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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

Continuum of Care

Nursing Homes

Rehabilitation Hospitals

Hospitals

Emergency Care Centers

Ambulatory Surgery Centers

Hospice & Palliative Care

Behavioral Health

Urgent Care Centers

Health Clinics

Primary Care Practices

Home Health

LiveWELL Carolinas

Specialty Care Practices

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

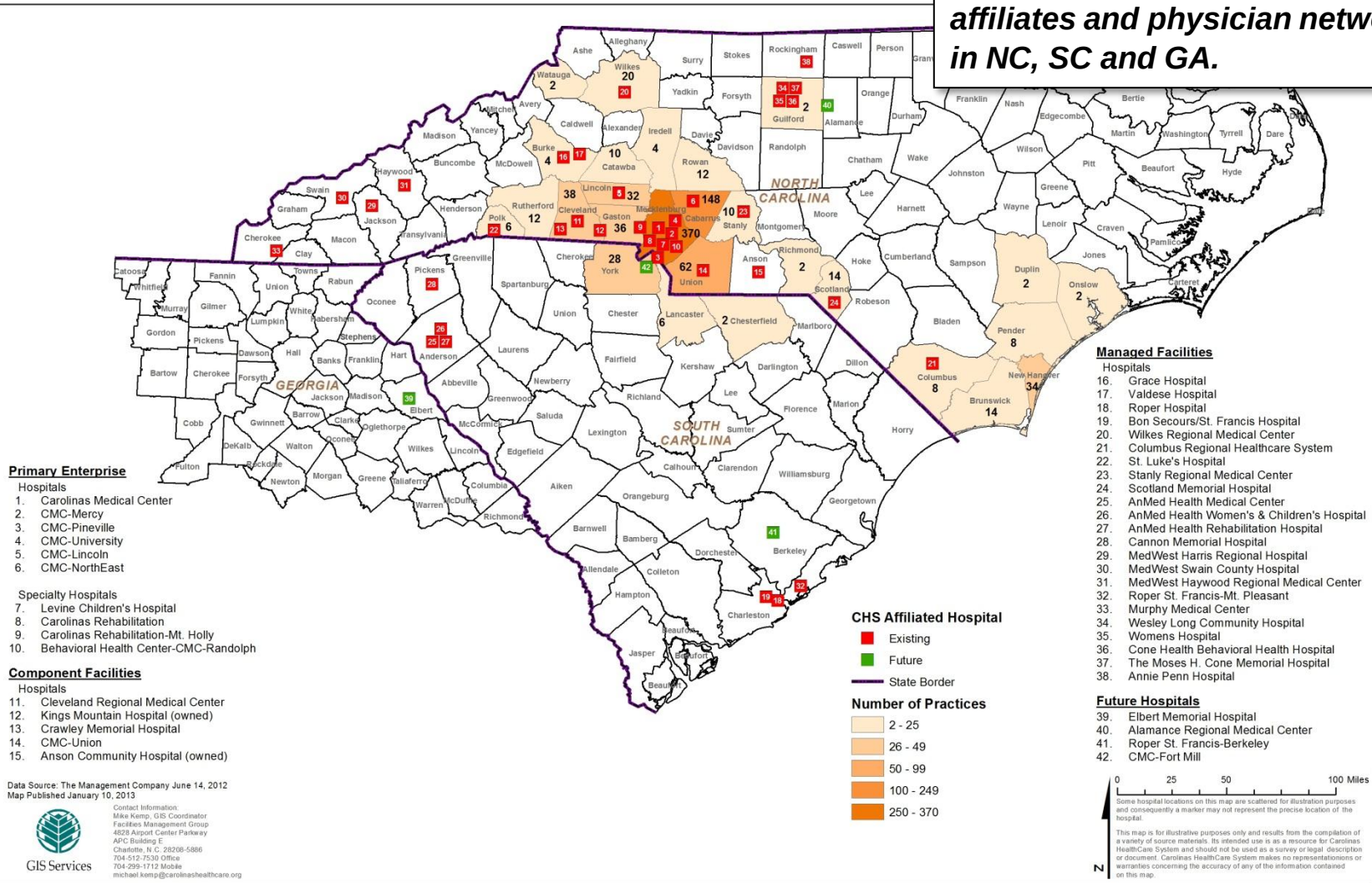
Key Statistics – 2012 Projected

- 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.



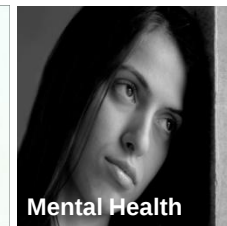
No Longer Business at Usual...

Fragmented patient care

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

Healthcare reform and the related imperative to cut costs

Emerging risk based payment models



Shifting economic landscape

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

Growing healthcare cost



Elements of Change

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

The Kaufman Hall Point of View, *Driving The Transition To Value-Based Care*, 2013



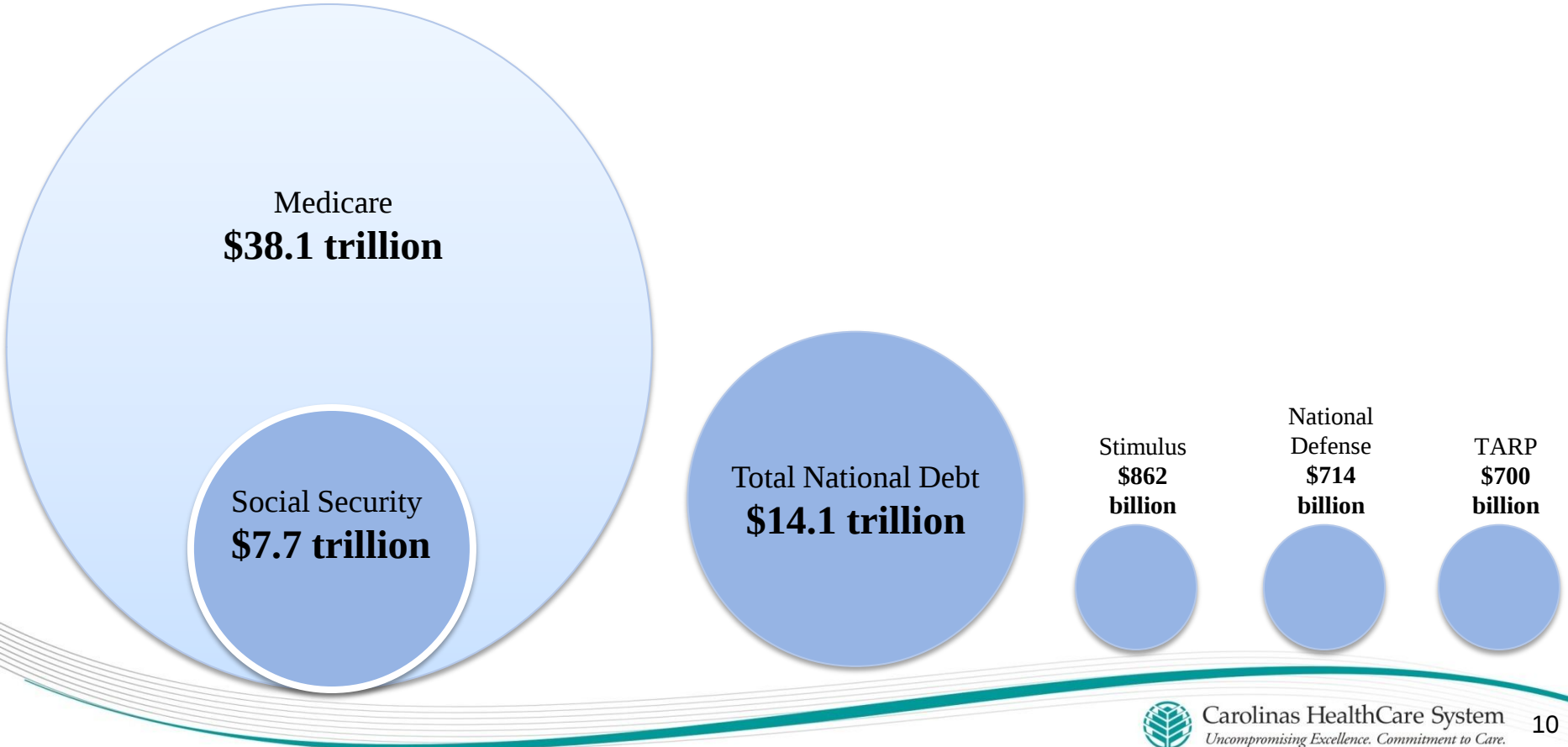
The Hundred Year Wave and the Roots of Reform

