Leveraging Electronic Health Record (EHR) Data to Transform healthcare

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

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Intermountain Healthcare
Healing for life®

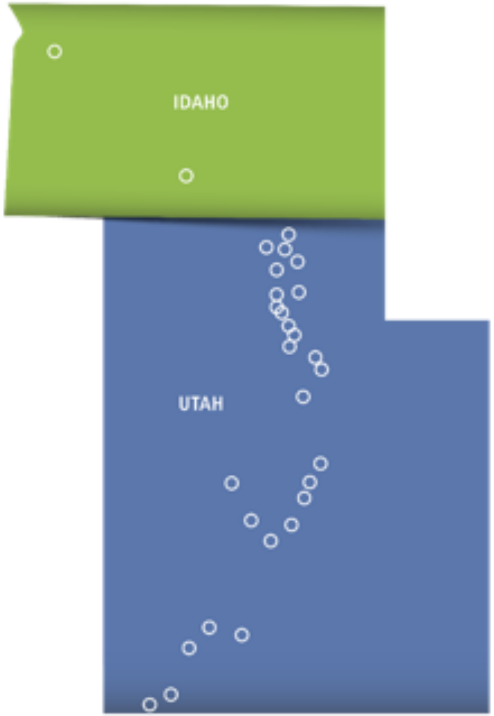
Integrated System

22
Hospitals

180
Medical Group Clinics

2,800
Licensed Beds

852,000
SelectHealth Members



We Are All Caregivers

39,000+ caregivers

Physicians

1,560
Employed

3,500
Affiliated

Advanced Practice Clinicians

680
Employed

1,100
Affiliated

Nurses

9,300

1/3 of Utah's nurses

Other Caregivers

