How Intermountain Healthcare Achieves the “Best Clinical Practice”

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Intermountain Healthcare Facts

- Not-for-profit
- Integrated Healthcare Delivery System
  - 23 Hospitals
  - 160+ Clinics
  - 750 Doctors and Physicians
- Select Health (health plan)
  - one million members and affiliates
- 30,000 Employees
- Utah and Southern Idaho
~1860 - 1910:

- New high standards for clinical education
  - Flexner Report: more than half of all U.S. "medical schools" shut down

- Strict requirements for professional licensing

- Clinical practice founded on scientific research
  - shift to germ theory, rather than "an imbalance of the 4 bodily humors," as the basis for understanding disease and its treatment
  - healthcare's first entry into "evidence-based medicine"
1912 : The 'Great Divide'

"... for the first time in human history, a random patient with a random disease consulting a doctor chosen at random stands a better than 50/50 chance of benefitting from the encounter."

» Harvard Professor L. Henderson
Current health care

is the best the world has ever seen

A few examples:

- From 1900 to 2000, average life expectancy at birth increased from only 49 years to almost 77 years.
- Since 1960, age-adjusted mortality from heart disease has decreased by 56%; and (from 307.4 to 134.6 deaths / 100,000)
- Since 1950, age-adjusted mortality from stroke has decreased by 70%. (from 88.8 to 26.5 deaths / 100,000)
Intermountain Healthcare’s Vision

- We will support our core aspiration to deliver "extraordinary care in all its dimensions" with our vision, which is to provide:
  - The **best clinical practice** delivered in a consistent and integrated way.
  - **Lowest appropriate** cost to the population we serve.
  - A service experience, supported by systems and processes, that focuses on patients, enrollees, families, and one another.
  - A genuine caring and concern in our interactions with patients, families, and one another.
Throughout the organization—frontline staff to top leadership—the following is needed to help achieve Intermountain’s Vision:

- The tools, technologies and processes to turn data into information, information into knowledge, to optimize decision making
  - This includes the core transactional IT systems—i.e. EMR’s, Financial Systems, Clinical Systems (Lab, Pharmacy, etc.)
  - The EDW (Enterprise Data Warehouse) as a means of achieving data integration, the foundation or infrastructure for data analysis
Quality Improvement

- W. Edwards Deming
  - Organize everything around value-added (front line) work processes
    (Quality improvement is the science of process management)

- Dr. Brent James
  - Pareto Analysis of clinical work processes
  - Clinical Programs Formed
    (clinical organizations to bring together clinicians who share common clinical work processes)
Pareto Analysis

All Clinical Programs -- based on: Total Cost

Coefficient of Variation (COV) = Std Dev / Mean

“Opportunity” = sum of (individual) case total costs - (group avg cost + 1 std dev)

Click on any column header to sort by that column. Default sort uses the “Opportunity” column.

Variability and outlier definitions based on: Total Cost

Severity of Illness (SOI): 1

Exclude outliers: ALL

For a brief discussion regarding the identification and treatment of “outliers” in this tool and the “ProCase” tool, click here.
Intermountain’s Clinical Programs

- Behavioral Health
- Cardiovascular
- Intensive Medicine
- Oncology
- Pediatric Specialty
- Primary Care
- Surgical Services
- Women & Newborns

Medical Specialties:
- General surgeons
- Urologists
- Ophthalmologists
- Otolaryngologists
- Plastic surgeons

Sample Clinical Work Processes:
- Appendectomy, bowel surgery, TURP
- Intraocular lens replacement
- Tubes and tymp, sinus procedures
- Skin grafting, cosmetic
<table>
<thead>
<tr>
<th>Clinical Program/EDW Partnership</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Business/Clinical Leader(s)</strong></td>
</tr>
<tr>
<td>- Determines vision priorities</td>
</tr>
<tr>
<td><strong>Outcomes Analyst/Statistician</strong></td>
</tr>
<tr>
<td>- Develops the analytical processes</td>
</tr>
<tr>
<td>- Performs advanced statistical analysis</td>
</tr>
<tr>
<td><strong>Data Manager</strong></td>
</tr>
<tr>
<td>- Serves as liaison between EDW and Clinical Program</td>
</tr>
<tr>
<td>- Leads requirements analysis effort</td>
</tr>
<tr>
<td>- Improves data quality</td>
</tr>
<tr>
<td>- Facilitates data capture of the operational systems</td>
</tr>
<tr>
<td><strong>Data Architect</strong></td>
</tr>
<tr>
<td>- Designs, develops, and maintains data infrastructure</td>
</tr>
<tr>
<td>- Provides software project management</td>
</tr>
<tr>
<td><strong>BI Developer</strong></td>
</tr>
<tr>
<td>- Assists with ETL</td>
</tr>
<tr>
<td>- Develops reports and reporting applications</td>
</tr>
</tbody>
</table>
Outcomes Improvement Approach

