Impact of EHR design and operational procedures on health care data for research

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Objectives

• Understand the underlying drivers for Electronic Health Record Design
• Understand the drivers that impact data integrity in the Electronic Health Record
• Understand the limitations of data sets
DISCLOSURE STATEMENT

• None to report
Drexel University College of Medicine: Drexel Medicine

- Multispecialty ambulatory practice
- 250 Physicians
- 17 subspecialties
- 500 Residents/Fellows
- 1000 medical students
- 1000 staff
- 300,000 outpatient visits per year
- Implementation of EHR in 2007
How did we get to this point?

[Image: AH-HA! WE FOUND THE PROBLEM!]

Crossing the Quality Chasm - 2001

• 6 Aims of Health care:
  • Should be:
    • Safe
    • Effective
    • Patient Centered
    • Timely
    • Efficient
    • Equitable
Crossing the Quality Chasm

• To be pursued by:
  • Health Care organizations
  • Professional Groups
  • Private Purchasers
  • Public Purchasers

• Goals:
  • Reduce the burden of illness, injury and disability to improve the health and functioning of [our population]
Crossing the Quality Chasm

• Patient as source of control
• Shared knowledge and free flow of information
• Evidence based decision making
• Safety as a system property
• Need for transparency
• Anticipation of needs
• Decrease in waste
• Cooperation amongst clinicians
US spends two-and-a-half times the OECD average

Total health expenditure per capita, public and private, 2010 (or nearest year)

1. In the Netherlands, it is not possible to clearly distinguish the public and private share related to investments.
2. Total expenditure excluding investments.
Information on data for Israel: [http://dx.doi.org/10.1787/889932315602](http://dx.doi.org/10.1787/889932315602).

Source: OECD Health Data 2012.

OECD = Organization for Economic Co-operation and Development (international organization of 34 countries founded in 1961 to stimulate economic progress and world trade)
“Once again, U.S. has most expensive, least effective health care system in survey” – The Washington Post, June 16, 2014

Meaningful Use

Meaningful Use Summary

Adoption of Electronic Health Records

Figure 1: Percent of non-Federal acute care hospitals with adoption of at least a Basic EHR with notes system and possession of a certified EHR, 2008-2014

NOTES: Basic EHR adoption requires the EHR system to have a set of EHR functions defined in Table A1. A certified EHR is EHR technology that meets the technological capability, functionality, and security requirements adopted by the Department of Health and Human Services. Possession means that the hospital has a legal agreement with the EHR vendor but is not equivalent to adoption.

*Significantly different from previous year (p < 0.05).

SOURCE: ONC/American Hospital Association (AHA), AHA Annual Survey Information Technology Supplement

Triple Aim → Quadruple Aim

• “improving the experience of care, improving the health of populations, and reducing per capita costs of health care” – The Institute for HealthCare Improvement, 2012

Health of the Provider
### Quality Payment Program: Merit Incentive Payment System (MIPS)

<table>
<thead>
<tr>
<th>Element</th>
<th>Was...</th>
<th>Weight</th>
<th>Future Weight</th>
<th>Reporting Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td>Patient Quality Reporting System (PQRS)</td>
<td>50%</td>
<td>30%</td>
<td>Registry/QCDR/Web Interface (248 patients)</td>
</tr>
<tr>
<td>Resource</td>
<td>Physician Value-PQRS (PV-PQRS)/ Value Modifier (VM)</td>
<td>10%</td>
<td>30%</td>
<td>Claims</td>
</tr>
<tr>
<td>Clinical Practice Improvement Activity (CPIA)</td>
<td>Didn’t exist before</td>
<td>15%</td>
<td>15%</td>
<td>Registry/QCDR</td>
</tr>
<tr>
<td>Advancing Care Information (ACI)</td>
<td>Meaningful Use (MU)</td>
<td>25%</td>
<td>25%</td>
<td>Registry/QCDR</td>
</tr>
</tbody>
</table>

Time in the EHR measured

• For every 1 hour of clinical care delivered, 2 additional hours of clerical/documentation work in the office
• An additional 1-2 hours of work occur at home
• Increased risk for physician burnout
• Increased risk for lower quality care (and documentation...)

