

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

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# 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

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## 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.

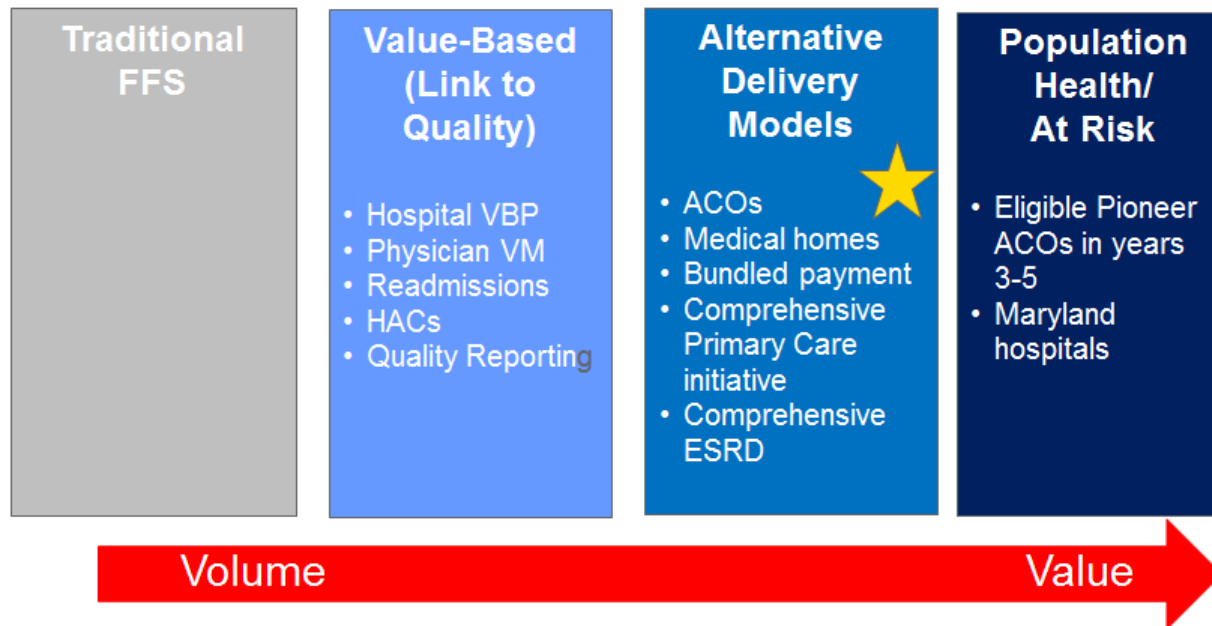
## Lorraine Hutzler, MPA



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*



# 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



Figure 1. The reimbursement decision for providers.



# 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)



Risk Factor	Points on Risk Stratification Scale
<b>1 Infection risk factors: <u>Staphylococcus Aureus</u> colonization</b> Every patient is screened If positive for staphylococcus colonization: <ul style="list-style-type: none"> <li>▪ Nasal mupirocin or povidone-iodine, chlorhexidine gluconate (CHG) wipes, and appropriate antibiotic coverage</li> <li>▪ If these requirements are not met then <i>hard stop</i> until protocol implemented</li> </ul>	Hard Stop
<b>2 Smoking (Tobacco use)</b> All tobacco users will be enrolled in tobacco cessation program 4 to 8 weeks prior to surgery	1
<b>3 Obesity</b> BMI greater than 40: <ul style="list-style-type: none"> <li>▪ Enroll in nutritional counseling program</li> <li>▪ Long-term weight loss program, and</li> <li>▪ Undergo bariatric consult.</li> </ul> BMI 35-40: <ul style="list-style-type: none"> <li>▪ Patients will be enrolled in nutritional counseling with consideration of acute weight loss program</li> </ul> BMI 30-35: <ul style="list-style-type: none"> <li>▪ Enroll in nutritional counseling program</li> </ul>	Hard Stop  2  1
<b>4 Cardiovascular Disease</b> Patient has history of coronary artery disease (CAD), stroke, peripheral vascular disease or VTED, age $\geq 60$ years and 2 cardiac risk factors: renal insufficiency (CrCl $< 60$ ml/min); Diabetes; chronic obstructive pulmonary disease; Hypertension; Recent smoker ( $< 30$ days); Cancer; Heart failure <ul style="list-style-type: none"> <li>▪ All qualifying patients will be enrolled in OPTIMIZE-OS peri-operatively</li> </ul>	1
<b>5 Venous Thromboembolic Disease</b> History of pulmonary embolus or deep venous thrombosis: <ul style="list-style-type: none"> <li>▪ Consider inferior vena cava (IVC) filter or aggressive VTED management</li> </ul> Has VTED risk factors: CVA, COPD, BMI $> 30$ , CAD, stroke, PVD, activated protein C resistance	2  1
<b>6 Neurocognitive, psychological and behavioral problems (including alcohol and drug dependency)</b> Alcohol abuse or chronic active narcotic dependency  Neurocognitive deficits such as traumatic brain injury (TBI), active psychiatric illness, dementia etc.  Score of 7 or more on catastrophizing, PHQ-9	2  1  1
<b>7 Physical Deconditioning</b> Nonambulatory or needs assistance with transfers status  Comorbidities affecting physical function and ambulation	2  1
<b>8 Diabetes</b> Fasting blood glucose $> 180$ <ul style="list-style-type: none"> <li>▪ Must be corrected prior to surgery, consider referral to diabetic management clinic (endocrinologist)</li> </ul> Hgb A1c $> 8$ <ul style="list-style-type: none"> <li>▪ Referred to diabetic management clinic (endocrinologist)</li> </ul> Well controlled DM	Hard stop  2  1

# Technology and Value for TJA Episodes

## POSH Readmission Score and OR of Readmission

POSH	0	1	2	3	4	5	6	7	8
Readmitted (A)	21	36	37	45	49	43	24	9	5
None (B)	89	95	39	31	12	3	0	0	0
Ratio = A/B	0.24	0.38	0.95	1.45	4.08	14.33	-	-	-
OR (Linear)	0.19	0.41	0.89	1.94	4.21	9.14	19.86	43.12	93.64
OR (Non-Linear)	0.24	0.38	0.95	1.45	4.08	14.33	-	-	-
OR (Linear, Age)	0.18	0.40	0.90	1.91	4.56	10.23	20.20	44.68	104.24
OR (NL, Age)	0.23	0.37	0.95	1.48	4.26	15.21	-	-	-

