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

Growth In Data Elements

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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!
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
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

The CathPCI Registry uses standardized data elements and definitions for:

- 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

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
HIT / EHR (POC Form) | Discrete Data (CDEs) | Structured Documentation | DQR *Credible Data* | Analysis, Measures | Benchmark Registries

**Build infrastructure**

**Use the data**

1. Near Real Time Clean Up

Heart Data Mart

Active Quality Improvement Cycle

Research
Episode of Care: Invasive & Interventional Cardiac Cath

Clinician evaluation
1. History of present illness (presentation)
2. Past medical history (risk factors)
3. Past clinical events, procedures
4. Social history, family history, ROS, PE

Functional testing

Diagnostic cath
Dx cath-specific info: operator, dx cath clinical status, results / findings, recommendations

Common data (dx + intervention)
Combined info: start/stop time, start vitals, access site, contrast, radiation, IABP timing, compassionate use

Interventional cath
Interv cath-specific info: operator, interv clinical status, meds STEMI details, lesions, interventions, outcomes, complications

In-hospital follow-up

Long-term follow-up

Data Tables
Demographic
Episode_of_Care
History_Past (med, surg, risk factors)
Current_Common (sxs, meds)
Current_STEMI
Current_Not_STEMI
Proc_Cardiatic_Cath (shared dx + PCI)
Proc_Cardiatic_PCI (PCI only)
Coronary_Anatomy
[Proc_Meds]
[Proc_Labs]
InHospital_Events
Discharge

Pre-Procedural

Diagnostic
[new sx, events, staged cath (~5% in-hospital)]

Intervention

Follow-up

ELECTIVE

ACS/STEMI
<table>
<thead>
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<tbody>
<tr>
<td><strong>Information Sources</strong></td>
<td>History &amp; Physical Other documents Laboratories</td>
<td>Existing clinical data History &amp; Physical Other documents Laboratories</td>
<td>History &amp; Physical Other documents Laboratories Consents</td>
<td>Pre-procedure evaluation packet Hemodynamics Catheterization images</td>
<td>Hemodynamics Catheterization images Measurements Calculations</td>
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<tr>
<td><strong>Information Captured as Digital Data</strong></td>
<td>Patient identifiers Demographics Diagnosis Laboratories</td>
<td>Patient identifiers Demographics History Physical Exam Previous studies Laboratories Diagnosis</td>
<td>Patient identifiers History &amp; Physical Other documents Laboratories Consents</td>
<td>Patient identifiers Procedures Hemodynamics Findings Measurements Medications Inventory</td>
<td>Patient identifiers Cath results Interpretation Tree diagram</td>
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<td><strong>Actors</strong></td>
<td>Physician requestor Scheduling hub / Communications Center</td>
<td>Advanced Practice practitioners Physician operator</td>
<td>Outpatient / inpatient nurses</td>
<td>Physician operator Cath lab nurses Cath lab technologists</td>
<td>Physician operator</td>
</tr>
<tr>
<td><strong>Information Systems</strong></td>
<td>Registration system Scheduling app Electronic Health Record</td>
<td>Electronic Health Record Procedure Reporting system</td>
<td>Electronic Health Record</td>
<td>Radiography Modality Hemodynamic Monitoring Procedure Documentation / Reporting system</td>
<td>Procedure reporting system</td>
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<tr>
<td><strong>Form Factor (for Actors)</strong></td>
<td>Desktop workstation</td>
<td>Mobile tablet</td>
<td>Bedside workstation</td>
<td>Multiple workstations: Radiography Modality Hemodynamic Monitoring Procedure Documentation</td>
<td>Desktop workstation</td>
</tr>
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<td><strong>Data Output</strong></td>
<td>Schedule – to scheduling app Orders – to Electronic Health Record (EHR) system</td>
<td>Clinical data – to procedure reporting system (history section) Patient status – to scheduling system → electronic schedule Orders – to EHR</td>
<td>Nursing documentation – to EHR Patient status – to scheduling system → electronic schedule</td>
<td>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]</td>
<td>Procedure results – to procedure reporting system (results section) → structured procedure report</td>
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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
Concurrent Abstraction

Facilitated Abstraction

Traditional Abstraction

Higher

Quality of Data

Lower

Quarters

Days

Data Collection to Use
Sample Missing Data Elements

Lumedx Go-Live
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