The Impact of Technology on Improving Value for the Total Joint Replacement Episode of Care

Richard Iorio, MD
Joseph A. Bosco, MD
Lorraine Hutzler, MPA
Department of Orthopaedic Surgery
NYU Langone Orthopaedic Hospital
Hospital for Joint Diseases
Disclosures

• Co-founder Labrador Healthcare Consulting Services
• Co-founder MyArthritisRx
• Co-founder Responsive Risk Solutions
• Co-founder Value Based Healthcare Consortium
• Consultant for Johnson and Johnson
• Consultant for Medtronic
• Product liability consultant for DePuy Orthopaedics
• Advisory Board for Wellbe, Pacira, MedTel, Muve Health, Force Therapeutics and MCS ActiveCare
• AAHKS, Knee and Hip Society Board Member
• Consultant reviewer for JBJS, CORR, JOA, JAAOS
• Editorial Board JBJS Reviews, Adult Reconstruction Section Editor
• Institutional Research Support: Pacira, Orthofix, DJO, Vericel, Orthosensor, Bioventus, and Ferring
Value Based Healthcare Consortium Members

wellbe

Medtronic

Force

PACIRA

ActiveCare®

SURGICAL DIRECTIONS

muve Health

medtel

VENN Health Partners

NYU Langone Health
Richard Iorio, MD

Richard Iorio, MD is Chief of Adult Reconstruction Division at NYU Langone Orthopedics Hospital. He designed and successfully implemented the Bundled Care Payment Initiative for total joints as well as developed and initiated our facility's same day total joint program. Dr. Iorio is the Chair of American Association of Hip and Knee Surgeons Committee on Advocacy and Healthcare Policy. He is nationally recognized as a thought leader on perioperative risk optimization.
Joseph A. Bosco III, MD

Joseph Bosco, MD is Vice Chairman of Clinical Affairs and the Director of the Center for Quality and Patient Safety at NYU Langone Orthopedics Hospital. He is a practicing orthopaedic surgeon recognized as a thought leader in value based payment and quality as well as an experienced consultant. Dr. Bosco has been named Castle Connolly Top Doctors for the New York Metro Area and most recently received the American Academy of Orthopaedic Surgeons Achievement Award.
Lorraine Hutzler, MPA

Lorraine Hutzler is the Associate Director of the Center for Quality and Patient Safety at NYU Langone Orthopedic Hospital. She designed, built and maintains a robust quality infrastructure for the Department of Orthopedic Surgery. Lorraine has extensive expertise in quality metrics management and reporting as well as Lean and Six Sigma Certification.
Technology and Value for TJA Episodes

**HHS / CMS Framework**

- **Traditional FFS**
- **Value-Based (Link to Quality)**
  - Hospital VBP
  - Physician VM
  - Readmissions
  - HACs
  - Quality Reporting
- **Alternative Delivery Models**
  - ACOs
  - Medical homes
  - Bundled payment
  - Comprehensive Primary Care initiative
  - Comprehensive ESRD
- **Population Health/At Risk**
  - Eligible Pioneer ACOs in years 3-5
  - Maryland hospitals

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**Volume**  **Value**
Technology and Value for TJA Episodes

**Merit Based Incentive Payment System**

- MIPS is default payment system
- Applicable to physicians, PAs, NPs, CNSs and CRNAs beginning in 2019
  - Others can be added in 2021
- Exemptions for:
  - Participants in alternative payment models (CJR and BPCI do not count as advanced APM’s yet)
  - Low volume threshold
Technology and Value for TJA Episodes

OPINION

• CMS continues to support the concept of bundled payment programs due to their success in decreasing cost and improving quality
• Although CMS has cut back the CJR MSA’s, CMS did not eliminate the program
• CMS realizes it made a mistake with CJR and did not allow physicians to take on risk as episode initiators, and required some hospitals to take on risk they couldn’t afford
• This led to less physician buy-in and a lack of urgency on the part of hospitals since there is no down side risk in the first year
• In 2018, CMS will open BPCI and CJR up again for conveners, episode initiators and physicians, in addition to hospitals.
• This will represent an opportunity for physician groups and physician champions to seize control of the episodes and the financial gain that can be realized from optimal management of the TJA episode
• Advanced APMs where physicians are required to take on risk will serve as a substitute for MIPS and will be a more reproducible measure of TJA quality than the generalized variables offered through MIPS
• Technology solutions can help with these issues
Technology and Value for TJA Episodes

