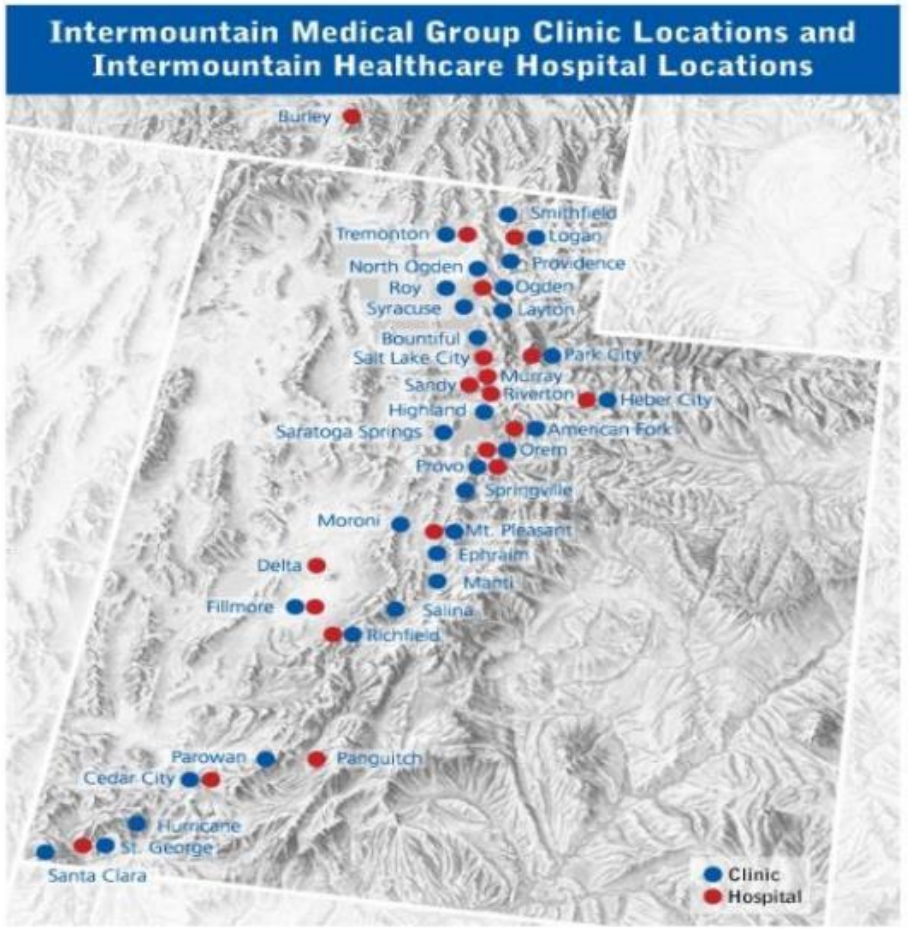
Improving Cancer Diagnosis and Care

Patient Access to Oncologic Imaging and Pathologic Expertise and Technology

February 2018

Intermountain Medical Group

- Diverse group of clinics and services
- 159 primary and secondary care clinic sites
- 38 urgent care locations
- 9 occupational health locations
- 7 on-site employer clinics
- 4 community/school clinics
- 18 retail pharmacies
- 5420 employees
- 1123 physicians
- 289 advance practice clinicians

