Use of Quality and Outcomes Data from the Hospital Perspective

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Disclosures

Neither I, Matthew L. Hanley, nor any family members, have any relevant financial relationships to be discussed, directly or indirectly, referred to or illustrated with or without recognition within the presentation. I have no financial relationships beyond my employment at Carolinas HealthCare System.
Carolinas HealthCare System (CHS)

• Second largest public, healthcare system in the nation
• Largest healthcare system in the Southeast
• 38 hospitals, 11 nursing homes and over 800 outpatient service locations
• Over 2,300 employed physicians and nearly 400 residents delivering care in over 500 sites
• Projected 2012 net operating revenue: $7.5 billion
• AA-rated since 1983
**Breadth of CHS**

**Summary of System**

- 60,000 employees
- Close to 800 care locations
- Nearly 7,500 licensed beds
- 11 long-term care facilities
- 12 home health agencies
- 9 hospice providers
- 8 freestanding EDs
- One of 5 academic medical centers in the state of North Carolina

**Key Statistics – 2012 Projected**

- 10.5 million patient encounters
- Over 6.2 million physician visits
- 281,393 inpatient discharges
- 573,323 adjusted discharges
- 1,079,393 ED visits
CHS Experience

Carolinas HealthCare System affiliates and physician networks in NC, SC and GA.
Today’s Agenda

- What we know to be true
- The response so far
- What we believe are the requirements
- Real issues at hand – implications and how they play out at the front line.
No Longer Business at Usual…

Rising demand for services, related to additional “insured” lives and aging, chronically ill population

Emerging risk based payment models

Healthcare reform and the related imperative to cut costs

Fragmented patient care

Increasing ties to metrics related to total cost of care, outcomes and the patient experience

Shifting economic landscape

Growing healthcare cost

Spending

Joint Disorder

Diabetes

Asthma/COPD

Mental Health

Timing

Costs
# Elements of Change

<table>
<thead>
<tr>
<th>Element of Change</th>
<th>Today</th>
<th>Future</th>
</tr>
</thead>
<tbody>
<tr>
<td>Care Focus</td>
<td>Sick care</td>
<td>“Healthcare,” wellness and prevention, disease management</td>
</tr>
<tr>
<td>Care Management</td>
<td>Manage utilization and cost within a care setting</td>
<td>Manage ongoing health (and optimize care episodes)</td>
</tr>
<tr>
<td>Delivery Models</td>
<td>Fragmented/silos</td>
<td>Care continuum and coordination (right care, right place, right time)</td>
</tr>
<tr>
<td>Care Setting</td>
<td>In office/hospital</td>
<td>In home, virtual (e-visits, home monitoring, etc.)</td>
</tr>
<tr>
<td>Quality Measures</td>
<td>Process-focused, individual</td>
<td>Outcomes-focused, population-based</td>
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<tr>
<td>Payment</td>
<td>Fee-for-service</td>
<td>Value-based (outcomes, utilization, total cost)</td>
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<tr>
<td>Financial Incentives</td>
<td>Do more, make more</td>
<td>Perform better on measures, make more</td>
</tr>
<tr>
<td>Financial Performance</td>
<td>Margin per service, procedure (bed, physician, etc.)</td>
<td>Margin per life</td>
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</table>
The Hundred Year Wave and the Roots of Reform

- 50 million people without Insurance
- Cost increases that are bankrupting the country
- Value that is being scrutinized
The Fiscal Gap (unfunded federal obligations – 2009)

- Unfunded obligations

- Medicare $38.1 trillion
- Social Security $7.7 trillion
- Total National Debt $14.1 trillion
- Stimulus $862 billion
- National Defense $714 billion
- TARP $700 billion
Bundled Payments Offer Greatest Impact on Cost Trends

Estimated Cumulative Percentage Changes in National Health Care Expenditures, 2010 through 2019, Given Implementation of Possible Approaches to Spending Reform

Organizational/Business Life Cycle

Inception

Growth

Maturity

Decline

Sigmoid Curve

Time
Prospering in a Changing Environment

- Facility based
- Team-based care
- Improved quality
- transparency
- Innovation
- Team accountability
- Standardization
- Information technology
- Care coordination
- Engaged physicians
- Safe