Five Clinical Pillars of Bundled Payment Success

1. Optimize patient selection and comorbidities
2. Optimize care coordination/patient education/expectations
3. Use a multimodal pain management protocol, minimize narcotics
4. VTED risk standardization and optimized blood management
5. Minimize postacute facility and resource utilization
Technology and Value for TJA Episodes

Current technology applications at NYULMC for Patient Selection and OR Cost Efficiency

- Perioperative Orthopaedic Surgical Home (POSH) and The Readmission Risk Assessment Tool (RRAT)
- Implant Selection Guidelines
- Cell Saver, Aquamantys, antibiotic bone cement, and aggressive anticoagulation
- All of these protocols can be regulated through technology solutions (Medtel)

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Points on Risk Stratification Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Induction risk factors, Staphylococcus Aureus colonization</td>
<td>Hard Stop</td>
</tr>
<tr>
<td>BMI greater than 40</td>
<td>Hard Stop</td>
</tr>
<tr>
<td>Patients will be enrolled in nutritional counseling program with consideration of acute weight loss program</td>
<td>2</td>
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<tr>
<td>All qualifying patients will be enrolled in OPTIMIZE-OS perioperatively</td>
<td>1</td>
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<tr>
<td>History of pulmonary embolus or deep venous thrombosis</td>
<td>2</td>
</tr>
<tr>
<td>History of coronary artery disease (CAD), stroke, peripheral vascular disease or VTED, age &gt;60 years and 2 cardiac risk factors: renal insufficiency (GFR &lt; 60 ml/min), diabetes, chronic obstructive pulmonary disease; Hypertension; Recent smoker (&lt;30 days); Cancer; Heart failure</td>
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<td>Neurocognitive, psychological, and behavioral problems (including alcohol and drug dependency)</td>
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<tr>
<td>Alcohol abuse or chronic active narcotic dependency</td>
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<tr>
<td>Score of 7 or more on catastrophic, PHQ-9</td>
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<tr>
<td>Physical Deconditioning</td>
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<tr>
<td>Nutritional or medical assistance with transfers status</td>
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<tr>
<td>Comorbidities affecting physical function and ambulation</td>
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<tr>
<td>Diabetes</td>
<td>Hard Stop</td>
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<td>Fasting blood glucose &gt;180</td>
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<td>Must be corrected prior to surgery, consider referral to diabetes management clinic (endocrinologist)</td>
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<tr>
<td>Hgb A1c &gt;8</td>
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<tr>
<td>Referred to diabetes management clinic (endocrinologist)</td>
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<tr>
<td>Well controlled DM</td>
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## Technology and Value for TJA Episodes

### POSH Readmission Score and OR of Readmission

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<th>POSH</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<tr>
<td>Readmitted (A)</td>
<td>21</td>
<td>36</td>
<td>37</td>
<td>45</td>
<td>49</td>
<td>43</td>
<td>24</td>
<td>9</td>
<td>5</td>
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<tr>
<td>None (B)</td>
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<td>95</td>
<td>39</td>
<td>31</td>
<td>12</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Ratio = A/B</td>
<td>0.24</td>
<td>0.38</td>
<td>0.95</td>
<td>1.45</td>
<td>4.08</td>
<td>14.33</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>OR (Linear)</td>
<td>0.19</td>
<td>0.41</td>
<td>0.89</td>
<td>1.94</td>
<td>4.21</td>
<td>9.14</td>
<td>19.86</td>
<td>43.12</td>
<td>93.64</td>
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<tr>
<td>OR (Non-Linear)</td>
<td>0.24</td>
<td>0.38</td>
<td>0.95</td>
<td>1.45</td>
<td>4.08</td>
<td>14.33</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>OR (Linear, Age)</td>
<td>0.18</td>
<td>0.40</td>
<td>0.90</td>
<td>1.91</td>
<td>4.56</td>
<td>10.23</td>
<td>20.20</td>
<td>44.68</td>
<td>104.24</td>
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<tr>
<td>OR (NL, Age)</td>
<td>0.23</td>
<td>0.37</td>
<td>0.95</td>
<td>1.48</td>
<td>4.26</td>
<td>15.21</td>
<td>-</td>
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</table>
Technology and Value for TJA Episodes

