Measuring and Modifying Profitability in Orthopaedic Trauma 
(and all of the rest of the hospital too)

Andrew N. Pollak, MD  
The James Lawrence Kernan Professor and Chair  
Department of Orthopaedics  
University of Maryland  
Chief of Orthopaedics  
University of Maryland Medical System

Potential Conflicts

• Royalties – Zimmer  
• Research Funding – Smith-Nephew

University of Maryland Medical System
Total Operating Revenue $3.2B
Why in the world do I need to know this

- You will eventually work for a hospital
  - Direct employment
  - Contracted service provider
  - Consultant
- Unprofitable activities are not sustainable independently
- Your ability to improve your service line’s profitability can impact your negotiating position
- Knowledge is power!

Definitions

- Profit
- Margin
Revenue

- How much does someone pay me for this
  - Net revenue

(Expense)

- How much does it cost me to do this procedure

Understanding Revenue

Charges = Gross Revenue

- NET REVENUE
- Contractual Discounts
- Refunds
- Bad Debts

Direct Variable Expenses

- Food
- Surgical Implants
- Medications

DVE
Direct Fixed Expenses

DFE – Easy to directly attribute

Indirect Fixed Expenses

IFE – Hard to directly attribute or proportion

Physician Services Contract?

- Salary?
- Paid per RVU?
- Paid per Case?
- Paid on call?
DIRECT MARGIN (CONTRIBUTION MARGIN)

Net Revenue - DVE - DFE = Direct Margin

TOTAL MARGIN

Direct Margin - IFE = Total Margin

Fiscal Environment - Profitability

Cost per Case

Revenue per Case
**Total Joint Network Data Transparency**

**Time Period:** FY2014

*Estimated cost based on 70% of charges equal costs and 30% of costs are variable.*

### Total Joint Network PAU – Readmission/Revisit Reduction

<table>
<thead>
<tr>
<th>Facility</th>
<th>PAU Revisit Charge</th>
<th>PAU Charges</th>
<th>Estimated Variable Cost</th>
<th>10% Reduction Savings</th>
<th>20% Reduction Savings</th>
<th>30% Reduction Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital A</td>
<td>$223,260</td>
<td>$29,584</td>
<td>$12,578</td>
<td>$25,516</td>
<td>$37,475</td>
<td></td>
</tr>
<tr>
<td>Hospital B</td>
<td>$249,311</td>
<td>$79,674</td>
<td>$5,983</td>
<td>$11,966</td>
<td>$17,950</td>
<td></td>
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<tr>
<td>Hospital C</td>
<td>$46,166</td>
<td>$3,879</td>
<td>$3,387</td>
<td>$6,775</td>
<td>$10,163</td>
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<tr>
<td>Hospital D</td>
<td>$38,408</td>
<td>$11,257</td>
<td>$3,387</td>
<td>$6,775</td>
<td>$10,163</td>
<td></td>
</tr>
<tr>
<td>Hospital E</td>
<td>$39,301</td>
<td>$12,272</td>
<td>$3,387</td>
<td>$6,775</td>
<td>$10,163</td>
<td></td>
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<tr>
<td>Hospital F</td>
<td>$51,344,192</td>
<td>$320,206</td>
<td>$32,020</td>
<td>$64,041</td>
<td>$96,061</td>
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<tr>
<td>Hospital G</td>
<td>$5,908</td>
<td>$1,415</td>
<td>$1,415</td>
<td>$2,830</td>
<td>$4,241</td>
<td></td>
</tr>
<tr>
<td>System</td>
<td>$3,243,545</td>
<td>$779,459</td>
<td>$155,690</td>
<td>$233,535</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- **ALOS by Day:**
  - THA: 0.19 Days = $255k annualized
  - TKA: 0.49 Days = $283k annualized
- **PAU – Readmission/Revisit Reduction:**
  - Estimated cost based on 70% of charges equal costs and 30% of costs are variable.
Total Joint Network
Length of Stay Initiatives

Potential Variable Cost Savings Realized by Reaching System Best Practice of Average Length of Stay (ALOS) of 1.78 Days