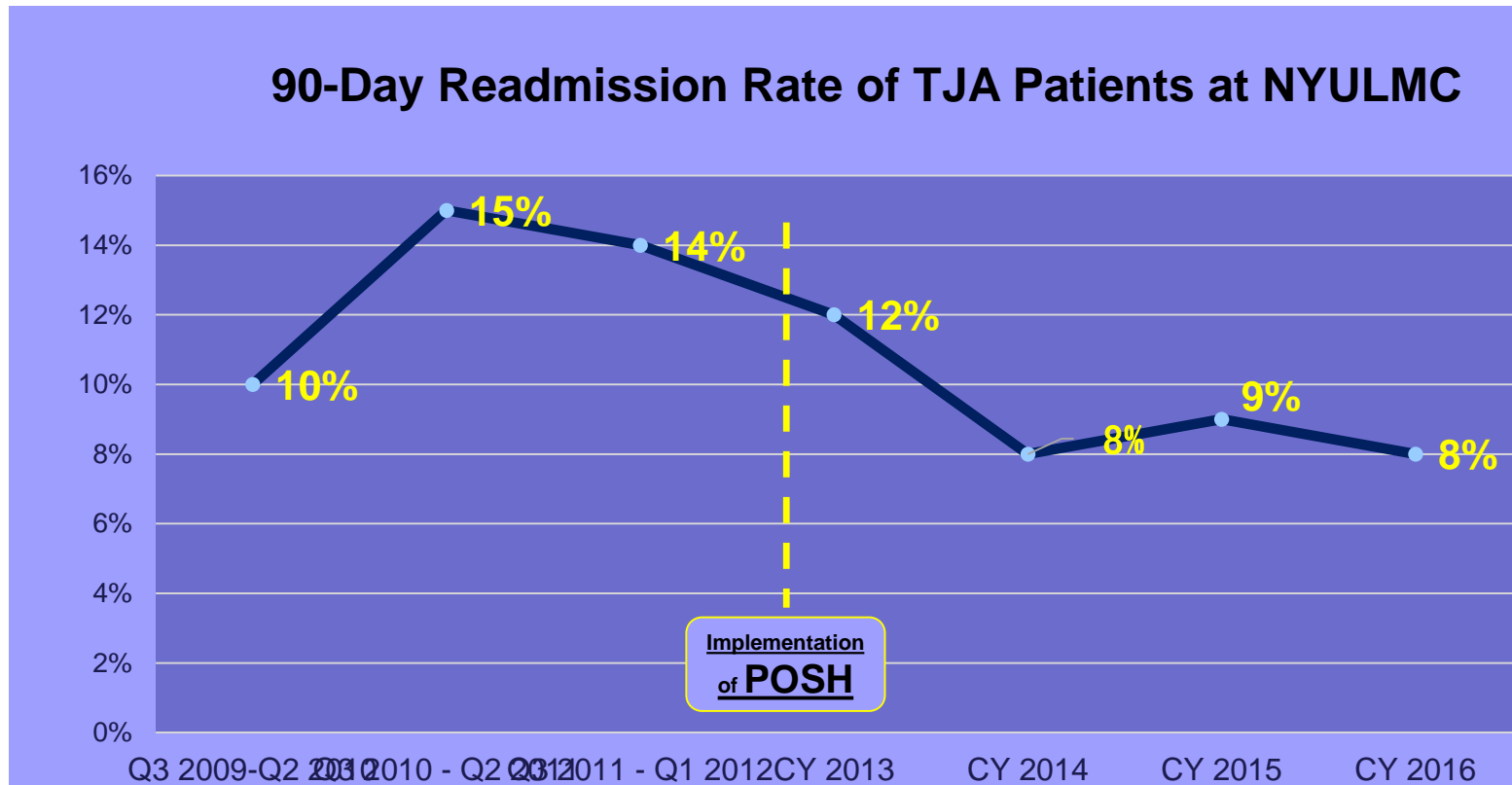
# Technology and Value for TJA Episodes

## 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 thrombophilia risk (Lipoprotein A, Factor VIII)
- Risk adjusted VTED prophylaxis, use ASA and SPCD's with standard risk patients, avoid aggressive anticoagulation

# Technology and Value for TJA Episodes

## POSH



In 2017, readmission rates with POSH program are 5.8%.....

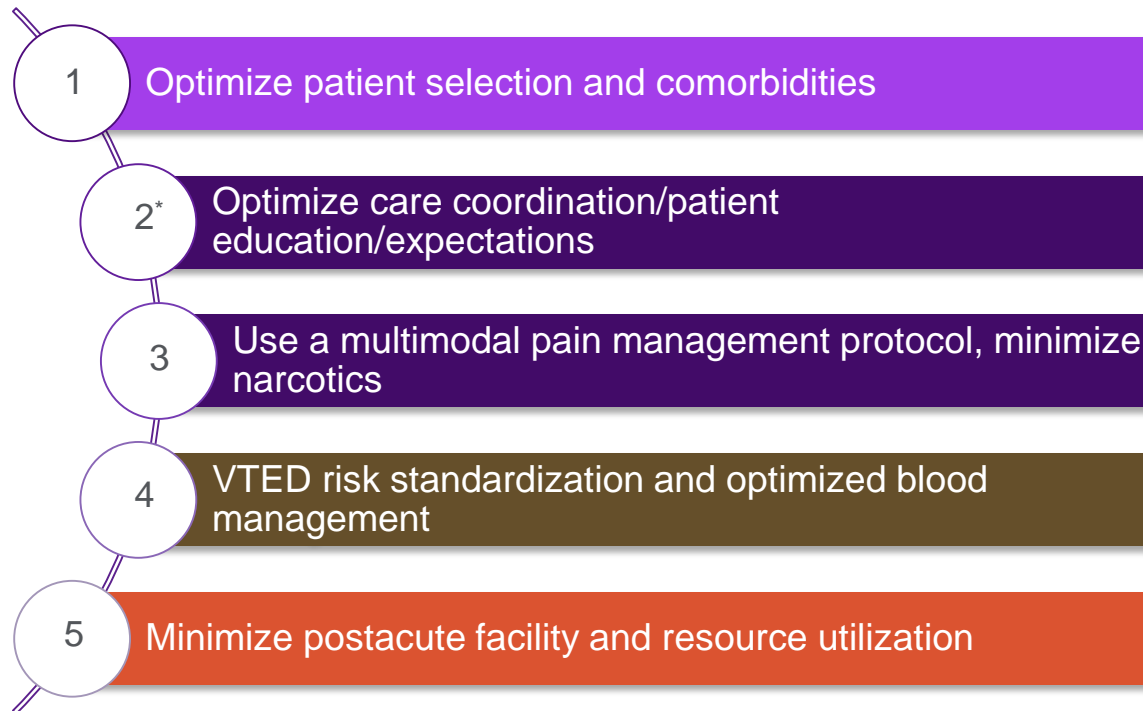
## Technology and Value for TJA Episodes

### 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
<u>Medically-optimized (Experimental)</u> (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%
<u>Non-optimized (Control)</u> (n=65)	5.7%		4.1%		3.1 (1.5)	80.4% 19.0%
<u>p-value</u>	0.704	0.352	0.321	0.659	0.001	0.106