Modifiable Risk Factors

- MRSA Screening and Decolonization, weight based antibiotic dosing, and use of Vancomycin and Gentamycin in high risk patients, Hepatitis C and HIV screening and treatment
- Smoking cessation (hard stop)
- Cardiovascular Optimization and Stroke Prevention (using PT, High dose Statins, and ACE inhibitors perioperatively)
- Aggressive weight control (hard stop at a BMI of 40) (SWIFT Trial)
- Catastrophizing avoidance, interventions for depression
- Drug and alcohol interventions
- Fall education prevention
- Physical deconditioning and frailty improvement interventions
- Diabetes control and nutritional interventions for malnutrition (Hard Stop with glucose > 180)
- Screening for high risk VTED patients with testing for thrombophyllia risk (Lipoprotein A, Factor VIII)
- Risk adjusted VTED prophylaxis, use ASA and SPCD’s with standard risk patients, avoid aggressive anticoagulation
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In 2017, readmission rates with POSH program are 5.8%......
Technology and Value for TJA Episodes

| Medically-Optimized versus non-Optimized Cohorts since implementation of POSH: A Comparison of Quality Outcomes |
|--------------------------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| Cohort (n=410) | 90-day readmission rates | Odds ratio of 90-day readmission (CI 95%) | 30-day readmission rates | Odds ratio of 30-day readmission (CI 95%) | LOS, days (SD) | Discharge disposition 1) Home 2) Inpatient facility |
| Medically-optimized (Experimental) (n=365) | 4.6% | 0.422 (0.054 - 3.279) | 1.5% | 0.627 (0.079-4.994) | 2.4 (0.9) | 89.2% 10.8% |
| Non-optimized (Control) (n=65) | 5.7% | 4.1% | 3.1 (1.5) | 80.4% 19.0% |
| p-value | 0.704 | 0.352 | 0.321 | 0.659 | 0.001 | 0.106 |
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Clinical Management Throughout the Pathway

The Importance of Care Coordination

- Enforces best practices / standardization of pathways, workflows, and order sets
- Improves communication between providers and to the patient
- Ensures follow-up after care transitions
- Optimizes Patient Education, Expectations and Outcomes

Goal
Develop a pathway with >80% use of all elements with exclusion determined by pathway criteria, not doctor preference
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Approaches to Change

Clinical Management
Technology
Clinician Behavior

Increase Alignment
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Multimodal Analgesia for TJA

- How do modern anesthetic local infiltration techniques in combination with a multimodal analgesia protocol affect:
  
  » Pain control
  » Narcotic use
  » Functional Milestones
  » Quality metrics
    • Length of stay, Discharge Disposition, Patient Satisfaction, Complications, Hospital Cost

- Is the Use of Patient Controlled Analgesia (PCA) necessary
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Opioid Sparing

Cohort 1: FNB, No LB, Post-operative PCA use 583 patients

Cohort 2: No FNB, LB, Post-operative PCA use 527 patients

Cohort 3: No FNB, LB, No Post-operative PCA use 685 patients
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Multimodal Analgesia for TJA

• Effective pain control following TJA has been shown to improve functional outcomes with specific emphasis on rapid rehabilitation

• As a result of eliminating FNBs and PCAs from our regimen
  • Equivalent pain control
  • Significant decreases in narcotic use
  • Faster mobilization and physical therapy participation
  • Decreased fall rate
  • Decreased length of stay
  • Improved discharge location
  • Improvement of Pain-related HCAHPS
  • Significant decrease in hospital cost
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Risk Stratified VTED Prophylaxis

• The optimal protocol that balances patient safety and efficacy for VTED prevention following TJA continues to be debated

• Aggressive VTED chemoprophylaxis has been associated with increased post-operative complications

• As of 2014 AAOS and ACCP guidelines along with SCIP measures now include aspirin as an acceptable agent for VTE prophylaxis

• Sequential pneumatic compression devices have proven to help reduce the incidence of VTED and the advent of mobile devices has improved patient compliance

• The combination of minimizing aggressive anticoagulation and the use of SPCD’s and ASA leads to less complications after TJA
NYULMC Risk Stratified VTED Prophylaxis

Cohort 1
Oct 2013 - Mar 2014

Standard of Care
(all patients)

- Enoxaparin (Gold standard)
  30 mg SQ BID x 2-4 wks
- Rivaroxaban
  10 mg PO QD x14 days
- Warfarin
  Target INR 2.0-3.0

Cohort 2
May 2014 - Oct 2014

Risk stratification
1. History of VTED
2. Active Cancer
3. BMI≥40
4. Current Smoker

Standard Risk
(0 risk factors)
- Aspirin
  325 mg PO BID x 28 days
- Sequential Pneumatic Compression Device
  18 hrs QD x 28 days