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Total Joint Volume</th>
<th>Variable Cost Per Day (est)</th>
<th>ALOS</th>
<th>Best Practice Target</th>
<th>Reduce Days to 25% of Target</th>
<th>Reduce Days to 50% of Target</th>
<th>Reduce Days to 75% of Target</th>
<th>Reduce Days to 100% of Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>464</td>
<td>$2.39</td>
<td>1.78</td>
<td>1.78</td>
<td>$44,608</td>
<td>$66,904</td>
<td>$89,200</td>
<td>$111,500</td>
</tr>
<tr>
<td>B</td>
<td>153</td>
<td>$3.25</td>
<td>1.78</td>
<td>1.78</td>
<td>$33,438</td>
<td>$50,157</td>
<td>$66,875</td>
<td>$84,157</td>
</tr>
<tr>
<td>C</td>
<td>491</td>
<td>$2.69</td>
<td>1.78</td>
<td>1.78</td>
<td>$66,198</td>
<td>$99,297</td>
<td>$132,396</td>
<td>$165,492</td>
</tr>
<tr>
<td>D</td>
<td>1,436</td>
<td>$1.78</td>
<td>1.78</td>
<td>1.78</td>
<td>$42,079</td>
<td>$63,029</td>
<td>$84,980</td>
<td>$106,931</td>
</tr>
<tr>
<td>E</td>
<td>425</td>
<td>$2.45</td>
<td>1.78</td>
<td>1.78</td>
<td>$42,447</td>
<td>$63,647</td>
<td>$84,847</td>
<td>$106,047</td>
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<tr>
<td>F</td>
<td>87</td>
<td>$3.10</td>
<td>1.78</td>
<td>1.78</td>
<td>$17,135</td>
<td>$25,703</td>
<td>$34,271</td>
<td>$42,839</td>
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<tr>
<td>G</td>
<td>84</td>
<td>$2.86</td>
<td>1.78</td>
<td>1.78</td>
<td>$13,498</td>
<td>$20,247</td>
<td>$26,996</td>
<td>$33,744</td>
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<tr>
<td>System</td>
<td>3,467</td>
<td>$2.28</td>
<td>1.78</td>
<td>1.78</td>
<td>$255,056</td>
<td>$384,083</td>
<td>$513,108</td>
<td>$642,134</td>
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</table>

Potential Variable Cost Savings Realized by Reaching System Best Practice of Average Length of Stay (ALOS) of 1.78 Days

UMMS Consolidated Income Statement

<table>
<thead>
<tr>
<th>(Millions $)</th>
<th>Fiscal Year 2016 Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Patient Service Revenue</td>
<td>$3,313.7</td>
</tr>
<tr>
<td>Other Operating Revenue</td>
<td>324.8</td>
</tr>
<tr>
<td>Total Operating Revenue</td>
<td>3,638.2</td>
</tr>
<tr>
<td>Less: Operating Expenses</td>
<td></td>
</tr>
<tr>
<td>Salaries and Fringes</td>
<td>1,732.7</td>
</tr>
<tr>
<td>Non-Salary Expenses</td>
<td>1,597.2</td>
</tr>
<tr>
<td>Depreciation and Interest</td>
<td>275.6</td>
</tr>
<tr>
<td>Total Operating Expenses</td>
<td>3,606.5</td>
</tr>
<tr>
<td>Net Operating Income/(Loss)</td>
<td>$91.7</td>
</tr>
<tr>
<td>OPERATING MARGIN %</td>
<td>0.9%</td>
</tr>
</tbody>
</table>

Does Fracture Care Make Money for the Hospital? An Analysis of Hospital Revenues and Costs for Treatment of Common Fractures

Kleweno, Conor P. MD; O'Toole, Robert V. MD; Ballreich, Jeromie MHS; Pollak, Andrew N. MD

J Orthop Trauma. 2014 Dec 1. [Epub ahead of print]
Research Question
• What is the profitability to the hospital associated with the most common orthopaedic trauma conditions?

Background
• Maryland Health Services Cost Review Commission
  – Independent agency setting hospital rates for all pts, including Medicare beneficiaries, at state’s acute-care hospitals

  Example of regulated reimbursement across payers
  – Rates take into account: hospital’s wages, charity care and severity of patient illnesses
  – CXR: St. Joseph’s $81 vs. Hopkins $155

• Requires Medicare subsidy but eliminates cost-shifting except from uninsured to insured

• Eliminates importance of payer mix in the analysis

Hypothesis
• Significant variation in profitability exists among common orthopaedic trauma conditions treated at STC
Goal

- Determine the profitability to the hospital associated with the most common fractures

Methodology

- Query hospital financial records FY 2008-12
- Identify admissions: principle diagnoses related to orthopaedic trauma
  - Pelvis
  - Acetabulum
  - Hip
  - Femur
  - Tibia
  - Ankle

Methodology

- Inclusion:
  - Principle Discharge Diagnosis
  - Inpatient course only

- Exclusion:
  - Open injuries
  - Outpatient care/procedures
  - Re-admissions
### Results