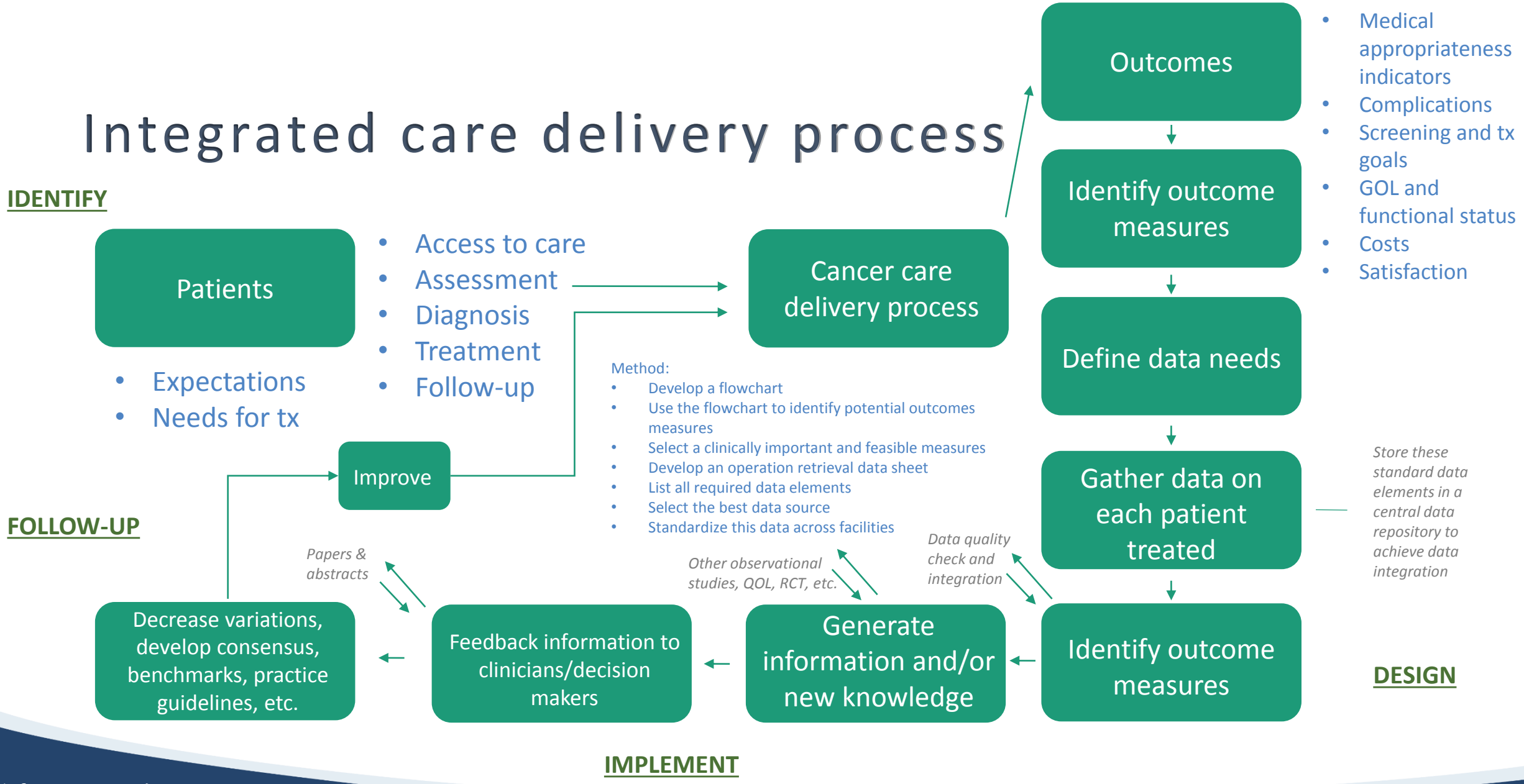


Landscape—Intermountain Healthcare

- A network of 22 hospitals in Utah and southern Idaho
- Contains a mix of employed and affiliated physicians
- Is an insurance provider
- Manages over 50% of the local market
- Not an HMO
- Not a seamless self-contained system

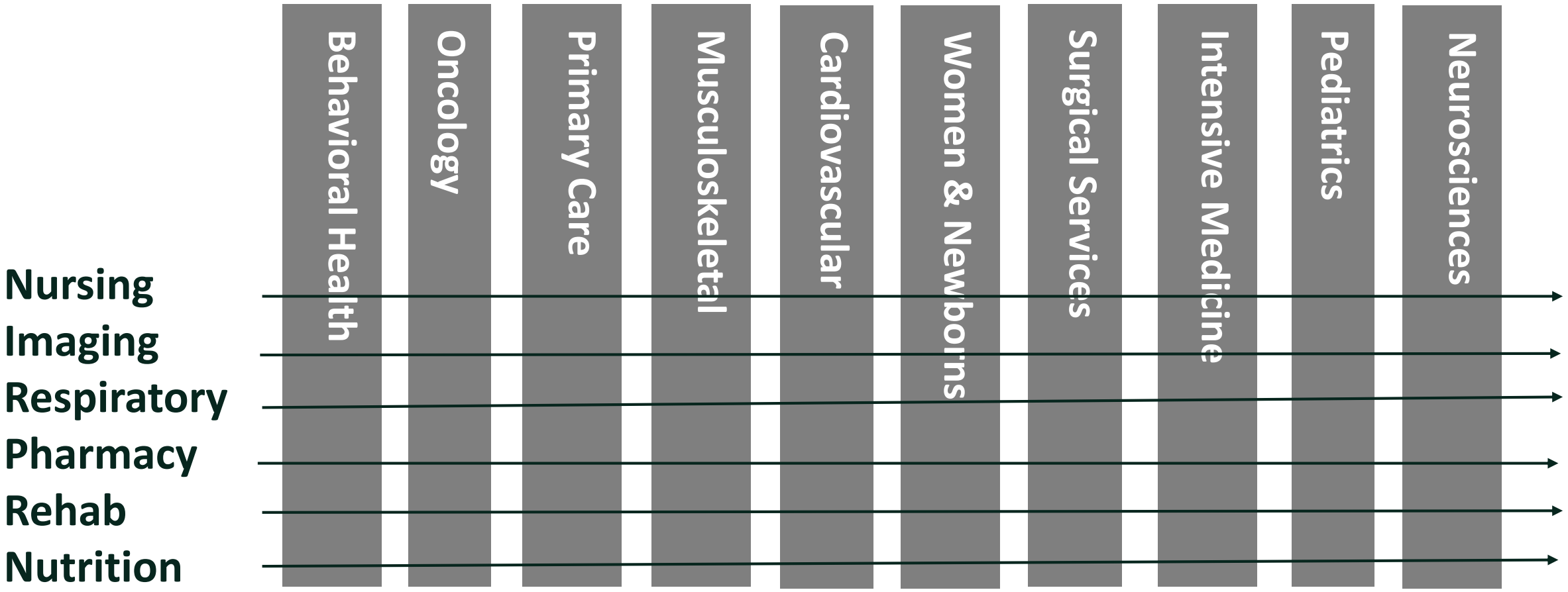
Ultimately the goal is to improve the quality of care by developing quality improvement strategies that proactively and consistently support clinical best practice.

Integrated care delivery process



Clinical Programs and Services

Working Together



Aggregated data repositories

Relational Data Warehouse

- Relational Data Store
- Semantic Data Store
- Data marts, cubes, etc.

Inpatient Clinical, Ambulatory Clinical, Financial, Supply Chain, Health Plan, Research

Oracle RDBMS, HDD, SQL Server

Data Lake

- Centralized persistence of high volume data
- ELT Repository
- ODS for Relational Data Warehouse
- Schema on Read Repository
- Data Discovery
- Pre-processing for Relational Data Warehouse
- Data Archive

Genomic Data, High volume Device Data, OLTP transaction Logs, Security transaction logs.

Hortonworks Hadoop, Spark

Federated Search

- Index of external data
- Index of unstructured data
- Data discovery

Clinical Documents, Enterprise Documents, Research subscriptions, Government sources, etc.

Solr

Cloud

- Alternate high volume storage
- Alternate high capacity computing

Cerner Healthe Intent, AWS, Azure, etc.

Managing a Process

- Means
  - The right data
  - In the right format
  - At the right time (and place)
  - In the right hands (the clinicians who operate the process)

Examples: Tumor-Specific Projects

Breast Cancer

- ER/PR Specimen Handling
- Breast Reconstruction
- IHC4 vs. Oncotype DX Testing
- MRI Utilization in Breast Cancer Patients
- Short-Term Imaging Follow-Up
- Sentinel Lymph Node
- Tissue Procurement
- Time to Biopsy
- Mammography Callback Rate
- Early Stage Adjuvant Radiation Therapy
- Node Dissection Rate for DCIS
- DCIS at Diagnosis
- Axillary Dissection Following Positive Sentinel Node Biopsy
- Early Stage at Diagnosis
- Neoadjuvant Chemotherapy
- ER/PR Hormone Therapy
- Micrometastasis
- Hypo-fractionation
- Breast Screening Cost
- BIRADS 3
- False Negative Mammography Project
- Spring-Loaded TruCut vs. Vacuum-Assisted Bx