27,000+

Volunteers

1,600

Utah's largest private employer

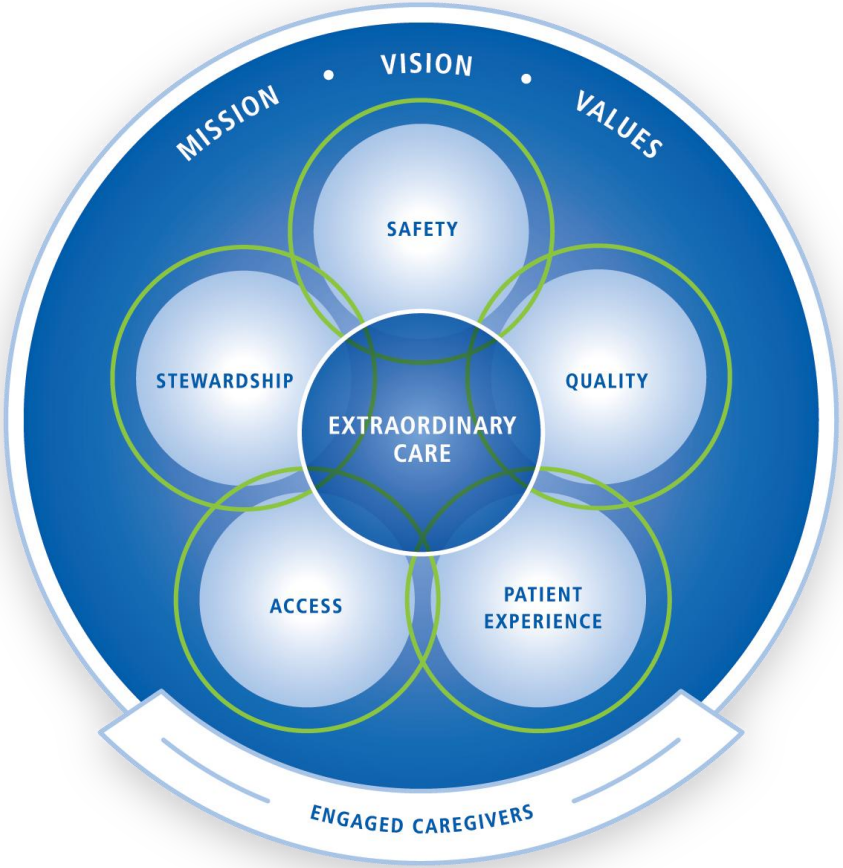
Strong Foundation

Mission

Helping people live the healthiest lives possible®

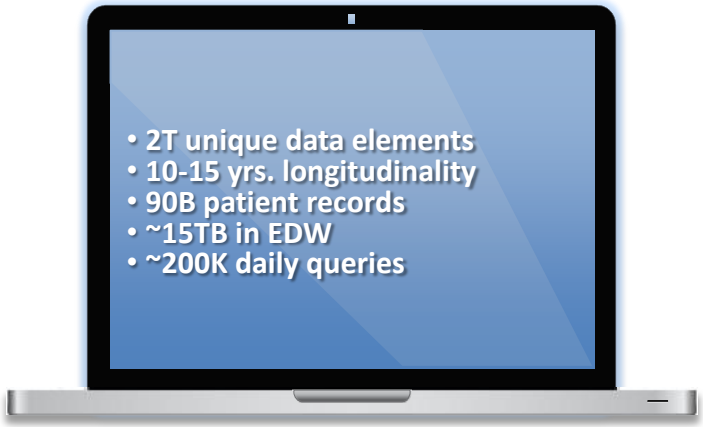
Vision

Be a model health system by providing **extraordinary care** and superior service at an affordable cost.



Intermountain Healthcare: We are Data Driven

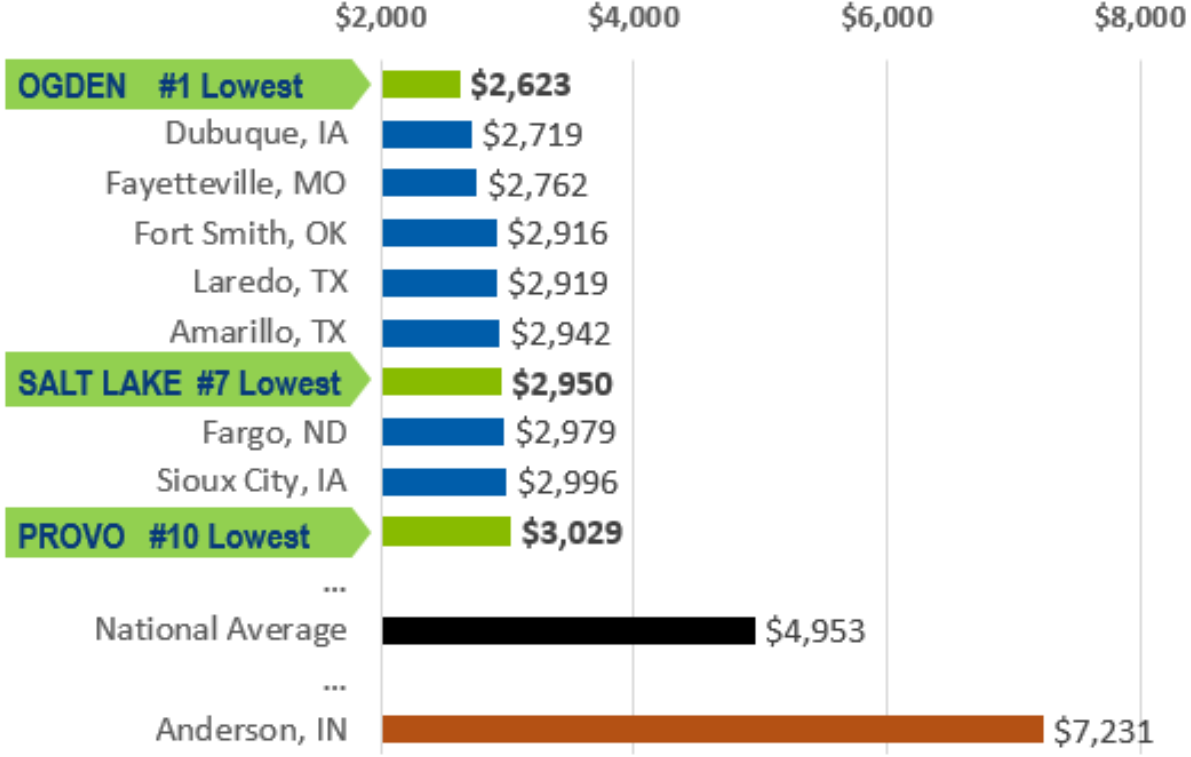
Intermountain has been using computers since the 1970s to amass one of the world's largest and most detailed repositories of clinical and financial healthcare data



