Leveraging Electronic Health Record (EHR) Data to Transform healthcare

Data-Driven Changes in Healthcare Lead to Improved Care and Lower Costs

Nicole Hobbs, PhD
Medical Informatics Director
May 3, 2017
Integrated System

22
Hospitals

2,800
Licensed Beds

180
Medical Group Clinics

852,000
SelectHealth Members
We Are All Caregivers

Physicians
- 1,560 Employed
- 3,500 Affiliated

Advanced Practice Clinicians
- 680

Nurses
- 9,300
- 1/3 of Utah’s nurses

Other Caregivers
- 27,000+

Volunteers
- 1,600

39,000+ caregivers

Utah’s largest private employer
Strong Foundation

Mission
Helping people live the healthiest lives possible®

Vision
Be a model health system by providing extraordinary care and superior service at an affordable cost.
Intermountain Healthcare: We are Data Driven

Intermountain has been using computers since the 1970s to amass one of the world’s largest and most detailed repositories of clinical and financial healthcare data.
Total Medical Spending (among commercially insured – 350 cities)

**$2,000**  |  **$4,000**  |  **$6,000**  |  **$8,000**
---|---|---|---
OGDEN  #1 Lowest | | | |
Dubuque, IA | $2,623 | | |
Fayetteville, MO | | $2,719 | |
Fort Smith, OK | | | $2,762 |
Laredo, TX | | | $2,916 |
Amarillo, TX | | | $2,919 |
UTAH is the only state with three communities in the top 10 for lowest spending

SALT LAKE #7 Lowest | | | |
Fargo, ND | | $2,950 | |
Sioux City, IA | | | $2,979 |

PROVO #10 Lowest | | | |
\[\text{...}\] | | | |
National Average | | $4,953 | |
\[\text{...}\] | | | |
Anderson, IN | | | $7,231 |
“Everybody is trying to systemically improve value and quality, but at Intermountain they have worked out the operational system and culture to do it.”

John Mendelsohn, MD
President,
MD Anderson Cancer Center
Foundation Leaders Over the Years

Dr. Homer Warner
• One of the fathers of medical informatics
• 1950s – computer assisted CV decision support
• 1970s – developed one of the world’s first computer-based electronic medical record systems

Dr. Brent James
• CQI - Standardization of clinical care through data analysis
• Developed Internationally recognized Advanced Training Program (ATP) in Clinical Practice Improvement for Healthcare Executives
Intermountain’s Enterprise Data Warehouse (EDW)

Data Sources
- Internal
  - Finance
  - Lab
  - Claims
  - Pharmacy
  - EMR
  - OTHERS
- External
  - State/Federal

Data Access
- BI Tools

Enterprise Data Warehouse
- SOURCE Data Marts
  - EMR
  - Patient Acct
  - Claims
  - Supply Chain
  - Patient Sat.
- SUBJECT Data Marts
  - Cardiovascular
  - Primary Care
  - Women & Newborn
  - AHR
  - Surgical Serv

Master Reference Data
Data Profile of the EDW

• **Data Systems**
  - Historically: we built a lot of our own systems
    • Inpatient EMR system since the 1970’s
  - Current: Implementing Cerner (through 2017), Implemented PeopleSoft (Apr 2014)

• **30 TB Oracle Data Warehouse**
  - All major and most minor data sources loaded nightly
    • Clinical, Financial, Claims, Patient Satisfaction, etc.
  - ~150,000,000 queries per month
  - 150,000,000,000 rows of data
    • Mostly “Coded” data
  - 15-20 years of data for most systems

• **120 TB Big Data Environment**
  - Data Lake
    • Hadoop Production Environment
    • Genomic files from sequencer
    • Device data from ICU devices

• **Analytic Tools**
  - Visualization – Tableau, Cognos
  - Statistical – R, SAS, SPSS
  - Machine Learning – Ayasdi, other pilots
Clinical Program Philosophy

Goal is to deliver the best care to every patient every time
Promote clinical research
Enhance the business-clinical partnership to optimize efficiency
Develop and improve processes using information systems and data
# Data and Analytics Integration in Clinical Programs – Team Approach

## Clinical Program Team

<table>
<thead>
<tr>
<th>Role</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business/Clinical Leader</td>
<td>• Determines vision priorities</td>
</tr>
</tbody>
</table>
| Outcomes Analyst/Statistician | • Develops the analytical processes  
                                 | • Performs advanced statistical analysis                                         |
| Data Manager                  | • Serves as liaison between EDW and Clinical Program  
                                 | • Leads requirements analysis effort  
                                 | • Improves data quality  
                                 | • Facilitates data capture of the operational systems                           |

## Data and Analytics Team

<table>
<thead>
<tr>
<th>Role</th>
<th>Responsibilities</th>
</tr>
</thead>
</table>
| Data Architect        | • Designs, develops, and maintains data infrastructure  
                                 | • Provides software project management                                          |
| BI Developer          | • Assists with ETL  
                                 | • Develops reports and reporting applications                                    |
Case Study: Leveraging Data in Elective Deliveries
Elective Deliveries <39 Weeks
Timing of Elective Inductions