# Technology and Value for TJA Episodes

## Five Clinical Pillars of Bundled Payment Success



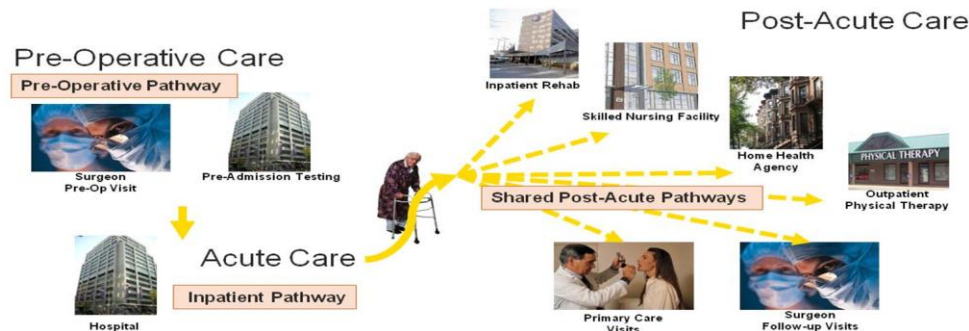


## Technology and Value for TJA Episodes

# 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

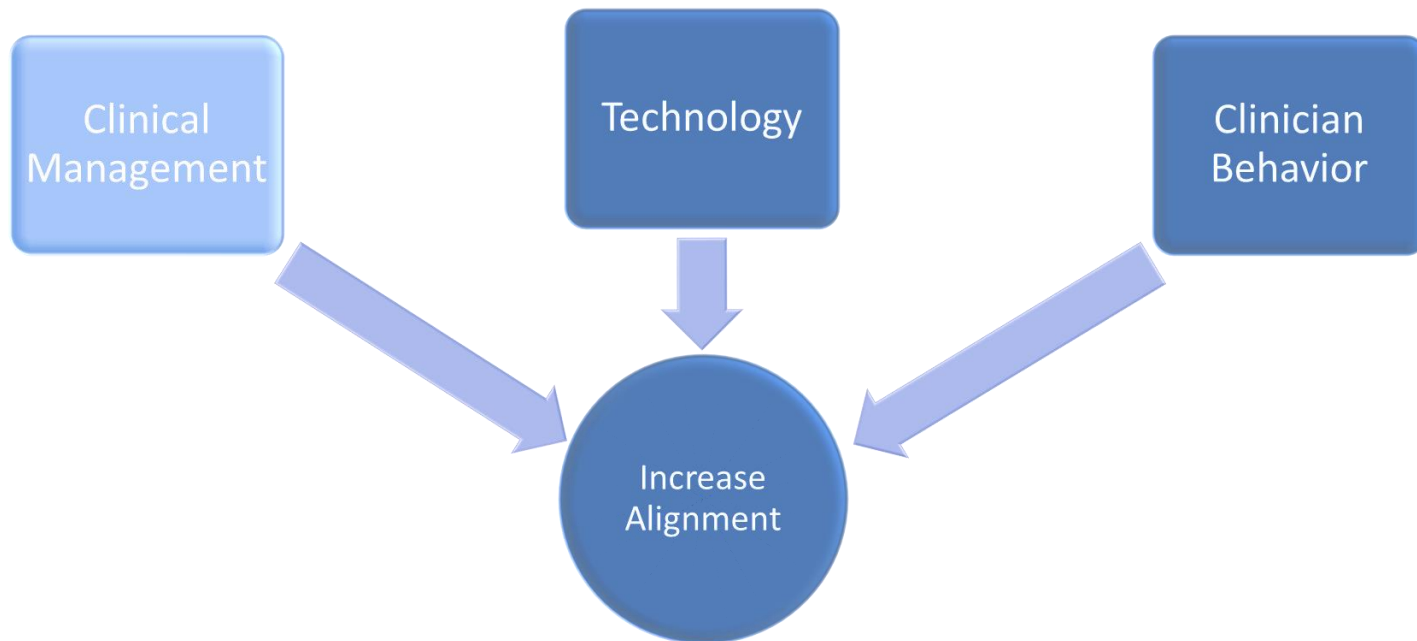


### Goal

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

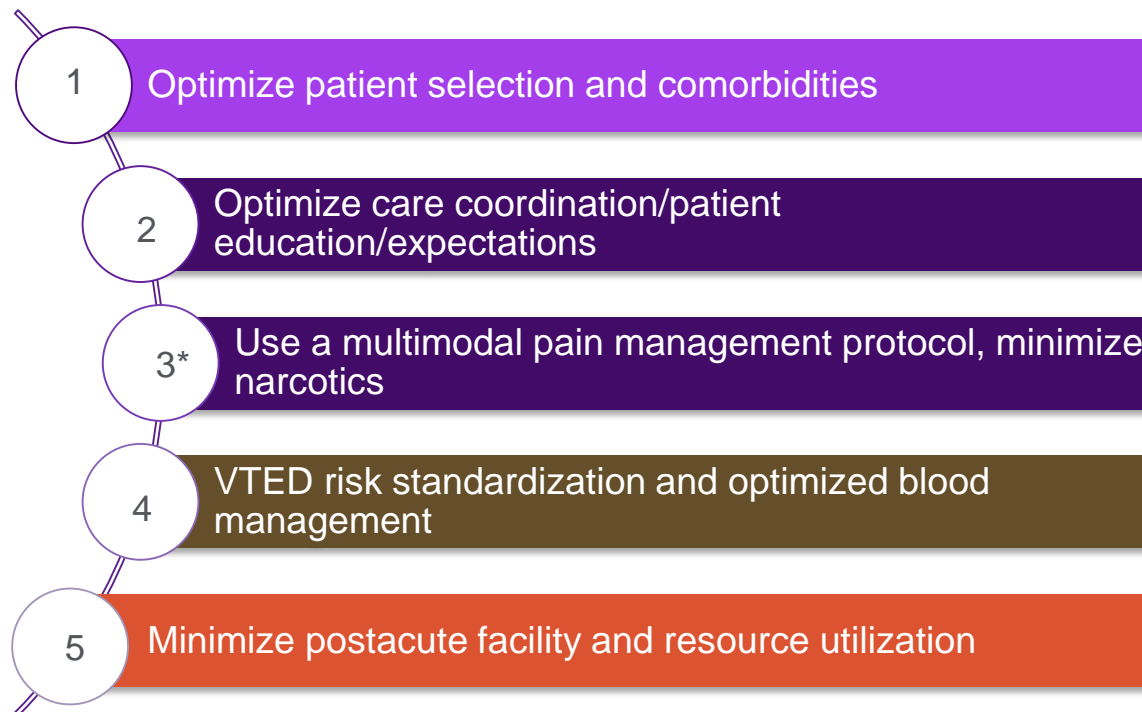
## Technology and Value for TJA Episodes