- 50 million people without Insurance
- Cost increases that are bankrupting the country
- Value that is being scrutinized

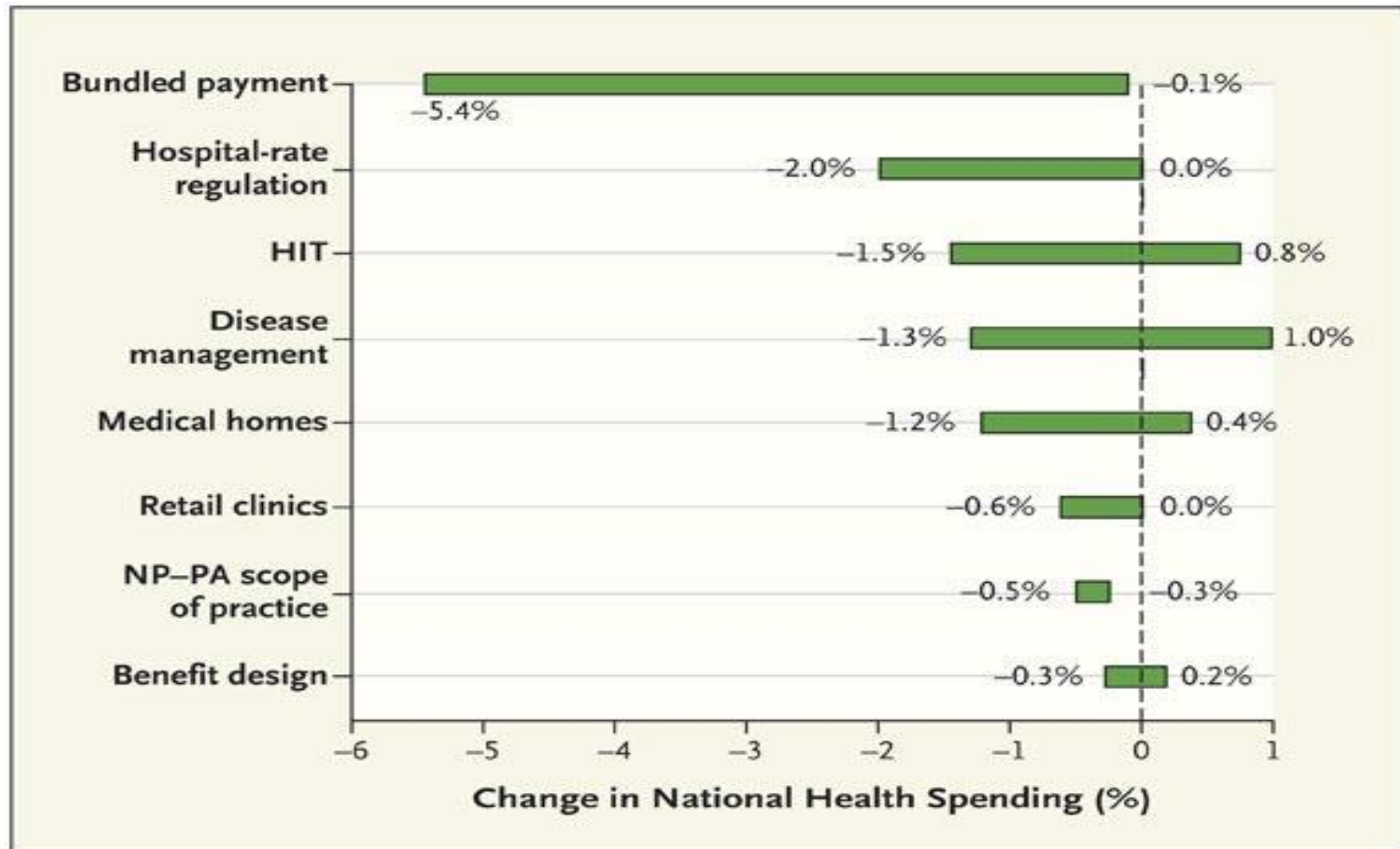


The Fiscal Gap (unfunded federal obligations – 2009)

- Unfunded obligations



Bundled Payments Offer Greatest Impact on Cost Trends

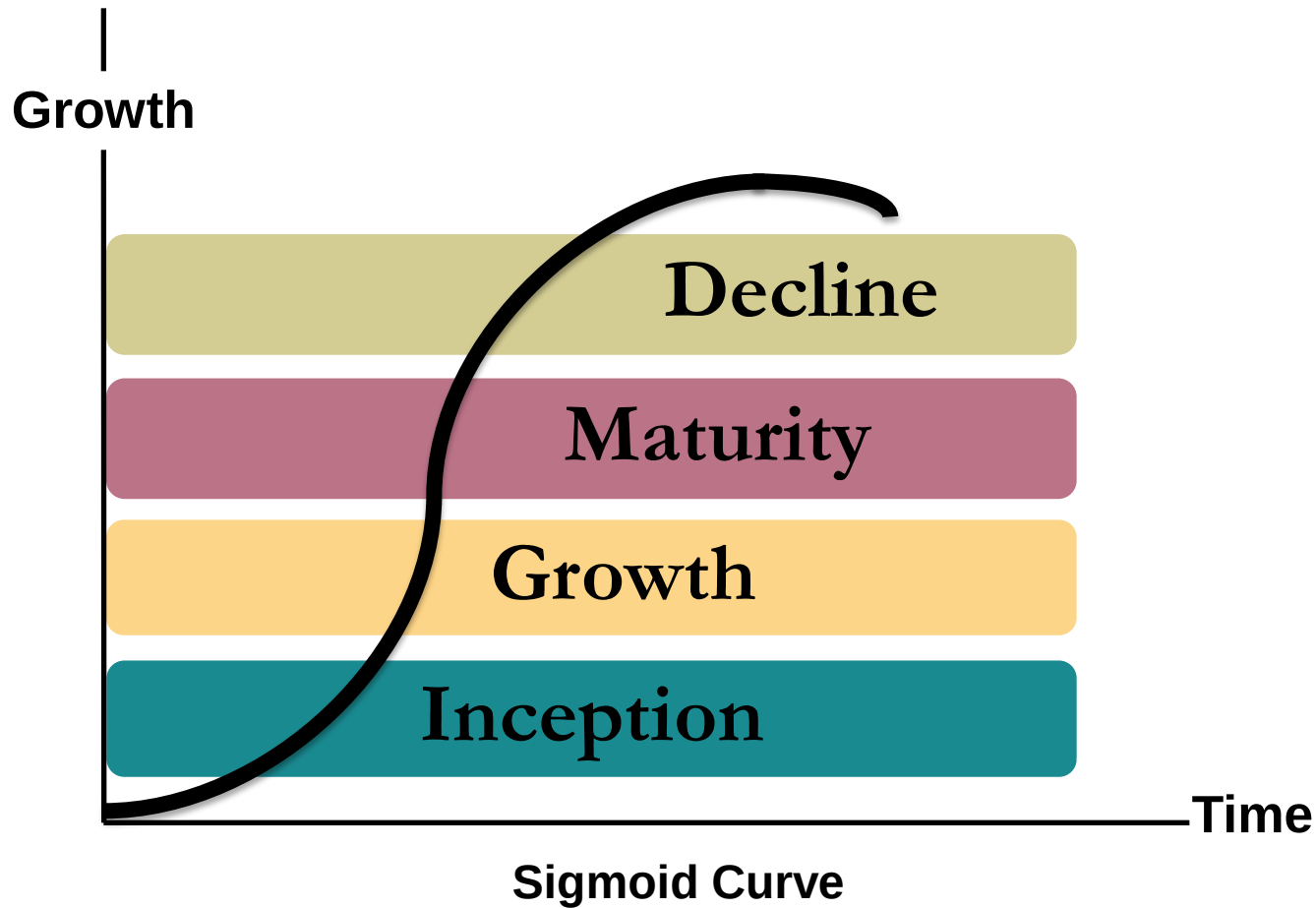


Estimated Cumulative Percentage Changes in National Health Care Expenditures, 2010 through 2019, Given Implementation of Possible Approaches to Spending Reform

