Enhancing Patient Care - A Surgical Journey in Supply Chain Cost, Quality and Outcome

Wendy Watson
UHN OR Supply Chain Manager
UHN at a Glance

Ten program areas spread across Four Hospitals and Eight sites:

- $2B Operating Budget
- Over 1,200 patient beds
- 24,000 Surgical Procedures
Clinical Specialty Supply Chain (CSSC) Transformation Project at UHN

- Funding to support the OR Supply Chain Technology Transformation (or “CSSC”) at TGH and TWH
- 2006 – 2009 business case, procurement process, site readiness

<table>
<thead>
<tr>
<th>Vision</th>
<th>To create an <strong>integrated supply chain technology enabled</strong> environment that <strong>enhances clinical workflow, patient safety and delivers data</strong> for decision making</th>
</tr>
</thead>
</table>
| Objectives | • Automate all inventory ordering and costing  
• Automate tracking of consignment implants  
• Integrate all systems – inventory, clinical, and purchasing (Pyxis, ORSOS, and SAP)  
• Automate case costing and data reporting |
CSSC Project Goals

Surgeon Cost Data & Savings
• Surgeons not aware of cost of surgical supplies
• Nurse charting by exception – time and accuracy issues
• Procedure card accuracy

Clinical Time Efficiency & Patient Safety
• Time of 4 FTEs to manage inventory
• 30% of nurse time searching for supplies
• Implant manual entry errors with lot and serial numbers

ORSC Technology & Process Efficiency
• $35M annual supply spend
• Nurse pen and paper solution 80%
• 16,000 items
• No electronic data, reports or consignment tracking – recalls
• Manual annual counts
**Before: Manual / Inefficient Silos**

- Manual OR Inventory Storage and Tracking
- Manual Clinical Charting in ORSOS
- Manual Re-ordering of OR Inventory
- Manual Upkeep of ORSOS Inventory Data
- Incomplete / Errors in Clinical Charts and Manual, Limited Case Costing

**Patient Safety Concerns**
## Lean Six Sigma Current State Mapping / Gap Analysis

<table>
<thead>
<tr>
<th>Current State</th>
<th>Future state</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Steps</strong></td>
<td>25</td>
<td>14</td>
</tr>
<tr>
<td><strong>Touch Time (minutes)</strong></td>
<td>42</td>
<td>19</td>
</tr>
<tr>
<td><strong>Total Process Time</strong></td>
<td>14 hrs 12 mins</td>
<td>8 hrs 19 mins</td>
</tr>
</tbody>
</table>

All Inventory: Stock, Non-stock and Consignment Implants – mapped workflow to Point-of-Care
What is possible?

Conferences

- Association for Healthcare Resource & Materials Management (AHRMM)
- Healthcare Information and Management Systems Society (HIMSS)

Case Study Publications

- Leading USA Hospital Case Studies
- AHRMM Knowledge Center

Request for Information (RFI)

- Vendor provided Information
- New solutions

4 Team Site Visits:

- Phoenix Arizona, Children’s Hospital & Mayo Clinic
- Toronto, Sick Kids Hospital
- Augusta Georgia, University Hospital
- West Penn, Allegheny Health System

RFP
Item Master

- Internal vs external
- Point-of-Care cost
- Item description - clinical requirements
- Complete for ALL items
Lean Mapping & Inter-disciplinary Team Planning

Lean Six Sigma Mapping
Site Readiness

Role Development
Knowledge Transfer

IT Planning

Policy Development
After: Pyxis Technology and Integration

**SAP**
- Plexuss data clerk creates OR item / vendor load sheet: 305C225 Valve Aortic Mosaic 25MM Medtronic

**Pyxis**
- Automatically updated with item: 305C225 Valve Aortic Mosaic 25MM Medtronic (item can now be loaded in Pyxis by ORSC)
- OR nurse takes 305C225 Valve Aortic Mosaic 25MM Medtronic by scanning the barcode

**SAP**
- ORSOS database is automatically updated with item: 305C225 Valve Aortic Mosaic 25MM Medtronic

**ORSOS**
- 305C225 Valve Aortic Mosaic 25MM Medtronic is automatically charted in the legal patient chart
- Plexuss buyer automatically receives order 305C225 Valve Aortic Mosaic 25MM Medtronic just-in-time

