Not Your Momma's Hip Replacement

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- HSS educational activities are carried out in a manner that serves the educational component of our Mission.
- As faculty we are committed to providing transparency in any/all external relationships prior to giving an academic presentation.

- Erica Fritz
- Sharlynn Tuohy

At Hospital for Special Surgery

- Disclosure: I DO NOT have a financial relationship with any commercial interest.

Objectives

- Understand the evolution of Total Hip Arthroplasty (THA)
- Understand advancements of surgical procedure
- Discuss pros and cons of Anterior vs. Posterior THA
- Understand indications for hip precautions and why they are changing
- Review urban orthopedic specialty hospital's current outpatient protocols for THA
- Discuss return to sport after THA
- Discuss drivers of rapid recovery that impact acute care rehabilitation staffing
- Highlight strategies on how acute care staffing has changed to meet increased demand while maintaining employee satisfaction
- Envision where the world of THA rehab is going
- **Create dialogue and challenge the status quo**

Non-objectives

- Provide you with a protocol on how to treat your THA patients
- List commonly used exercises in rehabilitating a THA patient
- To only present material - let's make this an interactive discussion!

Introduction

- Hip arthritis is a disabling disease with pain, limitation of motion, and often severe restriction of function

Introduction

- This has driven physicians to create and constantly improve the THA to address this; procedure continues to grow in popularity

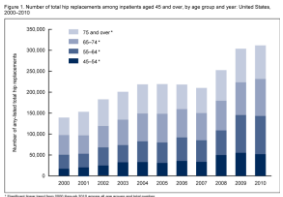
What is driving the change?

- The demands of patients for THA are no longer solely related to the resolution of hip pain and restoration of function, but also a quicker recovery
- Constraints from health care payers to reduce hospital length of stay
  - Some companies are now denying inpatient coverage for TKA/THA
  - Bundled payments
- Younger patients undergoing THA
- Move towards THA as an outpatient procedure
- Advancements in THA surgical procedures

Demographics

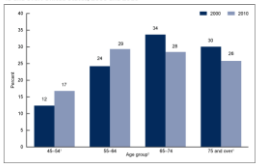
- According to the CDC, there are 332,000 THA performed each year in the US[1]
- HSS does nearly 4,000 THA per year
- Patients <65 years are projected to contribute to the majority of growth
- Use of primary THA in the US is projected to increase by 174% by 2030, to 532,000 cases annually
- As the surgical procedures improve, and patient demands increase, we must evolve to keep up!

THA volume in the US



THA age distribution in the U.S.

Figure 2. Percent distribution of total hip replacements among inpatients aged 45 and over: United States, 2000 and 2010



Courtesy of the CDC

We need to appreciate our past, in order to understand our future.

Thomas P. Sculco, MD
Orthopedic Surgery, Hip and Knee Replacement

Peter K. Sculco, MD
Orthopedic Surgery, Hip and Knee Replacement

Surgical history

- 1891 in Germany by Professor Themistocles Gluck.
  - Used ivory to replace femoral heads of patients with tuberculosis.
- 1925 in the U.S. by surgeon Marius Smith-Petersen.
  - Created the first "mold arthroplasty" out of glass.
- 1934- Wiles prosthesis
- 1953 in England by surgeon George McKee. Used metal-on-metal prosthesis with a cobalt-chrome surface over the acetabulum. Had a good survival rate (74% at 28 years), but grew unpopular due to local effects of metal particles from the prosthesis.

Wiles prosthesis

Surgical history

- 1962 in England by surgeon Sir John Charnley. **The modern THA is born!**
  - His *low friction arthroplasty* is identical, in principle, to the prostheses used today.
  - Stainless steel
  - 22 mm head
  - Plastic

Surgical history

- Low Friction Arthroplasty Designs
  - Use PTFE (Teflon) as plastic liner

Surgical history

- Problems led to Evolution in Design and Materials
  - Polyethylene Wear
  - Implant Fixation
  - Osteolysis
  - Loosening of cemented stems

Surgical history: Modern advancements

- Design
  - Increased size of femoral heads
- Materials
  - Cross link polyethene liners or ceramic liners
  - Stem: Titanium
  - Head: cobalt chrome or ceramic
- Templating
- Anesthesia
  - May use general anesthesia or localized anesthesia
- Improved soft tissue repair
- Tranexamic acid
  - Used to reduce major blood loss during a trauma

Modern advancements: Fixation non-cemented

- Changes in femoral stem design
- Porous Metal
- Plasma Sprayed
- Coatings HA
- Trabecular Metal

Modern advancements: Non-cemented sockets

- Porous
- Grooved
- Plasma sprayed
- Trabecular Metal

ilonehealth.com

Modern advancements: Articulating surfaces

- Metal/Polyethlylene
- Metal/Metal
- Ceramic/Polyethylene
- Ceramic/Ceramic

Modern advancements: Articulating surfaces

- Metal on Metal Stems
  - If not aligned properly create metal ion debride
  - Effects can be detrimental
  - Many have been revised
  - Still used in hip resurfacing.