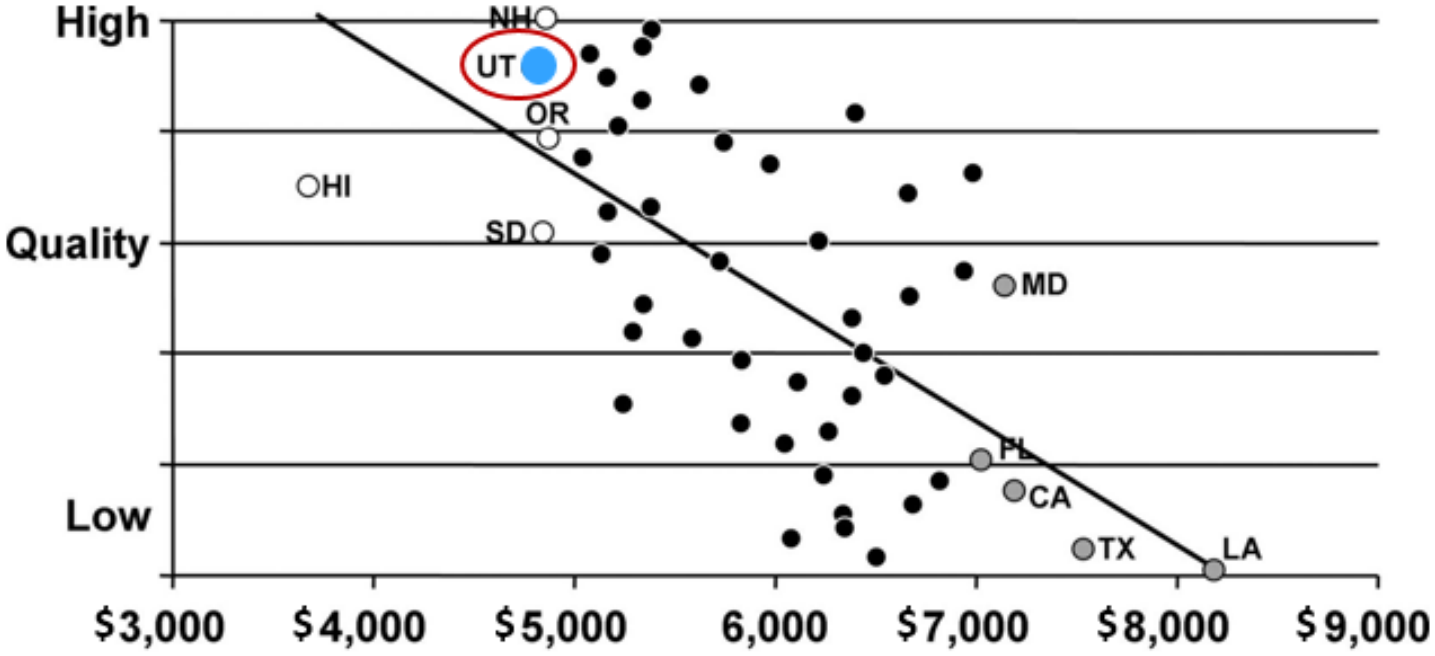
Total Medical Spending (among commercially insured – 350 cities)