High Risk
(1+ risk factors)
- Enoxaparin (Gold standard)
  30 mg SQ BID x2-4 wks
- Rivaroxaban
  10 mg PO QD x14 days
- Warfarin
  Target INR 2.0-3.0
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Results of NYULMC Risk Stratified VTED Protocol

• Risk stratified protocol patients (cohort 2) had a lower incidence of VTED than the group treated with aggressive anticoagulation

• There was a decrease in adverse events, readmissions, infections, and bleeding-related complications in the risk stratified protocol as well, although they did not reach statistical significance due to the lack of power

• Hospital costs were significantly lower in the ASA subgroup of cohort 2 \( (p<0.001) \), and overall costs were lower in the risk stratified cohort, however they were not statistically significant \( (p=0.674) \)

• Overall VTED rates were lower for the entire study group compared to the non risk stratified cohort
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Blood Management Techniques in a Value Based World

1. No transfusion trigger, use symptoms only

2. Use restrictive, conservative surgical measures, TXA, Regional Anesthesia, No Drains, Meticulous hemostasis

3. Avoid aggressive anticoagulation, use ASA and SPCD’s such as ActiveCare MCS device
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BPCI Readmissions by Discharge Setting

Readmission Rate by First Discharge Setting - Primary Joint of the Lower Extremity

- Self Care: 15% (n = 5 out of 33 self care pts)
- HHA: 8% (n = 31 out of 366 HHA pts)
- SNF: 15% (n = 37 out of 250 SNF pts)
- IP Rehab: 10% (n = 7 out of 72 IRF pts)
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Postacute Goal – Improved Outcomes and Patient Experience: NYULMC Postacute Partners

- Developed in collaboration with partners standard postacute pathways
- Focus on:
  - Bi-directional electronic exchange of information
  - Twice weekly updates on high-risk patients
  - Interdisciplinary weekly call
  - PAC report card
  - Quarterly PAC committee meeting

NYULMC = New York University Langone Medical Center; PAC = postacute care.

NYULMC clinicians and staff selected facilities based on a set of rigorous quality and care coordination criteria, taking into account existing clinical relationships, patient geography, and physician discharging preferences.
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New York University Lutheran: Augustana and Other SNF Average Length of Stay (ALOS)

Post acute average LOS by month

Updated with Medicare claims received, February 2016
SNF = Subacute Nursing Facility
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Change in Strategy?

Analysis of Number of Extra Hospital Days to Cost of Post Acute Care

Cost vs. Number Extra Hospital Days

- Home Discharge
- Sub-acute Rehab Discharge
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CREATING VALUE: A Mathematics problem

- **Value = Outcomes/cost**
  - Outcomes are the metric which matters most to patients
  - Theoretically if cost is decreased by 50% and outcomes are decreased by 10% value is created
  - Poorer quality is not acceptable
  - Any decrease in cost must not result in a decrease in outcomes

**ICER: Incremental cost effectiveness rate**

- Good - Increasing cost and equally increasing outcomes
- Better - Decreasing cost without effecting outcomes
- Best – Decreasing cost while improving quality and outcomes
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_Value Based Implants: Evolving and Adapting_

The evolution of the orthopedic implant industry over the last 30 years is a remarkable one. U.S. healthcare’s “fee-for-service” has allowed price increases across the board to run rampant. Implant designs are decades old. Differentiation among the crowded field of vendors is minimal in the most exaggerated comparisons.

Yet, the price of implants has gone up an average of 8% a year. The spotlight is on savings in healthcare and today’s supply chain in orthopedics sorely lacks the fundamental approach to being part of the solution we need to save our country’s healthcare system.

Just like generic pharmaceuticals, generic implants can bring billions in savings annually and are the next logical step in our urgent pursuit of value and accountability in healthcare.
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Value Based Implant Companies in the U.S.