<table>
<thead>
<tr>
<th>Structure</th>
<th>Net Revenue</th>
<th>Cost of Care</th>
<th>Margin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pelvis</td>
<td>58,982</td>
<td>37,215</td>
<td>21,767</td>
</tr>
<tr>
<td>Acetabulum</td>
<td>48,197</td>
<td>28,737</td>
<td>19,460</td>
</tr>
<tr>
<td>Hip</td>
<td>39,619</td>
<td>20,103</td>
<td>19,579</td>
</tr>
<tr>
<td>Femur</td>
<td>41,360</td>
<td>21,862</td>
<td>19,498</td>
</tr>
<tr>
<td>Tibia</td>
<td>33,470</td>
<td>16,145</td>
<td>17,325</td>
</tr>
<tr>
<td>Ankle</td>
<td>25,483</td>
<td>10,612</td>
<td>14,871</td>
</tr>
</tbody>
</table>

### Overall Direct Variable Expenses

- **Therapy**: 4%
- **Other**: 8%
- **Length of Stay**: 29%
- **O.R.**: 18%
- **Supplies**: 25%
- **Radiology**: 5%
- **Lab**: 4%
- **Pharmacy**: 7%
- **Other**: 8%

### Results

<table>
<thead>
<tr>
<th>Structure</th>
<th>Mean DVE*</th>
<th>Length of Stay (% DVE)</th>
<th>Supplies (% DVE)</th>
<th>O.R. (% DVE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pelvis</td>
<td>27,000</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Mean DVE*</td>
<td>Length of Stay</td>
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<td>O.R.</td>
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<td>--------</td>
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<tr>
<td>Pelvis</td>
<td>27,000</td>
<td>8,600 (34%)</td>
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<td>5,200 (20%)</td>
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*Direct Variable Expense*
### Results

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<tr>
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<td>3,800 (14%)</td>
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<tr>
<td>Acetabulum</td>
<td>20,000</td>
<td>5,900 (30%)</td>
<td>4,000 (20%)</td>
<td>3,700 (19%)</td>
</tr>
<tr>
<td>Hip</td>
<td>14,000</td>
<td>4,200 (30%)</td>
<td>3,800 (27%)</td>
<td>2,400 (17%)</td>
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*Direct Variable Expense*
Results

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<td>4,600 (29%)</td>
<td>2,500 (16%)</td>
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<tr>
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<td>11,000</td>
<td>3,000 (26%)</td>
<td>3,900 (34%)</td>
<td>2,000 (17%)</td>
</tr>
</tbody>
</table>

Discussion

- Costs
  - Direct variable expenses

- Length of stay (29%)
- Supplies (25%)

Conclusions

- Orthopaedic trauma care was profitable to hospital in a state-regulated system
- Significant variation in profitability exists among common fractures
- Main cost drivers are length of stay and supplies
If supplies are such an important driver of profitability in orthopaedic trauma, orthopaedic surgeons are likely to be well versed in orthopaedic implant costs correct?

Surveys Find Few Orthopedic Surgeons Know The Costs Of The Devices They Implant

Background

- Surgeons face obstacles in acquiring cost knowledge:
  - Vendor-hospital contracts often include confidentiality clauses
  - The price of implants can vary widely by site
  - Surgeons are not incentivized to learn costs
    - Doesn’t affect patient care or reimbursement

- At this point, the degree to which surgeons know implant costs is unknown
  - One small study (37 residents / 13 attgs) with no consistently applied definition of actual cost

- Purpose: Assess the extent to which ortho attendings and residents can estimate the costs of common orthopaedic trauma implant constructs
Methods

• Surveyed ortho attgs & residents at 7 trauma centers
  – Duke, Harvard, Maryland, Mayo Clinic, UPenn, Stanford, WashU

• Asked to estimate price of 10 common trauma implant constructs, each identified with x-ray & component list
  – 4 standalone constructs: distal radius plate, tibial nail, ankle xfix, TSF
  – 6 paired constructs: one-third tubular vs distal fibular locking plate, non-locking vs locking large fragment plate, DHS vs CMN
  – Vendors chosen to reflect usage patterns at each site
  – Disposables excluded

Methods (cont)

- Actual cost of each implant construct determined at each site
  – Defined as contract price paid to vendor by institution

- Estimates within 20% of actual cost defined as correct
  – Eg for an implant with an actual cost of $2500, estimates between $2000 and $3000 were considered correct

- Logistic regression used to determine factors associated with implant cost knowledge
• Overall survey response rate: 96% (503/522)
• Overall percentage of implant costs estimated correctly: 19% (95% CI 18%-20%)

Results (cont)

• Attending cost knowledge
  – Implant costs were correctly estimated 20% of the time (95% CI 18%-22%)
    • 42% underestimates, 38% overestimates
  – Individual estimates ranged from 1.8% of actual price to 24.6 times actual price