Individual patient focus

- Individual responsibility & autonomy
- Team accountability
- Standardization
- Engaged physicians
- Care coordination
- Innovation
- Team accountability
- Standardization
- Information technology
- Care coordination
- Engaged physicians
- Safe

Current Strain

- Patient-centric
- Reactive
- Uncoordinated
- Fee for service
- Silo work
- Volume-based
- Issue-focused
- Variable

Value

Volume

- Patient-centric
- Reactive
- Uncoordinated
- Fee for service
- Silo work
- Volume-based
- Issue-focused
- Variable
A Few Basic Questions Being Asked

What services exactly do you provide?
Are you any good?
How do you know?
Are you getting better?

The Importance of Differentiable Quality Performance

New System for Patients to Report Medical Mistakes
By ROBERT PEAR
Published: September 22, 2012

The New York Times
NYTIMES.COM
How to Stop Hospitals From Killing Us
Medical errors kill enough people to fill four jumbo jets a week. A surgeon with five simple ways to make health care safer.
Cost Disparity Across US Quality Varies Similarly

Medicare Reimbursements Per Enrollee
2006 Medicare Reimbursements by Hospital Referral Region

Source: Dartmouth Atlas Project

White Paper: Reducing Utilization Concerns Regarding Spinal Fusion and Artificial Disc Implants

“Spinal fusion remains very popular despite the significant risks and questionable outcomes.”

“Clinicians may be driven by financial incentives to perform more lucrative procedures. Many insurance companies now recommend a second opinion before spinal fusion.”
Healthcare…the Gum in the Economic Engine?
The Impact of the ‘Poly-Chronics’

Healthcare is the most complex thing we have ever tried to manage – Peter Drucker
The Importance of Differentiable Quality Performance as a Key Strategy

1. Getting to the table and staying in the game. Are we able to meet the agenda that has been prescribed (and articulate why we are good at what we do)?

2. Are we able to then lead the change and meaningfully invest in the creation of a new value proposition?
The Response – Money, Lives, and Results on the Line - ‘Pay For Performance’

- **Over Utilization**
  - High Quality
  - Average Quality
  - Low Quality
  - Harm
  - Under Utilization

**Incentives***

**Penalty***

Meaningful Use***

**Reward***

**Transparency***

**Support***
## Reform Landscape Driving Quality Related Changes

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<td>Value-Based Purchasing (VBP)</td>
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<td>30-day readmissions</td>
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<td>Hospital-acquired conditions</td>
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<td>Market basket reductions</td>
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<td>0.75%</td>
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<td>Multifactor Productivity Adjustment*</td>
<td>1.0%</td>
<td>0.7%</td>
<td>0.5%</td>
<td>0.5%</td>
<td>0.4%</td>
<td>0.5%</td>
<td>0.65%</td>
<td>0.9%</td>
<td>0.7%</td>
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<tr>
<td>Documentation and Coding Adjustment (DCA)**</td>
<td>4.9%</td>
<td>1.9%</td>
<td>2.1%</td>
<td>2.1%</td>
<td>2.1%</td>
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<td>Across the board cuts to finance the debt ***</td>
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<tr>
<td><strong>TOTAL IMPACT</strong></td>
<td>6.0%</td>
<td>6.7%</td>
<td>8.1%</td>
<td>10.6%</td>
<td>10.5%</td>
<td>11.4%</td>
<td>9.3%</td>
<td>9.4%</td>
<td>8.9%</td>
<td>8.7%</td>
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</table>

% = % of Medicare Inpatient Operating Payments

*The Multifactor Productivity Adjustment is an estimate generated by the CMS Office of the Actuary
**DCA, also known as the behavioral offset, shown here does not show the future effects of these cuts on baseline spending. Estimates FY 2014–FY 2017 impact of the American Taxpayer Relief Act of 2012
***If Congress has not adopted the Joint Committee’s report to reduce the deficit by at least $1.2 trillion, the 2% cut will be implemented January 2013

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Carolinhas Healthcare System
Uncompromising Excellence, Commitment to Care.