UTAH

is the only state with three communities in the top 10 for lowest spending



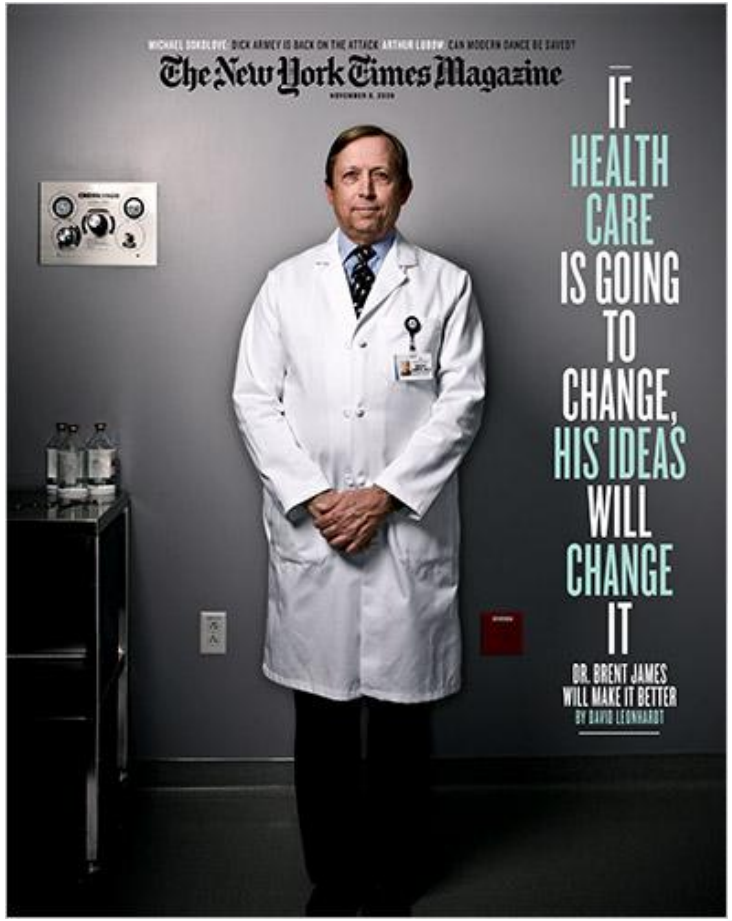
Annual Medicare Spending Per Beneficiary



Raymond J. Gibbons Circulation. 2007;115:2221-2230. Copyright © American Heart Association, Inc. All rights reserved.