Get picture of metal on metal synovitis/reaction

Modern advancements: Dual mobility cup

- Modular with constraint
- Indicated for populations at higher risk for dislocation:
  - Elderly Female
  - Revision
  - Spinal Fusion
  - Neuromuscular disease

Expansion of peripheral nerve blocks

- IPACK block
- Saphenous block
- Sciatic block
- Lumbar plexus block
- Femoral block
- Fascia Iliaca Block

Modern advancements: Anesthesia

- Increased use of regional anesthesia
  - Minimal side effects
  - Hospital length of stay
  - Patient satisfaction
- Neuraxial anesthesia for pain control
- Expansion of peripheral nerve blocks

Modern advancements: Soft tissue repair posterior THA

- Insert video of short ER tagging

Modern advancements: Increased stability posterior THA

- Insert video of checking hip stability during THA

Modern advancements: Soft tissue repair posterior THA

- Insert video of posterior capsule repair during THA

History of anterior approach

Anterior approach - Videos

- Insert videos

The anterior vs. posterior approach for THA debate

Anterior vs. posterior approach for THA

Posterior-Lateral

- Implant Placement- better
- Fracture Risk- less
- Blood Loss- less
- Surgical Time- faster
- Technically- straight forward
- Radiation Exposure- less
- Dislocation Rate- same
- LOS- same
- Pain- same
- Soft Tissue- "muscle separating"
- Sciatic Nerve Risk- same
- Recovery- same

Anterior

- Implant Placement- harder
- Fracture Risk- higher
- Blood Loss- more
- Surgical Time- longer
- Technically- harder
- Radiation Exposure- more
- Dislocation Rate- same
- LOS- same
- Pain- same
- Soft Tissue- "muscle sparing"
- Sciatic Nerve Risk- same
- Recovery- same

Current trend in post-op rehab: Are precautions too cautious?

- Why do we have precautions anyway?
  - To reduce risk of dislocation
    - But what's the real risk?
  - To allow for soft tissue repair to heal
  - To allow for surgical healing and bony ingrowth
    - Why some surgeons call for WB precautions post-op

Traditional hip precautions

- Restriction of hip flexion to 90 degrees
- No adduction
- No internal rotation
- No reaching to the floor
- No forward bending while seated
- No leg/ankle crossing
- Abduction pillow used in bed
- Supine sleeping
- Elevated chairs, toilet seats and car seats.
- But these were devised in the 1960's!

TIME OUT!

Trending: Reduced precautions

- Many surgeons reducing duration of precautions
  - 4 weeks vs. 6 weeks vs. 12 weeks
- Some surgeons are reducing number of precautions or not ordering precautions at all
  - Anterior Approach
    - Some MDs have discontinued precautions altogether
  - Posterior approach
    - Some MDs switched to "modified hip precautions" January 2014
    - Then switched to "pose avoidance" Jan 2016

Why change what already works?

- Most recent literature supports the decrease in dislocation risk with modern large head implants and improved surgical technique[5]
- The risk of instability decreased incrementally over time to <1% due to improvements in implants and techniques[6]
- Almost half of all dislocations within 90 days of surgery occurred due to falling or an unexpected twist, both of which are unlikely to be avoided with hip precautions protocol[7]
- While posterior hip precautions have been widely accepted by surgeons and patients, the literature supporting their efficacy has been sparse
- Patient expectations are paramount during the early recovery period after the procedure and removing THA precautions can alter a patient's perception of their recovery after the procedure

How do we know it's safe? Won't they dislocate?!

- The dislocation question: Soft tissue repair makes a difference; a meta-analysis in 2006 found: Posterior approach without soft tissue repair dislocation rate = 4.46%, and with soft tissue repair is 0.49%.
  - So, 8.21x greater relative risk of dislocation without soft tissue repair; included use of hip precautions[8]
- A separate systematic review found comparable dislocation rate associated with anterolateral, direct lateral and posterior approaches with soft tissue repair, 0.70%, 0.43%, and 1.01% respectively
  - This data demonstrates that adequate soft tissue repair greatly reduces the relative risk of dislocation[8]
- Cadaveric studies show: 4x greater resistance to torsional strength in soft tissue repair groups than in those without soft tissue repair [9]
- Study at HSS reduced hip precautions from 6 to 4 weeks; all patients had a standard posterior THA, with posterior soft tissue repair and a 28-36mm head size; 1% dislocation rate[10]
  - There was no increased risk of post-operative dislocation by reducing hip precautions to 4 weeks from 6 weeks

Multiple studies support reducing use of hip precautions: Anterior approach (Talbot et al.)