**Clinical Charting Interface**

**Orders Interface**

**Scheduling Interface**

**Item Master Interface**

**Reports / Business Insight**

**On-demand Reports**
After: Fully Integrated OR Supply Chain Solution

Automation

OR Nurse or MDRD scans/press button to vend the item

- Re-orders via SAP (just-in-time)
- Clinical Documentation
- Real-time Utilization Inventory, Surgeon Case Reports
OR Technology Workflow
*Real-time Supply Costs*
<table>
<thead>
<tr>
<th>Item Name</th>
<th>Item ID</th>
<th>Quantity</th>
<th>Unit of Issue</th>
<th>Unit Cost</th>
<th>Ext Cost</th>
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<tbody>
<tr>
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</tbody>
</table>

| Total | $0.00 | $2,467.20 | $2,467.20 |
Results

$4.6M Soft Savings

Time-savings from automation of:
• Clinical Charting (Nurse)
• Item Master
• Orders
• Annual Counts / Value on hand

$9.8M Hard Savings

Inventory Efficiencies from:
• Reduced Carrying Costs
• Par Level Reduction
• Inventory Back-up Elimination
• Product Standardization

Patient Safety Improvements

Clinical Chart Accuracy Improved by Scanned Implant Lot & Serial #
• Recalls Identified
• Stock-outs Minimized
• Expiration Dates & Latex Alerts
Barcode Challenges

Multiple Barcodes – Clinical Confusion – What to Scan?

2010 - Missing Barcodes, Proprietary Barcodes, Barcode Errors- Not Scanning

2013 upgraded to smart scanning

2018 – Barcode variation
Barcode Variation

Stacked
multiple scans required to refill Pyxis

2D Matrix - specific scanner

Linear

Scanner – upgrade to read all types
Barcode Standards

GS1

Industry Challenges:
DI many - to - one relationship, fluid
Sources – GUDID, GDSN

HIBCC

UDI Example

Required on the device label, packaging or, in some cases, on the device itself
Code in plain text and machine readable format (AIDC)

UDI = DI + PI

UDI Example

Health Care Barcode Structure

Primary Code (DI) / Secondary Code (PI)

HIBCC system identifier
Labeller’s ID “LIC”
Product Code
Packaging Index

Serial Number
Separator and ID
LOT up to 18 digits
Expiry Date
ID Expiry Date
UDI Tracking
# UDI EPR Integration

<table>
<thead>
<tr>
<th>Inv ID</th>
<th>Description</th>
<th>Serial #</th>
<th>Lot #</th>
<th>Qty</th>
<th>Site</th>
<th>Y/N</th>
<th>Expiry Date</th>
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<tbody>
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<td>310731</td>
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<td></td>
<td>07/11/2021</td>
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</table>

<table>
<thead>
<tr>
<th>Mfr Cat #</th>
<th>Supplier</th>
<th>Mfr ID</th>
<th>Date Rec'd</th>
<th>Charge</th>
<th>UDI</th>
<th>GTIN/Device Id</th>
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<tr>
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</table>
AHRMM* CQO Movement – Focus on Value

• A comprehensive, physician-led, sustainable process in which clinical and administrative stakeholders collaborate to establish, prioritize, implement, and monitor initiatives that align resources while maintaining or improving quality and outcomes

• Value increases when quality is improved and when cost is decreased (Value = Quality / Cost)
Physician Engagement is Key to a Robust Value Analysis Program

SMI Value Analysis Maturity Curve

**Value Analysis Novice**
- No process
- Price strategy: often single site, procures items with review of new products, V.A. Committee created, Cost reduction is primary driver of decisions, Emphasis on supplier-provided data

**Value Analysis Intermediate**
- Price strategy: data-driven decisions based on usage across all sites, Strives for system-wide involvement, Clinician engagement with supply chain limited, V.A. Committee makes final decisions, Limited development of objective non-financial criteria

**Value Analysis Advanced**
- Quality, waste, reduction, standardization: Focus moves beyond cost reduction, clinical and supply chain integration, reduce or eliminate waste and variety, Objective non-financial criteria strives to use evidence, System device formulary established, Incorporates forum for new technology assessment

**Value Analysis Future**
- Utilization, reduced variation, population management: Focus on safety, quality, and total cost of care across the patient experience, Clinically driven teams target utilization/variation, Data driven decisions utilize information from (EMR, EMIS, National metrics - outcome protocols), Policy requires that all decisions are evidence-based

The Surgeon Cost Report Card

JAMA Surgery

- **5.9% cost reduction** seen 3 months post-implementation in laparoscopic Roux-en-Y gastric bypass at TWH

- With 293 gastric bypasses performed at our hospital in 2014, setting this target would mean **potential yearly savings of up to $160,000** for RYGB alone – the **equivalent of 64 additional cases**
1. Surgeon Lead Cost Savings

