-centered, role-specific instruments
- Use the computer (not humans) to abstract and compile views of the data
- Reduce clinician cognitive burden

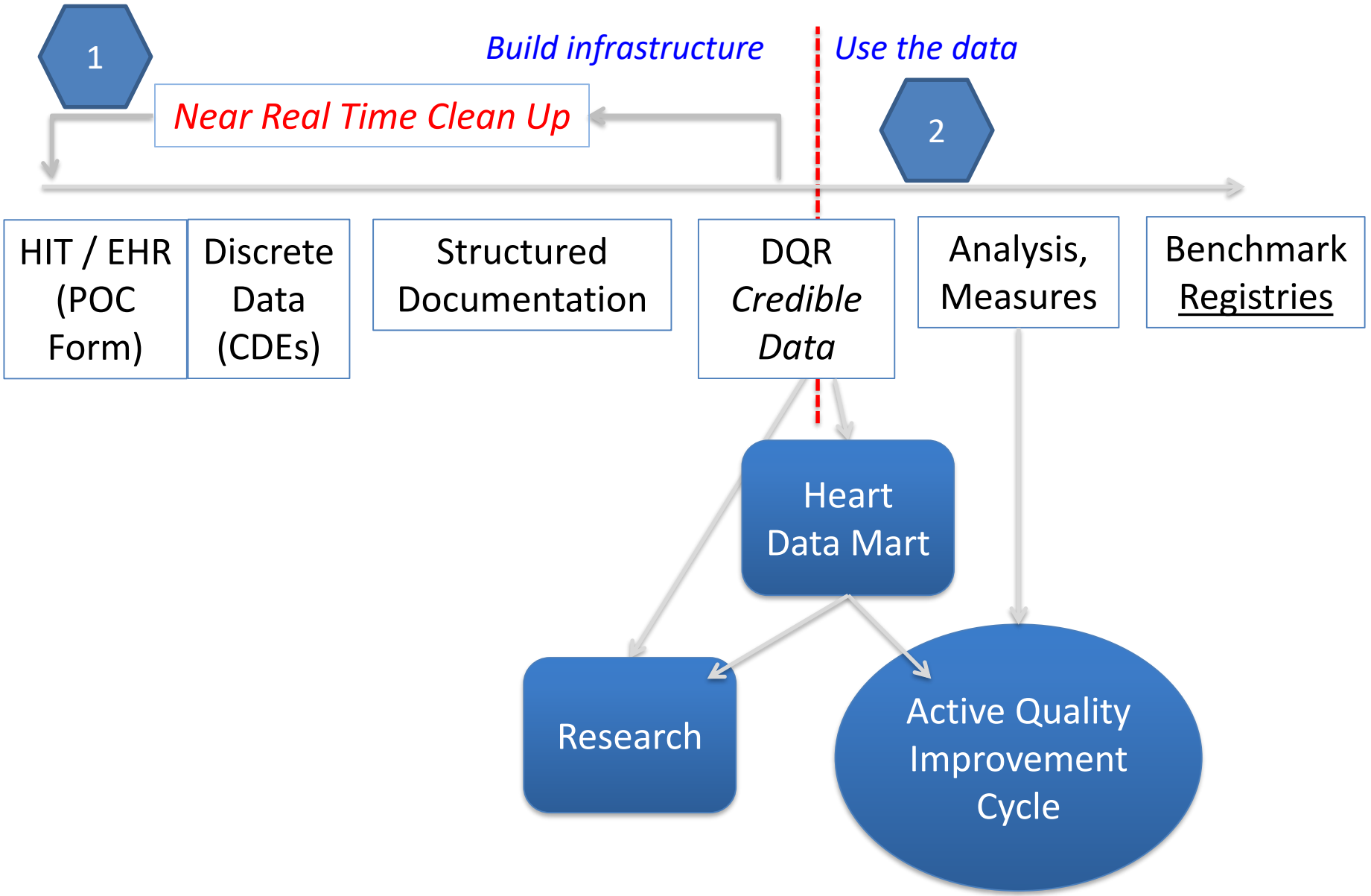
How Is Structured Reporting Done?