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## VBP Performance Periods

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<tr>
<th>Fiscal Year</th>
<th>1st Performance Period</th>
<th>Domains</th>
<th>VBP Score Weight</th>
<th>Medicare Claims or Performance Based</th>
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<tr>
<td>FY 2013</td>
<td>July 2011 - March 2012</td>
<td>Patient Experience of Care (HCAHPS)</td>
<td>30%</td>
<td>Performance</td>
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<td>FY 2013</td>
<td>July 2011 - March 2012</td>
<td>Clinical Process of Care</td>
<td>70%</td>
<td>Performance</td>
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<table>
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<th>Fiscal Year</th>
<th>2nd Performance Period</th>
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<td>April 2012 - December 2012</td>
<td>Patient Experience of Care (HCAHPS)</td>
<td>30%</td>
<td>Performance</td>
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<td>FY 2014</td>
<td>April 2012 - December 2012</td>
<td>Clinical Process of Care</td>
<td>45%</td>
<td>Performance</td>
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<td>FY 2014</td>
<td>July 2011 - June 2012</td>
<td>Outcome Measures (Mortality)</td>
<td>25%</td>
<td>Medicare Claims</td>
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</table>
### 3rd VBP Performance Period – for FY 2015

#### QUALITY 20%

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<tr>
<th>Baseline Period</th>
<th>Performance Period</th>
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</table>

#### OUTCOMES 30%

<table>
<thead>
<tr>
<th></th>
<th>Baseline Period</th>
<th>Performance Period</th>
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</table>

#### HCAHPS 30%

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<tr>
<th>Baseline Period</th>
<th>Performance Period</th>
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#### EFFICIENCY 20%

<table>
<thead>
<tr>
<th>Baseline Period</th>
<th>Performance Period</th>
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</table>

**NEW**

At Risk 1.5%
Quality Measures
Performance Based – Hospital Measured – All Equally Weighted

1. AMI7a: Fibrinolytic Therapy within 30 minutes
2. AMI 8a: Primary PCI within 90 minutes
3. HF 1: Discharge Instructions (heart failure)
4. PN 3b: Blood Culture prior to 1st antibiotic for pneumonia patients
5. PN 6: Initial antibiotic selection for Community Acquired Pneumonia
6. SCIP 1: Prophylactic antibiotic 1 hour before incision
7. SCIP 2: Selection of antibiotic for surgery patients
8. SCIP 3: Prophylactic antibiotic stopped within 24 hrs. after surgery
9. SCIP 4: Controlled 6am postoperative serum glucose for cardiac surgery
10. SCIP 9: Postoperative Urinary Catheter Removal on Post Operative Day 1 or 2
11. SCIP Card 2: Pre-admit beta blocker and perioperative period beta blocker
12. SCIP VTE 1: Ordered VTE prior to surgery - Removed for 3rd Performance Period, FY 2015
13. SCIP VTE2: Received appropriate VTE prophylaxis within 24 hrs. prior to and after surgery
Outcomes Domain
Claims Based – All Equally Weighted

Mortality Measures
1. AMI 30-day mortality rate
2. Heart Failure 30-day mortality rate
3. Pneumonia 30-day mortality rate

4. Complications / Patient Safety **
   a. Pressure Ulcer Rate
   b. Iatrogenic Pneumothorax Rate
   c. Central Venous Catheter-Related Bloodstream Infection Rate
   d. Postoperative Hip Fracture Rate
   e. Postoperative Pulmonary Embolism or Deep Vein Thrombosis Rate
   f. Postoperative Wound Dehiscence Rate
   g. Accidental Puncture or Laceration Rate

5. *Central Line Associated Blood Stream Infections
   * Hospital measured
   ** AHRQ (PSI-90) Composite
Efficiency Domain
Claims Based

1. MSPB-1: Medicare spending per beneficiary
   a) **Threshold** – Median Medicare spending per beneficiary ratio across all hospitals during the Performance Period
   b) **Benchmark** – Mean of lowest decile of Medicare spending per beneficiary ratios across all hospitals during the Performance Period
Who is Measuring?