Percent on Ventilator

<table>
<thead>
<tr>
<th>Week</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>37th</td>
<td>1.12%</td>
</tr>
<tr>
<td>38th</td>
<td>0.45%</td>
</tr>
<tr>
<td>39th</td>
<td>0.21%</td>
</tr>
</tbody>
</table>
Elective Deliveries <39 Weeks
Elective Deliveries <39 Weeks

$50M Annual Savings

Higher quality and reduced costs

$5.3B Projected Annual Savings
Case Study: Leveraging Data in our Sepsis Study
Sepsis Mortality at Intermountain Healthcare

• Sepsis is the most common cause of death in U.S. hospitals
• National mortality rates for ED sepsis cases: 20-50 %
• Intermountain’s sepsis mortality rate was already one of the best in the nation: 20.2 %
• Intermountain developed and deployed an evidence-based protocol for the aggressive detection and treatment of sepsis
• That rate was still unacceptably high to many of us.
Sepsis Mortality at Intermountain Healthcare

- Rigorous implementation of an 11 element bundle, later reduced to a practice that addressed only 7 elements
- Worked to achieve 80% compliance across our EDs
- Result: Intermountain's mortality rate for patients with severe sepsis or septic shock who were admitted through the ED decreased to 8.3%
Sepsis Mortality at Intermountain Healthcare
Sepsis Mortality at Intermountain Healthcare: Saving Lives and Reducing Costs

• As a result, with the 80% compliance, Intermountain achieved the following care and cost improvements from a study cohort of 4,329 patients from 2004 to 2010:
  o Survival rate increased from 20.2% mortality to less than 9%
  o Average LOS was reduced by 20 hours
  o Average cost per patient declined by nearly $3,000
Case Study: Leveraging Data in a Multidisciplinary Colon Surgery (MDCS)
## Colon Surgery: Evidence Based Interventions and Associated Measures

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Education</td>
<td>Enrollment</td>
</tr>
<tr>
<td>Early Mobilization After Surgery</td>
<td>Activity – PT / Nursing walking, transfers, etc.</td>
</tr>
<tr>
<td>Appropriate IV Fluid Admin</td>
<td>Fluid Administration</td>
</tr>
<tr>
<td>Narcotic Sparing Analgesia</td>
<td>Med Administration, Morphine Equivalence</td>
</tr>
<tr>
<td>Early enteral nutrition</td>
<td>Diet Administration</td>
</tr>
<tr>
<td></td>
<td>Bowel/Emesis/Flatus</td>
</tr>
<tr>
<td></td>
<td>Financial Measures</td>
</tr>
</tbody>
</table>
MDCS – EMR Considerations

HELP (EMR) Application

Enterprise Data Warehouse
Colon Surgery Care Process Report

<table>
<thead>
<tr>
<th>Group</th>
<th># Patients</th>
<th>Bowel Movement Recorded</th>
<th>Flatus Recorded</th>
<th>Emesis (after 24 Hrs) Recorded</th>
<th>Average Days to 1st Tolerated Meal</th>
<th>GI2</th>
<th>GI3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td># Patients</td>
<td>% BM</td>
<td>Avg Days to 1st</td>
<td># Patients</td>
<td>% Flatus</td>
<td>Avg Days to 1st</td>
</tr>
<tr>
<td>Enrolled</td>
<td>596</td>
<td>366</td>
<td>61.4%</td>
<td>2.35</td>
<td>365</td>
<td>61.2%</td>
<td>2.32</td>
</tr>
<tr>
<td>Not Enrolled</td>
<td>817</td>
<td>580</td>
<td>71.0%</td>
<td>3.74</td>
<td>552</td>
<td>67.6%</td>
<td>3.57</td>
</tr>
<tr>
<td>Combined</td>
<td>1,413</td>
<td>946</td>
<td>66.9%</td>
<td>3.20</td>
<td>917</td>
<td>64.9%</td>
<td>3.07</td>
</tr>
<tr>
<td>Unknown</td>
<td>89</td>
<td>44</td>
<td>49.4%</td>
<td>2.47</td>
<td>45</td>
<td>50.6%</td>
<td>3.22</td>
</tr>
<tr>
<td>Baseline</td>
<td>1,676</td>
<td>1,174</td>
<td>70.0%</td>
<td>3.70</td>
<td>1,151</td>
<td>68.7%</td>
<td>3.80</td>
</tr>
</tbody>
</table>
Results

• $1.2 million annual savings, LOS decreased from 8.44 to 6.75, while maintaining or improving clinical quality

• 2010 Computerworld Business Intelligence Award – Driving Process Change with BI
Intermountain Healthcare is a not-for-profit health system based in Salt Lake City. Recognized for its excellent clinical care and low costs, Intermountain strives to help people live the healthiest lives possible. For more information, visit www.intermountainhealthcare.org.

Intermountain Healthcare is a Utah-based, not-for-profit system of 22 hospitals, 200 clinics, a Medical Group with some 1,300 employed physicians, a health plans division called SelectHealth, and other health services. Helping people live the healthiest lives possible, Intermountain is widely recognized as a leader in clinical quality improvement and in efficient healthcare delivery. For more information about Intermountain, visit intermountainhealthcare.org, read our blogs at intermountainhealthcare.org/blogs, connect with us on Twitter at twitter.com/intermountain and on Facebook at facebook.com/intermountain.