“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

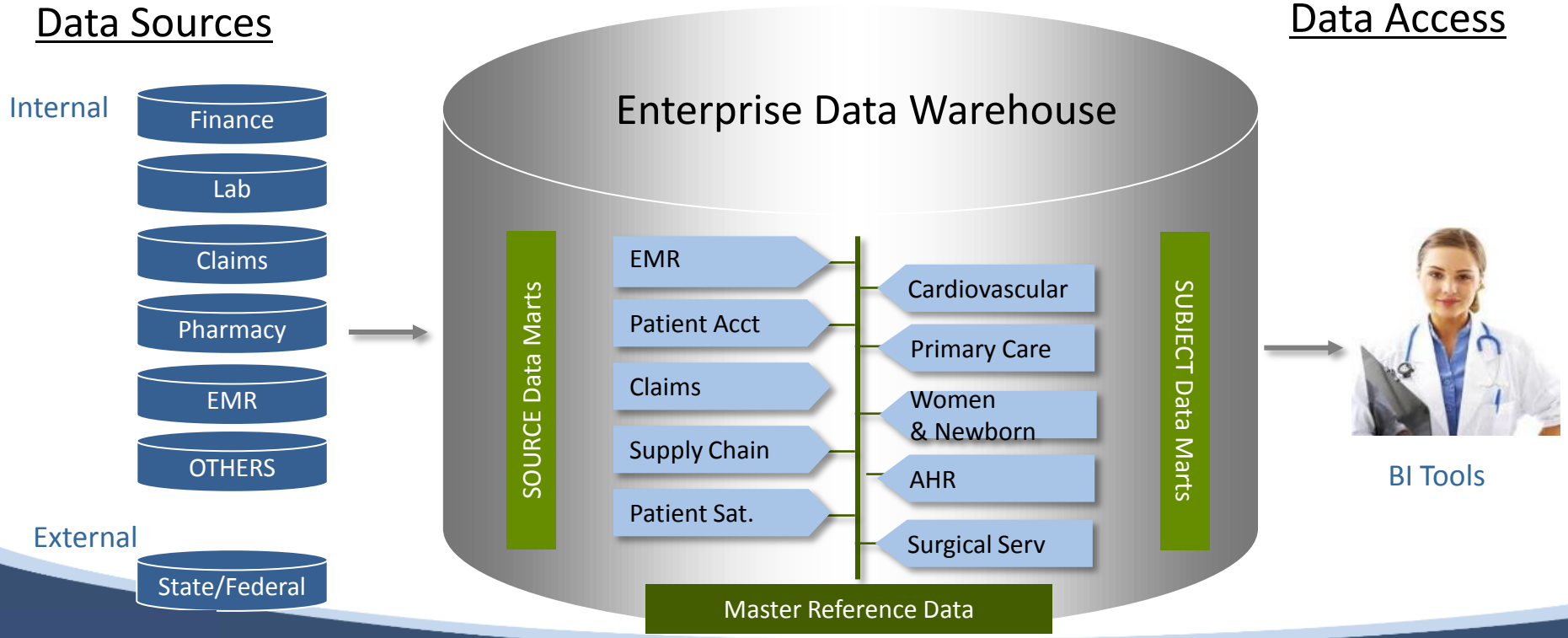
Dr. Homer Warner

- 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 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

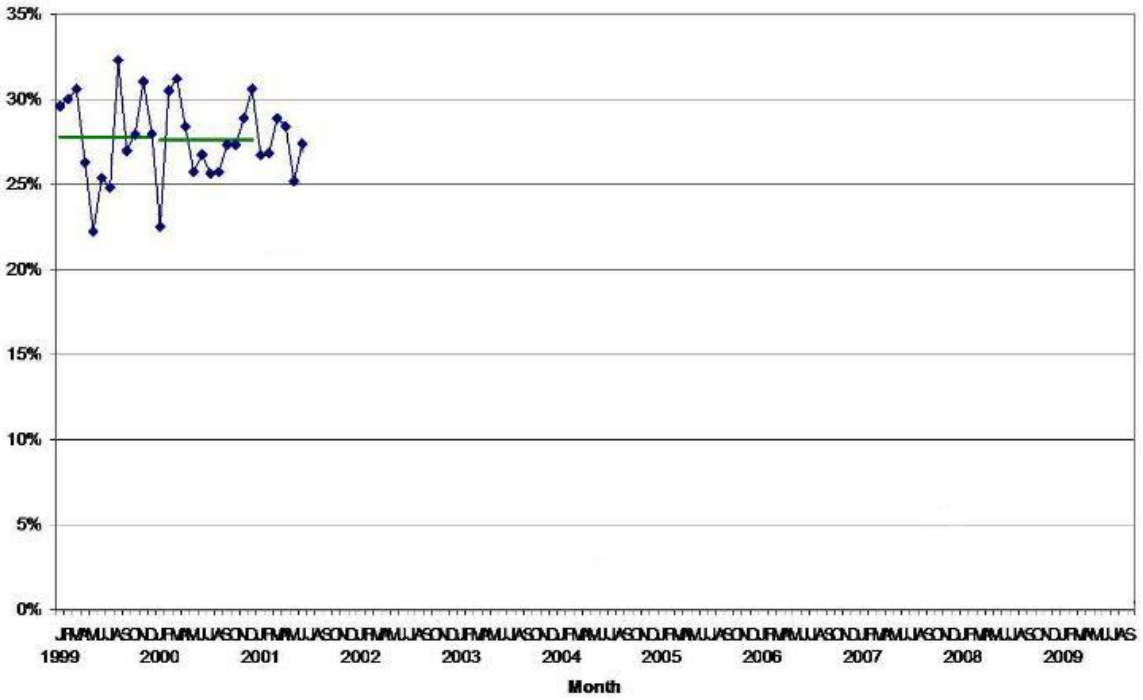
Business/Clinical Leader	• Determines vision priorities
Outcomes Analyst/Statistician	• Develops the analytical processes • Performs advanced statistical analysis
Data Manager	• Serves as liaison between EDW and Clinical Program • Leads requirements analysis effort • Improves data quality • Facilitates data capture of the operational systems