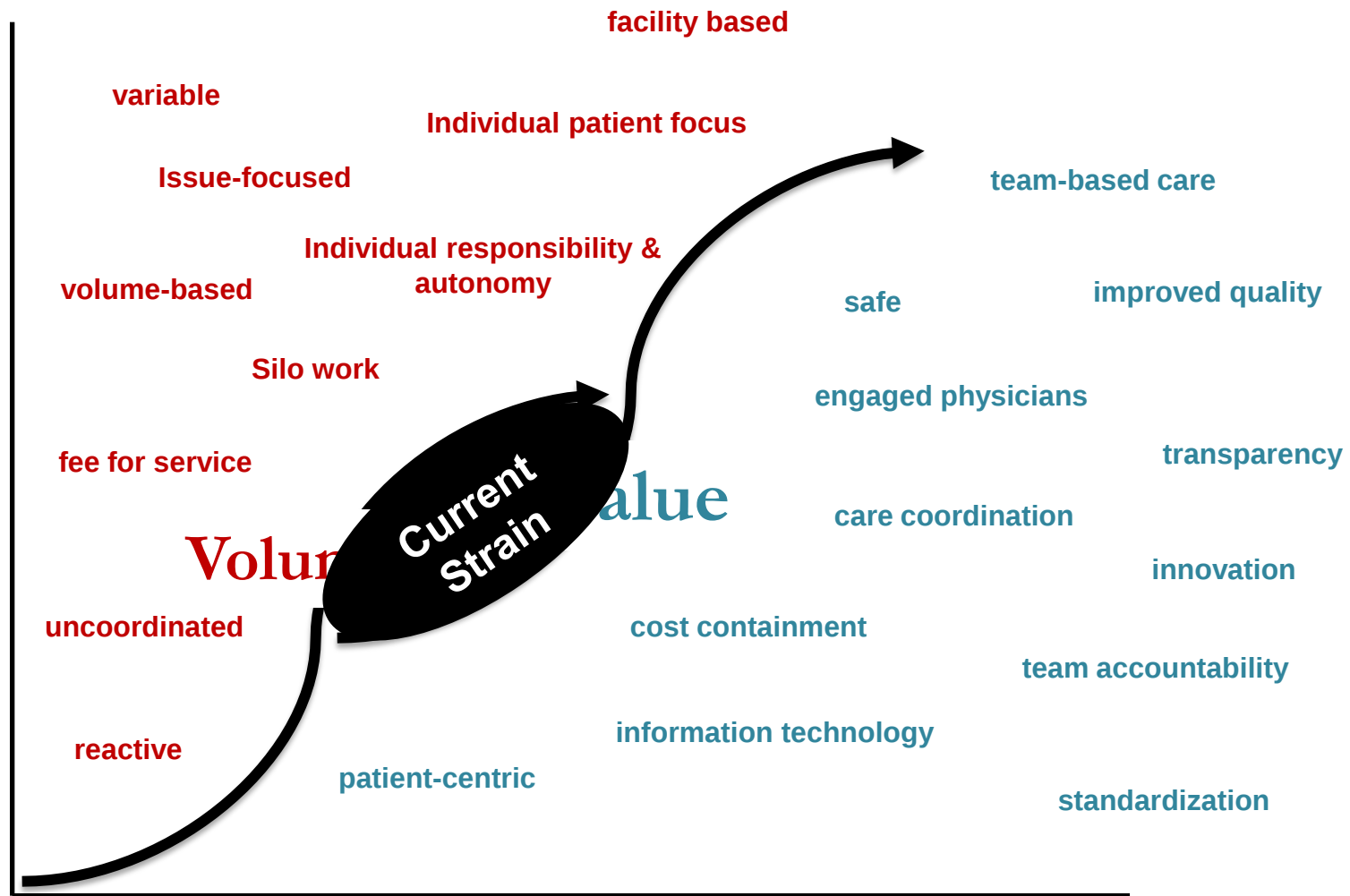
Hussey P et al. New England J Med 2009;361:2109-2111



Organizational/Business Life Cycle



Prospering in a Changing Environment



A Few Basic Questions Being Asked

What services exactly do you provide?

Are you any good?

How do you know?

Are you getting better?

<http://www.businessinsider.com/americas-health-care-system-is-bad-2013-4>



The Importance of Differentiable Quality Performance

THE WALL STREET JOURNAL.

U.S. EDITION Friday, September 21, 2012 As of 10:56 PM EDT

New System for Patients to Report Medical Mistakes

By ROBERT PEAR

Published: September 22, 2012

UNACCOUNTABLE



What Hospitals
Won't Tell You
and How
Transparency
Can Revolutionize
Health Care

MARTY
MAKARY, M.D.

Special Report: Medical record data breaches continue to rise / Page 25

Modern Healthcare

THE ONLY HEALTHCARE BUSINESS NEWS WEEKLY

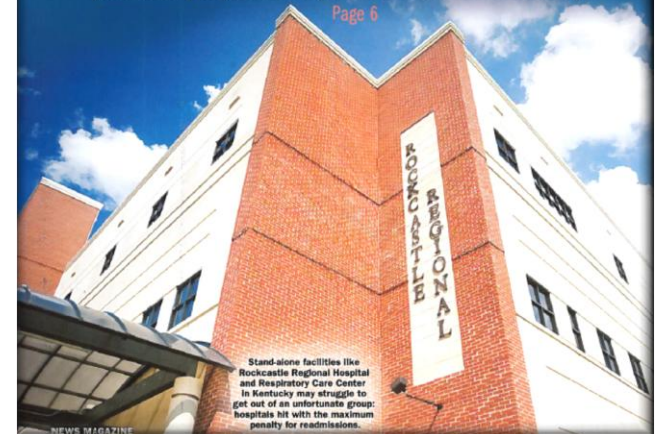
OCTOBER 1, 2012

\$5.5

PAINFUL PENALTIES

Vulnerable stand-alone hospitals could be hurt worst by the financial impact from the Hospital Readmissions Reduction Program

Page 6



Stand-alone facilities like
Rockcastle Regional Hospital
and Respiratory Care Center
in Kentucky may struggle to
get out of an unfortunate group:
hospitals hit with the maximum
penalty for readmissions.

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.