- Studied early dislocation rate in patients with anterolateral hip THA approach with no post-op restrictions
  - 499 cases w/ onlu 3 dislocations within 1 week of surgery, a rate of 0.6%[11]

The rate of dislocation is not increased when minimal precautions are used after total hip arthroplasty using the postero-lateral approach[12]

- Dislocation rates at 3 months for hip precuations vs. reduced precautions
  - Standard hip precautions (109) and reduced precautions (108).
  - Results: No dislocations in the less restricted group; 1 in usual care group
- Conclusion: Use experienced surgeons; femoral heads of >/= 28mm
- Larger studies are needed to verify this conclusion
- Changes included allowing hip flexion and _____
- Why one dislocation?
  - Anterosuperiorly when turning over in bed
  - Hip remained unstable after reduction and was probably due to a steep acetabular inclination angle (61 deg)
  - Other risk factors including an ASA grade of 3 and high BMI (45.6)

Do lifestyle restrictions and precautions prevent dislocation after THA? A systematic review and meta-analysis of the literature. [13]

- Reviewed both anterior and posterior-lateral approaches to THA
- Findings:
  - Decreased dislocation rate with decreased restrictions
  - Patient selection and surgical technique important in the prevention of post-operative dislocation than restrictions and precautions protocols after THA
  - Surgeons and PTs should not fear for an increased dislocation risk if they use a more liberal restriction and precautions protocol after THA, regardless of surgical procedure
- Conclusions:
  - "A more liberal lifestyle restrictions and precautions protocol…will lead to earlier and better resumption of activities and higher patient satisfaction"

Possible benefits of relaxed precautions

- Peak et al.,[14] study showed that patients given less precautions and restrictions enjoyed:
- High levels of satisfaction post-op
- Decreased cost!
  - Increased cost associated with hip precautions- $655 per patient for adaptive equipment.
- Earlier return to functional milestones
  - Faster return to work
- Improved quality of life

In light of this evidence, let's consider this:

- Should hip precautions be selectively applied?
- There is a place for standard hip precautions:
  - Previous hip surgery
  - Potential abductor weakness
  - Neurological conditions
  - Lumbar fusions
  - Hyper-flexibility
  - Connective-tissue disorders.
- Encourage patients to move in ways they find comfortable and adopt any position they chose. Do not push through discomfort.
- Open dialogue with referring MD is key!

UK survey of occupational therapist's and physiotherapist's experiences and attitudes towards hip replacement precautions and equipment[15]

- 170 participants completed survey
- Findings
  - % of individual's prescribing the following after THA:
  - raised toilet seated (95%)
  - furniture raises (79%)
  - helping hands/grabbers (77%)
  - perching stools (75%)
  - long handled shoes horns (75%)
  - Hip precautions were routinely prescribed by 97% of respondents.
- Of the 97% of people who routinely give patients THA precautions, 25% felt that this should not be a routine practice

Pose avoidance in posterior THA population

- Dr. Peter Sculco felt compelled to relax hip precautions due to the following:
  - Improved soft tissue repair
  - Size of implants
  - Relieve anxiety and fear of patients
  - Decrease "stiff" hips and backs
  - Insert videos and photos of patient examples.

Modified hip precaution study

PT Advancements in THA

Rehab history- The 1960's

- The average hospital LOS following surgery was 10-14 days.[2]
- Thereafter, many people went to rehabilitation facilities.
- All patients on standard precautions.

Courtesy of: APTA

Rehab history- The early 2000's

- Patients seen post op day #1
- All patients on standard total hip precautions
- Most surgeries were posterior approach - anterior THA has steadily gained prominence at HSS since then
- Patients pre-op education was through a joint class, post op protocol was not as progressive as it is today
- Hospital length of stay was 4 days
- Precautions were lifted on average between 8 weeks to 3 months

Evolution of standard of care

- Pre-operative education: one-on-one pre-operative
- Seen POD #0 – same day as surgery as early as 2 hours post-op
- Majority of patients discharge to home or directly to outpatient PT
- Relaxation of precautions by some MDs
- More robust allowance of return to sport by some MDs
- Average hospital length of stay 24 - 48 hours
- Some patients without precautions (for anterior THA) and others have pose avoidance precautions. In place typically between 4-12 weeks; surgeon dependent

Pre-operative education

- Exists in multiple forms:
  - Strength and conditioning programs
  - Group education classes
  - One-on-one PT information session

- Benefits for patients:
  - Build muscular strength, endurance, flexibility
  - **Set post-operative expectations** for recovery process
  - Can pre-train patients on use of assistive devices and transfers
  - Can deliver MD specific instructions for post-operative care

Pre-operative education

- How best to deliver?
  - Is it beneficial to do one pre-operative visit or multiple?
  - How soon before surgery should pre-operative PT be initiated?
  - What should pre-operative PT include?
- A Cochrane review in 2014 concluded:
  - "Pre-operative education may represent a useful adjunct, with low risk of undesirable effects, particularly in certain patients, for example people with depression, anxiety or unrealistic expectations, who may respond well to preoperative education that is stratified according to their physical, psychological and social need."