Institute of Medicine, Priority Areas
The Leapfrog Group, NSQIP
Healthy People 2010, U.S., Health & Human Services
HEDIS® of the National Committee for Quality Assurance
Hospital Quality Alliance (HQA)
Ambulatory Quality Alliance (AQA)
Agency for Healthcare Research and Quality (AHRQ)
CMS - Quality Improvement Organization
Physician Quality Reporting Initiative (PQRI)
American Medical Association - Specialty Consortiums
National Quality Forum
Advocate Efficiency and Cost Information
Specialty Specific Groups - NSQIP
Insurance, Payer plans
Where does the Data come from?

1. Claims and Administrative Data – ICD9 and CPT, Professional, Patient Demographics

2. Medical Records, EHRs, Quality Chart abstraction (Specialty specific registries - NSQIP)

3. Patient, consumer feedback
Serious Complications

- PSI 04 - Death among surgical inpatients with serious treatable complications
- PSI 06 - Iatrogenic pneumothorax
- PSI 11 – Postoperative respiratory failure
- PSI 12 – Postoperative PE or DVT
- PSI 14 - Postoperative wound dehiscence
- PSI 15 - Accidental puncture or laceration

Hospital Acquired Conditions

- Foreign object retained after surgery
- Air embolism
- Blood incompatibility
- Pressure ulcer stages III and IV
- Falls and trauma
- Vascular catheter-associated infection
- Catheter-associated urinary tract infection
- Manifestations of poor glycemic control
**Speaking Out of Many Sides of the Mouth**

Post operative spine patient remains on ventilator due to prolonged anesthesia

- "Post Operative Acute Respiratory Failure"
- Flagged as a Preventable Post Operative Complication

- "Post Operative Acute Respiratory Insufficiency due to prolonged anesthesia"
- Potential loss in DRG severity of condition…lower Case Mix Index…lower reimbursement
How the information may be used – a payers perspective

Potentially Avoidable Complication Rate

Hospital

- % Dollars in PAC
- % Dollars in Typical
- Per Patient Average
Wal-Mart to cover U.S. workers’ heart and spine surgeries

Retailer signs deal with six health centers
Blue Cross to Accept One Payment for Knee Replacements

1/18/2013  Blue Cross and Blue Shield of North Carolina announced Thursday a deal with Duke University Health System that will allow the insurer's customers to make one payment covering care for a period before, during and after knee replacement surgery. The "bundled payment" would cover treatment in the pre-surgical period 30 days before hospitalization, the surgery and follow-up care within 90 days after the patient is discharged from the hospital, according to a news release from the insurer. The program became effective Jan. 1, and is available to the insurer's customers when knee replacements are done by Duke University doctors at Duke University Hospital or Durham Regional Hospital, which is part of the system.
Tiering Facilities and Providers

Understanding the Big Picture

+ **Provider Payment Progression**
  - Consists of development and implementation of various payment strategies across the provider continuum, allowing for flexibility and concurrent implementation to achieve an aggressive medical expense target. In addition to Blue Quality Hospital and Physician programs, it includes including bundled and global payment, and alternative care delivery models.

+ **Development of a Tiered BDC Network**
  - Consists of the development of a tiered Blue Distinction Center Network within North Carolina.

+ **Offering Tiered Product in 2013**
  - Product will be at a lower premium than other PPO products and allow member to access Tier 1 providers at a lower cost share than Tier 2 providers

+ **Transparency of Cost/Quality Project**
  - Consists of identifying, development, and deploying the transparency materials, and use of the Care Compare tool as a part of cost transparency.
Physician Compare Initiative

Welcome to the Centers for Medicare and Medicaid Services (CMS) Physician Compare Initiative webpage. This page is intended to inform physicians and other healthcare professionals about the Physician Compare website. Currently this page has basic information about Physician Compare as well as important news. Soon it will include helpful resources and information related to Physician Compare, an overview of the information currently available on the site, and plans for public reporting of quality of care data on the site.

What is Physician Compare?

Physician Compare (http://www.medicare.gov/find-a-doctor) is a website created by CMS to allow consumers to search for physicians and other healthcare professionals enrolled in the Medicare program, in accordance with Section 10331 of the Affordable Care Act (ACA). The purpose of Physician Compare is to help consumers make informed choices about healthcare they receive through Medicare.

