Cost and Value Considerations in Adult Deformity Surgery

The Role of Innovations and Bending the Cost Curve

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Disclosures

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• Ownership/Stock/Options:
  – Providence Medical, Simpirica

• Royalties:
  – Medtronic
Overview

- Sustainability Challenges in Deformity Surgery
  - Quality and Complications
  - Costs
- Bending the cost curve
  - Disruptive Technologies/Cost-saving interventions
  - Physician Leadership/Stewardship and Cost Awareness
- Payment reform as a disruptive innovation
  - Alternative Payment Models
  - Appropriate Use Criteria
  - Transition from Fee for Service to Value-based care
  - Improve quality and value through integrated care pathways

Healthcare Deficiencies
Cost of Healthcare

- 2009 US Healthcare budget = $2.5 trillion
  - 17.3% of GDP

What do we get for what we spend?
Rajaee SS, Bae HW, Kanim LE, Delamarter RB. 

You Get What you Pay For

In this world, you get what you pay for.

Kurt Vonnegut
Correlating Spending and Outcomes

• Patients in higher spending regions are:
  – Less likely to receive evidence-based treatments (effective care)
  – No more likely to receive elective major surgical procedures (preference-sensitive care)
    • Wennberg 2004

• Patients with selected serious conditions such as heart attacks over time found that survival was slightly worse in the higher spending regions
  • Fisher, 2003

The Quality Chasm

• IOM identified deficiencies of quality of care, and little financial reward for improvement of quality of care (2001)

• Alternative Payment Models:
  – Performance-based payments
  – Bundled Payments- Shared Risk
  – Accountable Care

• Intent is to provide a financial incentive for an evidence-based approach to care
Pay-for-Performance
Considerations in Application to the Management of Spinal Disorders
Sigurd Berven, MD, Amanda Smith, MA, Kevin Bozic, MD, and David S. Bradford, MD

• Pay for Performance Initiatives may provide a financial incentive for high quality care
  – Transition from Volume to Quality Metrics

• Challenge is to define parameters that best represent quality care and consensus practices

Measuring Quality is Challenging

• Choosing Appropriate Dashboards
• Setting appropriate standards
• Controlling for covariates
• Risk adjustment and stratification
Evidence for Quality of Care

- Process Variables
  - Antibiotic Dosing
  - DVT Prophylaxis
  - Documentation

- Utilization Variables
  - Rates of surgery
  - Rates of imaging

- Complications
  - Unscheduled return to OR
  - Revision within 180 days
  - Infection
Value Proposition

• The right goal of healthcare is to provide superior patient value
  – Porter and Teisberg, 2006

The value proposition in healthcare is an analysis of the benefits of care relative to the direct cost and risk of providing the care

Value = Fxn(Benefit/Cost)

Optimizing Value

Improve outcomes and quality of care

Decrease costs of care
Optimizing Value

Improve outcomes and decrease costs of care.

Ondra’s Two cardinal rules for the value equation:

1) The numerator can NEVER be decreased

2) The absolute value must increase

Bending the cost curve in Musculoskeletal Innovations

- Rapidly increasing spending is largely accounted for by the widespread adoption of new technologies that do not provide an incremental improvement in clinical outcomes.\textsuperscript{1,2}

- Geometric rate of rise in cost without corresponding benefit

![Graph showing rising costs from 2010 to 2035](chart.png)
Bending the cost curve in Musculoskeletal Care

- Rapidly increasing spending is largely accounted for by the widespread adoption of new technologies that do not provide an incremental improvement in clinical outcomes\textsuperscript{1,2}

\begin{figure}
\centering
\includegraphics[width=\textwidth]{cost_curve}
\caption{Current trend vs. Short-term cuts}
\end{figure}

- \textbf{5\% reduction across the board for reimbursement for healthcare}

\begin{figure}
\centering
\includegraphics[width=\textwidth]{SGR_Repeal}
\caption{SGR Repeal: Encouraging APM Participation}
\end{figure}
Bending the cost curve in Musculoskeletal Care

- Rapidly increasing spending is largely accounted for by the widespread adoption of new technologies that do not provide an incremental improvement in clinical outcomes\(^1,2\)

- A technology may add value if it improves outcomes or reduces costs

- A short-term investment in value-adding technologies and systems may bend the cost curve and reduce spending over time