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Cost Disparity Across US

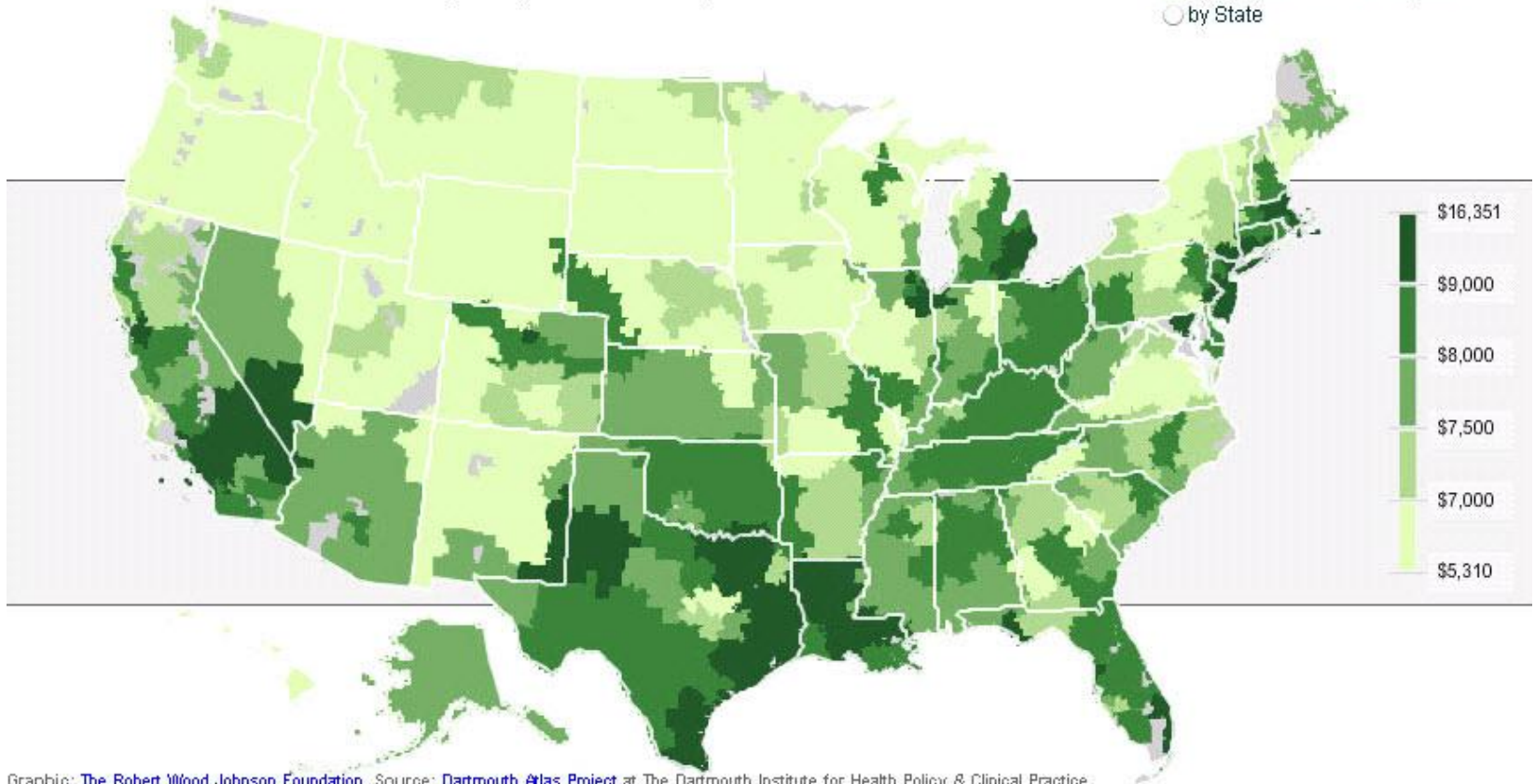
Quality Varies Similarly

Medicare Reimbursements Per Enrollee

2006 Medicare Reimbursements by Hospital Referral Region

Total Reimbursements (2006) ▾

- by Hospital Referral Region
- by State



Graphic: [The Robert Wood Johnson Foundation](#). Source: [Dartmouth Atlas Project](#) at The Dartmouth Institute for Health Policy & Clinical Practice.

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.**”

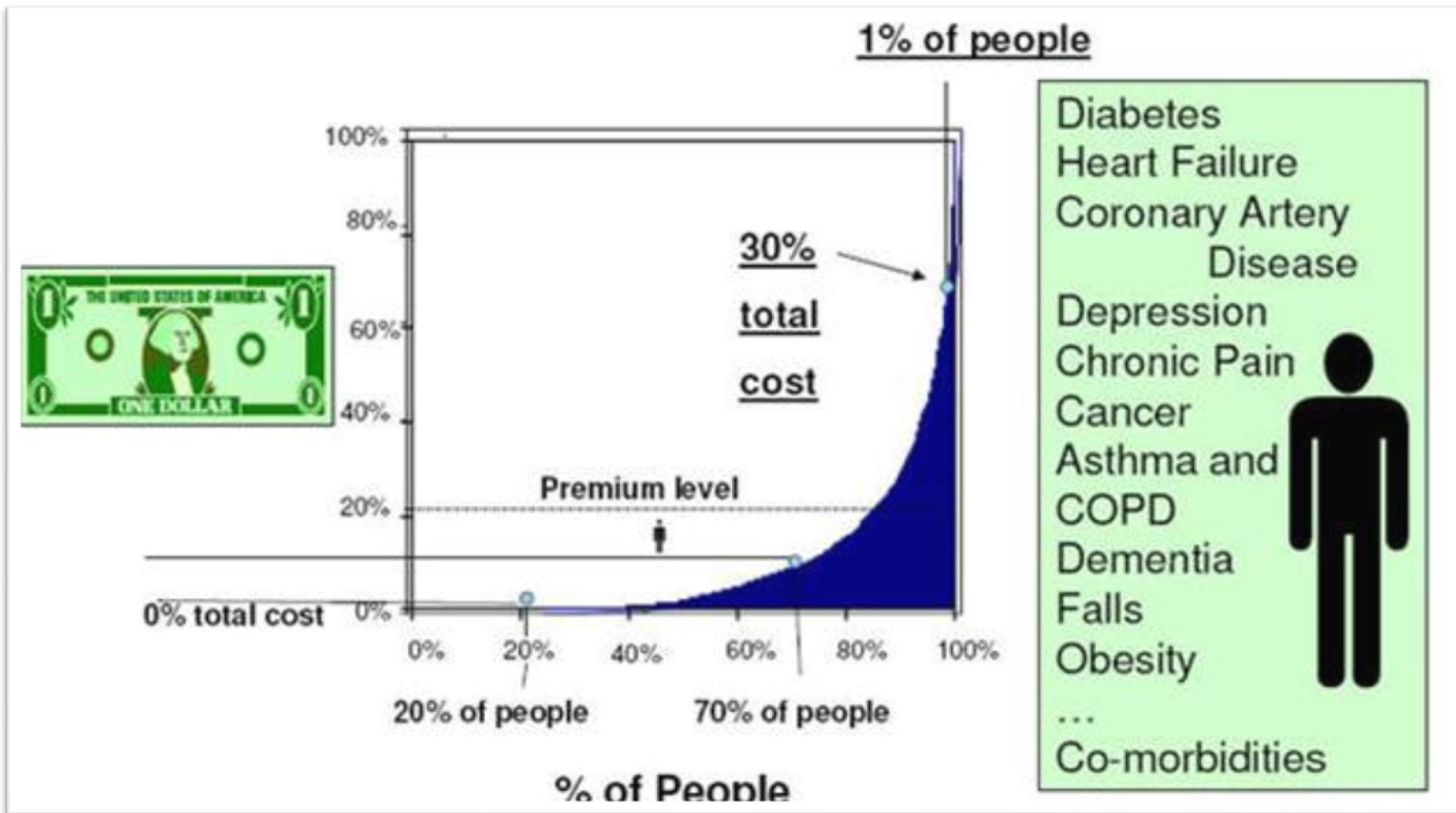
“Clinicians may be driven by financial incentives to perform more lucrative procedures. Many insurance companies now recommend a second opinion before spinal fusion.”