Currently, Physician Compare allows users to find basic information including:

- Physicians’ and other healthcare professionals’ names, addresses, phone numbers, specialties, clinical training, and genders
- If physicians and other healthcare professionals speak languages other than English
- The hospitals with which physicians and other healthcare professionals are affiliated
- If physicians and other healthcare professionals are accepting new Medicare patients
- If physicians and other healthcare professionals accept the Medicare-approved amount, billing no more than the Medicare deductible and coinsurance
- Information about physicians and other healthcare professionals who participate in the Physician Quality Reporting System (PQRS) and/or the Electronic Prescribing (eRx) Incentive Program

Consumers will be able to select physicians and other healthcare professionals based on robust and reliable quality of care data to be added no earlier than 2014.
Moving beyond the prescribed agenda
What will be measured – shifting focus?

Improving triple aim™ population outcomes

Population Health

Metrics:
- Outcomes
- Select HEDIS metrics
- Health status
- Mortality rates

Experience of Care

Metrics:
- Patient satisfaction
- PAM Scores (Patient Activation Measures)

Per Capita Costs

Metrics:
- Total medical PMPM
- Total Medical Trend
- Total Rx PMPM
- Admissions/1000
- Readmission rate

The term triple aim is a trademark of the Institute for Healthcare Improvement

Source: Premier
Implications

- Success in the post reform environment requires:
  - Physician leadership and engagement
  - Team approach to care and improvement
  - Devotion to Evidence-Based Care (EBC)
  - Culture of accountability

Providers that can develop innovative ways to meet demand, reduce cost and exceed quality requirements will prosper.
The Requirements – Dedicating Infrastructure, Tools, and Capabilities

- Culture of safety
- Lean training/methodologies
- Focus on quality performance transparency
- The Science of Process Improvement
- Data Analytics
- Physician Leadership
How do we provide this level of information?

Variable Direct Cost by Surgeon – single TKA

<table>
<thead>
<tr>
<th>Surgeon</th>
<th>Number of Cases</th>
<th>Average Total Cost</th>
<th>Standard Deviation</th>
<th>Coefficient of Variation</th>
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<tbody>
<tr>
<td>A</td>
<td>44</td>
<td>$6,670</td>
<td>589.54</td>
<td>8.838668</td>
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<td>B</td>
<td>42</td>
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<td>C</td>
<td>31</td>
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<td>D</td>
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<td>E</td>
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<td>11</td>
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<td>Group Average</td>
<td>$6,584</td>
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Hanley M. 2012
Or this?

Variation among surgeon in choice of suture for a total knee replacement

<table>
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<tr>
<th>Sutures</th>
<th>Variable Direct Cost Per Item</th>
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<td>725006900 SUTURE PDS II VIO MONO 2 27 CP</td>
<td>$4.34</td>
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<td>725006910 SUTURE ETHILON BLK MONO 3-0 18 PS</td>
<td>$5.11</td>
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<td>725006991 SUTURE MONOCRYL UD 4-0 27 PS 2</td>
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<td>1</td>
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<tr>
<td>725007011 SUTURE TICRON 1 ORTHO</td>
<td>$9.12</td>
<td>2</td>
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<td>725007092 SUTURE #2 PDS 60</td>
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<tr>
<td>725008497 SUTURE QUILL 36<em>26CM</em>36MM</td>
<td>$35.01</td>
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<td>725008498 SUTURE QUILL 36<em>26CM</em>48MM</td>
<td>$36.55</td>
<td>17</td>
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<tr>
<td>725008499 SUTURE QUILL 36<em>30CM</em>36MM</td>
<td>$33.48</td>
<td>5</td>
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<td>725008500 SUTURE QUILL 30<em>30CM</em>18MM</td>
<td>$36.12</td>
<td>1</td>
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</table>

Sutures provide an opportunity for cost improvement. Costs range from $2.73 to $36.55.