### Approaches to Change



## Technology and Value for TJA Episodes

### Five Clinical Pillars of Bundled Payment Success



# Technology and Value for TJA Episodes

## 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**



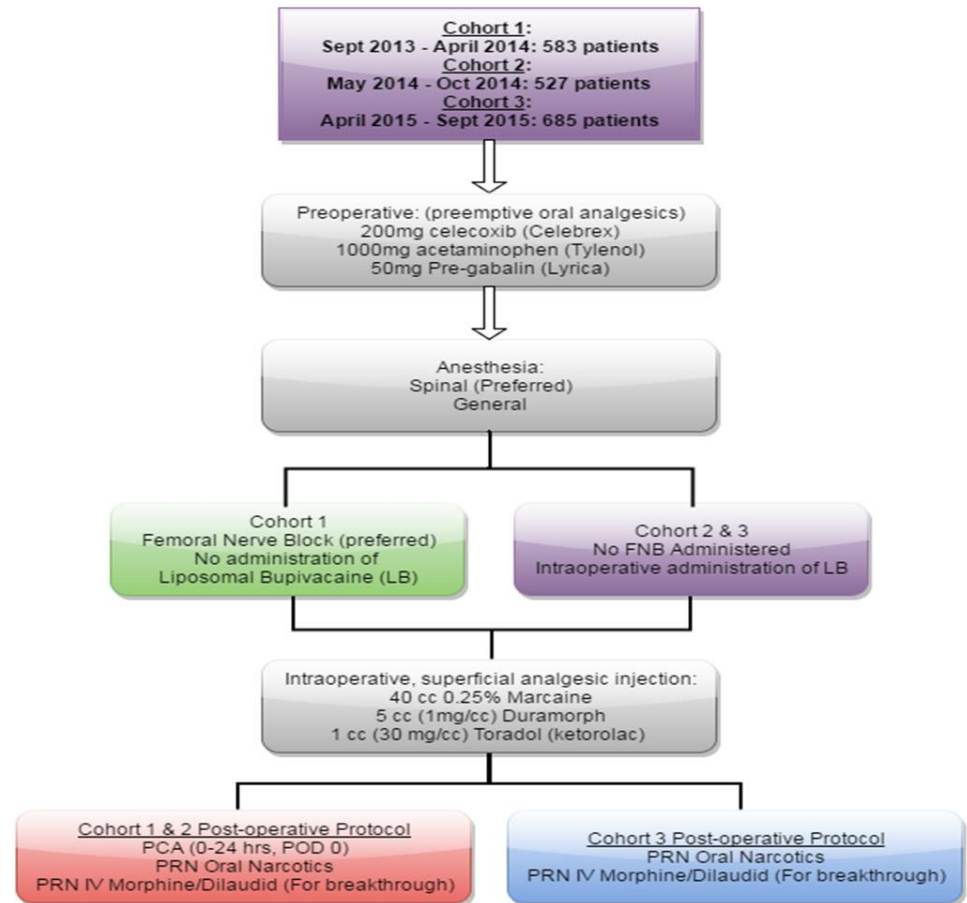
# Technology and Value for TJA Episodes

## 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



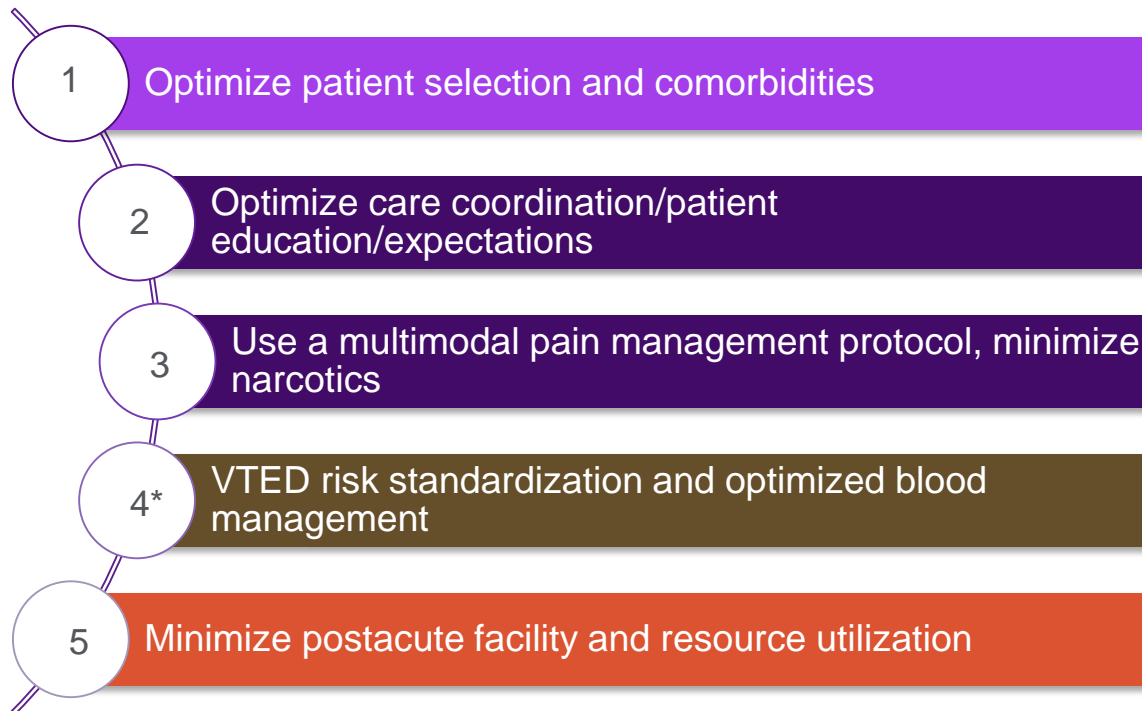
# Technology and Value for TJA Episodes

## 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

## Technology and Value for TJA Episodes

# Five Clinical Pillars of Bundled Payment Success



# Technology and Value for TJA Episodes

## Risk Stratified VTED Prophylaxis

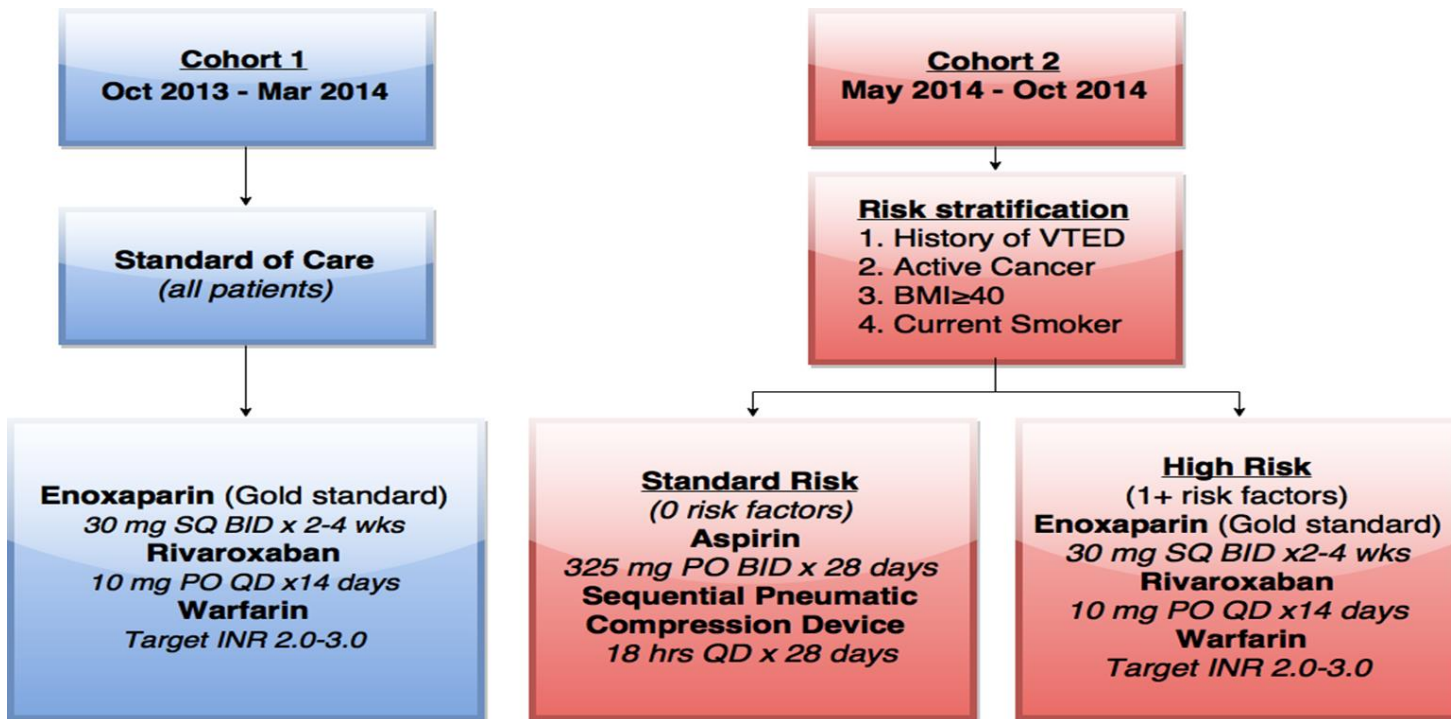
- The optimal protocol that balances patient safety and efficacy for VTED prevention following TJA continues to be debated
- Aggressive VTED chemoprophylaxis has been associated with increased post-operative complications
- As of 2014 AAOS and ACCP guidelines along with SCIP measures now include aspirin 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





# Technology and Value for TJA Episodes

## NYULMC Risk Stratified VTED Prophylaxis



## Technology and Value for TJA Episodes

### Results of NYULMC Risk Stratified VTED Protocol

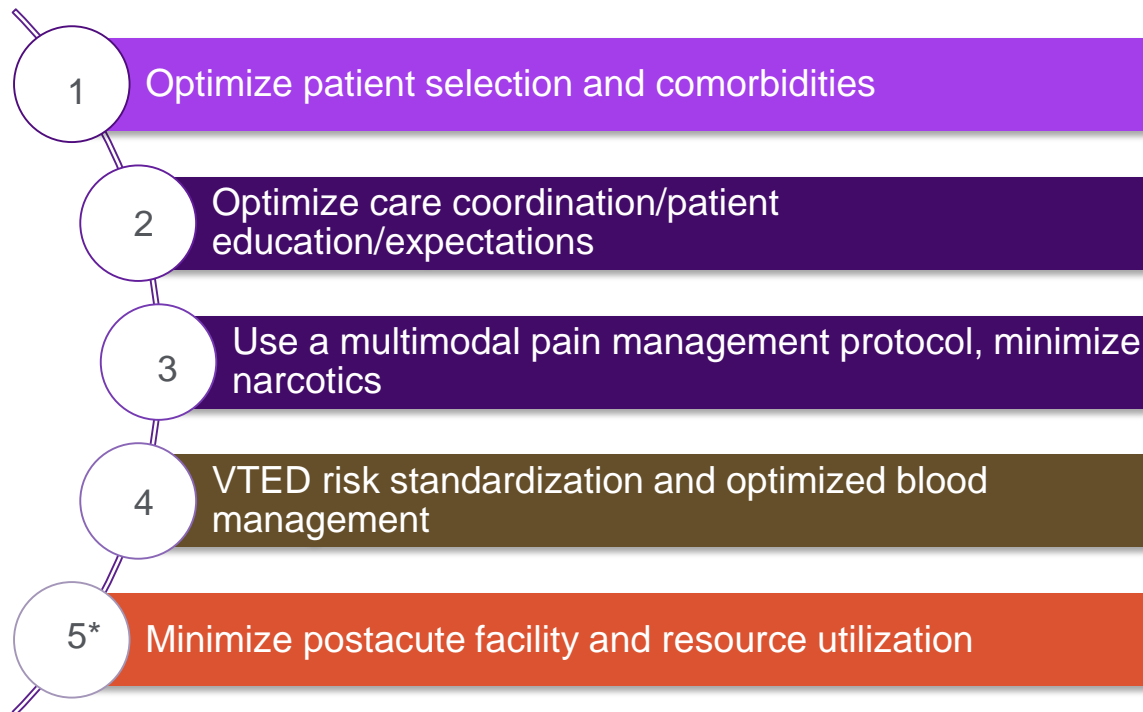
- Risk stratified protocol patients (cohort 2) had a lower incidence of VTED than the group treated with aggressive anticoagulation
- There was a decrease in adverse events, readmissions, infections, and bleeding-related complications in the risk stratified protocol as well, although they did not reach 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

## Technology and Value for TJA Episodes

### Blood Management Techniques in a Value Based World

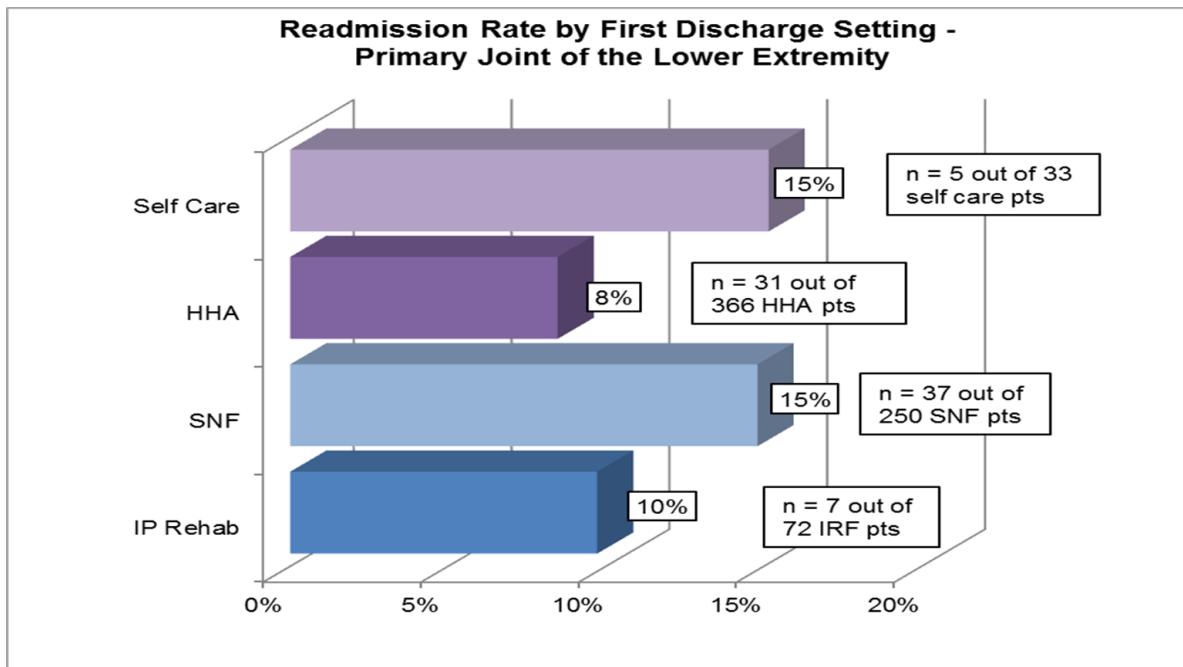
1. No transfusion trigger, use symptoms only
2. Use restrictive, conservative surgical measures, **TXA**, Regional Anesthesia, No Drains, Meticulous hemostasis
3. Avoid aggressive anticoagulation, use ASA and SPCD's such as ActiveCare MCS device