PRELIMINARY RESULTS OF PHYSICAL THERAPY PREOPERATIVE EDUCATION WITH SUPPLEMENTAL WEB-BASED APPLICATION ON PATIENT SATISFACTION AND FUNCTIONAL OUTCOMES POST-TOTAL JOINT REPLACEMENT: A RANDOMIZED CONTROLLED TRIAL: OPO100

Rupali Joshi, Peter White, Mary Murray-Weir, Michael Alexiades

- Results: Experimental group:
  - Felt they were better prepared to leave the hospital post-operatively
  - Were overall more satisfied with their pre-operative education
  - Required fewer postoperative PT visits (3.3 vs. 4.4 visits for control group)
  - Met postoperative functional discharge requirements significantly faster (1.6 days vs. 2.7 days)
  - Trended towards a reduction in hospital LOS compared to the current standard of care (2.4 days versus 2.6 days)

One-on-one PT: Standard of care*

- One-on-one PT visit on pre-operative screening day
- Stair training
- Transfer training
- Gait training
- Educated on use of lateralized microsite
- Post-operative exercises
- Discharge Planning
- Review DME
- **Surgeon specific instructions**
  - WB precautions
  - Specific post-op precautions

The HSS microsite

HSS microsite

- **Hip Replacement/ Resurfacing**
- Left Posterior Hip Replacement: 6,441
- Right Posterior Hip Replacement: 7,466
- Left Anterior Hip Replacement: 2,069
- Right Anterior Hip Replacement: 2,556
- Left Hip Resurfacing: 1,156
- Right Hip Resurfacing: 409

- **Knee Replacement**
- Left Knee Replacement: 7,061
- Right Knee Replacement: 7,375
- Left Partial Knee Replacement: 573
- Right Partial Knee Replacement: 518
- **Shoulder Replacement**
- Left Shoulder Replacement: 1,328
- Right Shoulder Replacement: 1,725

That's 38,677 unique views to our microsite from January- June 2017!

Pre-op PT utilization

- *Efficacy of Physical Therapy Pre-operative Education with a Supplemental Web- Based Application on Discharge disposition, Functional Outcomes and Patient Satisfaction Post Total Joint Replacement: A randomized Control Trial*" was presented at ARJR Rounds on September 24, 2015
- **3,519 pre-ops** seen since Sept 24, 2015 through October, 2017
- Currently seeing 250+ pre-op visits per month

Year	# of Pre-op visits
9/24/2015-12/31/2016	1/1/2017-10/31/2017
1,218	2,301

Pre-op PT: Why it matters

- Ambulatory surgery for joint replacements
  - Some insurance payers are denying inpt stays after TJA
  - Some surgeons are moving towards same day discharge for patients
  - Preparation ahead of time is critical for patients to be comfortable discharging
  - Less time in hospital= less time for acute PT to train patients and clear them after surgery
  - Increased costs attenuated by reducing inpatient LOS

THA pathways

- Acute care inpatient stay
  - One size fits all
  - Pathway adherence low from PACU admit to d/c
  - 2017, assigned 3 levels to meet individuality and what is actually happening based on real data
    - Rapid
    - Usual care
    - Complex

THR same day surgery

- Interdisciplinary workgroup task force identified early 2017
- Identified needs to facilitate this
- Surgeons involved
- Anesthesia involved
- PA's, nursing, rehab, IT, nutrition, hospitalists, case management, operational excellence, pt. educ
- Developed strict criteria to start
- Roll-out November 2017

Same day THR criteria

- No medicare
  - Subsequently did identify and complete same day MC
- Agreeable to leave same day
- Has caregiver support
- Home care set-up for following day
- No significant co-morbidities, medically stable
- < 70 years old
- Microsite and webinar development

Home care-front loading services

- NYC metro area intensive home services available
- VNS provides 5-7 day a week rehab services to eligible patients
- Criteria
  - _
  - _
  - _
  - _
- Facilitates throughput

Initial data same day THR

- # ___surgeries with anterior approach
- # ___ surgeries with posterior-lateral approach
- ___% met pathway goals on-time
  - Left same day
- ___% stayed over
  - Reasons: _____