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

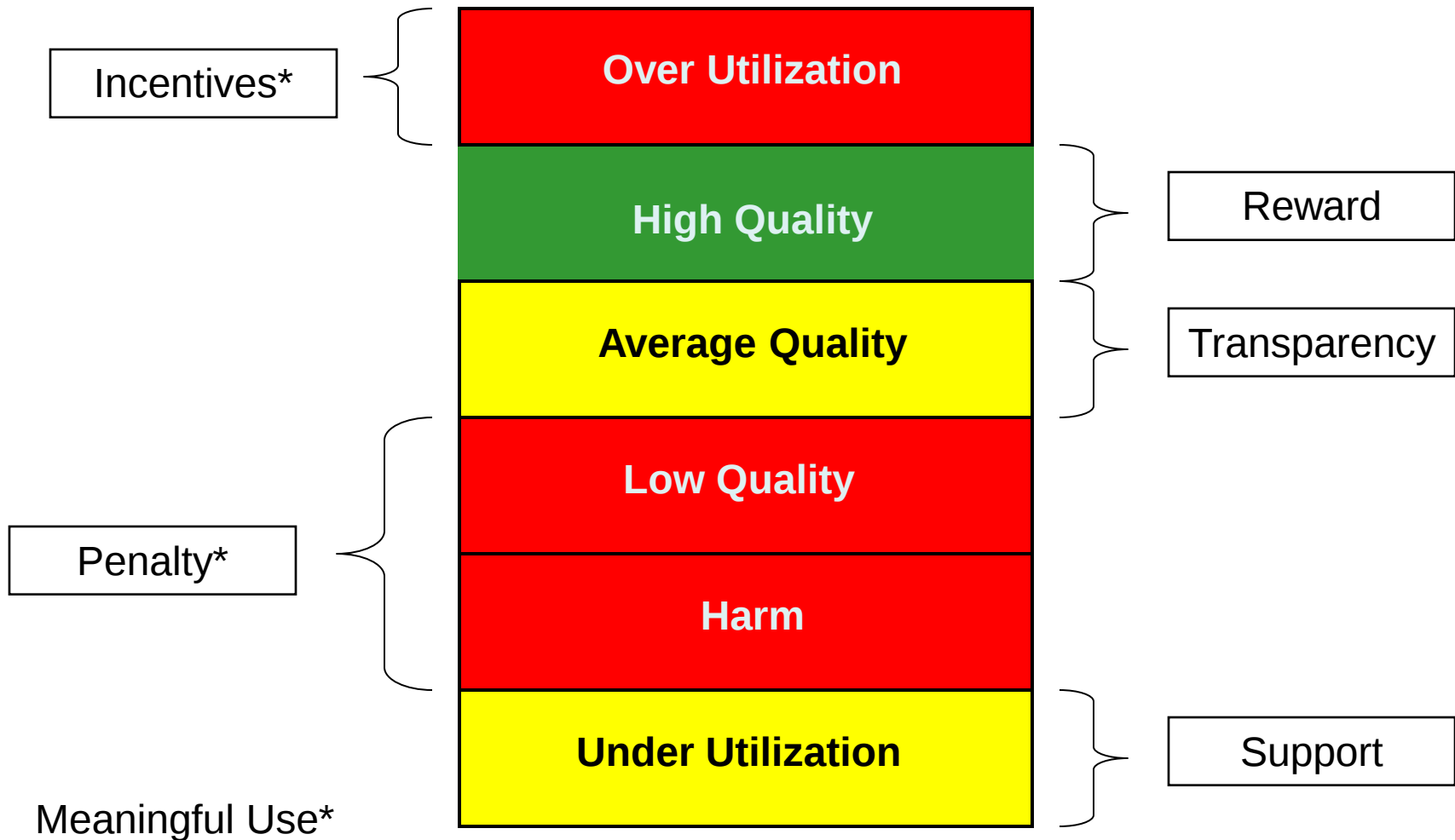


The Importance of Differentiable Quality Performance as a Key Strategy

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’



Reform Landscape Driving Quality Related Changes

	OCT 2011	OCT 2012	OCT 2013	OCT 2014	OCT 2015	OCT 2016	OCT 2017	OCT 2018	OCT 2019	OCT 2020
Value-Based Purchasing (VBP)		1.0%	1.25%	1.5%	1.75%	2.0%				
30-day readmissions		1.0%	2.0%	3.0%						
Hospital-acquired conditions				1.0%						
Market basket reductions	0.1%	0.1%	0.3%	0.2%		0.75%				
Multifactor Productivity Adjustment*	1.0%	0.7%	0.5%	0.5%	0.4%	0.5%		0.65%	0.9%	0.7%
Documentation and Coding Adjustment (DCA)**	4.9%	1.9%	2.1%	2.1%	2.1%	2.1%				
Across the board cuts to finance the debt ***		2.0%								
TOTAL IMPACT	6.0%	6.7%	8.1%	10.6%	10.5%	11.4%	9.3%	9.4%	8.9%	8.7%

% = % 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 affects 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



VBP Performance Periods

Fiscal Year	1st Performance Period	Domains	VBP Score Weight	Medicare Claims or Performance Based
FY 2013	July 2011 - March 2012	Patient Experience of Care (HCAHPS)	30%	Performance
FY 2013	July 2011 - March 2012	Clinical Process of Care	70%	Performance

Fiscal Year	2nd Performance Period	Domains	VBP Score Weight	Medicare Claims or Performance Based
FY 2014	April 2012 - December 2012	Patient Experience of Care (HCAHPS)	30%	Performance
FY 2014	April 2012 - December 2012	Clinical Process of Care	45%	Performance
FY 2014	July 2011 - June 2012	Outcome Measures (Mortality)	25%	Medicare Claims



3rd VBP Performance Period – for FY 2015

QUALITY 20%	
Baseline Period	Performance Period
January 1, 2011 – December 31, 2011	January 1, 2013 – December 31, 2013

HCAHPS 30%	
Baseline Period	Performance Period
January 1, 2011 – December 31, 2011	January 1, 2013 – December 31, 2013

OUTCOMES 30%		
	Baseline Period	Performance Period
Mortality	October 1, 2010 – June 30, 2011	October 1, 2012 – June 30, 2013
Complications/ Patient Safety	October 15, 2010 – June 30, 2011	October 15, 2012 – June 30, 2013
Central Line Associated Bloodstream Infections	January 1, 2011 – December 31, 2011	February 1, 2013 – December 31, 2013

NEW

**At Risk
1.5%**

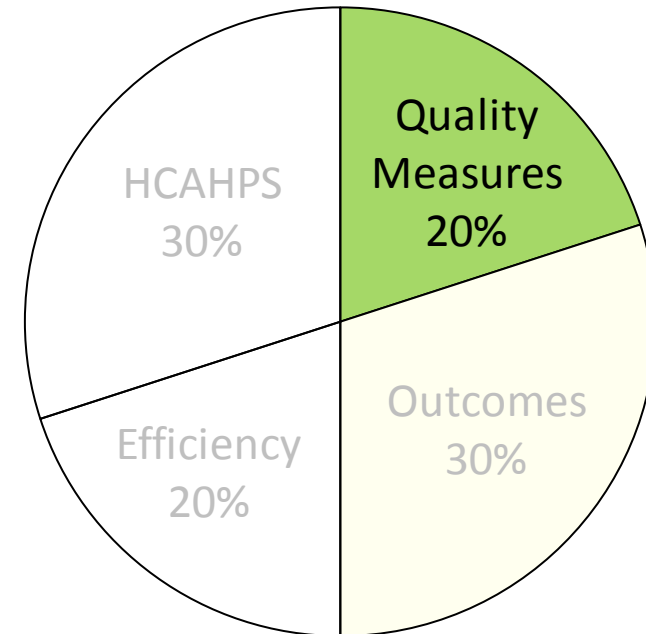
EFFICIENCY 20%	
Baseline Period	Performance Period
May 1, 2011 – December 31, 2011	May 1, 2013 – December 31, 2013



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

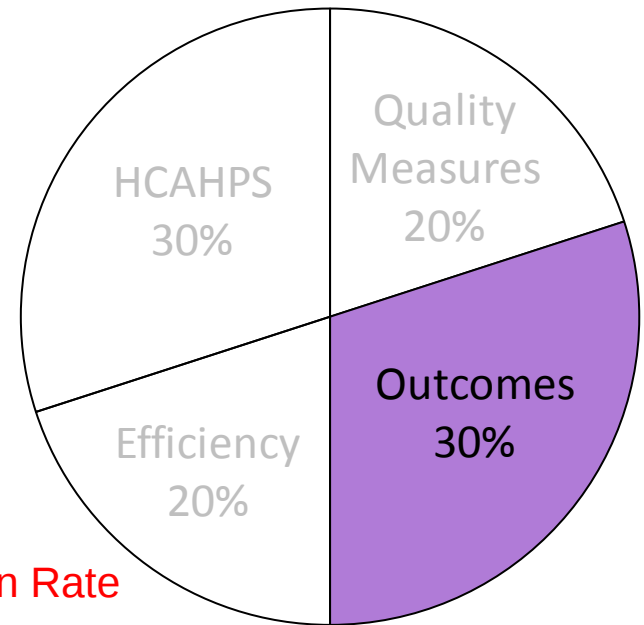
4. *Complications / Patient Safety ***

- 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*

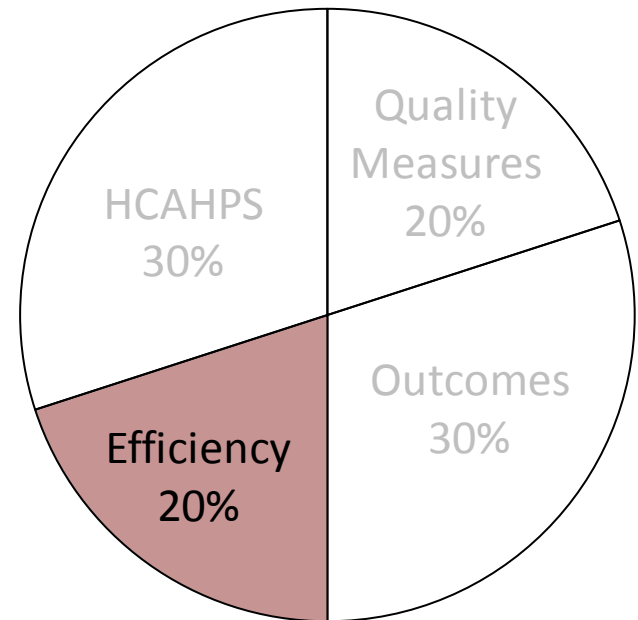


Efficiency Domain

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

Hospital Acquired Conditions

- 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
- 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”