# Technology and Value for TJA Episodes



## Technology and Value for TJA Episodes

### BPCI Readmissions by Discharge Setting



# Technology and Value for TJA Episodes

## 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

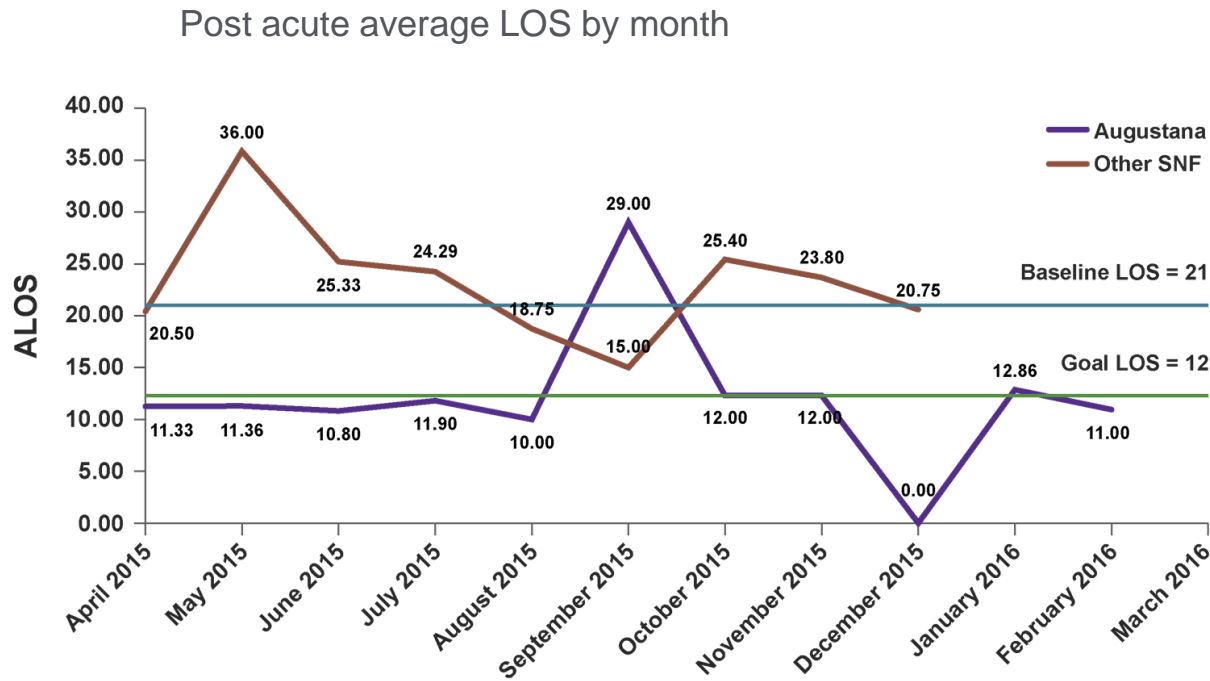


NYULMC = New York University Langone Medical Center; PAC = postacute care.

*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.*

# Technology and Value for TJA Episodes

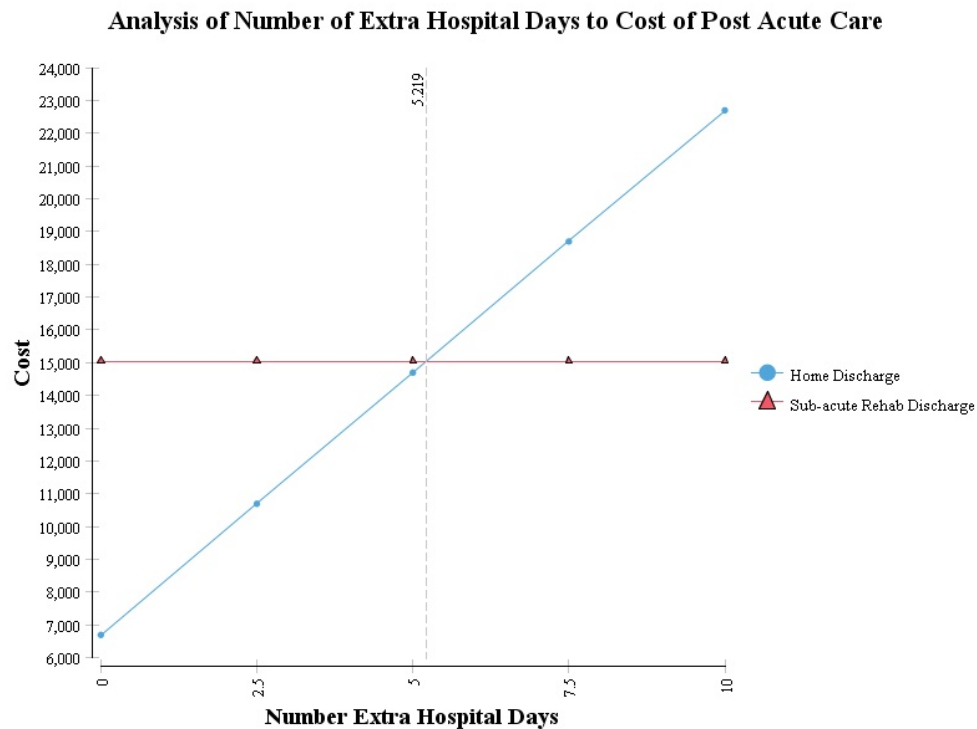
## New York University Lutheran: Augustana and Other SNF Average Length of Stay (ALOS)



Updated with Medicare claims received, February 2016  
SNF = Subacute Nursing Facility

# Technology and Value for TJA Episodes

## Change in Strategy?





# Technology and Value for TJA Episodes

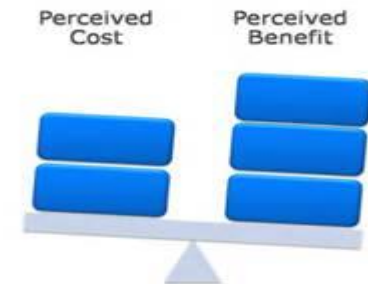
## CREATING VALUE: A Mathematics problem

### ➤ 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



## Technology and Value for TJA Episodes

### *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.

# Technology and Value for TJA Episodes

## 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.siora.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>  
Covenant 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.

# Technology and Value for TJA Episodes

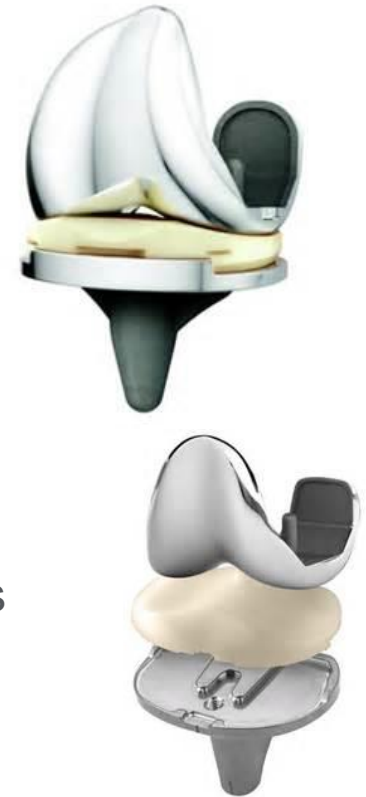
## *Bundling Drives Value*

- 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

# Technology and Value for TJA Episodes

## 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 manufacturer



## Technology and Value for TJA Episodes

# Same Day Discharge TJA

When we started training in 1986, the average LOS for TJA was 10 days...