Lessons learned

- Homecare set-up
- Pharmacy information
- Change in culture
- Order set changes

Updated THA guidelines pre-op

Updated THA guidelines- week 1

Updated THA guidelines- weeks 2 through 6

Updated THA guidelines- weeks 7-12

Updated THA guidelines- weeks 13-18

Pearls and Pitfalls of Treating THA From an Outpatient Perspective

Pearl: Pre-operative PT may increase LE muscular power

Pearl: Understanding the relationship between THA dislocation rate and spinal fusion

Pitfall: Training for strength alone vs. explosive strength

Pitfall: Not obtaining surgeon's recommended hip precautions and return to sports clearance

Pitfall: Physical activity may not increase after THA

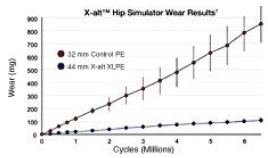
Pitfall: Not using latest evidence to treat this population

Return to Sport after THA

Then vs. now return to activity

- Then....
  - Rhematoid arthritis
  - Walking only
  - 10-20 year life span
- Now....
  - Anyone with joint degeneration (RA, OA, DDH)
  - Return to sports
  - Likely last a lifetime

Polyethylene vs. cross linked polyethylene wear



THA return to sports on the web

- Insert photos of THA

Theoretical activity related concerns after THA

- Fracture
- Dislocation
- Aspectic loosening
- Bearing surface wear

→ No good evidence to support ANY of these concerns!

J Biomech. 2016 Jul 5;49(10):2068-75. doi: 10.1016/j.jbiomech.2016.05.014. Epub 2016 May 26.

Damage in total knee replacements from mechanical overload.

Zimmerman WF[1], Miller MA[2], Cleary RJ[3], Izant TH[4], Mann KA[5].

- Examined effects of mechanical overload on 18 explanted cadaver prostheses.
- Measured bone- strain interface micro-motion.
- Fixed to mechanical test frame and applied 1-10x BW axial loads through prostheses.
- Results: 15 cadavers completed 10x BW without failure. On average, loads of 8x BW or greater were needed for failure.
- Failure was defined as micromotion exceeding 150 micrometers.
- None of the knees showed any signs of bone damage at loads of 4x body weight or less.

Return to Sport After THA

- Based on these findings could we conclude that sporting activities that provide 4x or less BW pressures are safe? Less than 8x or less?
- Long term follow up of survivorship of prosthesis in patients engaged in sporting activity is yet to exist.

Peak tibial forces

Activity	Peak Tibial Forces (x body weight)
Stair Master Level 1	2.4 ± 0.1
Stair Master Level 3	3.3 ± 0.3
Elliptical Level 1	2.3 ± 0.2
Elliptical Level 11	2.2 ± 0.3
Leg Press – foot reaction force 1x body weight	2.8 ± 0.1
Knee Extension – resistance 0.2x body weight	1.5
Rowing Machine	0.9 ± 0.1

Return to athletic activity- Consensus of the Hip Society and American Association of Hip and Knee Surgeons

Return to sport after THA

ROUND TABLES

Ask the Experts: Advising patients on sports activity following joint arthroplasty

Orthopedics Today; April 2011

- Richard Iorio, MD
- " As the quality of the bearing surfaces improves and survivorship of TJA implants improves, the extent of perceived allowable athletic activity continues to be expanded. Just as the recommendation of the Hip and Knee Societes expanded between 1999 and 2005, I expect they will continue to become more adventurous as the technology of joint replacements improves."

Return to sport after THA

- Considerations
  - How long has it been since they participated in the sport?
  - Adeqquate ROM, flexibility, strength to meet demands of the sport?
  - Condition of non-involved side?
  - Assess form with sporting activity

Why don't all patients return to sports? (Chang, et al. 2015)

- Why patients do not participate in sports activities after TKA
- 369 patients having undergone TKA given questionnaire 1 year post-op
- 76% reported they returned to sports
- Of the 24% who did not, 34% of these had participated in sports pre-operatively
  - 38% symptoms in operative knee
  - 33% symptoms in spine
  - 9.5% symptoms in non-operative knee

Jogging after THA (Abe, et al. 2013)

- 804 hips in 608 patients having undergone HRA (81 patients) and THA (527 patients)
- Mean age = 62 years, mean BMI = 23.2, mean follow up = 4.8 years
- At follow up visits:
  - Questionnaire on jogging routines
  - Radiographs to assess implant migration as well as software assessing polyethylene wear
  - Serum cobalt & chromium ion concentrations
- 70% of those who jogged pre-operatively continued jogging post-operatively
- No c/o of pain
- No radiographic evidence of loosening, abnormal component migration or excessive wear at last follow up (mean 4.8 years)
- Reasons for not jogging in the 10/33 patients who jogged pre-operatively:
  - Anxiety, impossible because of pain, decreased ROM, muscle weakness, knee or lumbar pain
- Younger age, male, HRA, pre-operative jogging all associated w/ post-op jogging

J Arthroplasty. 2012 Sep;27(8):1518-1525.e2. doi: 10.1016/j.arth.2012.02.001. Epub 2012 Apr 17.