The best clinical practice delivered in a consistent and integrated way

- Define Best Practice (Care Process Models)
- Measure Performance and Compliance
- Disseminate Results
- Determine Outcomes
- Pareto Analysis
An Example of a Recent Success

- Multi-Disciplinary Colon Surgery
- Care process model was developed by the General Surgery and Pain Management development teams of Intermountain Healthcare’s Surgical Services Clinical Program
- Focuses on involving the patient and a team of medical professionals in coordinated, evidence-based colon surgery care
Evidence Based Interventions to prevent POI (postoperative ileus)

- Patient education and involvement
- A multidisciplinary team approach
- Optimized anesthesia
- Narcotic sparing analgesia
- Earlier mobilization after surgery
- Early enteral nutrition
- Appropriate IV fluid administration
- Surgical care improvement project measures
Evidence Based Measurements

- Enrollment
- Modalities
- LOS
- Pain Monitoring
- Activity/Ambulation
- Complications
- Financials

- Diet
- Fluids
- Morphine equivalence
- Bowel / Emesis / Flatus
STOOL COLOR/CHARACTER AND TESTS

1. Bile
2. Black
3. Blue
4. Bright red
5. Brown
6. Clay
7. Clear
8. Green
9. Orange
10. Pink
11. White
12. Yellow
13. Specimen sent (oFT):
14. Bloody
15. Clots
16. Formed
17. Hard
18. Liquid
19. Loose
20. Melena
21. Mucous
22. Seedy
23. Soft
24. Tarry
25. Color/char (FT):
26. Guaiac =+
27. Guaiac QA Done =
Data Capture and Data Integration

- Tactical App (Enrollment)
- HELP (EMR)
- Financial Data
- EDW

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Multi-Disciplinary Colon Surgery Care Process Report

System totals include ALL sites with Colon Resection Patients.
Numbers reflect ALL identified Colon Resection Patients.

From: Apr 1, 2008  To: Dec 31, 2020

Select all  Deselect all

- American Fork (USR)
- Utah Valley (USR)
- Alta View (UCR)
- Cottonwood (UCR)
- LDS (UCR)
- Riverton (UCR)
- Intermountain Medical Center (UCR)
- Bear River Valley (UNR)

- Definitions
- Dashboard
- Demographics
- Pain
- GI
- Fluid (NA)
- Follow-up (NA)
- Financial
- Activity
- Length of Stay
- Complications

Facility  1st Enrolled Case
Logan Regional  May 5, 2008
McKay Dee  Jun 25, 2008
American Fork  Jul 28, 2008
Dixie Regional  Aug 13, 2008
Utah Valley  Oct 8, 2008
Intermountain Medical Center  Feb 2, 2009
LDN  Mar 5, 2009
Alta View  Apr 13, 2009
Valley View  Jun 2, 2009
Riverton  Mar 12, 2010

GI

<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>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>
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<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>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>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>
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</table>
**Financial**

### System Percentage by Payer Classification

<table>
<thead>
<tr>
<th>Group</th>
<th># Patients</th>
<th>% DRG</th>
<th>% FFS</th>
<th>% Fixed</th>
<th>% Charity</th>
<th>% Bad Debt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrolled</td>
<td>576</td>
<td>59.0%</td>
<td>29.0%</td>
<td>7.1%</td>
<td>4.3%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Not Enrolled</td>
<td>778</td>
<td>65.8%</td>
<td>23.8%</td>
<td>5.8%</td>
<td>4.0%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Combined</td>
<td>1,354</td>
<td>62.9%</td>
<td>26.0%</td>
<td>6.4%</td>
<td>4.1%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Unknown</td>
<td>66</td>
<td>63.5%</td>
<td>33.3%</td>
<td>0.0%</td>
<td>3.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Baseline</td>
<td>1,675</td>
<td>62.4%</td>
<td>29.0%</td>
<td>4.7%</td>
<td>3.0%</td>
<td>0.6%</td>
</tr>
</tbody>
</table>