## Technology and Value for TJA Episodes

### 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



# Technology and Value for TJA Episodes

## 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

Medical Criteria	Other Criteria
• No active CAD or arrhythmia	• Patient must be in full agreement
• No patients on chronic anticoagulation medications	• Patient must have a coach
• No patients with moderate to severe obstructive sleep apnea	• Patient and coach must attend pre-operative education session
• Hb. $\geq$ 12	• Exclude patients with Medicare as primary insurance
• BMI < 40	

# Technology and Value for TJA Episodes

	SDD	TJA	Other	TJA
	Top Box %	PG% USA	Top Box %	PG % USA
Communication with Nurses	95	99	83	72
Responsiveness of Staff	83	96	68	55
Communication with Doctors	88	96	81	43
Cleanliness of Hospital	88	96	74	46
Quietness of Hospital	69	78	56	30
Pain Management	93	99	78	88
Communication about Meds	85	99	66	59
Discharge Information	100	99	95	97
Care Transitions	71	98	59	80
Overall Rating of Hospital	87	95	75	56
Willingness to Recommend	89	95	81	79

## 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

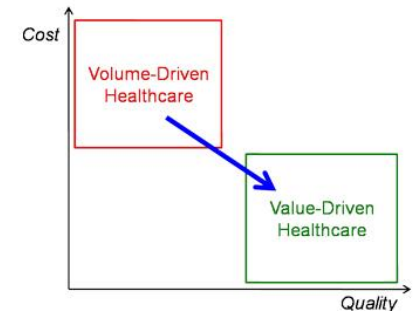
### Secondary Exclusion Criteria for Same Day Discharge

- 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

$$\text{Value} = \frac{\text{Quality}^*}{\text{Payment}^\dagger}$$

\* A composite of patient outcomes, safety, and experiences  
† The cost to all purchasers of purchasing care

\*Evangelista, Perry; Aversano, Michael W.; Koli, Emmanuel; Brandt, Aaron; Inneh, Ifeoma; Bosco, Joseph A.; and [lorio, Richard](#). [Effect of TXA on transfusion rates following TJA: A Cost and Comparative Effectiveness Analysis](#). Submitted to Journal of Arthroplasty, July, 2015.

- Decreasing OR Waste
  - Payne, Ashley; Slover, James; Inneh, Ifeoma; Hutzler, Lorraine; [lorio, Richard](#); Bosco, Joseph: [Orthopaedic Implant Waste: An Analysis and Quantification](#). American Journal of Orthopaedic Surgery. Accepted for publication, September, 2015.
- Decreasing Complications and Readmissions
- Decreasing post acute care facility admissions

# Technology and Value for TJA Episodes

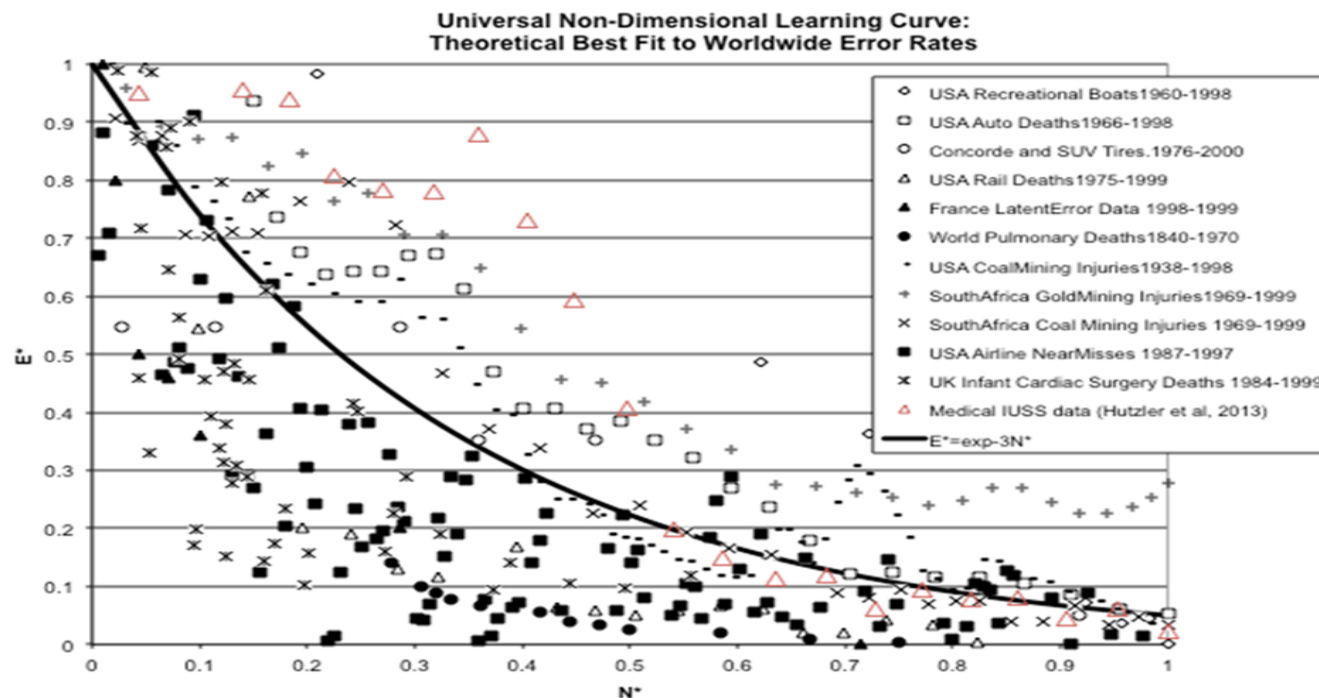
## Examine Care Pathways and Order Sets



- 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

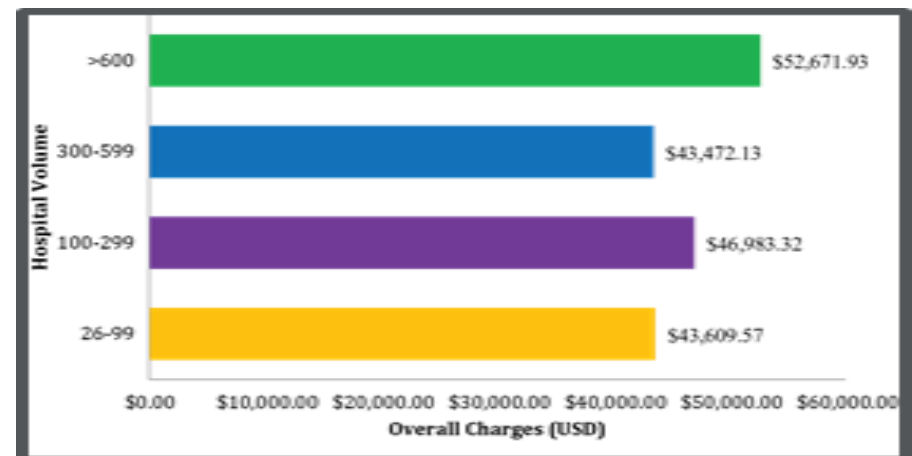
## Improved Outcomes at High Volume Centers