Colorectal Cancer

- Stage III Chemotherapy
- Rectal Cancer – Endoscopic Ultrasound
- Colon Familial Polyp (HICCP-UPDB)
- Metastatic Colon Cancer Tissue
- Colon 12 Node Retrieval
- HPNCC Genetics & Lynch Syndrome Project
- Pancreaticoduodenectomy Study
- Colonoscopy Frequency S/P Definitive Cancer Surgery

Melanoma

- Melanoma Database
- Ear Melanoma Study

Lung Cancer

- State-Wide Lung Cancer Screening Program
- Pre-Operative Imaging

GYN Cancers

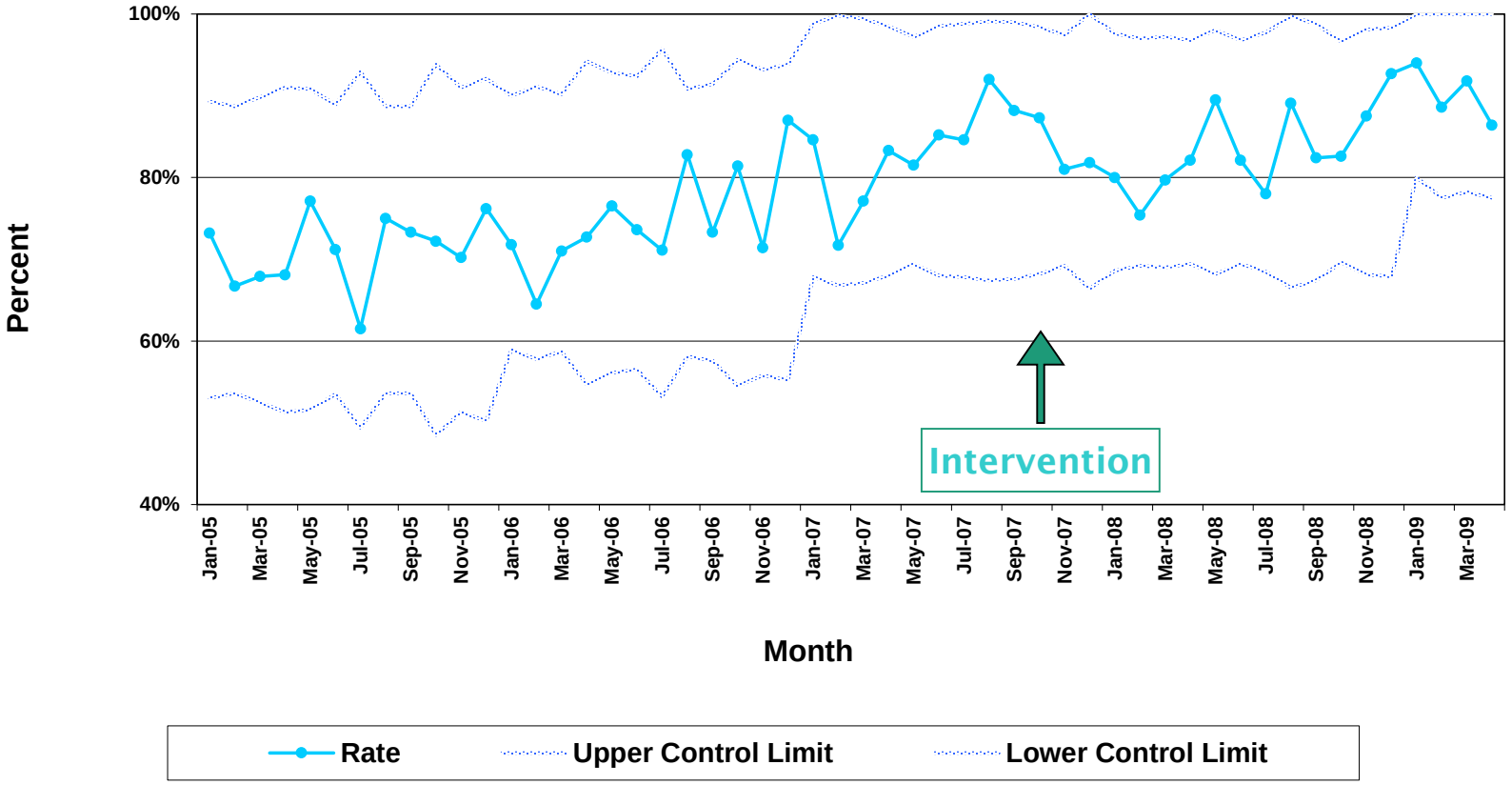
- Endometrial Ablation Cancer Study
- Type II Endometrial Cancer and Obesity
- Estrogen Insensitivity Study
- Ovarian Cancer Study
- Endometrial Familiarity Study
- PAP & HPV Testing
- Endometrial Lynch Syndrome Project
- Stage III Radiation