Sustainable Deformity Surgery

- Bending the Cost Curve/Optimizing Value
  - Adopt Technology in response to ICER
  - Surgeon Awareness of Cost
    - Cost Minimization
  - Develop Appropriate Use Criteria
  - Establish Systems to Promote Good Outcomes
    - Multidisciplinary Conferences
  - Reduce Complications
  - Reduce Reoperations/Readmissions
  - Improve Durability
The Promise of New Technology

• Save Lives
• Improve Access to Information
• Increase Productivity
• Reduce Errors
• Improve Quality of Life

Moore’s Law - 2005

Source: Intel
Moore’s Law Applied to Medicine

- Every 2 years would result in a halving of:
  - Infant mortality
  - Implant failure
  - Readmissions
  - Reoperations
  - Complications

Technology in Healthcare

[Graph showing the cost of computing per million DNA bases from 1999 to 2010 on a logarithmic scale]
Technology in Healthcare

Drivers of Increased Healthcare Expenditure in the US

• 2004;351:1591–1593.

• Development of New Technologies that add cost without clear improvement outcome or performance

• Enthusiastic adoption of New Technologies
  – Pharmaceuticals
  – Surgical Techniques
  – Medical Devices
Value assessment of new technologies

Line of clinical equipoise: Determines what society is willing to pay for a change in health status

Cost/QALY = Incremental cost of gaining one Quality Adjusted Life Year

Clinical Study
Total hospital costs of surgical treatment for adult spinal deformity: an extended follow-up study

Ian M. McCarthy, PhD, Richard A. Hostin, MD, Christopher P. Ames, MD, Han J. Kim, MD, Justin S. Smith, MD, PhD, Omenaba Boachie-Adjei, MD, Frank J. Schwab, MD, Eric O. Klineberg, MD, Christopher I. Shaffrey, MD, Munish C. Gupta, MD, David W. Polly, MD, and International Spine Study Group

- Avg hospital cost $120,394
- Primary surgery cost $103,143
- Readmission cost $67,262
- OR costs avg $70,154
Surgery for Adult Deformity is cost-effective at $140,000

- Assumptions
  - 10 year durability of surgery without revision
  - Maintenance of improvement in health status with surgery
  - Deterioration of health status with non-operative care

Does Treatment (Nonoperative and Operative) Improve the Two-Year Quality of Life in Patients With Adult Symptomatic Lumbar Scoliosis

A Prospective Multicenter Evidence-Based Medicine Study

Surgical group had improvement of 0.19 yrs c/w non-op
DRG: $54,000 for operative reimbursement
Non-op Care: $10,800
ICER (2 yrs) = $121,579
Improvement would need to be maintained 5 yrs to be cost effective
**Patient Population**

- N=109 patients
  - 36 upper thoracic, 63 lower thoracic
- 51% of fusions were circumferential (N=56)
  - 50 pts fused in same visit, 6 pts fused in 2 visits

<table>
<thead>
<tr>
<th>Table 1: Demographic Data</th>
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<tbody>
<tr>
<td>Age</td>
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<tr>
<td>Gender</td>
</tr>
<tr>
<td>BMI</td>
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<tr>
<td>BMI 18.5-25 (Healthy)</td>
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<tr>
<td>BMI 25-30 (Overweight)</td>
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<td>BMI 30+ (Obese)</td>
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<tr>
<td>Comorbidities</td>
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</tbody>
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**Financial Data: Summarized**

- Mean cost of all fusions was $78,899
  - Upper = $88,091
  - Lower = $74,366
- Mean cost of all circumferential fusions was $90,231
  - Upper = $96,658
  - Lower = $85,752
- Mean cost of posterior only fusions was $66,926
  - Upper = $72,935
  - Lower = $64,973
- 5 Fold variance in the overall cost of care
Financial Data

**Posterior (Upper)**
- Implants: $1820
- OR Services: $2876
- Room and Board: $7585
- Non-Implant Supply: $9665
- Blood: $9738
- Rx: $36451
- ICU: $4533

**Circumferential (Upper)**
- Implants: $5435
- OR Services: $3019
- Room and Board: $8736
- Non-Implant Supply: $13972
- Blood: $3019
- Rx: $14507
- ICU: $5435

Cost Contribution and Cost Variability

- There was greater than a 5 fold variation in the total cost of care
- Implants, on average, contributed to 47% of the total cost of a hospital admission
  - 5.9 fold variation between highest and lowest implant charges
- Drug costs were the most variable cost bucket, but smallest contributor
  - 20.35 fold variation, 3.2% avg. contribution
- Least variability was in room and board charges for circumferential fusions (1.74)
Clinical outcomes