# 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 ( $P < .0001$ ).





# Technology and Value for TJA Episodes

## 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

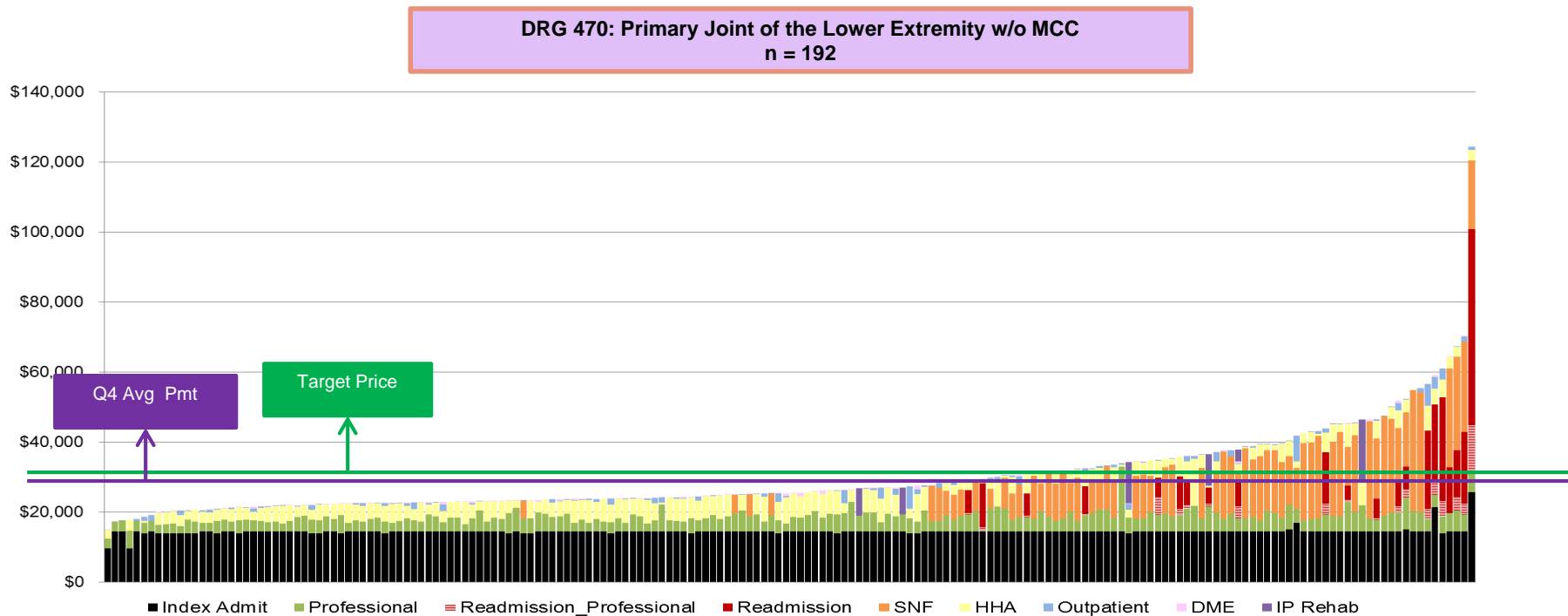
## BPCI/CJR

- 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



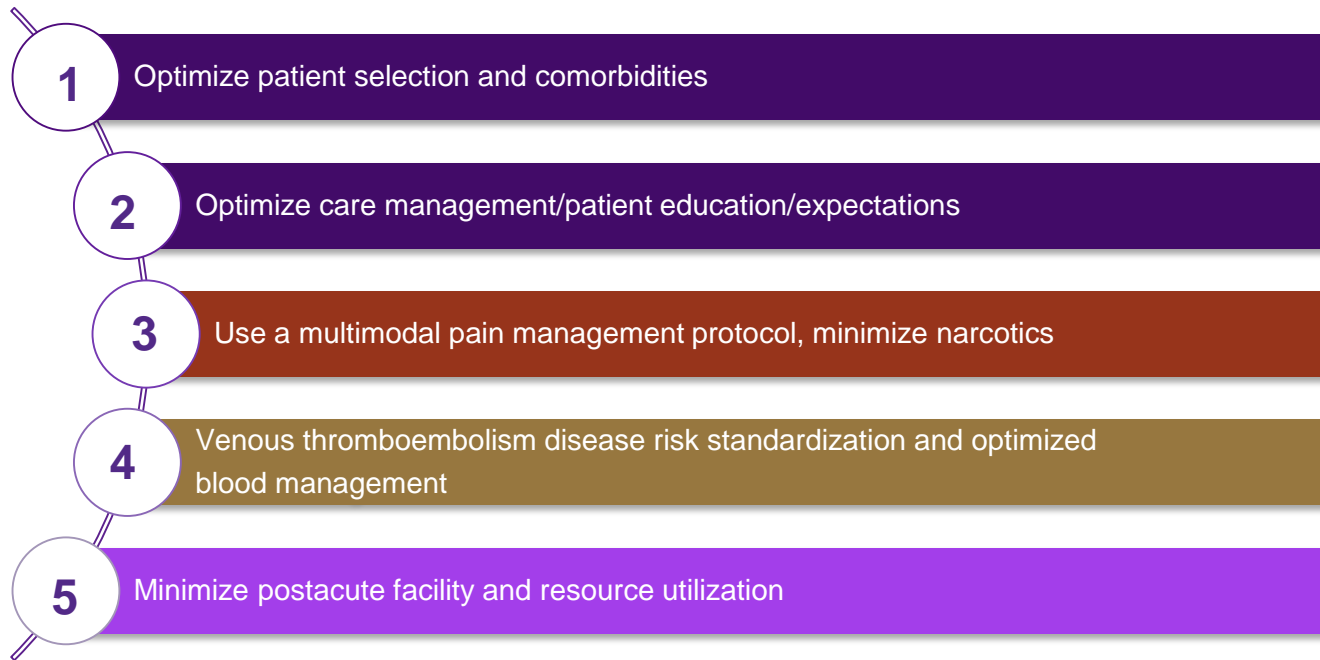
# Technology and Value for TJA Episodes

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



# Technology and Value for TJA Episodes

## Five Clinical Pillars of APM plus 2



**6. Data, transparent data, real-time data, believable data, accurate data...**

**7. Gain Sharing and alignment**

# Technology and Value for TJA Episodes

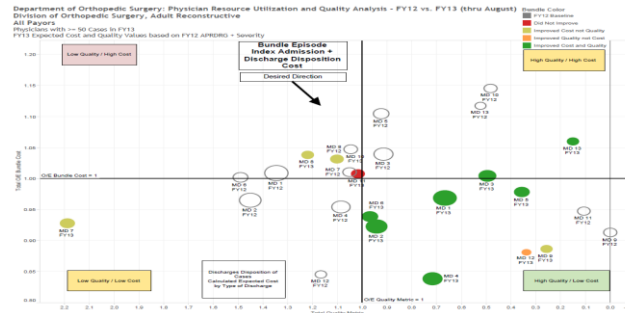
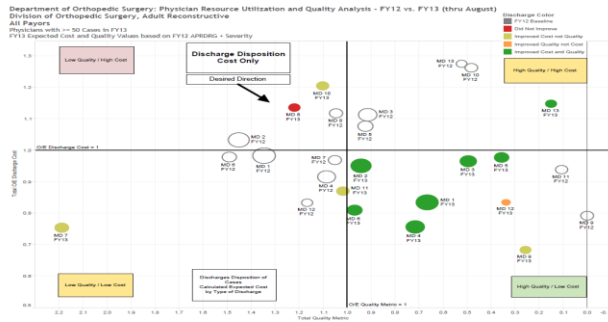
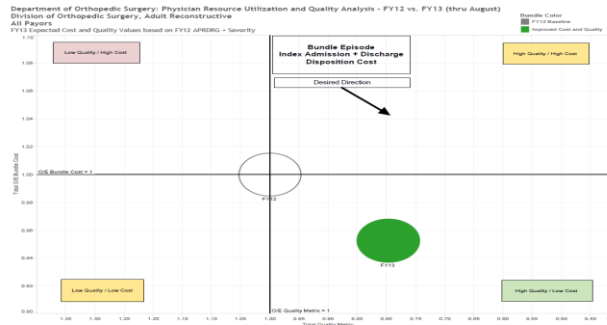
## Use of Physician Specific Metrics to Monitor Value

	# Patients Discharged	ALOS	Discharge Disposition							90-Day Readmission Rate - Closed Episodes Only <sup>1</sup>		
			Rehab Facility	SNF	Total Facility-Based Care	HHA	Home/ Self Care	Total Home-Based Care	# Readmissions	# Patients	90-Day Readmission Rate	
<b>Primary Joint of the Lower Extremity</b>	865	3.51	6%	37%	43%	54%	3%	57%	42	338	12%	
<b>HJD</b>	813	3.41	6%	34%	40%	57%	3%	60%	35	317	11%	
<b>DRG 469 - Primary Joint w MCC</b>	19	6.84	21%	32%	53%	42%	5%	47%	1	2	50%	
Physician A	4	6.00	25%	50%	75%	25%	0%	25%	0	0	0%	
Physician B	4	8.75	25%	25%	50%	50%	0%	50%	0	0	0%	
Physician C	2	5.47	0%	50%	50%	0%	50%	50%	0	0	0%	
Physician D	2	4.50	0%	50%	50%	50%	0%	50%	0	0	0%	
Physician E	2	6.63	100%	0%	100%	0%	0%	0%	0	0	0%	
Physician F	2	9.35	0%	50%	50%	50%	0%	50%	0	1	0%	
Physician G	1	3.00	0%	0%	0%	100%	0%	100%	0	0	0%	
Physician H	1	13.00	0%	0%	0%	100%	0%	100%	0	0	0%	
Physician I	1	3.00	0%	0%	0%	100%	0%	100%	1	1	100%	