Orthimo (Total Joints) [http://www.orthimo.com/]
Ortho Direct USA (Sports Med, Joints, Spine) [http://www.orthodirectusa.com/]
RōG Sports Medicine (Sports Med) [http://www.buyrog.com/]
Siora Surgicals Pvt. Ltd. (Trauma) [http://www.siiora.org/]
ImplantPartners brand under MicroPort fka Wright Medical (Hip, Knee) [http://www.implantpartners.com/]
Syncera brand under Smith and Nephew (Hip, Knee) [http://syncera.com/us/]
Villoy Implants (Hip) [http://villoy.com/]
Responsive Orthopedics [http://www.responsiveknee.com/]
OrthoSolutions (Extremities) [http://www.orthosolutions.com/]
Intralign (Joints) [http://www.intralign.com/]
Intuitive Spine LLC (Spine) [http://www.intuitivespine.com/]
SpineDirect LLC (Spine) [http://www.spinedirectonline.com/]
Emerge Medical (Trauma) [http://www.emergemedical.com/news.html]
Convenant Orthopedics (Joints, Trauma) [http://www.covenantortho.com/]
The Orthopaedic Implant Company (Trauma, Spine) [http://www.orthoimplantcompany.com/]
NovoSource (Total Knees) [http://www.novosource.net/]
Empower Spine (Spine) [http://www.empower-ortho.com/]
Parcus Medical (Sports) [http://parcusmedical.com/]
Back2Basics Spine (Spine) [http://www.back2basicsspine.com/]
Eisertech (Spine) [http://www.eisertech.com]
Prodigy Orthopedics (very early) [http://prodigyorthopedics.net/]
Technology and Value for TJA Episodes

The First Step: Physician Alignment

• Qualify a quality generic supplier which can offer significantly lower prices for stable technologies.

• Remove unnecessary costs and pass those savings on to the buyer. They have no sales force; the product is purchased via a web-based portal and there is no consignment. The company has elected to take smaller margins and targets value-based buyers. These are knowledgeable, informed buyers. These are buyers who understand value.

• The industry will propagandize and say that the product is inferior. The outcomes will worsen due to no rep being present. Can orthopaedic surgeons perform excellent surgery without a laser pointer at their back table? After all, these stable technology designs have been functionally the same for years.

• By 2017, 40% of orthopaedic surgeons are hospital employed hospitals. Quality outcomes and efficiencies are rewarded. Performance and cost effectiveness matters — for everyone.

• As reimbursements decline, ASCs and acute care facilities will have real difficulty trying to survive paying the current mark-up for stable technology implants. These products are quality, “time tested” technologies that have exhausted their patient value. As soon as surgeons understand that they can have the same quality to which they are accustomed, the transition to generics will accelerate.

• Then hospitals and ASCs can once again become owners of the implants, the instruments and the process that allows these savings. When this happens, we can begin to save medicine.
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Bundling Drives Value

• Incentivizing the surgeon to find better value is the lynchpin to driving prices down.

• While in their infancy, true bundled payment programs are proving to be fruitful for provider, facility and most importantly, patients, in the pursuit of better value. These bundled payment programs reimburse facility and surgeon with one, predetermined payment. The result is that physician and facility are aligned and driven to find the best value for the best delivery of care.

• A separate reimbursement for facility and surgeon is a large impediment to lower healthcare costs. The movement is considered to be one where healthcare migrates from “fee-for-service” to “pay-for-performance.” Under fee-for-service, incentives are all volume driven and do not reward value. Pay-for-performance awards best practices and highest value.

• The incentives for surgeons are not in their reimbursement per se, but rather the quality of medicine they practice. Large, academic hospitals are proving to be the most progressive in moving to generic devices. Gainsharing is a key to driving this change.

• While methodologies vary, large, academic hospitals provide service-line reinvestment when doctors create better value. Whether it’s for research, expanding the fellowship program, or adding supporting clinical staff, all of which allow doctors to practice better medicine and further its science
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The End Game

• Large companies come to the table with value based pricing

• Initially, they will only offer their second tier implants

• Volume commitment vs. fixed pricing

• Eventually all implants will be involved in these discussions with and without representative and distributor services depending on the capability, finances and resources of the client hospital

• NYU used this strategy to secure significant savings while committing to 75% of volume for one manufactures
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Same Day Discharge TJA

When we started training in 1986, the average LOS for TJA was 10 days…
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The Future of Same Day Discharge for TJA

- A recent forecast from healthcare intelligence company Sg2 projects the number of outpatient joint replacement procedures to increase by 200% in the next decade.