Data and Analytics Team

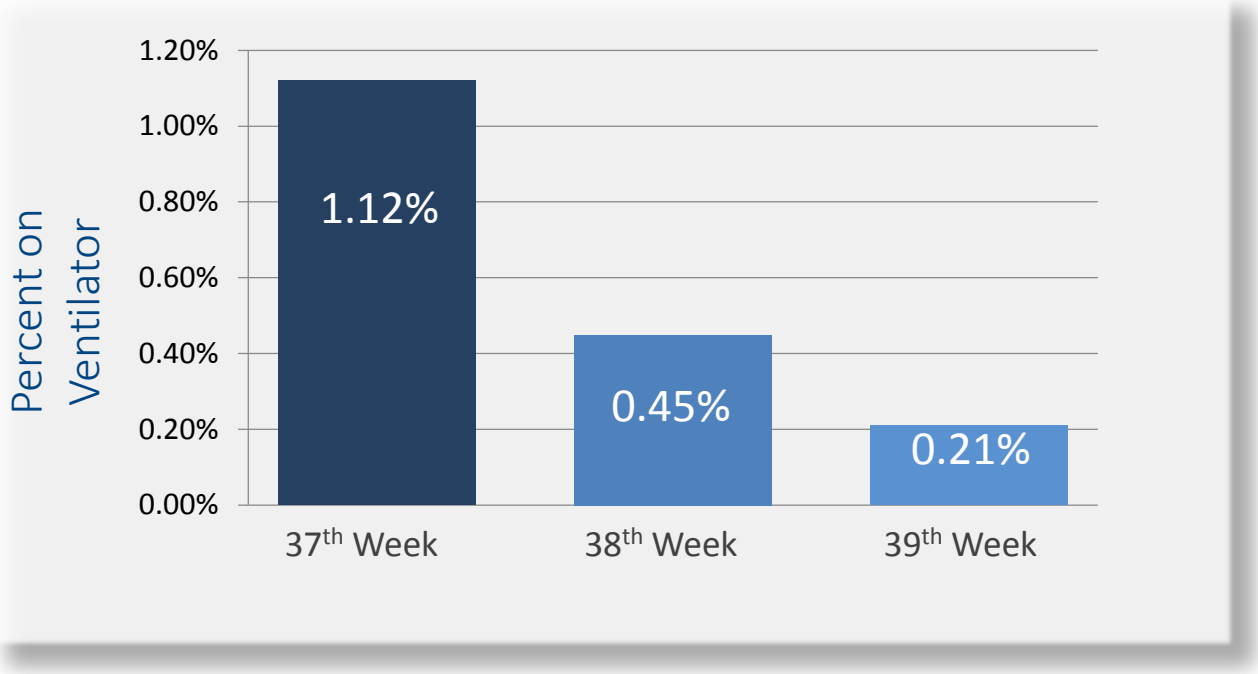
Data Architect	• Designs, develops, and maintains data infrastructure • Provides software project management
BI Developer	• Assists with ETL • Develops reports and reporting applications