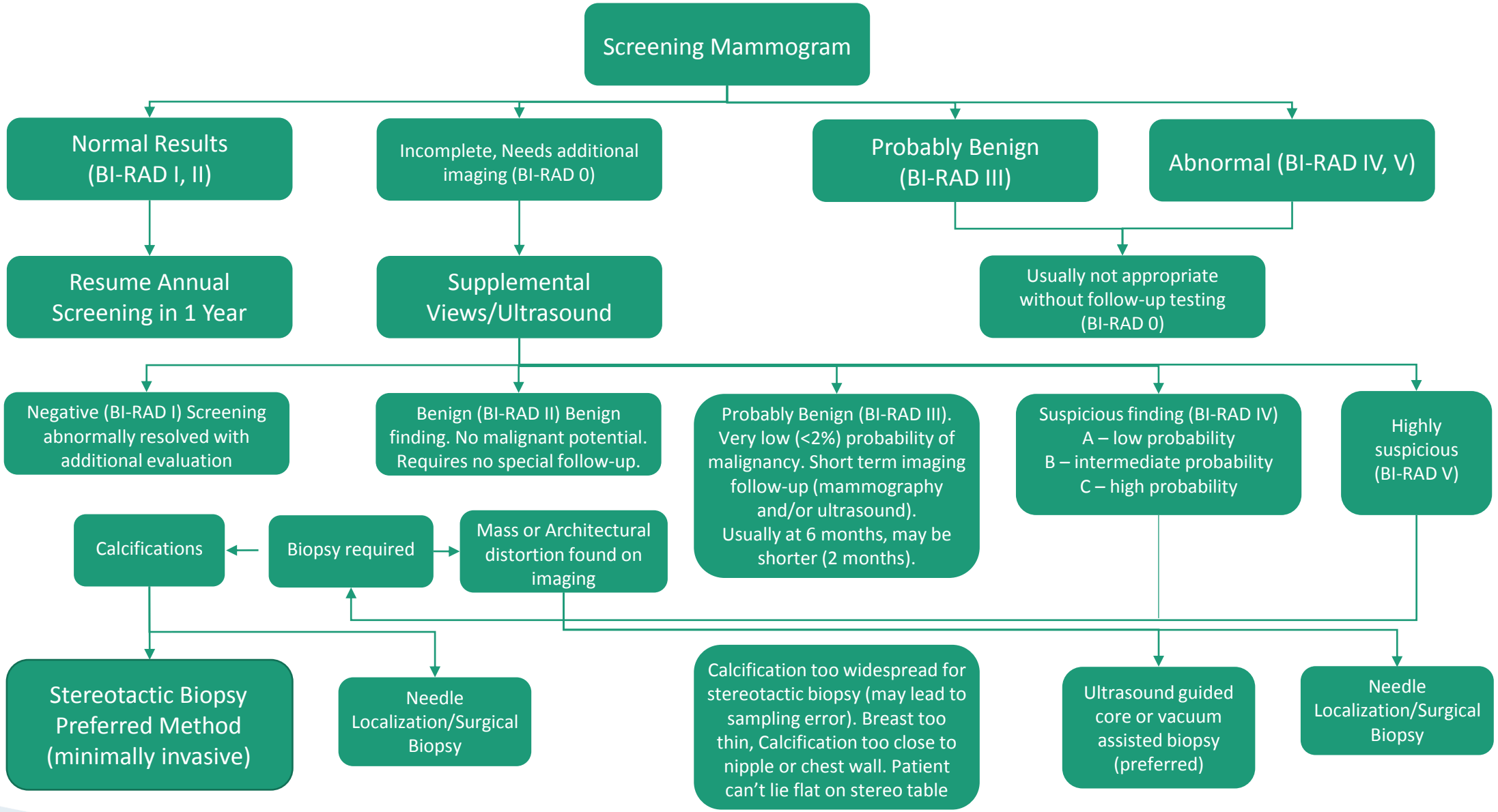
Urologic Cancers

- Epidemiology of Testicular Cancer in the Utah Population
- Prostate Quality of Life Study
- Appropriate use of Advanced Imaging in Prostate Cancer
- Radiation Treatment Templates
- Renal Cancer Database
- Finasteride
- Familial Polyp
- Prostatectomy Length of Stay (LOS)
- Prostatectomy Variable Cost Evaluation
- Physician Report Card
- PSA Recurrence
- Prostatectomy Margin Status