### System Totals

### System Totals / Case

<table>
<thead>
<tr>
<th>Group</th>
<th># Patients</th>
<th>Median Cost</th>
<th>Average Cost</th>
<th>Average Variable Cost</th>
<th>Average Payments</th>
<th>Net Operating Income</th>
<th>Contribution to Margin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrolled</td>
<td>576</td>
<td>$10,088</td>
<td>$11,808</td>
<td>$6,133</td>
<td>$15,317</td>
<td>$3,510</td>
<td>$9,184</td>
</tr>
<tr>
<td>Not Enrolled</td>
<td>778</td>
<td>$14,214</td>
<td>$20,585</td>
<td>$10,503</td>
<td>$22,581</td>
<td>$1,806</td>
<td>$11,888</td>
</tr>
<tr>
<td>Combined</td>
<td>1,354</td>
<td>$11,752</td>
<td>$16,851</td>
<td>$8,644</td>
<td>$19,491</td>
<td>$2,531</td>
<td>$10,738</td>
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<tr>
<td>Unknown</td>
<td>66</td>
<td>$15,216</td>
<td>$18,522</td>
<td>$8,016</td>
<td>$16,296</td>
<td>($2,397)</td>
<td>$8,109</td>
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<tr>
<td>Baseline</td>
<td>1,675</td>
<td>$12,266</td>
<td>$18,715</td>
<td>$10,775</td>
<td>$20,757</td>
<td>$1,997</td>
<td>$9,937</td>
</tr>
</tbody>
</table>

Dollars are adjusted to 2007 CPI.
Accounts with a substantial balance due are not included, unless Patient Account Services has coded the account as closed.
Hospital Net Operating Income = Total Payments to Hospital – Hospital Total Costs.
Hospital Contribution to Margin = Total Payments to Hospital – Hospital Variable Costs.
## Enrolled Patient Ambulation Summary

<table>
<thead>
<tr>
<th>Account #</th>
<th>Surgery Date</th>
<th>Discharge Date</th>
<th>POD</th>
<th>Activity with Duration</th>
<th>Activity without Duration</th>
<th>Duration Minutes</th>
<th>Hygiene</th>
<th>Activity with Free-Text</th>
<th>Goal Met</th>
</tr>
</thead>
<tbody>
<tr>
<td>123456789</td>
<td>Jun 3, 2010</td>
<td>Jun 6, 2010</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>105</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>315</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>7</td>
<td>2</td>
<td>265</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>123456789</td>
<td>May 27, 2010</td>
<td>Jun 9, 2010</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>125</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>5</td>
<td>6</td>
<td>265</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>123456789</td>
<td>Jun 8, 2010</td>
<td>Jun 12, 2010</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>195</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>8</td>
<td>1</td>
<td>1,080</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>123456789</td>
<td>Jun 17, 2010</td>
<td>Jun 23, 2010</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>6</td>
<td>3</td>
<td>175</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Patient discharged prior to POD.*

*Patient has no documented Ambulation on DOS/POD.*
Multidisciplinary Colon Surgery

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

**Finalist**

*2010 Computerworld Business Intelligence Award – Driving Process Change with BI*
Diabetes Case Study

- Primary Care
  - Diabetes
  - Integrates five disparate data sources
  - Winner

  • *National Exemplary Practice Award*

America’s Health Insurance Plans (fka: AAHP)
Diabetes Physician Report

Diabetes Summary Report
Provider: 
Period: Jul 2006 - Jun 2007

Patients Tested (Prop of Tot Pts %) - All Patients

<table>
<thead>
<tr>
<th>Test Type</th>
<th>Provider</th>
<th>Region</th>
<th>System</th>
</tr>
</thead>
<tbody>
<tr>
<td>HbA1c</td>
<td>227 (97%)</td>
<td>1,486 (87%)</td>
<td>29,674 (83%)</td>
</tr>
<tr>
<td>LDL/Trigl</td>
<td>209 (89%)</td>
<td>1,348 (79%)</td>
<td>25,030 (70%)</td>
</tr>
<tr>
<td>Eye Exam</td>
<td>23 (48%)</td>
<td>148 (45%)</td>
<td>4,316 (34%)</td>
</tr>
<tr>
<td>Microalbuminuria</td>
<td>199 (85%)</td>
<td>1,220 (71%)</td>
<td>18,883 (53%)</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>225 (96%)</td>
<td>1,506 (88%)</td>
<td>22,041 (85%)</td>
</tr>
</tbody>
</table>

Tot Patients: 235, 1,711, 35,701

**Notes:**
- Eye exam % calculated using SelectHealth patients only.
- Includes spot microalbumin, 24 hour urine for protein and microalbumin/creatinine ratio within the reporting period, or any history of treatment for nephropathy.
- Blood pressure data only available for physicians with access to Intermountain EMR.