Medical Education

• One just needs to look at how physicians are trained in further understanding the data collected in EHRs
  • “90% of diagnoses come from a detailed history”
    • Identify the reason for visit (Chief Complaint)
    • Discuss the details regarding the complaint (e.g. timing, severity, associated signs and symptoms)
    • Contributory Family, Medical, Social History, Surgical History
    • Review of Organ Systems to identify other related issues
    • Physical Exam
    • Assessment (synthesis of the information gathered)
    • Plan
Documentation and Billing

• Complete documentation reflects the performance of the physician with the patient and follows a regimented set of guidelines
  • 1995 Evaluation and Management guidelines
    • Chief Complaint (CC)
    • History of Present Illness (HPI)
    • Past Family, Medical, Social History
    • Review of Systems (ROS)
    • Physical Exam
    • Assessment
    • Plan

Evaluation and Management Guidelines

• Documentation may either be in HPI or specific sections: Duplication!

The guidelines recognize three areas of Past, Family and/or Social History:

Past History
A review of current medications, prior illnesses and injuries, operations and hospitalizations, allergies and age-appropriate immunization status.

Family History
A review of significant medical information about the patient’s family, including information about the health status or cause of death of parents, siblings and children; specific diseases related to problems identified in the CC, HPI or ROS.

Social History
An age-appropriate review of significant activities that may include information such as marital status, living arrangements, occupational history, use of drugs, alcohol or tobacco, extent of education and sexual history.

Electronic Progress Notes

• Benefits:
  • Legible
  • Better quality notes

• Shortfalls
  • Note Bloat
    • Improper use of “Cut and Paste” with duplication without updating
    • Single Click templates “All normal”
Documentation approaches vary…

FREE TEXT GOES HERE

SINGLE CLICK OPTIONS
Data Integrity

• Data integrity refers to the overall completeness, accuracy and consistency of data.
Data input: If you’ve seen one physician…

- you’ve seen one physician…

  - Coronary Artery Disease
  - CAD
  - Heart Failure
  - Heart Disease
  - HF
  - CHF
  - Congestive Heart Failure
  - Low Ejection Fraction
  - ASCVD
  - Myocardial infarction
  - MI
  - MI s/p stent
  - MI s/p PTCA
  - MI s/p balloon angioplasty
  - CABG
  - Coronary Artery Bypass Graft
  - CHF with EF<55%
  - CHFpEF
  - Ischemic Cardiomyopathy
Most organizations are not like Kaiser Permanente…

- Data sources come from disparate sources
  - Payers
  - Hospitals
  - Other health care systems
  - Ancillary Services
    - Home Health
    - Nursing Homes
    - Skilled Nursing Facilities
    - Lab Vendors
Data Integrity

- Inaccurate Reporting
  - Sensitivity of reporting ranging from 46-98% per measure

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| Table 2. Absolute Rates of Recommended Care, as Measured by Automated Report and Manual Review |
|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|
| Measure                                      | Electronic Report (0.30 to 0.46) | Manual Review (0.70 to 0.84) | Difference (95% CI) |
| Appropriate asthma medication                | 0.38 (0.30 to 0.46) | 0.77 (0.70 to 0.84) | −0.39 (−0.50 to −0.29) |
| Cancer screening                             |                                |                                |                          |
| Breast cancer                                | 0.26 (0.19 to 0.34) | 0.33 (0.25 to 0.41) | −0.07 (−0.17 to 0.04) |
| Cervical cancer                              | 0.23 (0.16 to 0.30) | 0.20 (0.14 to 0.27) | 0.03 (−0.07 to 0.12) |
| Colorectal cancer                            | 0.20 (0.14 to 0.27) | 0.21 (0.14 to 0.28) | −0.01 (−0.10 to 0.08) |
| Diabetes                                     |                                |                                |                          |
| Hemoglobin A1c test done                     | 0.77 (0.69 to 0.83) | 0.75 (0.68 to 0.82) | 0.01 (−0.08 to 0.11) |
| Hemoglobin A1c level <7%                     | 0.43 (0.35 to 0.51) | 0.43 (0.35 to 0.52) | −0.01 (−0.12 to 0.11) |
| Hemoglobin A1c level >9% or no test          | 0.35 (0.27 to 0.43) | 0.35 (0.28 to 0.44) | −0.01 (−0.11 to 0.10) |
| LDL cholesterol level <2.59 mmol/L (<100 mg/dL) | 0.57 (0.49 to 0.65) | 0.37 (0.30 to 0.46) | 0.20 (0.09 to 0.31) |
| Influenza vaccine, age ≥50 y                 | 0.35 (0.28 to 0.44) | 0.30 (0.23 to 0.38) | 0.05 (−0.05 to 0.16) |
| IVD                                          |                                |                                |                          |
| Appropriate antithrombotic medication        | 0.75 (0.68 to 0.82) | 0.65 (0.57 to 0.73) | 0.10 (0.00 to 0.20) |
| LDL cholesterol level <2.59 mmol/L (<100 mg/dL) | 0.53 (0.44 to 0.61) | 0.43 (0.35 to 0.52) | 0.09 (−0.02 to 0.21) |
| Pneumococcal vaccination                     | 0.27 (0.20 to 0.34) | 0.48 (0.40 to 0.56) | −0.21 (−0.32 to −0.11) |

IVD = ischemic vascular disease; LDL = low-density lipoprotein.