   - TWH Neuro Surgery Led by Dr. Tymianski
     - Disposable Cost Reduced 30%
     - Additional Surgeries Made Possible
     - 4 Months
     - $750,000 Savings

   - Rouxen – Y Gastric Bypass
     - 4 Gen. Surg. Surgeons Led by Dr. Tim Jackson
     - Surgeon Cost Report Pilot
     - $160,000/Year Potential Savings
     - 7 Months

   - Potential Savings 6.9%
# Average Surgeon Cost Comparison
## VATS Lobectomy

<table>
<thead>
<tr>
<th>Category</th>
<th>Group Avg. (52 cases)</th>
<th>Surgeon A (12 cases)</th>
<th>Surgeon B (2 cases)</th>
<th>Surgeon C (7 cases)</th>
<th>Surgeon D (9 cases)</th>
<th>Surgeon E (16 cases)</th>
<th>Surgeon F (6 cases)</th>
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</thead>
<tbody>
<tr>
<td>Catheters</td>
<td>$6.48</td>
<td>$6.34</td>
<td>$6.21</td>
<td>$6.21</td>
<td>$6.20</td>
<td>$6.99</td>
<td>$6.21</td>
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<tr>
<td>Drains</td>
<td>$64.38</td>
<td>$71.29</td>
<td>$71.00</td>
<td>$71.00</td>
<td>$55.22</td>
<td>$64.56</td>
<td>$53.83</td>
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<tr>
<td>Dressings</td>
<td>$33.12</td>
<td>$71.44</td>
<td>$52.82</td>
<td>$24.08</td>
<td>$23.76</td>
<td>$11.47</td>
<td>$32.23</td>
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<tr>
<td>Disposables</td>
<td>$58.66</td>
<td>$37.86</td>
<td>$0.00</td>
<td>$146.66</td>
<td>$111.72</td>
<td>$22.74</td>
<td>$33.34</td>
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<tr>
<td>Harmonics / Ligasure</td>
<td>$83.18</td>
<td>$0.00</td>
<td>$339.59</td>
<td>$86.81</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$506.39</td>
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<tr>
<td>Medical Surgical</td>
<td>$151.95</td>
<td>$149.22</td>
<td>$167.79</td>
<td>$163.53</td>
<td>$147.68</td>
<td>$153.01</td>
<td>$142.20</td>
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<tr>
<td>Staples and Reloads</td>
<td>$1,464.27</td>
<td>$1,519.52</td>
<td>$1,577.12</td>
<td>$1,757.61</td>
<td>$1,204.54</td>
<td>$1,366.58</td>
<td>$1,624.06</td>
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<tr>
<td>Sterile Supplies</td>
<td>$35.54</td>
<td>$37.73</td>
<td>$35.60</td>
<td>$32.02</td>
<td>$34.27</td>
<td>$35.72</td>
<td>$36.65</td>
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<tr>
<td><strong>Average Overall</strong></td>
<td><strong>$1,917.23</strong></td>
<td><strong>$1,913.73</strong></td>
<td><strong>$2,276.07</strong></td>
<td><strong>$2,304.40</strong></td>
<td><strong>$1,595.94</strong></td>
<td><strong>$1,674.95</strong></td>
<td><strong>$2,480.91</strong></td>
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<tr>
<td>% Over / Under Average</td>
<td>0.00%</td>
<td>-0.18%</td>
<td>18.72%</td>
<td>20.19%</td>
<td>-16.76%</td>
<td>-12.64%</td>
<td>29.40%</td>
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<tr>
<td>Avg. LOS (days)</td>
<td>4.44</td>
<td>3.42</td>
<td>3.00</td>
<td>4.43</td>
<td>4.11</td>
<td>5.69</td>
<td>4.17</td>
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</tbody>
</table>
CQO Report Card Project at UHN: A Value-Based Approach to OR Supply Chain

• Funding to support the development and implementation of a “CQO Report Card” at UHN
  • $500,000 over 2 years (Mar 2018 – Feb 2020)
• Working with Techna Institute at UHN

<table>
<thead>
<tr>
<th>Vision</th>
<th>Develop CQO reporting solution that will enable value-based decision-making that will support safe and cost-effective patient care</th>
</tr>
</thead>
</table>
| Objectives | 1. Reporting Platform & Data Analytics: Build technology platform and use data analytics to develop dynamic reports  
2. Procedure Cohort Development: Develop procedure cohorts for like-procedure comparison  
3. Clinical Outcomes: Link Pyxis supply cost data to NSQIP patient outcomes |