• Factors associated with cost knowledge:
  – Trauma subspecialists demonstrated greater knowledge in univariate analysis (28% vs 19%, OR 1.7, p=0.007), but difference not significant when controlling for other variables (OR 1.3, p=0.23)
Conclusions

• In this multicenter study of 503 surgeons that captured 96% of potential respondents, most believed that cost should play an important role in the selection of orthopaedic trauma implants

• However, actual knowledge of implant costs was low
  – Attendings correctly estimated implant cost 20% of the time

• If surgeons are to manage resources by choosing lower cost implants when medically appropriate, knowledge of implant costs must be improved above current levels
  – However, this is challenging due to vendor confidentiality clauses and lack of incentives for surgeons
Bottom Line

• Understanding profitability in orthopaedic trauma is important
• Direct variable expenses are important drivers of profitability
• Implant costs contribute to direct variable costs in an important way
• Surgeons know little about implant costs

Implant cost modification strategies

• Goals
  – Decrease cost
  – Retain access to valuable and novel technology
  – Retain surgeon choice
    • Recognizing associated interests
      – Not all of them need to be conflicts
    • Recognizing need to retain surgeons in a competitive environment
    • Recognizing need to prioritize patient interests

Cost drivers in variable supplies

• Implant developing and manufacturing costs
  – Fixed
• Marketing costs
  – Variable
• Sales cost
  – Variable
• Inventory costs
  – Variable
Implant cost modification strategies

• Decreasing implant price
  – Single or limited number of vendors
    • Best strategy from a cost containment perspective alone
      – Must achieve surgeon buy-in
        • Can be extremely difficult
    • Decreases vendor cost of service
      – Sales and marketing
      – Inventory

• Alternatives to single vendor strategies
  – Need to improve surgeon implant cost knowledge
  – Encourage surgeons to work with vendors to lower implant costs OR to select lower cost implants
  – Encourage vendors to aggressively price to grow market share
    • Growth must be linked to price

Utilization – Price Relationship

• Typically – NONE
**RED-YELLOW-GREEN**

**Procedure**
- Intramedullary Nails
  - Femoral Nail
  - Tibial Nail
- Hip Fracture
  - Trochanteric Nail
  - Short
  - Sub Trochanteric Nail
  - Long
- Plate & Screw Procedures
  - Distal Femur Plate
  - Proximal Tibia Plate
- External Fixation
  - Lower Extremity Ex Fix

**Preferred Vendor**
- Mid Range

**Patient Specific Requirements**
- Not Available

Choice of implant remains at surgeon discretion.

*This tool is intended to guide physician utilization in situations where multiple systems are clinically appropriate.*

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**FREE-YELLOW-GREEN**

- **Principles**
  - Post RYG chart in each operating room
  - Educate nurses to check on RYG option for each case
  - Record RYG compliance
  - *Publish RYG scores*
  - Align incentives

---

**RYG Report Card**

<table>
<thead>
<tr>
<th>Surgeon</th>
<th>Red (%)</th>
<th>Yellow (%)</th>
<th>Green (%)</th>
<th>Cumulative Score</th>
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</thead>
<tbody>
<tr>
<td>Surgeon A</td>
<td>10%</td>
<td>40%</td>
<td>50%</td>
<td>0</td>
</tr>
<tr>
<td>Surgeon B</td>
<td>25%</td>
<td>20%</td>
<td>55%</td>
<td>65</td>
</tr>
<tr>
<td>Surgeon C</td>
<td>0%</td>
<td>80%</td>
<td>20%</td>
<td>60</td>
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<tr>
<td>Surgeon D</td>
<td>40%</td>
<td>0%</td>
<td>60%</td>
<td>60</td>
</tr>
<tr>
<td>Surgeon E</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
<td>100</td>
</tr>
</tbody>
</table>
RED-YELLOW-GREEN

• Rebidding
  – Initial price points locked on upside for 2 years
  – Rebids allowed periodically (q 6 months) to adjust RYG chart
  – Rebids must be lower
  – Additional discounts must be across the board

• Results
  – Vendors hated it - initially
  – Rebidding requests came in almost immediately
  – Surgeon compliance anecdotally increasing
  – Surgeons become advocates for decreasing price
  • Don’t want to be seen as Red utilizers
  • Put pressure on vendors to respond
RED-YELLOW-GREEN

• Ideal Outcome
  – Leapfrog to find the price bottom
  – Limit number of vendors on shelf to surgeon choice in context of informed decision making
  – Aligned incentives ongoing

Summary

• Cost containment drives profitability/sustainability
• Variable costs are the most controllable
• Implants drive variable costs for many cases
• Implant cost control can be achieved with surgeon alignment