1Ann Internal Med. 2013, 158: 77-83.
EHR Data more complete than claims

• Analysis of diabetics using claims data vs data extracted from the EHR
• Claims data only identified 75% of existing diabetics
• EHR data identified 97% of existing diabetics
83yo with PMHx CAD, atrial fibrillation, MR s/p MVR, DM, HTN, CHF with EF=45%, urinary incontinence presents for followup.
83yo with PMHx CAD, atrial fibrillation, MR s/p MVR, DM, HTN, CHF with EF=45%, urinary incontinence presents for followup.

**SUMMARY:**

- 34 problems
- Limit of 10 submissions for Medicare Claims (used to be 4)
- Diagnoses need to be submitted annually for patients (impacts risk scores)
Documented Plan

- **Plan:** #1 Diabetes
  - Check hgbA1c
  - Consult Podiatry and Ophthalmology
  - Check BMP as had elevated Creatinine at last visit
  - Start Glipizide
  - Start Statin

- #2 HTN- controlled
  - Continue current regimen

- #3 Prostatic obstruction
  - Followup with Urology

- #4 CHF- compensated
  - Continue current regimen

- #5 Health maintenance
  - Flu and Pneumovax today

- #6 Atrial fibrillation
  - Continue to monitor
Charge Capture

### Visit Charge Selector
 eroted by Code)

**View:** Internal Medicine

No entries in list

### Modifier Group:

- [ ] SAME PHYSICIAN/SEPARATE PROCEDURE
- [ ] THIS SERVICE HAS BEEN PERFORMED IN ...
- [ ] INTERNAL AUDITING

### ICD-10 Diagnosis

<table>
<thead>
<tr>
<th>#</th>
<th>ICD-10</th>
<th>Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I50.9</td>
<td>Congestive heart failure</td>
</tr>
<tr>
<td>2</td>
<td>I48.91</td>
<td>Atrial fibrillation</td>
</tr>
<tr>
<td>3</td>
<td>E11.9</td>
<td>Type 2 diabetes mellitus without complication</td>
</tr>
<tr>
<td>4</td>
<td>E11.65</td>
<td>Type 2 diabetes mellitus, uncontrolled</td>
</tr>
<tr>
<td>5</td>
<td>Z23</td>
<td>Need for pneumococcal vaccination</td>
</tr>
</tbody>
</table>

### CPI Code | Modifier | Visit Charge |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>99214</td>
<td>25,GC</td>
<td>OFC/OUTPT E&amp;M ESTAB MOD-HI 25 MIN</td>
</tr>
</tbody>
</table>

Linked Dx: 1,2,3,4,5
Additional means of data capture
Improving the Health of a Population: Data and Patient Quality Reporting System (PQRS)

• Case Study:
  • PQRS Measure #7: Beta blocker therapy for Prior Myocardial Infarction or Left Ventricular Systolic Dysfunction (LVEF <40%)

• How would you find this information?
  • PQRS relies on billing codes (ICD-10- formerly ICD-9)

• Additional background:
  • Left Ventricular Systolic Dysfunction does not have a billing code
    • Requires additional billing code: G8694
  • Patient Quality Reporting System results reported nationally in 2014 for consumers to allow comparison with other organizations
  • Value Based Modifier program – Payment to the organization will be based on performance on quality measures

• What concerns would you have for your organization?
  • Potential risk for 1) poor outcomes falsely attributed solely based on extraction technique; 2) lower reimbursements
Data and Predictive Analytics
What’s happening?

Cleveland Clinic, IBM launch new Watson project to find new treatment options for cancer patients

How to improve?

• Understand the data sources and methods of data entry to understand the limitations of the data requested

• Less focus on programs that do not necessarily improve quality
Additional Sources of Data and Future Applications

• Health Share Exchanges
• Precision Medicine
• Advancements in Artificial Intelligence