>40 active and on-going projects

Sentinel Node

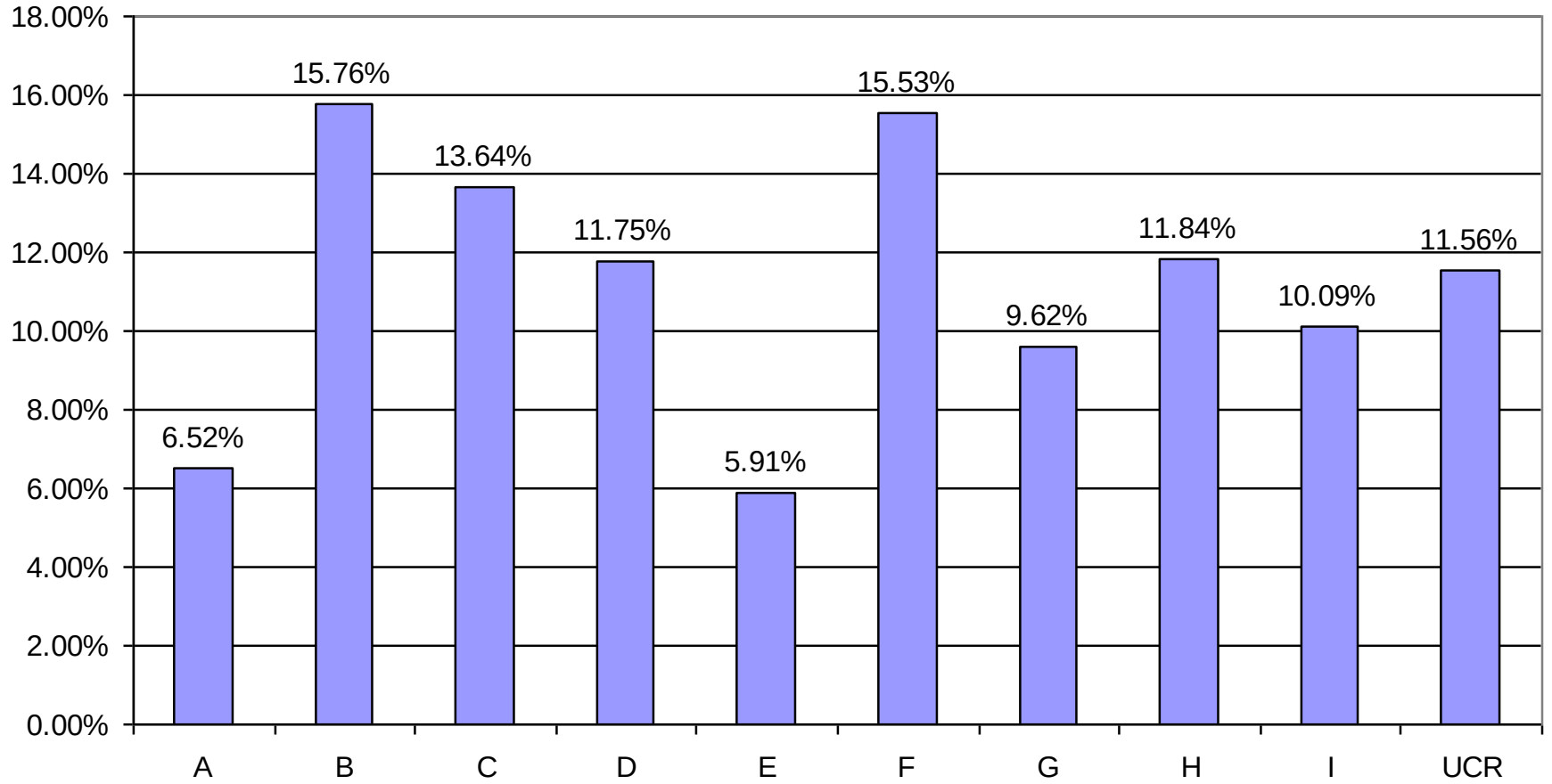



Screening Mammogram
Normal Results (BI-RAD I, II)
Incomplete, Needs additional imaging (BI-RAD 0)
Probably Benign (BI-RAD III)
Abnormal (BI-RAD IV, V)
Resume Annual Screening in 1 Year
Supplemental Views/Ultrasound
Usually not appropriate without follow-up testing (BI-RAD 0)
Negative (BI-RAD I) Screening abnormally resolved with additional evaluation
Benign (BI-RAD II) Benign finding. No malignant potential. Requires no special follow-up.
Probably Benign (BI-RAD III). Very low (<2%) probability of malignancy. Short term imaging follow-up (mammography and/or ultrasound). Usually at 6 months, may be shorter (2 months).
Suspicious finding (BI-RAD IV)
A – low probability
B – intermediate probability
C – high probability
Highly suspicious (BI-RAD V)
Calcifications
Biopsy required
Mass or Architectural distortion found on imaging
Stereotactic Biopsy Preferred Method (minimally invasive)
Needle Localization/Surgical Biopsy
Calcification too widespread for stereotactic biopsy (may lead to sampling error). Breast too thin, Calcification too close to nipple or chest wall. Patient can't lie flat on stereo table
Ultrasound guided core or vacuum assisted biopsy (preferred)
Needle Localization/Surgical Biopsy

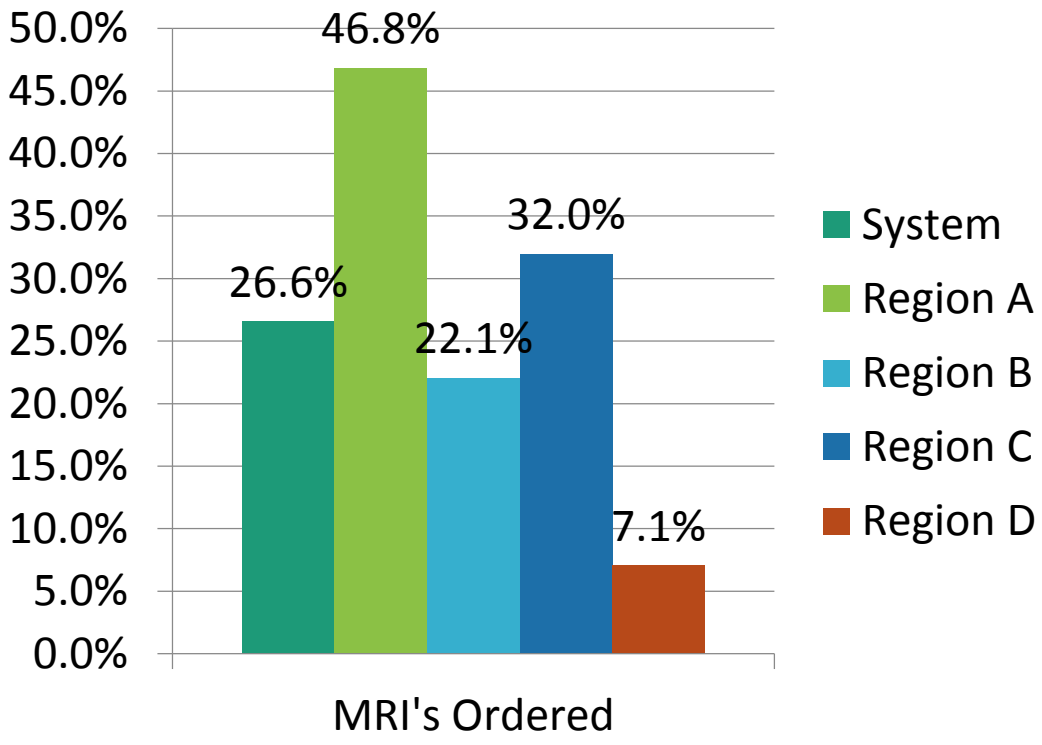
January-June 2006 Callback Rate

UCR Physicians

Goal : < 10%



2015: Breast Cancer
MRI Use and Practice Variation



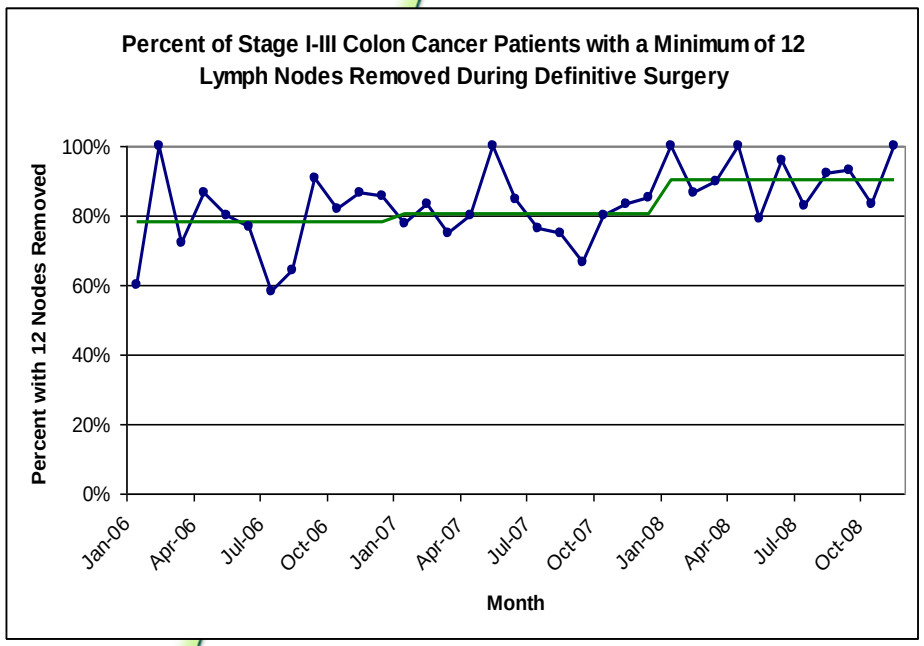
Bilateral Mastectomy Rate System Wide 11.8% (562/4,762)