Hanley M. 2012
## Sample Data Capabilities of many different Health Systems

<table>
<thead>
<tr>
<th>Current State:</th>
<th>Future State:</th>
<th>Impact:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reporting Performance Metrics</td>
<td>Analyzing Performance Metrics</td>
<td>Efficiency, Quality, Costs</td>
</tr>
<tr>
<td>Minimal Predictive Analytics</td>
<td>Focus on Predictive Analytics</td>
<td>Quality, Costs, Population Health</td>
</tr>
<tr>
<td>Manual Data Abstraction</td>
<td>Automated Data Abstraction</td>
<td>Efficiency, Costs</td>
</tr>
<tr>
<td>Multiple Data Silos</td>
<td>Enterprise Data Warehouse (EDW)</td>
<td>Efficiency, Quality</td>
</tr>
<tr>
<td>No Data Governance</td>
<td>Robust Data Governance</td>
<td>Safety, Efficiency, Quality</td>
</tr>
<tr>
<td>Minimal Self-Service Capacity</td>
<td>User Driven Data Access</td>
<td>Efficiency, Quality, Costs</td>
</tr>
<tr>
<td>Limited Awareness of Analytics</td>
<td>Data is a System Asset</td>
<td>Data Quality</td>
</tr>
<tr>
<td>Poor Data Quality</td>
<td>High Quality Data/One Source of Truth</td>
<td>Data Quality, Efficiency</td>
</tr>
<tr>
<td>Unmet Analytic Needs</td>
<td>High Client Satisfaction</td>
<td>Efficiency, Quality, Costs</td>
</tr>
</tbody>
</table>
## Technology to Support Priorities

### Accelerators for Rapid Value Creation:

<table>
<thead>
<tr>
<th>Software</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verisk</td>
<td>Allows capability to conduct population analysis, employer group analysis, practice pattern variation, episode analysis on claims data</td>
</tr>
<tr>
<td>Humedica</td>
<td>Allows capability to conduct population analysis and provide medical home reporting using clinical (EMR) data. Can compare, analyze and identify clinical best practices near real time.</td>
</tr>
<tr>
<td>Predixion</td>
<td>Removes reliance on technical analysts to accelerate predictive analytics capability. Point of care predictive analytics through workflow.</td>
</tr>
</tbody>
</table>
• Allow any surgeon, practice group or hospital to contribute to and access quality and outcomes data to a national registry
\textbf{N^2QOD}

\textit{Essential Features}

- Patient, hospital and provider characteristics (risk adjustment)
- Cost/utilization data (efficiency)
- Complications (safety)
- Patient Reported Outcomes (effectiveness, patient centered care)
- Longitudinal perspective (durability of results)
- Quality control and robust data collection systems (trust)
### The N²QOD Lumbar Spine Module: Variables

#### Enrollment Variables: Patient, Structural, Clinical, Surgical

<table>
<thead>
<tr>
<th>Patient Variables</th>
<th>Clinical Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Security Number</td>
<td>Dominant Symptom: Back Pain, Leg pain, Back equal to Leg Pain, Motor Deficit</td>
</tr>
<tr>
<td>MR#</td>
<td>DOB</td>
</tr>
<tr>
<td>Patient name</td>
<td>Date of surgery</td>
</tr>
<tr>
<td>Principal spine diagnosis (inclusion criteria)</td>
<td>Gender (M/F)</td>
</tr>
<tr>
<td></td>
<td>Patient address/ phone number</td>
</tr>
<tr>
<td>Race/Ethnicity (White, Black or African American, Asian, Hispanic or Latino, American Indian, Other)</td>
<td>Patient address/ phone number</td>
</tr>
<tr>
<td>Level of education</td>
<td>DOB</td>
</tr>
<tr>
<td></td>
<td>Duration of Symptoms (&lt;3mo, &gt;3mo, unknown)</td>
</tr>
<tr>
<td></td>
<td>Ability to ambulate (independent, assistive device, non-ambulatory)</td>
</tr>
<tr>
<td></td>
<td>DOB</td>
</tr>
<tr>
<td></td>
<td>Height (cm (or inches))</td>
</tr>
<tr>
<td></td>
<td>Weight (kg (or lbs))</td>
</tr>
<tr>
<td></td>
<td>Employment status</td>
</tr>
<tr>
<td></td>
<td>Activities status</td>
</tr>
<tr>
<td></td>
<td>Smoking status</td>
</tr>
<tr>
<td></td>
<td>DM</td>
</tr>
<tr>
<td></td>
<td>CAD</td>
</tr>
<tr>
<td></td>
<td>Depression and/or Anxiety Disorder</td>
</tr>
<tr>
<td></td>
<td>Osteoporosis (yes/no)</td>
</tr>
<tr>
<td>Condition caused by work related or motor vehicle injury (yes/no)</td>
<td>Surgical Variables</td>
</tr>
<tr>
<td>Insurance payer</td>
<td>Date of Surgery</td>
</tr>
<tr>
<td>Workers Compensation claim</td>
<td>Surgical approach- Posterior, Anterior alone</td>
</tr>
<tr>
<td>Liability of disability Insurance claim</td>
<td>Laminecotomy yes/no Levels (0,1,2,3)</td>
</tr>
<tr>
<td></td>
<td>Arthrodesis yes/no Levels (0,1,2,3)</td>
</tr>
<tr>
<td>Structural Variables*</td>
<td>Surgical approaches</td>
</tr>
<tr>
<td>Hospital, Practice, Surgeon</td>
<td>Posterior instrumentation (N, Y*, company/brand specifics name)</td>
</tr>
<tr>
<td>Urban, Suburban, Rural</td>
<td>Hospital, Practice, Surgeon</td>
</tr>
<tr>
<td>Private vs. Public Hospital</td>
<td>Interbody Graft (Yes/No), How placed</td>
</tr>
<tr>
<td>Annual Volume (Practice, Surgeon)</td>
<td>Estimated Blood loss</td>
</tr>
<tr>
<td>Neurosurgery Residency</td>
<td>Length of surgery (minutes)</td>
</tr>
<tr>
<td>U.S. Region, State</td>
<td>ASA Grade</td>
</tr>
</tbody>
</table>