What are young patients doing after hip reconstruction?

Delasotta LA[1], Rangavajjula AV, Porat MD, Frank ML, Orozco FR, Ong AC.

- 62 patients surveyed
- 60/62 patients participated in recommended activities
  - 2 active in jogging and squash
- Why not doing higher impact activities?
  - Fear (29%)
  - Surgeon recommendation (26%)
  - Hip Pain (14%)
  - Fatigue (17%)
  - Decreased interest (14%)

Bone Joint J. 2014 Aug;96-B(8):1041-6. doi: 10.1302/0301-620X.96B8.32813.

Pre-operative function, motivation and duration of symptoms predict sporting participation after total hip replacement.

Ollivier M[1], Frey S[2], Parratte S[3], Flecher X[4], Argenson JN[5].

- 815 patients THA 1999-2005.
  - 64% return to sports activity UCLA> 5
- Reasons for not returning to sport:
  - Fear of dislocation (32%)
  - Avoiding wear (16%)
  - Recommendation of surgeon (16%)
- Predictors for return to sports:
  - Shorter duration of symptoms
  - Motivation
  - Higher pre-op HHS

HSS rehab's return to sport criteria

- MD Clearance
- No increase in pain or edema with activity
- Symmetries LE strength, Y-balance
- Descend 8" step without pain or deviation
- Strength, flexibility and motion throughout the kinetic chain to meet demands of sport
- Independent with full HEP

Return to sport after THA

- Definitely avoid this activity!!

Future state of outpatient THA care?

- Selectively applied precautions
- Remote PT
  - Pre-recorded exercises accessed via computer
  - Patients can follow progression at home.
  - Bini and Mahajan found it to be as successful as clinic-based PT[16]
- Group based therapy
  - Studies show patients receiving group PT classes achieve similar progress for ROM and patient reported outcome measures (PROMS) as patients receiving one-on-one PT
  - May be a cost effective option for delivering care

The Rapid Recovery Era: Acute Care, Staffing Models & Discharge Trends

Healthcare is changing; staffing needs are changing

What is driving these changes?

- Higher healthcare expeditures/costs
  - 3.2 trillion US dollars in 2015; 17.8% GDP; $10K pp
- Declining reimbursement
- Need to reduce length of stay
- Advances in surgical techniques
- Advances in technology
- Lean initiatives
  - CJR bundles, SNF oversight

http://money.cnn.com/2016/12/02/news/economy/health-care-spending/index.html

Rehab's role in cost containment?

- **Improve throughput!**
  - Discharge patients to home with home services safely
  - Rapid/Enhanced recovery models
    - Multi-modal approach to peri-operative care
  - Lean initiatives
    - Comprehensive joint replacement bundles
    - Follow patients through post-acute stay
      - Develop relationships with SNF/sub-acute
      - Alerts when patients readmitted locally
    - Interested in significance of pre-op home visit

Effects of the LOS on cost of TKR and THR

- Hospital costs for TJA increased 2002-2013
- Increased costs attenuated by reducing inpatient LOS
- Upward trend in utilization of joint arthroplasty
  - Reduction in LOS remains an important target for cost containment

Molloy et al. 2017

Enhanced recovery model

Galbraith et al, 2017

Education

Pre-operative education

- Group classes
- Website formats – webinars, videos
- Written handouts or pamphlets
- Evidence demonstrates may or may not benefit patient; warrants further investigation

Pre-op PT 1:1 consult

- Review surgeon specific protocol
- Can flag unique needs; notify surgeon's office/inpt team
- Individualize session to patient and caregiver needs
- High patient satisfier based on patient feedback

McDonald et al. *Cochrane Reviews*. 2014

Day of surgery mobilization

- Evidence DOS mobilization decreases LOS
- LOS decreased by .21 days in 2007 (Juliano et al. 2011)
  - No difference in achievement of functional milestones
    - Functional milestone tool no longer sensitive enough to detect changes as LOS decreased (days vs. hours)
    - Multi-modal approach still required enhancements
- 2014 meta-analysis decreased LOS by 1.8 days (Guerra et al. 2015)
  - 5 RCT's, 633 participants

Ongoing rehabilitation

- During hospital stay
  - BID PT plus additional practice session
  - Add additional visits in same day as needed to achieve milestones earlier if resources available
- Post-acute stays
  - SNF oversight
  - Relationships with sub-acute facilities
- Home services (Intensive Home PT 5-7 days/week)
- Outpatient services