“Post Operative Acute
Respiratory Insufficiency due
to prolonged anesthesia”

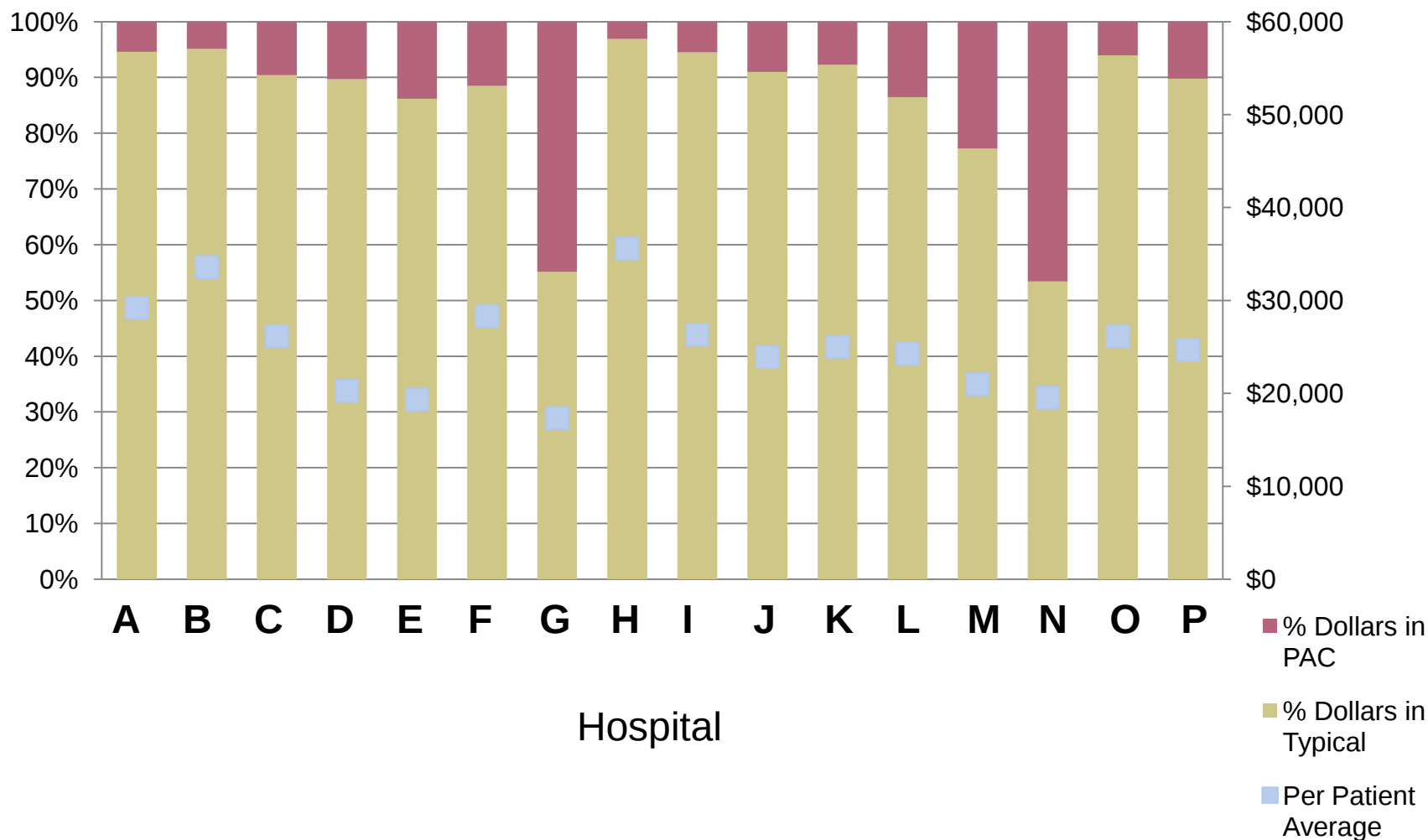
Flagged as a
Preventable Post
Operative Complication

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



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.

Medicare

Medicaid/CHIP

Medicare-Medicaid
Coordination

Insurance
Oversight

Innovation
Center

Regulations
and Guidance

Research, Statistics,
Data and Systems

Outreach and
Education

[Home](#) > [Medicare](#) > [Physician Compare Initiative](#) > Physician Compare Initiative

Physician Compare Initiative

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:

- o Physicians' and other healthcare professionals' names, addresses, phone numbers, specialties, clinical training, and genders
- o If physicians and other healthcare professionals speak languages other than English
- o The hospitals with which physicians and other healthcare professionals are affiliated
- o If physicians and other healthcare professionals are accepting new Medicare patients
- o If physicians and other healthcare professionals accept the Medicare-approved amount, billing no more than the Medicare deductible and coinsurance
- o 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.