Case Study: Leveraging Data in Elective Deliveries

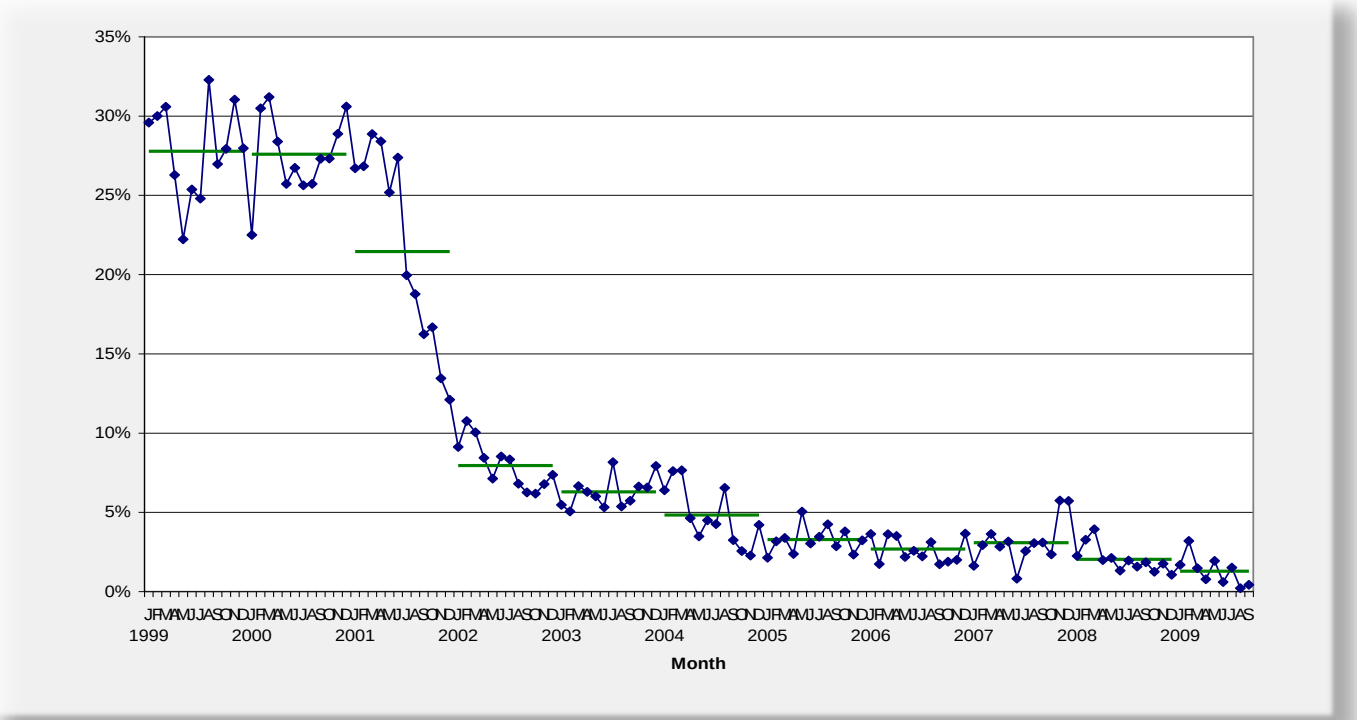
Elective Deliveries <39 Weeks



Timing of Elective Inductions



Elective Deliveries <39 Weeks



Elective Deliveries <39 Weeks

Higher quality and reduced costs

Case Study: Leveraging Data in our Sepsis Study

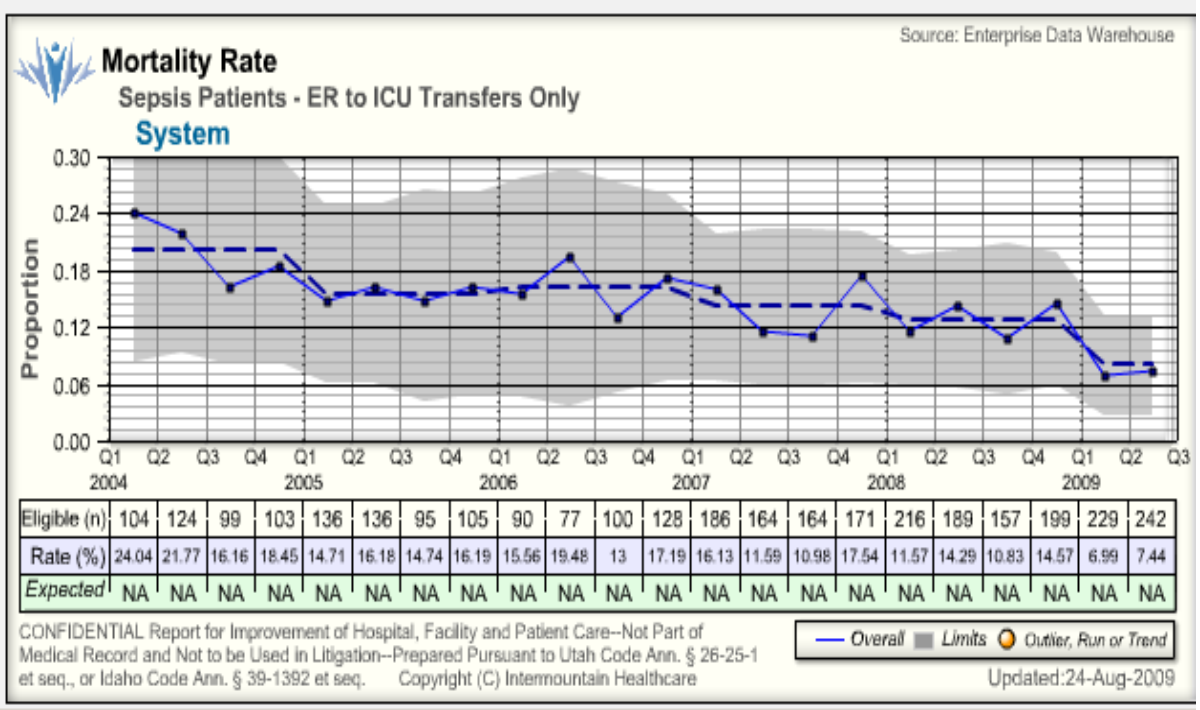
Sepsis Mortality at Intermountain Healthcare