- Engineered, best-practice workflows
- Just in time, context specific, high usability, point of care data capture via forms
- Lots of business rules
- Optimized IT form factors
- Computer is a compiler

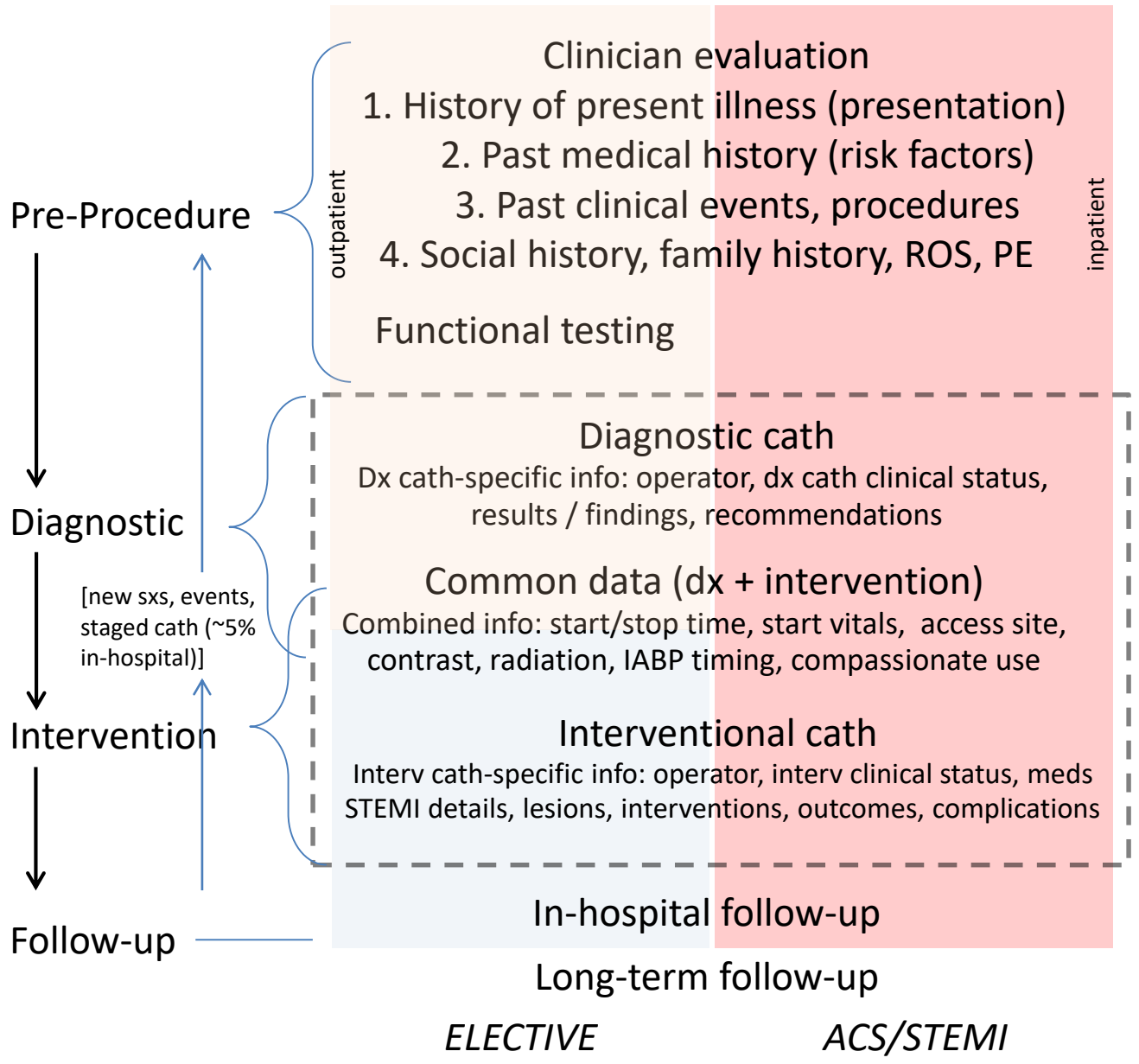
In other words …

- Command of who does what when, where, and how

Duke Heart Center - Dataflow End State



Episode of Care: Invasive & Interventional Cardiac Cath

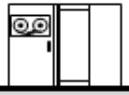


Data Tables

Demographic
Episode_Of_Care
History_Past (med, surg, risk factors)
Current_Common (sxs, meds)
Current_STEMI
Current_Not_STEMI