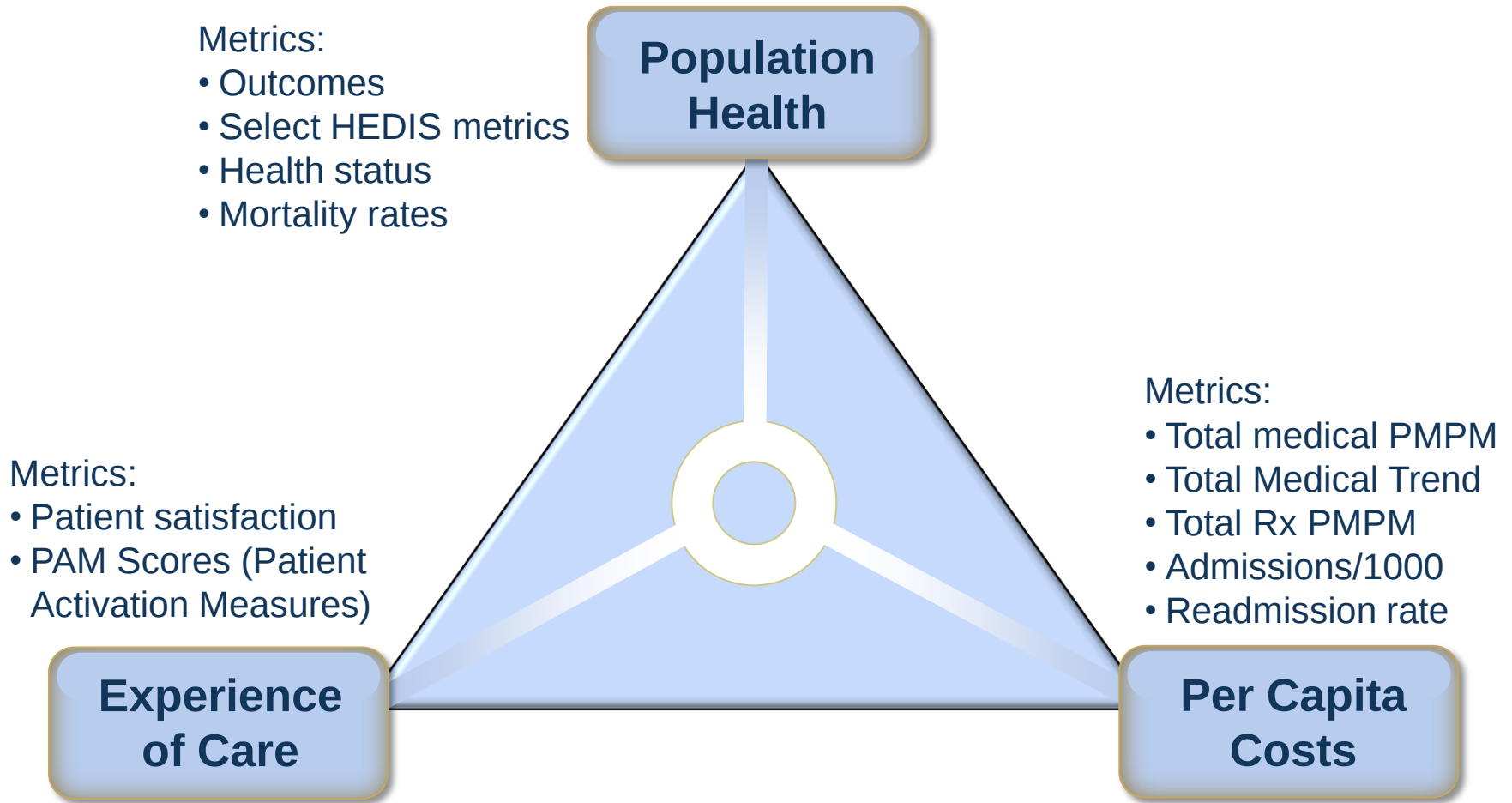


Moving beyond the prescribed agenda



What will be measured – shifting focus?

Improving triple aim™ population outcomes



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

Source: Premier



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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

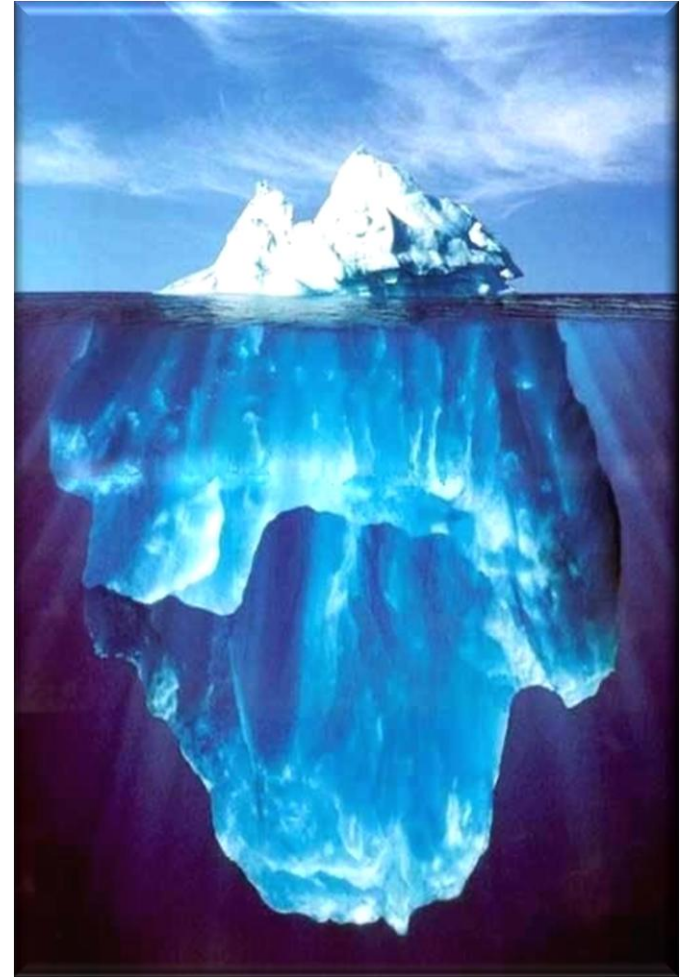


Providers that can develop innovative ways to meet demand, reduce cost and exceed quality requirements will prosper.



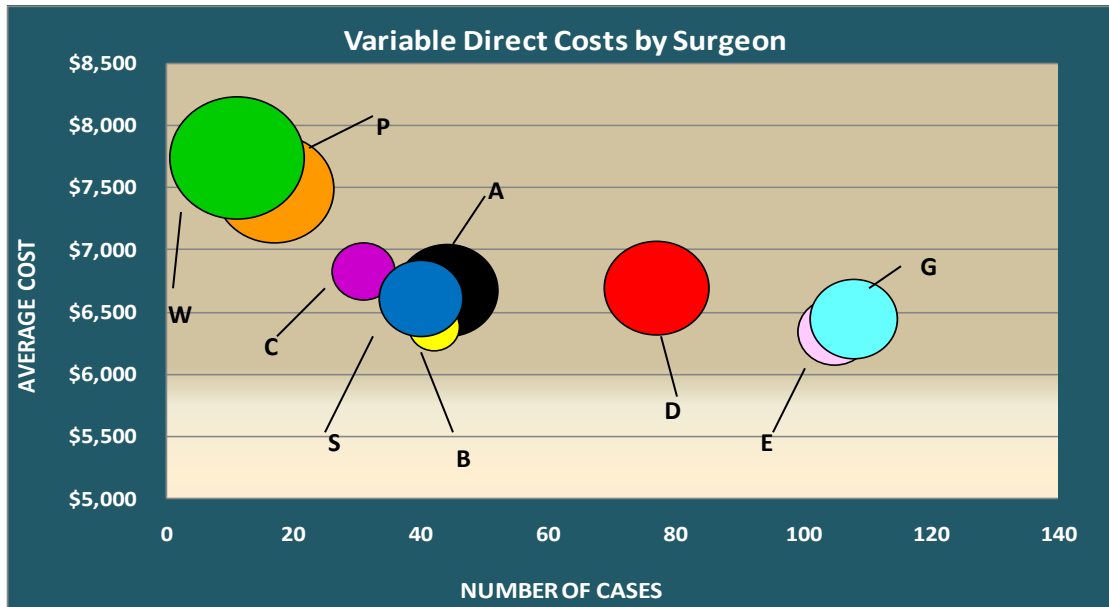
The Requirements – Dedicating Infrastructure, Tools, and Capabilities

- 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



Total Variable Direct Cost				
Surgeon	Number of Cases	Average Total Cost	Standard Deviation	Coefficient of Variation
A	44	\$ 6,670	589.54	8.838668
B	42	\$ 6,380	286.56	4.491458
C	31	\$ 6,822	374.65	5.491761
D	77	\$ 6,695	605.31	9.041865
E	105	\$ 6,343	402.79	6.350437
G	108	\$ 6,443	492.92	7.650942
P	17	\$ 7,487	770.22	10.287148
S	40	\$ 6,613	482.87	7.301662
W	11	\$ 7,743	900.97	11.636477
Group Average		\$ 6,584		

Hanley M. 2012



Or this?

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

Sutures	Variable Direct Cost Per Item	A	B	C	D	E	G	P	S	W
725005020 FIBERWIRE W 2 SUTURES	\$42.34			1						
725005501 SUTURE FIBERWIRE W TAPP\ERED NDL	\$28.28			2						11
725006774 SUTURE VICRYL PLUS CT 1 UNDYED 2	\$2.73			1				36		
725006787 SUTURE VICRYL ANTIBAC VIO BR 27CT	\$2.81	98			1	1		1		
725006791 SUTURE VICRYL CTD ANTIBAC 1 27 CT	\$2.81					214			1	22
725006805 SUTURE VICRYL ANTIBAC VIO BR 3-0	\$2.98					1				
725006851 SUTURE PDS II CT CLOSURE	\$3.41					108				
725006892 SUTURE VICRYL PLUS OS 6 UNDYED	\$4.26			1						
725006896 SUTURE VICRYL 1 OS 6 ORTHO	\$4.26								40	
725006897 SUTURE VICRYL UD BR 2 0 27 OS 6	\$4.26	49	1	13	31	222		3	4	22
725006899 SUTURE PDS II 1 OS 6 ORTHO	\$4.34								1	
725006900 SUTURE PDS II VIO MONO 2 27 CP	\$4.34		83							
725006910 SUTURE ETHILON BLK MONO 3-0 18 PS	\$5.11	1								
725006991 SUTURE MONOCRYL UD 4-0 27 PS 2	\$7.07		1		1	8	1		15	
725007011 SUTURE TICRON 1 ORTHO	\$9.12	2		58	5				1	
725007092 SUTURE #2 PDS 60	\$29.56						12			
725008497 SUTURE QUILL 36*26CM*36MM	\$35.01	16	41	32	80		115	3	40	
725008498 SUTURE QUILL 36*26CM*48MM	\$36.55	17		3	48		221		4	
725008499 SUTURE QUILL 36*30CM*36MM	\$33.48	5	43	28	30		1	18	38	
725008500 SUTURE QUILL 30*30CM*18MM	\$36.12		1						26	