- 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



Eligible (n)	104	124	99	103	136	136	95	105	90	77	100	128	186	164	164	171	216	189	157	199	229	242
Rate (%)	24.04	21.77	16.16	18.45	14.71	16.18	14.74	16.19	15.56	19.48	13	17.19	16.13	11.59	10.98	17.54	11.57	14.29	10.83	14.57	6.99	7.44
Expected	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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:
  - Survival rate increased from 20.2% mortality to less than 9%
  - Average LOS was reduced by 20 hours
  - 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

Intervention	Measure
Patient Education	Enrollment
Early Mobilization After Surgery	Activity – PT / Nursing walking, transfers, etc.
Appropriate IV Fluid Admin	Fluid Administration
Narcotic Sparing Analgesia	Med Administration, Morphine Equivalence
Early enteral nutrition	Diet Administration
	Bowel/Emesis/Flatus
	Financial Measures

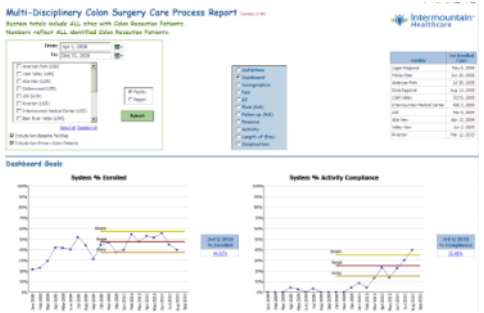
MDCS Data Capture

Tactical App (Enrollment)

HELP (EMR)

Financial Data

EDW



MDCS – EMR Considerations

HELP (EMR) Application

Enterprise Data Warehouse

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STOOL COLOR/CHARACTER AND TESTS

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

	FCILTY_ID	ACCT_NO	EMPI	STRING_DTS	SYSTEM_DTS	STOOL_COLOR_CHARACTER_DSC	NURSE_NM	ROOM_CD
1	154					Brown, Soft	Sandra Wilson	T521
2	116					(null)	(null)	2128
3	154					(null)	Shauna Bath	ER
4	154					Flatus	Erin Dinkel	1132

	STOOL_AMOUNT_DSC	STOOL_FREETEXT_NOTES
1	Large	huge
2	(null)	pt. states food + liquid goes through back end, loose stools x2
3	(null)	reports dark stool with some bright red bleeding since tuesday
4	(null)	pt states no BM since admit

Colon Surgery Care Process Report

System Total												
		Bowel Movement Recorded			Flatus Recorded			Emesis (after 24 Hrs) Recorded		Average Days to		
Group	# Patients	# Patients	% BM	Avg Days to 1st	# Patients	% Flatus	Avg Days to 1st	# Patients	% Emesis	1st Tolerated Meal	GI2	GI3
Enrolled	596	366	61.4%	2.35	365	61.2%	2.32	58	9.7%	1.40	2.82	2.54
Not Enrolled	817	580	71.0%	3.74	552	67.6%	3.57	102	12.5%	3.28	5.16	4.52
Combined	1,413	946	66.9%	3.20	917	64.9%	3.07	160	11.3%	2.34	4.07	3.60
Unknown	89	44	49.4%	2.47	45	50.6%	3.22	10	11.2%	3.37	3.51	3.49
Baseline	1,676	1,174	70.0%	3.70	1,151	68.7%	3.80	226	13.5%			

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.