Functional milestones

- Tool to evaluate quality and efficiency of PT for patients
  - Utilized on inpatients undergoing TJA at HSS
- This tool was introduced in the 1980's when LOS was significantly greater
- Derived from consensus building from the therapy staff
- Resulted in years of collecting data

Functional milestone achievements 2007

- Day of Surgery
  - Average # days to achieve FM (Mon, Tues, Wed)
    - THR Cane Unassisted 2.67 = 64 hours
    - THR Stairs Unassisted 2.62 = 62.9 hours
  - Average # days to achieve FM (Th, Fri, Sat)
    - THR Cane Unassisted 2.79 = 67 hours
    - THR Stairs Unassisted 2.81 = 67.4 hours
- POD #1
  - Average # days to achieve FM (Mon, Tues, Wed) and (Th, Fri, Sat)
    - THR Cane Unassisted 3.34 = 80 hours
    - THR Stairs Unassisted 3.27 = 78.5 hours

Functional milestone achievements 2017

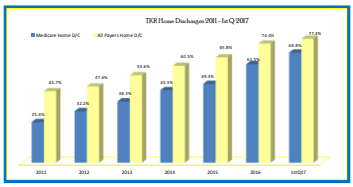
Acute Care PT Clearance /Functional Milestones	Hours
THA PT Clearance (48 hour Pathway)	**43**
Total Patients	353
THA Cane Unassisted	38
THA Stairs Unassisted	44
THA RW Unassisted	43
TKA PT Clearance (72 hour Pathway)	**56**
Total Patients	197
TKA Cane Unassisted	48
TKA Stairs Unassisted	55
TKA RW Unassisted	55
Uni PT Clearance (23 hour Pathway)	**16**
Total Patients	48
Uni Cane Unassisted	15
Uni Stairs Unassisted	15
Uni RW Unassisted	16
Hip Resurfacing PT Clearance (48 hour Pathway)	**27**
Total Patients	26
Hip Resurfacing Ax Cr Unassisted	24
Hip Resurfacing Stairs Unassisted	27
Hip Resurfacing RW Unassisted	27

Average hours to "clear" PT

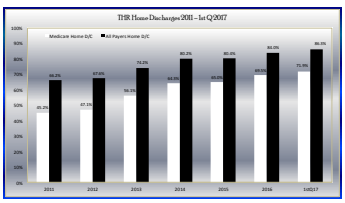
Functional milestone achievements comparison

Acute Care PT Clearance/Functional Milestones	DOS 2007 (M, T, W)	DOS 2007 (Th, F, S)	Hours 2017
THA PT Clearance (48 hour Pathway)			**43**
Total Patients			353
THA Cane Unassisted	64	67	38
THA Stairs Unassisted	63	67	44
THA RW Unassisted			43

Acute Care Urban Orthopedic Hospital TKR home discharges 2011 – YTD 2017



Acute Care Urban Orthopedic Hospital THR home discharges 2011- YTD 2017



Significant inpatient staffing changes

- Adding permanent staff to weekends
- Extending hours of service
- Adding additional sessions for mobility
- Staffing for the demand based on pathway requirements

Adding permanent staff to weekends

Patient/Hospital Benefit

- Time to clear rehab consistent per day of week
- MDR's with permanent staff
- Engaged staff who is aware of daily operations
- Reduce per-diem costs

Staff Benefit

- Weekend differential
- Staff requests weekend day preferred
- Engaged staff on weekends
- Ownership of protocol changes
- Senior staff an opportunity to be in charge of day

Extending hours of service
7a to 9p M-F; 7a-5p Sat/Sun

Patient/Hospital Benefit

- Greater DOS coverage
- Patient d/c in evening vs. staying overnight
- Clear early AM to adhere to expected d/c date/time
- Consistency of care
- Patient satisfaction-greater opportunity to be seen

Staff Benefit

- Staff chooses preferred weekend day or late night
- Staff can work 4 long days instead of 5 days a week
- Stagger work schedule combo long/short days

Adding additional opportunities for mobility

Patient/Hospital Benefit

- Primary THR/TKR BID session
- Patients receive additional practice session
  - Goal of ambulation to increase opportunities to be up and walking
- Facilitate throughput; pts may receive additional sessions to clear and go home
- High patient satisfaction

Staff Benefit

- Continuity of care
- Increase opportunities to interact with patient to ensure all questions/concerns addressed

Opportunities for staff to learn and grow

- Participate in interdisciplinary rounds
- Physician rounds
- Grand Rounds/Inservice/Case Studies/Journal clubs
- Rotation system
- Projects/data collection/research/CQI
- Students and interns
- Career ladder (title, responsibility and promotion options)
- Make staff opinions count; touchpoints with staff (open to feedback, suggestions, and ideas)

Current state: Where are we and what's next?