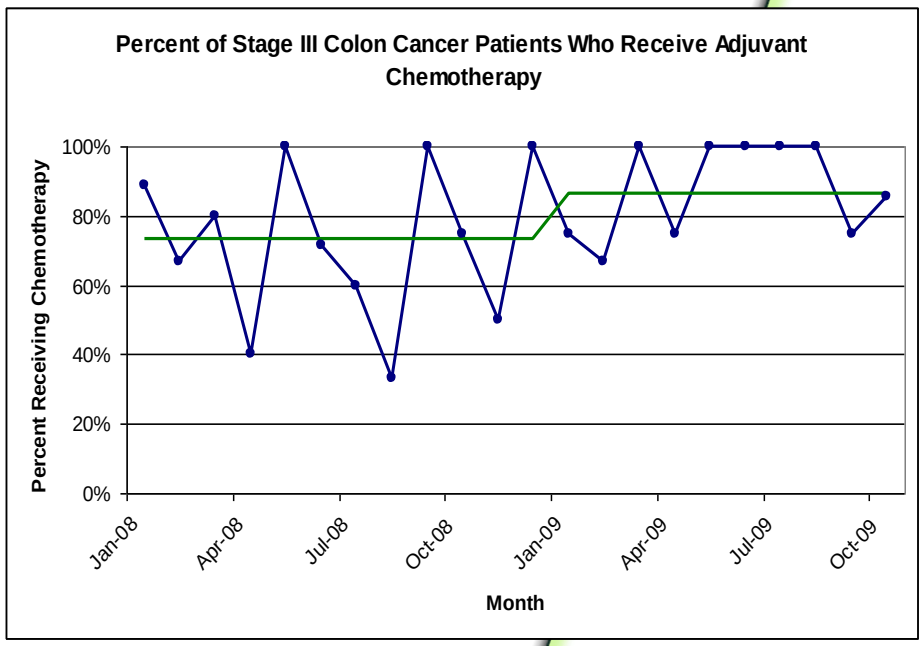
Region A	16.0% (146/913)
Region B	9.7% (205/2,109)
Region C	15.9% (157/986)
Region D	7.2% (54/754)

False-negatives mammography

- Project Purpose: To decrease the rate of false negative mammography in the Intermountain Healthcare system.
- Lead Physician: Brett Parkinson M.D.
- Data Requirements
  - all false negative cases.
    - Defined as screening mammogram with result of BIRADS 1 or 2 who develops a cancer within 1 year of normal screening.