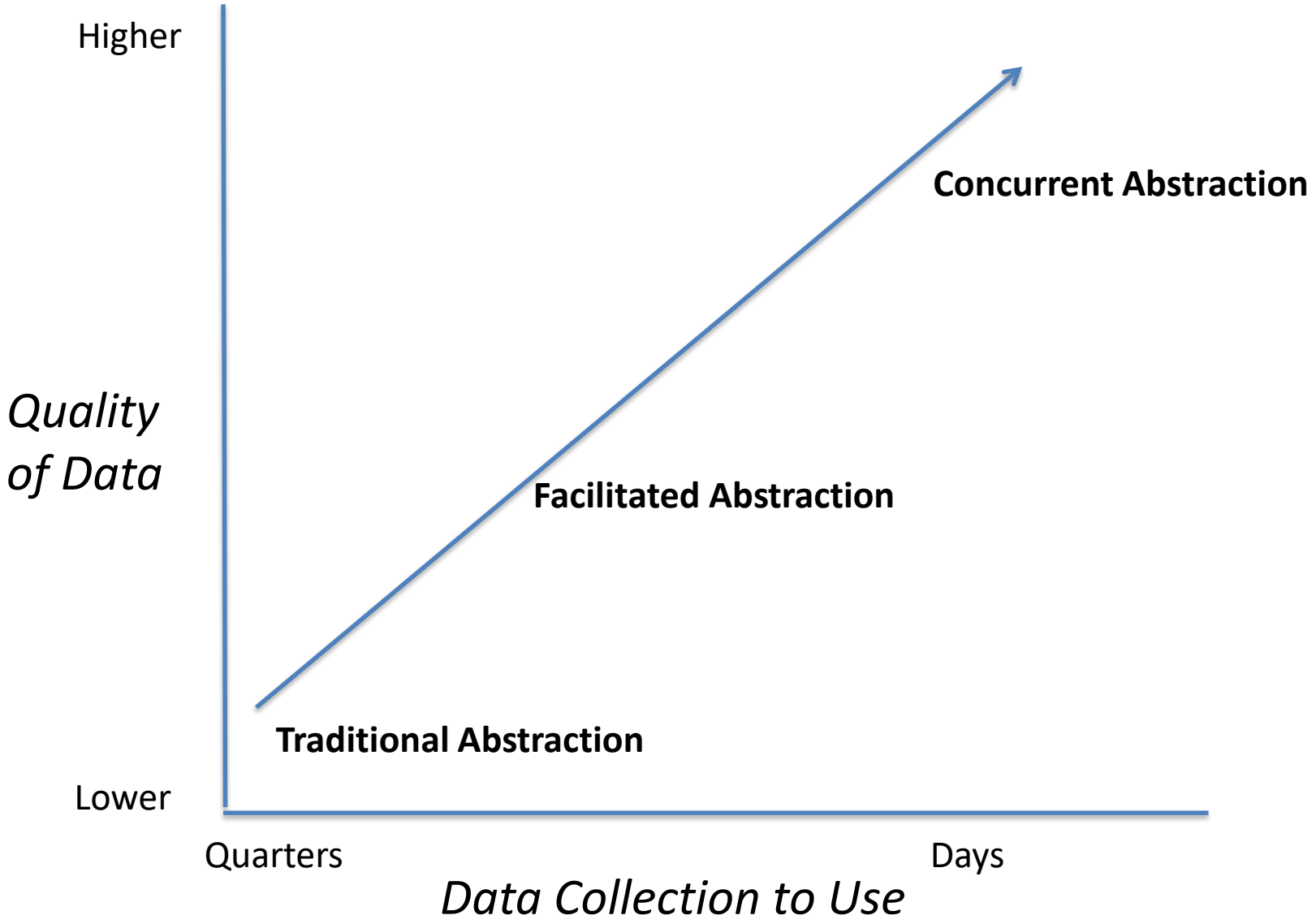
Proc_Cardiac_Cath (shared dx + PCI)
Proc_Cardiac_PCI (PCI only)
Coronary_Anatomy
[Proc_Meds]
[Proc_Labs]