Out of Scope / Limitations
• Outcomes for NSQIP-participating divisions  
• Outcomes not real-time (90-day lockout period)
1. Reporting Platform & Data Analytics

![Reporting Platform & Data Analytics](image)

### Service Cost

<table>
<thead>
<tr>
<th>Procedures</th>
<th>Surgeon Name: Jane Doe</th>
<th>Surgical Division: Thoracic Surgery</th>
<th>Site: TGH</th>
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</thead>
<tbody>
<tr>
<td>VATS: LOBECTOMY</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

- **Your Average**
  - Total Case Length (Hours): 02:57
  - Surgical Time (Hours): 03:10
  - $1,920 (5 cases)

- **Group Average**
  - Total Case Length (Hours): 03:05
  - Surgical Time (Hours): 03:30
  - $1,917.23 (52 cases)

- **Minimum Cost:** $1,023

<table>
<thead>
<tr>
<th>Surgeon Cost (No. of Units)</th>
<th>Inventory Category</th>
<th>Group Cost (No. of Units)</th>
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</thead>
<tbody>
<tr>
<td>6.34 (1.0)</td>
<td>CATHETER THORACIC</td>
<td>(1.0) 6.48</td>
</tr>
<tr>
<td>71.29 (2.0)</td>
<td>DRAINAGE THORACIC (CHEST DRAIN / TUBING)</td>
<td>(1.8) 64.88</td>
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<tr>
<td>71.44 (8.1)</td>
<td>DRESSINGS (SPONGES, PATTIES, SURGICELL, STERI STRIPS)</td>
<td>(7.6) 33.12</td>
</tr>
<tr>
<td>37.86 (1.3)</td>
<td>UMENTS DISP (TROCARS, CAUTERY, CLIPS, BLADES, ENDO C)</td>
<td>(1.6) 58.66</td>
</tr>
<tr>
<td>149.22 (23.5)</td>
<td>MED SURG (PACKS, CLIPS, DRAINS, SUCTION, PREP)</td>
<td>(21.9) 151.95</td>
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<tr>
<td>1,519.52 (7.4)</td>
<td>STAPLES AND Reloads</td>
<td>(7.1) 1,464.27</td>
</tr>
<tr>
<td>37.73 (23.5)</td>
<td>STERILE SUPPLIES</td>
<td>(25.0) 35.54</td>
</tr>
<tr>
<td>0.08 (0.1)</td>
<td>SUPPLUS GENERAL MEDSURG POUR SOLUTIONS</td>
<td>(0.1) 0.09</td>
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<tr>
<td>20.35 (10.0)</td>
<td>SUTURES</td>
<td>(9.5) 20.14</td>
</tr>
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</table>
1. Reporting Platform & Data Analytics

![Image](image_url)

### Service Cost

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Surgeon Name</th>
<th>Surgical Division</th>
<th>Site</th>
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</thead>
<tbody>
<tr>
<td>VATS LOBECTOMY</td>
<td>Jane Doe</td>
<td>Thoracic Surgery</td>
<td>TGH</td>
</tr>
</tbody>
</table>

#### Your Average

- Cost: $1,920
- Time: 02:57
- Cases: 5

#### Group Average

- Cost: $1,917.23
- Time: 03:05
- Cases: 52
- Minimum Cost: $1,023

### Surgeon Cost (No. of Units)

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CATHETER THORACIC</td>
<td>$6.34</td>
<td>(1.0) 6.48</td>
</tr>
<tr>
<td>DARINAGE THORACIC (CHEST DRAIN / TUBING)</td>
<td>$71.29</td>
<td>(2.0) 64.38</td>
</tr>
<tr>
<td>DRESSINGS (SPONGES, PATTIES, SURGICELL, STERI STRIPS)</td>
<td>$71.44</td>
<td>(8.1) 53.12</td>
</tr>
</tbody>
</table>

### ORSOS Case

<table>
<thead>
<tr>
<th>ORSOS Case</th>
<th>Procedure Date</th>
<th>Inventory ID</th>
<th>Category</th>
<th>Description</th>
<th>Quantity</th>
<th>Cost ($)</th>
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### SUTURES

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### Minimum Cost

- VATS LOBECTOMY: $1,023
- Catheter Thoracic: $6.48
- Darinage Thoracic (chest drain/tubing): $64.38
- Dressings (spoons, patties, surgicell, steri strips): $53.12

2. Procedure Cohort Development

### Example 1: One Matched Sub Procedure

**PROCEDURE COMBINATION**
- **MAIN PROCEDURE:** THYROIDECTOMY (G19615)
- **SUB PROCEDURES:**
  - TRACHEOSTOMY (G19055)
  - REIMPLANT PARATHYROID (G09720)