Example: Sutures

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

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

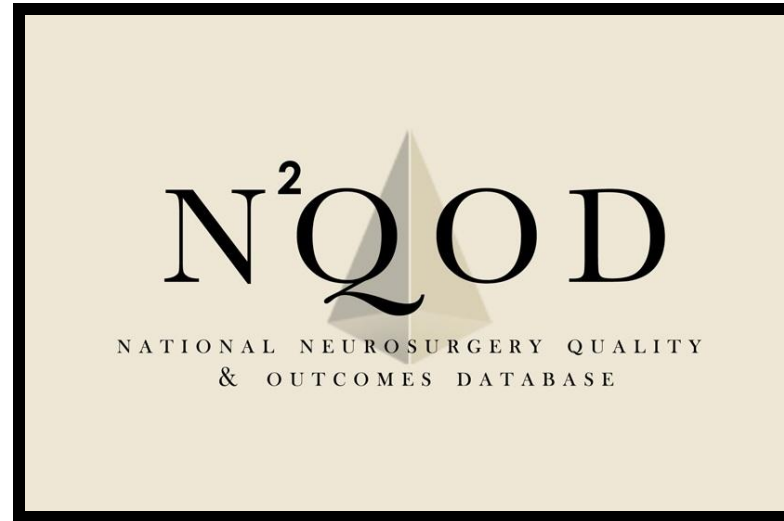


Technology to Support Priorities

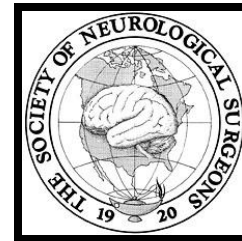
Accelerators for Rapid Value Creation:

Software	Description
Verisk	Allows capability to conduct population analysis, employer group analysis, practice pattern variation, episode analysis on claims data
Humedica	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.
Predixion	Removes reliance on technical analysts to accelerate predictive analytics capability. Point of care predictive analytics through workflow.





- Allow any surgeon, practice group or hospital to contribute to and access quality and outcomes data to a national registry



N²QOD

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

Patient Variables	Clinical Variables
Social Security Number MR# Patient name Principal spine diagnosis (inclusion criteria)	Dominant Symptom: Back Pain, Leg pain, Back equal to Leg Pain, Motor Deficit)
DOB Date of surgery Gender (M/F) Patient address/ phone number Race/Ethnicity (White, Black or African American, Asian, Hispanic or Latino, American Indian, Other) Level of education	Duration of Symptoms (<3mo, >3mo, unknown) Ability to ambulate (independent, assistive device, non-ambulatory)
Height (cm (or inches)) Weight (kg (or lbs))	Prior Surgery at same level and side (Yes/No, unknown)
Employment status Activities status	Disc Collapse (Yes/No) <i>*level of surgery only</i>
Smoking status DM CAD	Modic endplate changes (Yes/No) <i>*level of surgery only</i> Surgery within 12 mos. of Lumbar Procedure (y/n, type)
Depression and/or Anxiety Disorder Osteoporosis (yes/no)	Disc herniation (Yes/No) <i>*level of surgery only</i>
Condition caused by work related or motor vehicle injury (yes/no) Insurance payer Workers Compensation claim Liability of disability Insurance claim	<u>Surgical Variables</u> Date of Surgery Surgical approach- Posterior, Anterior alone Laminectomy yes/no Levels (0,1,2,3) Arthrodesis yes/no Levels (0,1,2,3)
<u>Structural Variables*</u>	Posterior instrumentation (N, Y-, company/brand specifics name)
Hospital, Practice, Surgeon Urban, Suburban, Rural	Interbody Graft (Yes/No), How placed
Private vs. Public Hospital	Estimated Blood loss
Annual Volume (Practice, Surgeon)	
Neurosurgery Residency	Length of surgery (minutes)
U.S. Region, State	ASA Grade
<i>*entered once</i>	

Longitudinal Quality Data

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



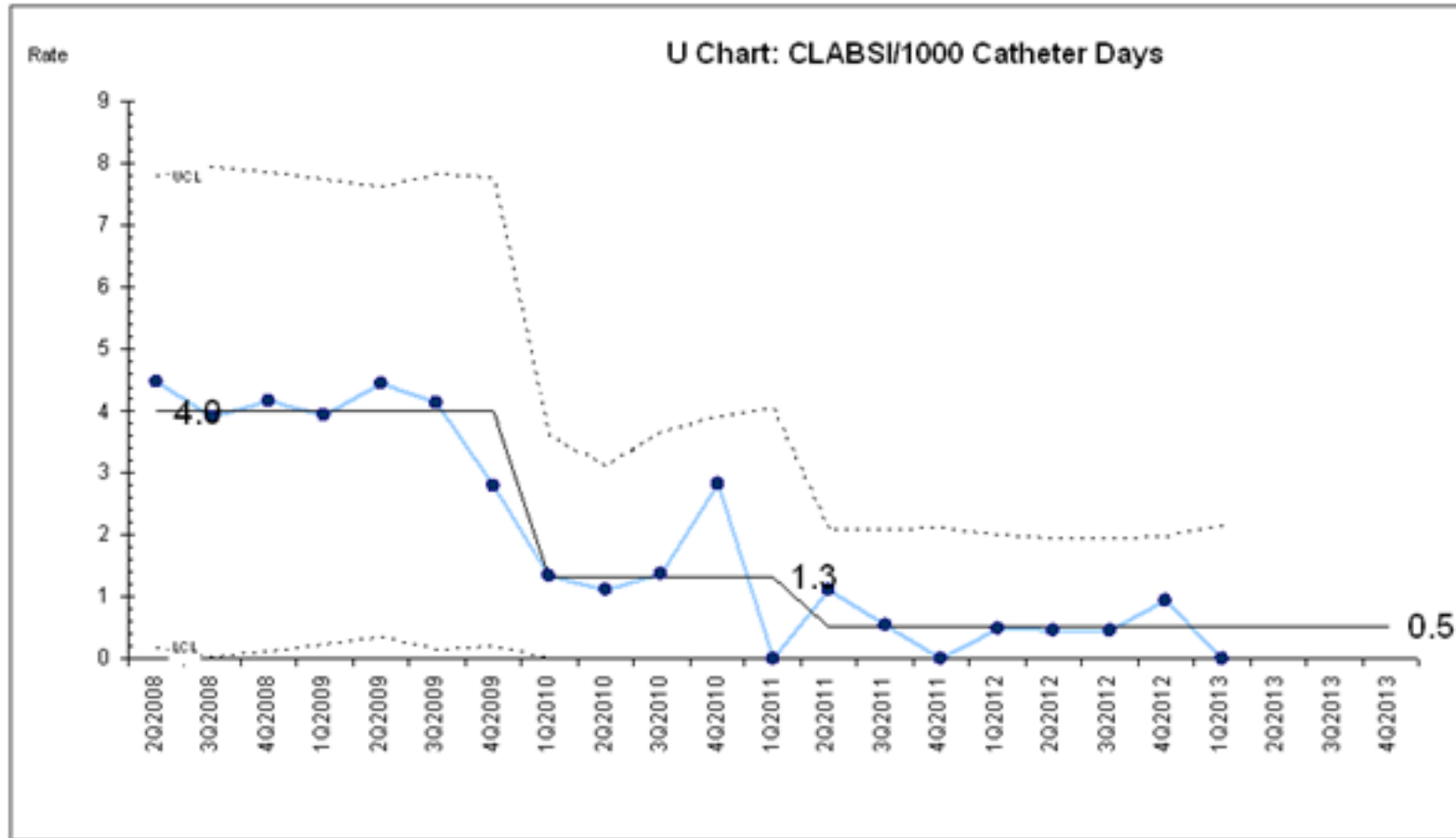
Lean/Sigma Method for Healthcare

- **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



Source: Premier



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