#### Longitudinal Quality Data

<table>
<thead>
<tr>
<th>30-day Quality</th>
<th>3-month Quality</th>
<th>12-month Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of hospital stay</td>
<td>ODI (10 questions)*</td>
<td>ODI (10 questions)*</td>
</tr>
<tr>
<td>DC location</td>
<td>EQ-5D (5 questions)*</td>
<td>EQ-5D (5 questions)*</td>
</tr>
<tr>
<td>Readmission to Hospital</td>
<td>Back and Leg Pain Scale*</td>
<td>Back and Leg Pain Scale*</td>
</tr>
<tr>
<td>(yes/no)-reason in pull-down menu</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Return to OR (spine related)</td>
<td>NASS Patient Satisfaction Index (PSI)</td>
<td>NASS Patient Satisfaction Index (PSI)</td>
</tr>
<tr>
<td>(yes/no)-reason in pull-down menu</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surgical Site Infection</td>
<td>Work Status [No, Yes-part (mo), Yes-full (mo)] / Activities status*</td>
<td>Work Status [No, Yes-part (mo), Yes-full (mo)] / Activities status*</td>
</tr>
<tr>
<td>(yes/no) Treatment modality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DVT/PE (yes/no)</td>
<td>Revision Surgery – [No, Yes-same level, Yes-adj level]</td>
<td>Revision Surgery – [No, Yes- ]</td>
</tr>
<tr>
<td>UTI (yes/no)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MI/CVA (yes/no)</td>
<td>Re-admission to hospital within 3 months-(yes/no)-reason</td>
<td></td>
</tr>
<tr>
<td>Surgical Site hematoma (yes/no)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Neuro Deficit (yes/no)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mortality (yes/no), cause</td>
<td>*also recorded at enrollment</td>
<td></td>
</tr>
</tbody>
</table>
Lean/Sigma Method for Healthcare

• 1. Identify a high-priority clinical process (key process analysis)
• 2. Build an evidence-based best practice protocol
  (always imperfect: poor evidence, unreliable consensus)
• 3. Blend it into clinical workflow (don't rely on human memory; make
  • it the lowest energy state, default choice that happens automatically unless
    someone intervenes)
• 4. Embed data systems to track (1) protocol variations and (2) short and long term patient results (intermediate and final clinical, cost, and satisfaction outcomes)
• 5. Demand that clinicians vary based on patient need
• 6. Feed data back (variations, outcomes) in a learning loop - continuously update and improve the protocol (including gauge theory)

Source: James B. 2012
Science of Process Improvement
The End of an Illusion
A Chance to be Part of Something Bigger
Come in We’re QUALITY