- That translates to approximately 20% of all hip and knee replacement procedures that orthopaedic surgeons are expected to perform in the U.S. by 2025.
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Same Day Discharge TJA

3,444 patients reviewed who received TJA in 2016

- Using these criteria, 70.3% of patients were eligible for SDD
- Over one third of ASA class 3 patients were found to eligible as well
- Most frequent cause of ineligibility was BMI > 40 (32.66%), Severity of Comorbidities (28%), and untreated OSA (25.2%)

Primary Inclusion Criteria for Same Day Discharge

<table>
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<tr>
<th>Medical Criteria</th>
<th>Other Criteria</th>
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<tbody>
<tr>
<td>No active CAD or arrhythmia</td>
<td>Patient must be in full agreement</td>
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<tr>
<td>No patients on chronic anticoagulation medications</td>
<td>Patient must have a coach</td>
</tr>
<tr>
<td>No patients with moderate to severe obstructive sleep apnea</td>
<td>Patient and coach must attend pre-operative education session</td>
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<tr>
<td>Hb. ≥ 12</td>
<td>Exclude patients with Medicare as primary insurance</td>
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<tr>
<td>BMI &lt; 40</td>
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## Technology and Value for TJA Episodes

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<th>Category</th>
<th>SDD Top Box %</th>
<th>TJA PG% USA</th>
<th>Other Top Box %</th>
<th>TJA PG % USA</th>
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<td>99</td>
<td>83</td>
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<tr>
<td>Responsiveness of Staff</td>
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<td>Communication with Doctors</td>
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<td>Cleanliness of Hospital</td>
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<td>Quietness of Hospital</td>
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<td>Pain Management</td>
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<td>Communication about Meds</td>
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<td>Overall Rating of Hospital</td>
<td>87</td>
<td>95</td>
<td>75</td>
<td>56</td>
</tr>
<tr>
<td>Willingness to Recommend</td>
<td>89</td>
<td>95</td>
<td>81</td>
<td>79</td>
</tr>
</tbody>
</table>

### HCAHPS Scores of SDD TJA vs In-hospital TJA at NYUloh
Technology and Value for TJA Episodes

The Future….

- There are 3 possible venues for SDD
  - Hospital
  - ASC
  - Specialized Orthopaedic Facility (MuveHealth)

- SDD is 50% more profitable non-SDD TJA

- Even Medicare SDD (6% of our cases) has a higher margin than non-SDD Medicare TJA (18% vs. 5%) without considering the bundle

- If we were able to translate our NYULMC hospital experience to the outpatient arena we could expect a 20% increase in profitability

Secondary Exclusion Criteria for Same Day Discharge

- Age > 65 years
- ASA 3 or 4
- Ischemic Heart Disease (positive stress test)
- On aggressive anticoagulation or Plavix
- Have poor ventricular function (LVEF < 50%)
- Have oxygen dependent pulmonary disease
- Have renal insufficiency or end stage renal disease, Cr > 1.6
- Have steroid dependent asthma or COPD
- Have pulmonary hypertension (PAP>45)
- Are morbidly obese, BMI 40 or greater
- Have chronic liver disease (Childs class B or worse)
- Have cerebral vascular disease
- Have sleep study proven obstructive sleep apnea without treatment, or STOP/BANG >5
- Insulin Dependent Diabetes Mellitus, Blood Glucose above 180
- History of DVT or PE
- History of Congestive Heart Failure
- Hgb < 11 or Jehovah’s Witness
Technology and Value for TJA Episodes

Creating Value: Increasing cost and outcomes for New Technology

- ICER for all new technology introductions
- Does increase in cost result in an increase in outcomes?
  - If yes, how much does the increase in outcomes cost?
  - How many dollars per QALY?
- Case for improved Bearing surfaces
  - Does an In Vitro decrease in wear result in QALY’s for a 70 y/o? a 75y/o? …
- Disposables - Aquamantys, knotless barbed sutures, etc
- Pharmaceuticals, Liposomal bupivacaine, IV acetaminophen
- Additional technology – Navigation, Robots, Personalized Instruments

Do outcomes justify cost?

- Must have a formalized Institutional mechanism to determine ICER
- If not quantitatively then qualitatively must be justified
- New Products Committee
Technology and Value for TJA Episodes

Creating Value: Decreasing Cost without affecting Outcomes

• Reference Pricing
  ➢ Establishing a ceiling price for commonly used items, such as implants

• All Aspects of Care Pathway must add Value
  – “Routine” laboratory testing
  – Blood Management*
  – Use of autotransfusion devices
  – Cell Saver
  – TXA*
  – Antibiotic cement


• Decreasing OR Waste

• Decreasing Complications and Readmissions

• Decreasing post acute care facility admissions
Technology and Value for TJA Episodes