- 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

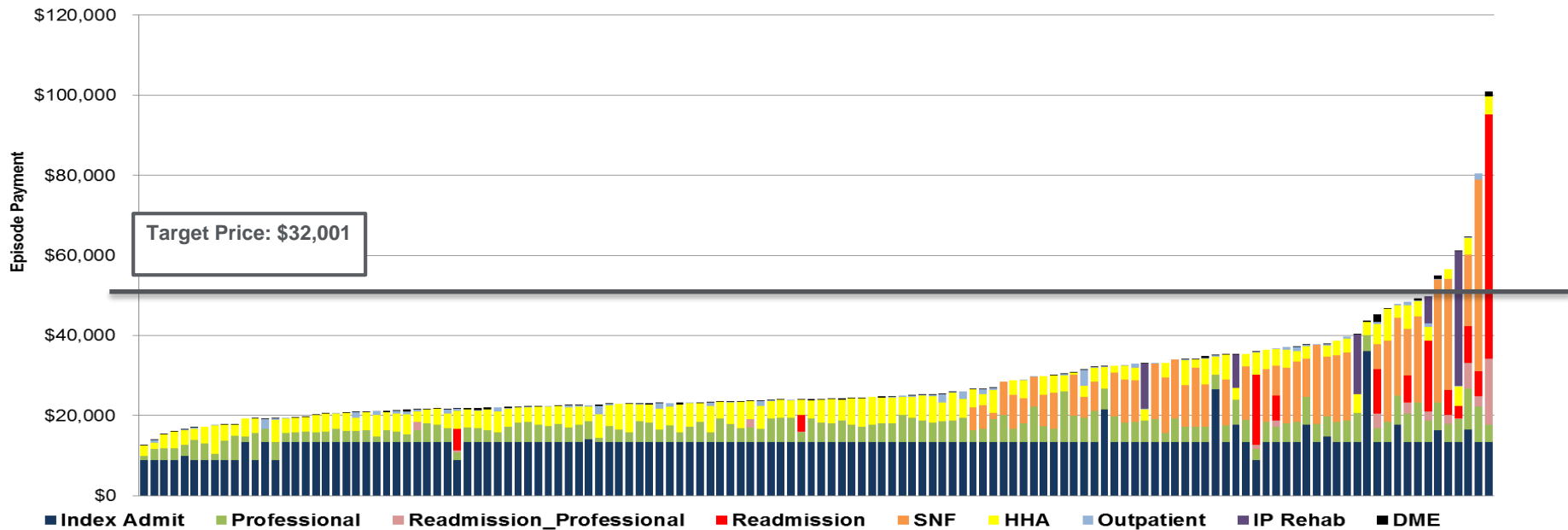
# Physician Resource Utilization and Quality Analysis

## Department Average, Physician Discharge and Total Cost Comparison



# Technology and Value for TJA Episodes

## Q1 2015 Episode Composition DRG 470: Primary Joint w/o MCC

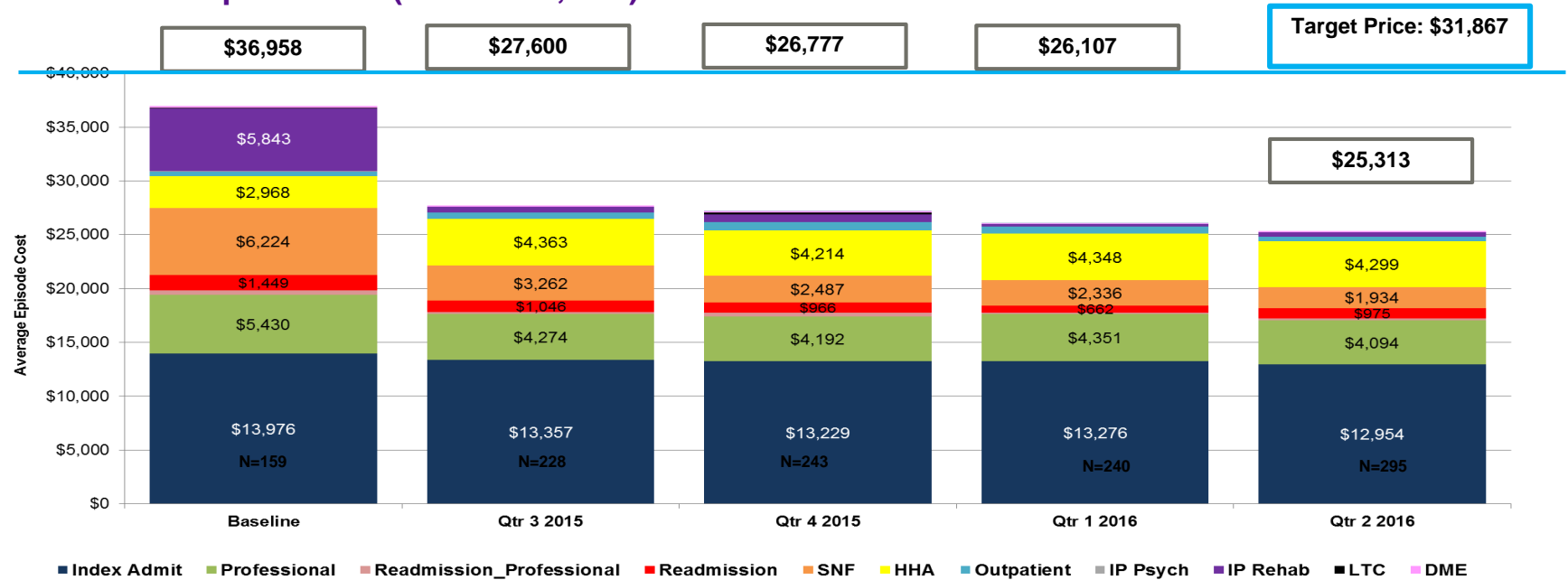


Based on BPCI Medicare claims data

# 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

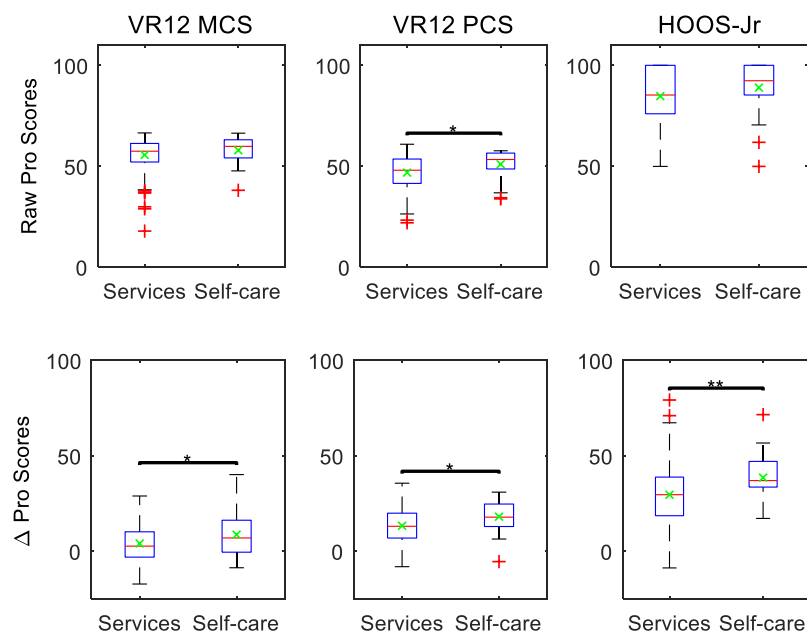
## Home Health Services are Not Required Following Total Hip Arthroplasty

TABLE I Patient Demographic Characteristics			
	EPRA-HHS (N = 135)	EPRA only (N = 30)	p
Age	65.2±9.9	58.2±11.2	<0.001
Gender – Female	54.8% (74)	66.7% (20)	0.31
BMI	26.8±5.1	26.5±4.6	0.94
Race			0.22
White	96.3% (130)	93.3% (28)	
Black or African American	3.7% (5)	3.3% (1)	
American Indian/Alaskan Native	0% (0)	3.3% (1)	
Hispanic Descent	2.2% (3)	6.6% (2)	
ASA			0.21
Median Score	II	II	
I (normal, healthy)	5.9% (8)	16.7% (5)	
II (mild systemic disease)	60.7% (82)	80.0% (24)	
III (severe systemic disease)	31.9% (43)	3.3% (1)	
IV (life threatening systemic disease)	1.4% (2)	0% (0)	
Baseline RAPT	9.74±3.79	10.27±3.64	0.16
Baseline PRO Scores			
VR-12 MCS	51.6±10.5	48.8±6.2	0.20
VR-12 PCS	33.7±8.3	33.3±6.9	0.82
HOOS-Jr.	55.2±13.2	50.4±12.8	0.06
Technological Inclination			
Preoperative EPRA Logins	6.3±6.4	6.4±4.3	0.80
Preoperative Videos Watched	13.7±14.1	13.2±12.1	0.85
Mobile Device Downloads	34% (46)	40% (12)	0.58

# 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 25<sup>th</sup> and 75<sup>th</sup> 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