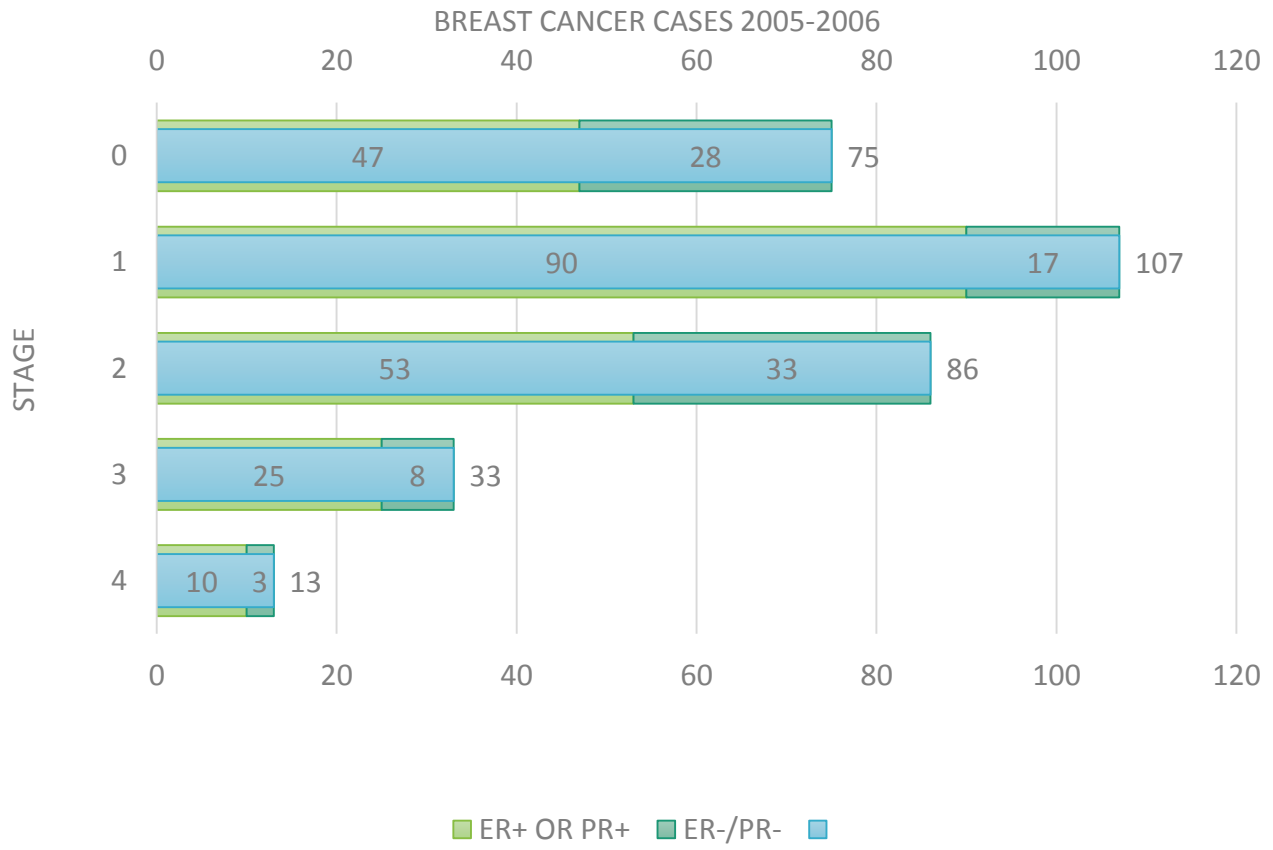
Colon Cancer Staging and Treatment





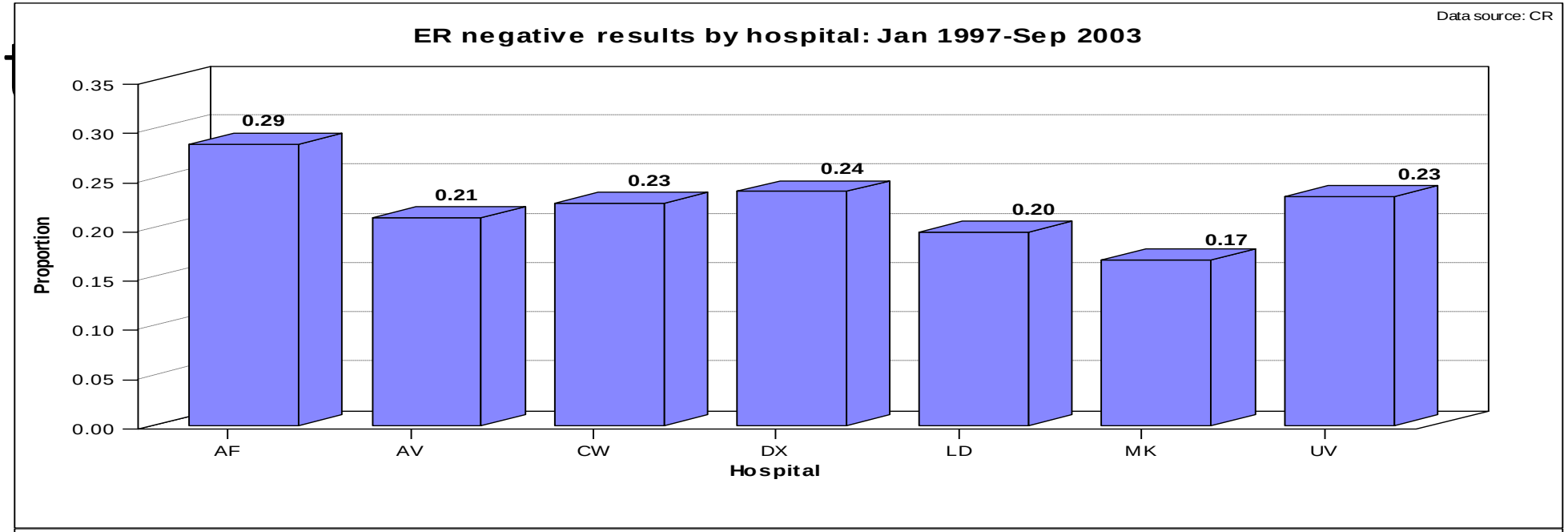
Example

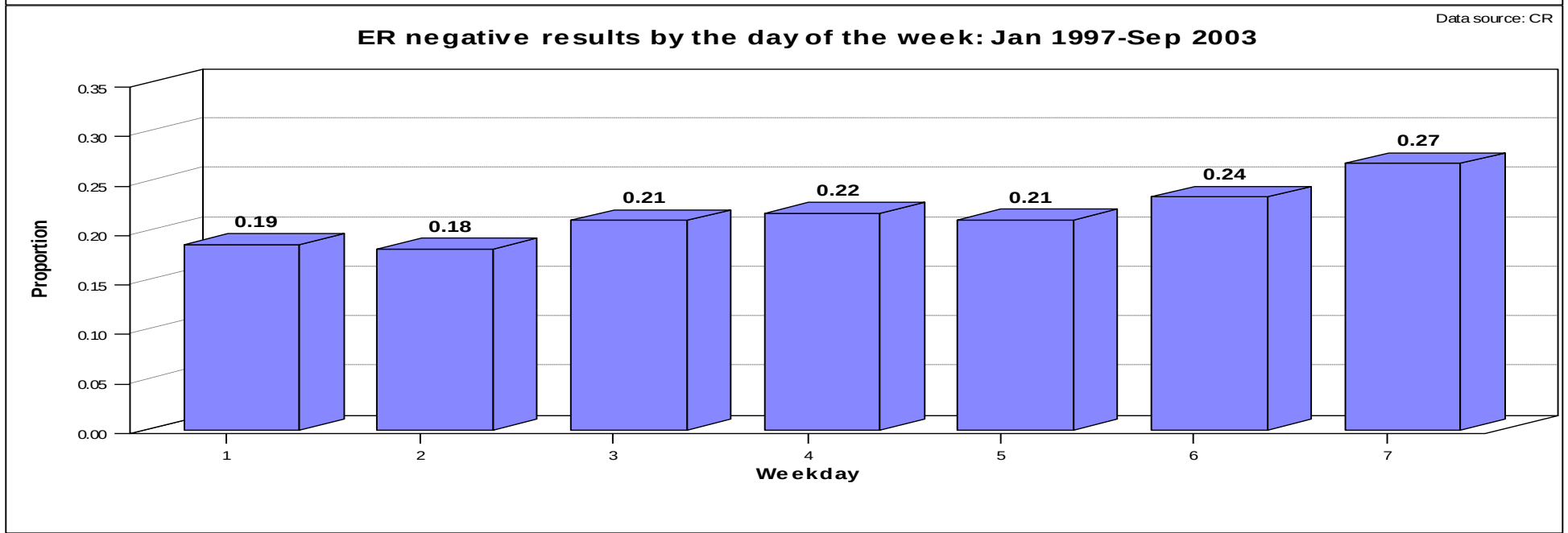
UNR Stage I-III Breast Cancer Cases by Hormone Receptor Status



ER/PR Project

Pat





Data Sources

- **Genomic Health**
  - Onco*type* DX test scores
  - (Working to get results reliably in PowerPath / Help 2)
- **CCF Database**
  - Onco*type* DX Order Date
  - Pathology Date
  - Chemotherapy Given
  - Hormone Tx Given
- **Tumor Registry**
  - ER Status
  - PR Status
  - Stage
  - Grade

IHC4 vs. Oncotype

Update on breast cancer
Hormone receptor testing initiatives

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Challenges

- Clinical Program historically no authority
- Regional Hospitals had independent priorities and budgets
- Medical staffs nonaligned
- Medical staffs have variety of incentives and reimbursement models
- No unified system organization
- Providers in fact compete internally for services and revenue

Opportunities

- Restructure management team
- Eliminate regional competitive model and centralize budget
- Centralize low volume procedures
- Restructure reimbursement to fit with a value based model
- Develop system wide data systems (ASCO Cancer LinQ,Via Oncology,Unified tumor registry)
- Strengthen physician alignment
- Leverage Select Health
- Authority to Clinical Programs