Examine Care Pathways and Order Sets

- All interventions should add value
- Scrutinize “Routine” orders for value
- Aquamantys
- VTED Surveillance….Do you really need that CTA?
- Routine Post-op blood tests in PACU
  - HCT < 3% are less than 25
  - Cr/Bun < 0.2% are > 2
  - $50.00 per test, we are spending $25K to find one abnormal result
- Bone Cement
  - No need to routinely use two 40g bags
  - Most TKR’s can be done with one bag
  - Strict evidence based guidelines for Antibiotic cement use
    - History Of SSI
    - IDDM
    - Revision operation
    - Inflammatory arthritis
    - Obesity?
    - Smoking?
Technology and Value for TJA Episodes

Improved Outcomes at High Volume Centers
Technology and Value for TJA Episodes

New York State: Higher Volume Hospitals Have A Lower Infection Rate

- Compared with lower volume hospitals, patients who underwent THR at the highest volume hospitals had significantly lower surgical site infection rates ($P = .003$) and higher total hospital charges ($P < .0001$).
Approaches to Change: Technology

I. Historical Data and Quality Metric Analysis
   ➢ Venn, MuveHealth, Medtronic

II. Resource Utilization and Patient Optimization
   ➢ MedTel, Wellbe, Force, URX mobile, MuveHealth, Medtronic

III. Care Management
   ➢ Wellbe, Force, URX mobile, MuveHealth, TAV

IV. Post-Operative Care and Rehabilitation
   ➢ Force, URX mobile, Wellbe, MuveHealth, Medtronic

V. PROM’s and Quality Reporting Requirements
   ➢ Wellbe, Force, URX mobile, MuveHealth, Medtronic

VI. Prospective Dashboards and Quality Metrics
   ➢ Venn, Labrador, Medtronic

VII. Risk Sharing Partners
   ➢ Medtronic, MuveHealth
Technology and Value for TJA Episodes

BPCI/CJR

• Bringing Value to Healthcare is the current mantra

• Episode of care delivery such as bundled payment offers a framework to measure the amount of value brought to a diagnosis

• Using a bundled payment implementation case study as an example of Value improvement would be illustrative for our purposes today
Technology and Value for TJA Episodes

Primary Joint
Distribution of Q4 2013 Medicare episode payments compared to baseline target price

DRG 470: Primary Joint of the Lower Extremity w/o MCC
n = 192

$140,000
$120,000
$100,000
$80,000
$60,000
$40,000
$20,000
$0

Q4 Avg Pmt
Target Price

Index Admit  Professional  Readmission_Professional  Readmission  SNF  HHA  Outpatient  DME  IP Rehab
Technology and Value for TJA Episodes

Five Clinical Pillars of APM plus 2

1. Optimize patient selection and comorbidities
2. Optimize care management/patient education/expectations
3. Use a multimodal pain management protocol, minimize narcotics
4. Venous thromboembolism disease risk standardization and optimized blood management
5. Minimize postacute facility and resource utilization

6. Data, transparent data, real-time data, believable data, accurate data…
7. Gain Sharing and alignment
## Technology and Value for TJA Episodes

### Use of Physician Specific Metrics to Monitor Value

<table>
<thead>
<tr>
<th>Primary Joint of the Lower Extremity</th>
<th># Patients Discharged</th>
<th>ALOS</th>
<th>Rehab Facility</th>
<th>SNF</th>
<th>Total Facility-Based Care</th>
<th>HHA</th>
<th>Home/ Self Care</th>
<th>Total Home-Based Care</th>
<th># Readmissions</th>
<th># Patients</th>
<th>90-Day Readmission Rate</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<tr>
<td>HJD</td>
<td>865</td>
<td>3.51</td>
<td>6%</td>
<td>37%</td>
<td>43%</td>
<td>54%</td>
<td>3%</td>
<td>57%</td>
<td>42</td>
<td>338</td>
<td>12%</td>
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<tr>
<td>DRG 469 - Primary Joint w MCC</td>
<td>813</td>
<td>3.41</td>
<td>6%</td>
<td>34%</td>
<td>40%</td>
<td>57%</td>
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<td>50%</td>
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<td>Physician G</td>
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<td>Physician H</td>
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<td>3.00</td>
<td>0%</td>
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<td>0%</td>
<td>100%</td>
<td>0%</td>
<td>100%</td>
<td>1</td>
<td>100%</td>
</tr>
</tbody>
</table>

- **Quality** (all observed to expected ratios)
  - VTE
  - Readmissions
  - SSI’s
- **Cost displayed on a 2x2 matrix with 4 quadrants**
  - Direct Cost of index admission
  - Cost of discharge disposition
Physician Resource Utilization and Quality Analysis

Department Average, Physician Discharge and Total Cost Comparison
Q1 2015 Episode Composition
DRG 470: Primary Joint w/o MCC

Target Price: $32,001

Based on BPCI Medicare claims data
Technology and Value for TJA Episodes

Episode Spend by Claim Type – HJD/Tisch
Total Joint Replacement (DRGs 469, 470)

Data source: Q2 2016 Reconciliation Bundled Payment Medicare claims
Technology and Value for TJA Episodes

What are the next targets for value based TJA Episodes in a mature market?