- Revision surgery rate was 24% at 2 years
  For these pts:
  - Avg time until revision was 249 days
  - Avg # of revisions per patient 1.47

- Circumferential fusion was protective for revision surgery

- Reasons for revision surgery include
  - Hardware Failure (9)
  - Proximal Junctional Failure (5)
  - Pseudoarthrosis (4)
  - Infection (3)
  - Other (3)

Cost per QALY

[Graph showing the relationship between implant cost and improvement in EQ5D]
Cost per QALY

**Improvement in EQ5D per Implant Cost**

![Graph showing the relationship between implant cost and EQ5D improvement with equation and R² value: $y = 4E^{-0.06}x + 0.06$, $R^2 = 0.0327$.]

**Patient Reported Outcomes**

- 81% of patients had a positive change in health status after fusion surgery
  - Average improvement in EQ-5D was 0.21
- Lower thoracic fusion relieved pain more effectively than those with extended constructs
- Health status improved more consistently in shorter constructs
- No correlation between surgical approach and patient reported outcomes
Conclusions

- ASD is common and can cause significant disability and compromise in HRQoL
- At 1 year follow-up after multilevel spine surgery 81% of patients reported significant improvement in HRQoL
  - 65% reported improved back pain
  - 71% reported improved leg pain
- The average cost of surgery was $78,899
  - Circumferential surgery was more expensive than posterior surgery
- At 1 year, Avg Cost/QALY was $375,000
  - If the duration of improvement if 4+ years, multilevel surgery would be cost effective at <$93,750/QALY

Cost minimization in treatment of adult degenerative scoliosis

Omar M. Uddin, BA1, Raqueeb Haque, MD1, Patrick A. Sugrue, MD1, Yousef M. Ahmed, MD1, Tarek Y. El Ahmadieh, MD1, Joel M. Press, MD2, Tyler Koski, MD1, and Richard G. Fessler, MD, PhD3

Journal of Neurosurgery: Spine
Posted online on August 28, 2015.

- Total Charges Higher for Open Surgery Compared to MIS:
  - $269,807 MIS vs $391,889 Open
- Lower Length of Stay with MIS
  - 7 days MIS vs 14.9 days Open
- Less EBL with MIS
  - 470 ml MIS vs 2873 ml Open
Total Charges Higher for Open Surgery Compared to MIS:
- $269,807 MIS vs $391,889 Open

Is Cost Minimization Really the Goal of Care?
Less EBL with MIS
- 470 ml MIS vs 2873 ml Open

Open Surgery had Better improvement of Sagittal Balance
- SVAMIS = 63.47 mm vs preoperative SVAOpen = 71.3 mm
- SVAMIS = 51.17 mm vs postoperative SVAOpen = 28.17 mm
  (p = 0.03).

Open Surgery had Better Clinical Outcomes
- MIS patients experienced less reduction after 1 year
  - $\Delta$VASMIS = -3.36, $\Delta$VASOpen = -4.73, p = 0.04
Reimbursement Reform

- Current fee for service healthcare economy has led to unsustainable increases in cost without a clear improvement in outcome or value of care
- Reimbursement reform will result in significant changes for all stakeholders in the healthcare economy

Fee For Service Medicine

- Reimbursement based upon volume
- Dissociation between reimbursement and outcome of care
- Impact on total Cost of Care
Focus on the Full Continuum of Care Rather than the Episode of Care

- Outpatient Wellness
  - Preventative Health
  - Pharmacologics
- Emergency Visits
- Hospital Care
  - Limit cost of acute care
- Transitional Care Facilities
  - Limit Readmissions
- Home Care

Episode Payments Provide Incentives to Create a System of CARE

“Expect to take on more financial risk and to be held accountable, clinically and economically, for what happens across the continuum of care—whether we ‘own’ the continuum or not.”

—Michael Sachs, Chairman and CEO, Sg2

CARE = Clinical Alignment and Resource Effectiveness; IP = inpatient; SNF = skilled nursing facility; OP = outpatient.
Conclusions

• Demonstrating value in spine care will be necessary to preserve coverage, funding levels, and access to care in a healthcare economy with limited resources.

• Fee for Service Payment Model is associated with increased cost without correlating improvement in quality/outcomes.

• Traditional Quality measures alone have limited utility in measuring value of care.
  – May provide disincentives for appropriate care.

• Payment Reform will is directed toward changing volume-based incentives to value-based incentives.

• Payment reform will extend accountability for outcomes of an episode of care to include pre-operative, intraoperative and post-operative management decisions.