Molecular Tumor Board

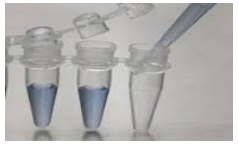
- Multi-institutional participants
- Experts in Cancer Genomics
- Interpretation of Findings

Cancer Genomics Workflow

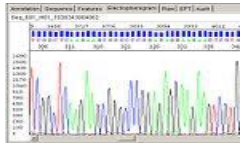
Personalized Medicine Clinic  Day 1

Tumor Biopsy  Day 2-3

Pathology Review  Day 4-5

Sample Prep  Day 6-7

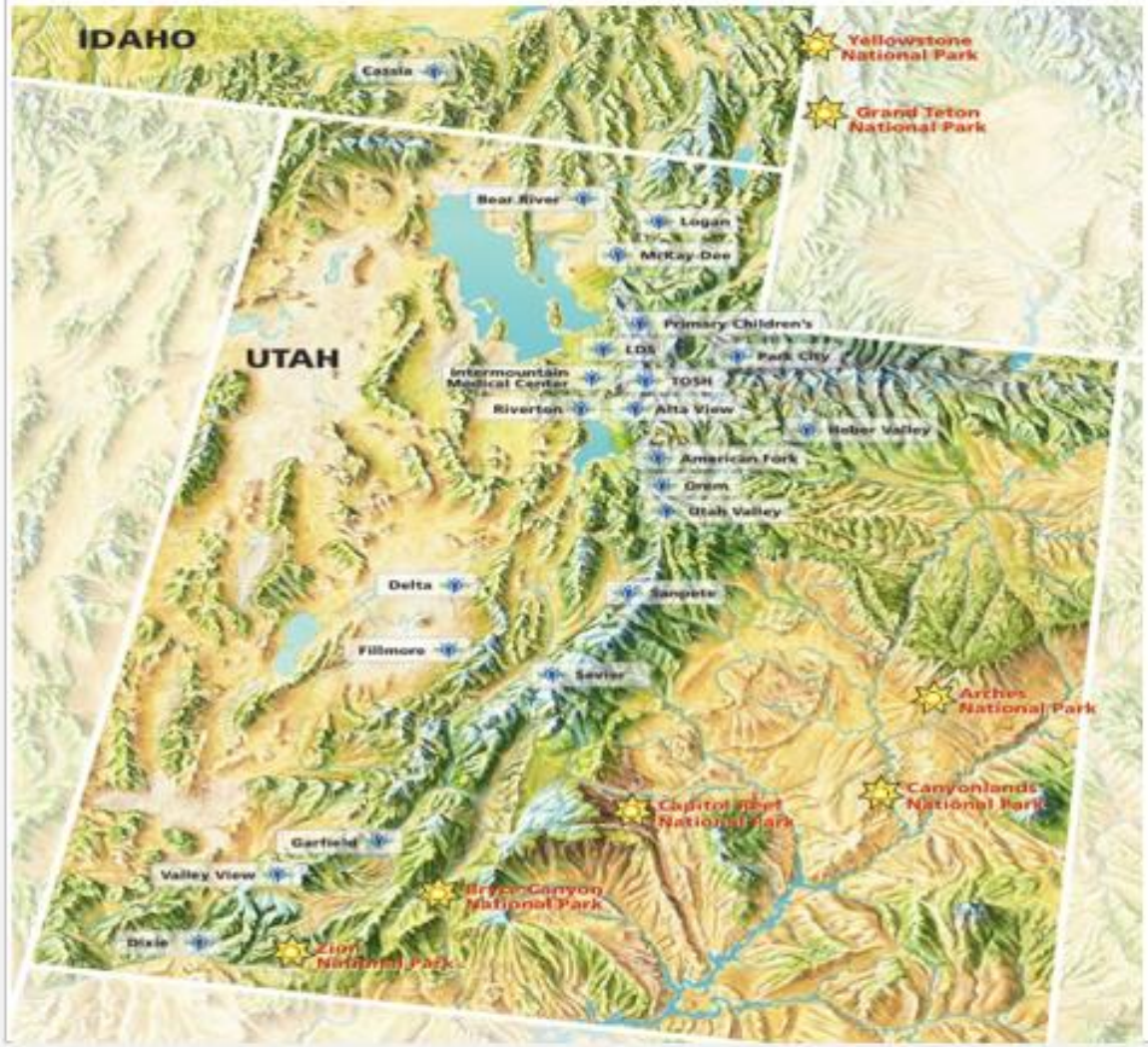
Molecular analysis (NGS)  Day 8-9

Analytics  Day 10-13

Molecular Tumor Board  Day 14-15

Results and Treatment  Day 16-17

Setting: Integrated non-for-profit healthcare system



- 1 academic medical center
  - Multiple ICU's
  - All 24/7 intensivist staffed
- 4 regional/referral hospitals
  - 24/7 intensivist staffed
- 7 community hospitals
  - ICU staffed by non-intensivists
- 7 rural hospitals
  - No ICU
- Life Flight – air and ground transport

PRESENTED AT: Society of Critical Care Medicine

d on the community hospitals

Results: Mortality

	Pre-TCC N (%)	Post-TCC N (%)	Total	Relative Risk of Mortality (OR) (95% CI)	p
Survived to ICU discharge	3,295 (97.40)	3,234 (98.18)	6,529		
Died in ICU	**88 (2.60)**	**60 (1.82)**	**148**	**0.66 (0.45-0.97)**	**0.034**
Survived to hospital discharge	3,283 (97.04)	3,226 (97.94)	6,120		
Died during hospitalization	**95 (2.96)**	**68 (2.06)**	**163**	**0.67 (0.47-0.96)**	**0.029**

- Multivariate analysis
- Logistic regression model included age, sex, acute physiology score, and TCC status (pre- versus post-)
- Excludes comfort care/withdrawal of life support

Tele-Health for Oncology

- Ability to provide oncology care anywhere
  - Opportunities to tap into system resources and expertise
  - Subspecialty experts opinion
  - Standardized treatment, flow and services

Results of Tele-Oncology

- -Over 500 visits completed
- -4 different locations
- -High patient satisfaction
- -Patient stays close to home
- -Revenues stay in the community

Key Requirements for Quality Improvement

- Culture (constructive not punitive)
- Infrastructure(data systems and analyst)
- Leadership(clinical and operational)
- Engagement (appropriate metrics)
- Bandwidth (overwhelming extramural, nonpatient care requirements)