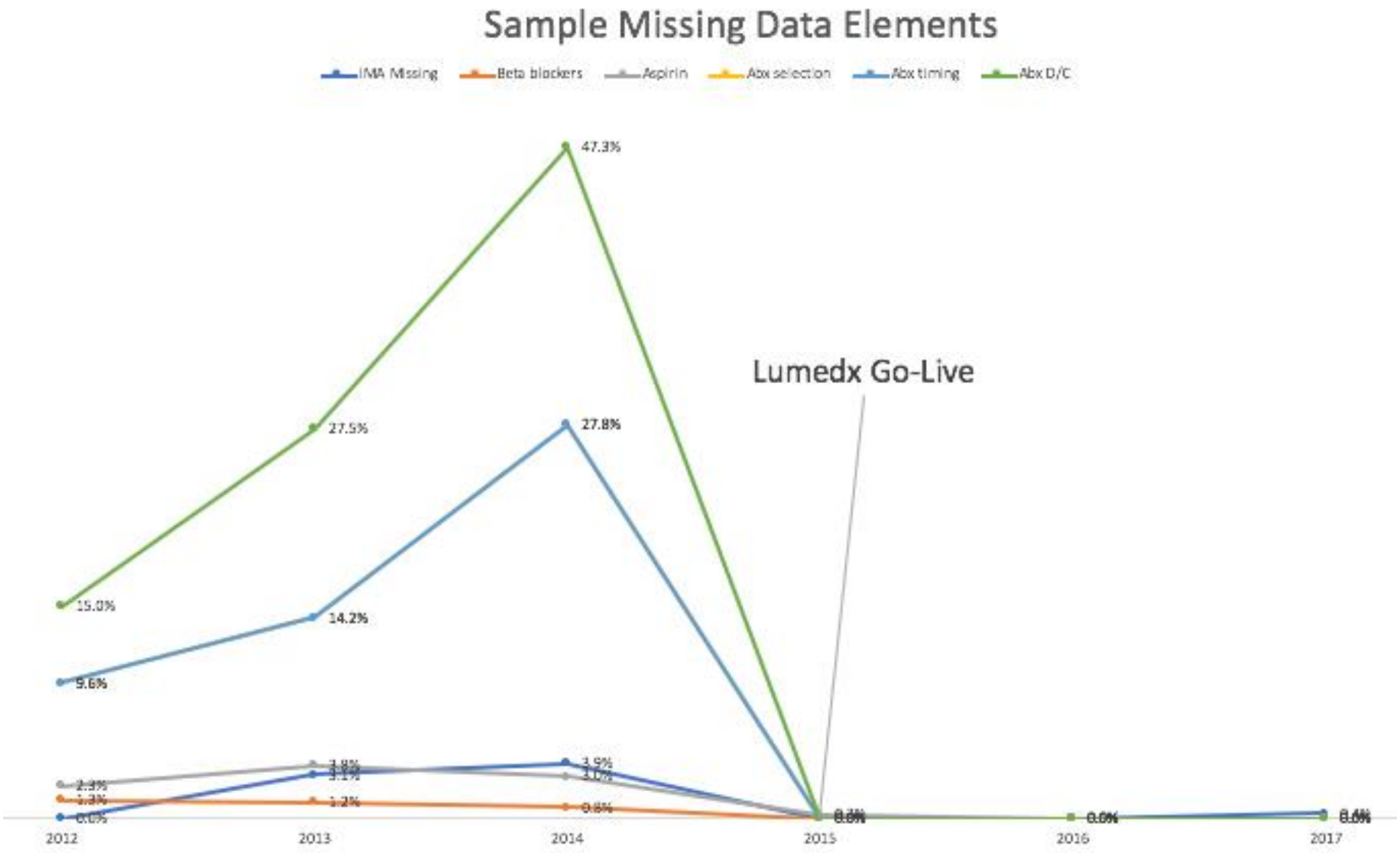
InHospital_Events
Discharge

Process	Schedule Patient for Cath Procedure	Physician Pre-Procedure Evaluation and Consent	Nursing Pre-Procedure Evaluation	Cardiac Catheterization Procedure	Analysis and Report Generation
Information Sources	History & Physical Other documents Laboratories	Existing clinical data History & Physical Other documents Laboratories	History & Physical Other documents Laboratories Consents	Pre-procedure evaluation packet Hemodynamics Catheterization images	Hemodynamics Catheterization images Measurements Calculations
Information Captured as Digital Data	Patient identifiers Demographics Diagnosis Laboratories Insurance	Patient identifiers Demographics History Physical Exam Previous studies Laboratories Diagnosis	Patient identifiers Height, weight, vital signs Medications	Patient identifiers Procedures Hemodynamics Findings Measurements Medications Inventory	Patient identifiers Cath results Interpretation Tree diagram
Actors 	Physician requestor Scheduling hub / Communications Center	Advanced Practice practitioners Physician operator	Outpatient / inpatient nurses	Physician operator Cath lab nurses Cath lab technologists	Physician operator
Information Systems 	Registration system Scheduling app Electronic Health Record	Electronic Health Record Procedure Reporting system	Electronic Health Record	Radiography Modality Hemodynamic Monitoring system Procedure Documentation / Reporting system	Procedure reporting system
Form Factor (for Actors)	Desktop workstation	Mobile tablet	Bedside workstation	Multiple workstations: Radiography Modality Hemodynamic Monitoring Procedure Documentation	Desktop workstation
Data Output	Schedule – to scheduling app Orders – to Electronic Health Record (EHR) system	Clinical data – to procedure reporting system (history section) Patient status – to scheduling system → electronic schedule Orders – to EHR	Nursing documentation – to EHR Patient status – to scheduling system → electronic schedule	DICOM Modality Worklist to Modality, Hemodynamic, and Procedure Documentation systems → procedure log report; and data for procedure report (procedure section) [See also IHE CATH, CRC profiles]	Procedure results – to procedure reporting system (results section) → structured procedure report