• Home Health Services
• Home and Outpatient Physical Therapy
• Same Day Discharge TJA
• Referenced based payment models where the patient has financial incentives for delivering the episode for less cost
• Arthritis bundles in a population health management model where TJA reimbursement will be paid from the arthritis episode pool
Technology and Value for TJA Episodes

Home Health Services are Not Required Following Total Hip Arthroplasty

• At our institution, all postoperative total hip arthroplasty (THA) candidates have received home health services (HHS), consisting of visiting nurses and physical therapists. However, with a more technologically inclined patient population, telemedicine and electronic patient rehabilitation applications (EPRA) can be used to deliver perioperative services at the comfort of the patient’s home.

• The aim of this study is to investigate the clinical utility of a digital rehabilitation app in a patient population undergoing an uncomplicated primary THA.
# Technology and Value for TJA Episodes

Home Health Services are Not Required Following Total Hip Arthroplasty

<table>
<thead>
<tr>
<th>TABLE I Patient Demographic Characteristics</th>
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<tr>
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<tr>
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<tr>
<td>Age</td>
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<td>Black or African American</td>
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<tr>
<td>American Indian/Alaskan Native</td>
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<td>Hispanic Descent</td>
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<tr>
<td>ASA</td>
</tr>
<tr>
<td>Median Score</td>
</tr>
<tr>
<td>I (normal, healthy)</td>
</tr>
<tr>
<td>II (mild systemic disease)</td>
</tr>
<tr>
<td>III (severe systemic disease)</td>
</tr>
<tr>
<td>IV (life threatening systemic disease)</td>
</tr>
<tr>
<td>Baseline RAPT</td>
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<tr>
<td>Baseline PRO Scores</td>
</tr>
<tr>
<td>VR-12 MCS</td>
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<tr>
<td>VR-12 PCS</td>
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<tr>
<td>HOOS-Jr.</td>
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<tr>
<td>Technological Inclination</td>
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<td>Preoperative EPRA Logins</td>
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<tr>
<td>Preoperative Videos Watched</td>
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<tr>
<td>Mobile Device Downloads</td>
</tr>
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</table>
Technology and Value for TJA Episodes

Improved Pro Scores with digital home PT and Education vs Home Services

Figure 1: PRO Score Improvements: Box and whisker plots showing the difference between baseline and 12-week PRO scores. Graphs are labeled according to their respective PRO scores. Top row show raw PRO scores, bottom row displaying relative change in score. X-axis indicates the cohort, while the y-axis shows the average change in PRO scores. X-axis indicates the cohort, while the y-axis shows the average PRO score. Red line indicates median; green “x” indicates mean; blue box indicates 25th and 75th percentile; whiskers indicated maximum and minimum; and red “+” indicate outliers. Significance values: * p<0.05, ** p<0.01, *** p<0.001
Technology and Value for TJA Episodes

Take home message:

• The integration of electronic rehabilitation tools is gaining acceptance within the orthopaedic community. Our study comparatively evaluated patients receiving EPRA only and EPRA-HHS and found superior PROs with EPRA only despite poorer baseline HOOS-Jr scores.

• We therefore demonstrate that EPRA is non inferior to patients receiving EPRA-HHS in providing adequate postoperative care. Further studies are warranted to elucidate if the significantly superior outcomes of EPRA only is a result of underlying differences in the protocol versus an unseen patient selection bias.

• Additionally, EPRAs are able to generate clinically meaningful metadata which allows for improved patient progress tracking, and potentially allows surgeons to screen for patients at risk for unfavorable outcomes.
Technology and Value for TJA Episodes

Conclusions

• Evidence based, cost effectiveness analysis
• Standardized protocol adoption
• Transparent data
• Physician alignment
• Gain sharing
• Technology can replace FTE’s, lower costs, and optimize care delivery
• Value based care is the best way to care for our patients
Thank You

Division of Adult Reconstruction
Department of Orthopedic Surgery
NYU Langone Health