**SIGNIFICANT MATCHED:** TRACHEOSTOMY
**IN-SIGNIFICANT MATCHED:** REIMPLANT PARATHYROID

**PROCEDURE COHORT**
- THYROIDECTOMY, TRACHEOSTOMY

### Example 2: More Than One Matched Sub Procedure

**PROCEDURE COMBINATION**
- **MAIN PROCEDURE:** THYROIDECTOMY (G19615)
- **SUB PROCEDURES:**
  - MEDIASTINOSCOPY (G10055)
  - DISSECTION NECK (G19970)

**SIGNIFICANT MATCHED:**
- MEDIASTINOSCOPY
- DISSECTION NECK

**PROCEDURE COHORT**
- THYROIDECTOMY, MEDIASTINOSCOPY, DISSECTION NECK

### Example 3: No Matched Sub Procedure

**PROCEDURE COMBINATION**
- **MAIN PROCEDURE:** THYROIDECTOMY (G19615)
- **SUB PROCEDURES:**
  - ALLERGY LATEX (G09971)

**SIGNIFICANT MATCHED:** <NO MATCH>
**IN-SIGNIFICANT MATCHED:** ALLERGY LATEX

**PROCEDURE COHORT**
- THYROIDECTOMY

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<table>
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<th>Service</th>
<th>Total Case Volume</th>
<th>Annual No. of Procedure Code Combinations</th>
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3. Clinical Outcomes

• ACS NSQIP captures **30-day outcomes** on patients undergoing major operations

• Enables external benchmarking among participating sites with risk-adjustment

• UHN pilot in 2012 (General Surgery); expanded to include almost all divisions by 2016
  - Vascular, Cardiac and Thoracic Surgery participate in SVS VQI / STS

• **Ontario Surgical Quality Improvement Network** (31 hospitals)
  - Dr. Timothy Jackson, Provincial Clinical Lead at Health Quality Ontario

• **Mercy Health System (45 hospital network) also linking supply costs to NSQIP outcomes**
  - Reducing variation is key to realizing operational efficiencies
  - Standardization
  - Cost per case
  - Post market surveillance
An Example from UHN – Orthopaedic Surgery

- High rate of surgical site infections (SSIs) in patients undergoing knee replacements at UHN, compared to other centres (risk-adjusted NSQIP data)

- Orthopaedic Surgery adopted J&J triclosan-coated sutures for all TKR and THR

- SSI rate dropped by 1.5% (TKR) pre versus post intervention

- Incremental cost per suture of $0.12 ($700 annually); but assuming SSI direct cost of $4,000, represents potential savings of $44,000 annually (TKR and THR)

- Note: WHO suggests use of triclosan-coated sutures for purpose of reducing risk of SSI, independent of the type of surgery

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An Example from Stanford University Hospital – Thoracic Surgery

Intraoperative costs of video-assisted thoracoscopic lobectomy can be dramatically reduced without compromising outcomes

READ at the 97th Annual Meeting of The American Association for Thoracic Surgery, Boston, Massachusetts, April 28-May 3, 2017.

- “VATSL costs vary widely by surgeon and are influenced by disposable equipment use”
- “Cost-effective instrumentation selection can decrease the cost of VATSL by 19% with equivalent outcomes”
- “Surgeons can safely reduce intraoperative VATSL costs by eliminating use of unproven, expensive surgical adjuncts/disposables”
An Example from Centura Health – Orthopaedic Surgery

**Challenge:**
- **Significant variation** in usage of antibiotic-impregnated bone cement in total joint replacements; some physicians using in every patient, whether or not a new joint replacement or revision.
- Also variation in type of antibiotic used along with the dosage, and disagreement re use of premixed cement or compounding on site.

**Solution:**
- Collaboration between Hayes (review of the evidence) and multiple stakeholders at Centura Health resulted in standard of practice in use of antibiotics in bone cement, identifying:
  1. when to use an antibiotic and for which patients,
  2. proper dosing,
  3. use of premix vs. compounding.

- Identified up to **$900,000 [USD] annual savings**
A Value-Based Approach to OR Supply Chain

• Reducing costs is no longer enough – quality, outcomes and evidence need to become driving forces in supply decisions

• A provider-led, physician-engaged sourcing model and "patients first“ focus

• Evidence-based clinical outcomes to select medical products focuses on value, not lowest cost

• Fostering clinical alignment between physicians and supply chain delivers significant savings without compromising patient care
Questions?

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416 340 4800 x8889