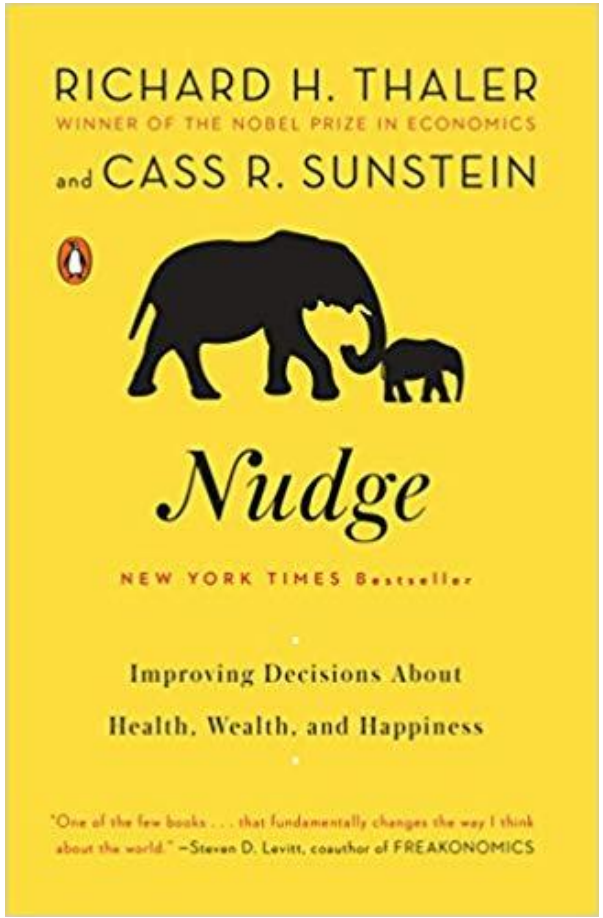
What Does SR Fix?

- MINIMAL CHART ABSTRACTION
- Single source of data (trust and verify)
- Reusable data – “collect data once, use many times”
- Explicitly prompts for presence / absence of data – not just charting by exception
- MD emphasis on findings, results, interpretation, recommendations – not “art”
- ↑ workflow efficiencies, ↓ FTEs
- ↑ Clinical data, data quality, completeness


Higher
Quality of Data
Lower
Concurrent Abstraction
Facilitated Abstraction
Traditional Abstraction
Quarters
Days
Data Collection to Use



A Little Behavioral Economics …



Human frailties - and the need for "choice architecture":

- Unrealistic optimism
  - If interoperability were that easy …
- Loss aversion
  - Inertia favors stasis
- Status quo bias
  - "Easy Button" default option
- Framing effects
  - How to convince ("sell")

What Did We Accomplish at Duke?

- Problem: inaccurate data, incomplete reports
  - Distributed responsibility for acquiring data to the individual closest to that data
  - Eliminated double documentation (prelim + final report)
  - Having the attending MD (not the fellow) author the report – in <3 min
- Problem: fellow service vs. education
  - Fellow work now focused on cognitive assessment, understanding context & results
- Problem: MD workload = delays to final report
  - Was: 4+ days on average
  - Now: before the end of the procedure

What is Needed for Ubiquitous Structured Reporting?

1. MD, staff, professional society transformation
   -- conversion from dictation to information model
2. Government, payer, health systems transformation
   -- shift emphasis from payment to data
3. Informatics: common data elements (CDE) → controlled vocabularies; common data model (CDM); data interoperability (HL7, IHE, etc.)
4. Clinical industrial engineering (process modeling) to describe, guide, implement best-practice workflows
   -- who does what when, where, and how
   -- implementation science, change management
5. IT platform, solution set

Thank You!

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Visit the DCRI-Pew Project

https://dcri.org/registry-data-standards