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Case Study: Diabetes

Primary Care Diabetes
HbA1c > 9 - All Patients
System

Quick Options: View [HbA1c > 9] for All Patients (Averaged) in System

Graph showing trends in HbA1c levels from June 1999 to June 2007.
Case Study: Diabetes

Primary Care Diabetes
HbA1c<7 - All Patients
System

Quick Options: View | HbA1c < 7 for All Patients (Averaged) in System

Graph showing the trend of HbA1c levels from 1999 to 2007 for all patients in the system.
Business Intelligence at Intermountain Healthcare

Business Intelligence (BI) at Intermountain is an integrated set of technical and analytical processes and capabilities that enable optimized decision making and strategy execution.

The success of Intermountain’s BI Program is influenced by its collective capabilities across each of these dimensions:

1. Sound strategy and leadership
2. Applications and data supporting the execution of this strategy
   - EDW (Enterprise Data Warehouse)
   - Standard reporting and analytic tools (IBM Cognos, Statit EQC, etc.)
3. A Delivery Engine comprised of well integrated ‘gears’, that can create, support, and evolve the applications and information that supports STRATEGY EXECUTION
The Vision: Data Integration

**Integrated Reporting and Analysis**

A single source for complex data analysis and reporting

- **Claims & Eligibility**
- **EDW**
- **Financial Data**
- **Clinical Data**
Why Have an EDW?

There are three primary reasons why the Enterprise Data Warehouse exists at Intermountain Healthcare:

- **Performance**
  - To not negatively impact performance of transactional data and to improve performance of analytical reports (by organizing the data appropriately)

- **Integration**
  - Allows integrated reporting and analytics

- **Ease of Use**
Enterprise BI

- EDW = Enterprise Data Warehouse
  - The trusted source of integrated data for reporting and analytics
- Used throughout the enterprise
  - Clinical Quality Improvement
  - Operations (hospitals, clinical services, medical group, health plan)
  - Research
- An analytics culture, ever growing appetite for data
Key Customer Areas

- Clinical Programs
  - Cardiovascular
  - Women & Newborns
  - Primary Care
  - Pediatrics
  - Behavioral Health
  - Oncology
  - Intensive Medicine
  - Surgical Services

- SelectHealth
  - Actuary
  - Operations
  - Marketing

- Clinical Support Services
  - Hospital Regions
  - Supply Chain Organization
  - Revenue Cycle Organization
  - Intermountain Medical Group
  - Quality Management
  - Finance
  - Strategic Planning
  - Human Resources
  - Payroll
  - Medical Informatics
  - Lab Services
  - Others…
EDW Then And Now

1997

• 1.5 FTEs
• 1 million records
• Very academic prototype
• 10 users willing to take a risk
• 100 queries per day

2011

• 38 FTEs
• 80 billion records
• 10 TB
• Seen as a critical system
• Thousands of users
• 150,000 queries /day
EDW/BI Awards

2002

• National Exemplary Practice Award
• America’s Health Insurance Plans (AAHP)

2003

• Most Wired Innovator Award
• Hospital and Health Networks

2004

• Baseline Magazine ROI Award
• Baseline Magazine and Nucleus Research

2005, 2006, 2010

• Best Practices in Business Intelligence Award (Computerworld)
Recent Projects/Areas of Focus

- Qualibria - EMR co-development with GE Healthcare
- BI Competency Center (BICC)
  - Project Prioritization
  - BI Build vs. Buy Process
  - ACE – Analytic Center of Excellence – better coordination of “analysts”
  - Enterprise Data Governance
- Super Registry - Analytic Health Repository
- ARRA / Hitech, ACO’s
The best clinical practice delivered in a consistent and integrated way.
Summary

- Business/Clinical and IT partnership for successful BI
- Champion Analytics from the Top
  - Executive sponsorship/support, Analytics culture
- E in EDW is for Enterprise, not Electronic
  - Data is an enterprise asset and must be treated as such, efforts resourced appropriately
- Analytics is a journey, not a project or destination
  - EHR data is only one piece of the data puzzle – can leverage and gain much from financial/casemix data readily available
Comments and Questions