ACUTE CARE

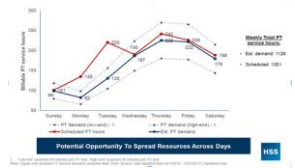
PT Staffing Effectiveness Project

PT Staffing Effectiveness Project Aims To Deliver A New Staffing Model That Meets PT Demand To Reduce Time To Clear Rehab

Problem statement	• Demand for PT services is not consistently captured, stratified, and communicated • Effectively staffing to a moving target is difficult, time-consuming and labor-intensive • Most important, today's staffing process pulls clinical resources away from patient care
Deliverables	1. Assess opportunity to improve patient healing times and align staffing to demand 2. Design new staffing model to more effectively assign daily patients & determine optimal level of staffing
Benefits	• Clinically appropriate throughput and length of stay • Decreased costs for HSS and patient-family • Patient and staff satisfaction

Assessment | Solution Design

The Gap Between Staff Levels And Census Appears Notably Higher On Mondays and Tuesdays Than The Rest Of The Week

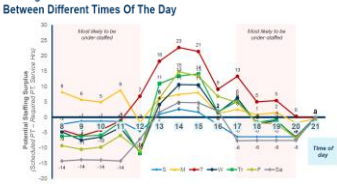


Potential Opportunity To Spread Resources Across Days

HSS

Assessment | Solution Design

Staffing Should Also Account For Fluctuations In PT Demand Between Different Times Of The Day



Mornings and late afternoons appear to be slightly understaffed; further opportunity to spread resources across hours of the day

HSS

Assessment | Solution Design

Analysis Suggests Staffing, Timing Of Early PT Visits, And Patient Age / Complexity Most Impact Rehab Clear Time

2nd PT visit optimally timed

Occur before 11a or after 3p

Fall within the 'Goldilocks' zone' for THR patients

1st PT visit 'on schedule'

Rehab initiated on:
- POD1 for Spine 3, Spine 4, and Peds Spine pathways
- DOS for all other pathways

Staffing aligned to demand

Scheduled PT hours reflect expected PT hours (derived from volume and pathway mix)

Complexity

Lower co-morbidity count (i.e. Elix-Hauser score)

Reduced Time To Clear Rehab

Age

Over 25 y.o. and under 55 y.o

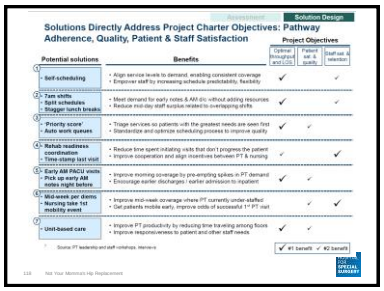
HSS

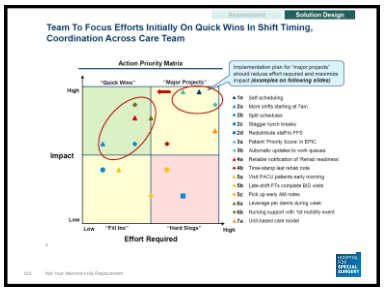
Solution Design

Solutions Contributed By PT Team Emphasize Coordination, Reallocation Of Existing Resources, And Standardization

	Potential solutions	Description
1	Decentralize scheduling responsibilities	a) Introduce digital self-scheduling tool
2	Shift timing of PT staff schedules	a) More staff schedules starting at 7am b) Split schedules to reduce shift overlap c) Stagger lunch breaks d) Redistribute staff to FFS in early afternoon
3	Standardize & automate patient prioritization	a) Add patient-specific 'Priority Score' to PT summary tab b) Automatically update PT work queues
4	Better coordinate hand-off and sequencing	a) Refresh protocol for 'rehab readiness' notification between PACU and PT b) Time-stamp last rehab note in EPIC
5	Refocus existing staff	a) Early-shift PTs visit PACU patients early am b) Late-shift PTs complete BID visits c) Late-shift PTs pick up early AM notes
6	Redistribute PT milestones across care team	a) Leverage per diems during the week, complete DOS visits in evenings b) Nursing complete first mobility event for home-bound cases
7	Centralize clinical resources	a) Adopt variant of Unit-based care model

Source: PT leadership and staff workshops, interviews





Solution design

- Refocus existing staff: more shifts begin at 7 am
- Develop priority Score in EMR (EPIC) for scheduling
- Reliable notification of PT readiness through EMR communication

Future state of acute care orthopedics?

- Ambulatory surgeries for TJA more prevalent
  - Medicare reimbursement driving this
- Acute care orthopedic rehab staffing models may resemble nursing staff models with longer shifts and 7 day a week coverage
- Continue to improve technology with implant design, templating and surgical technique
- Intensive home services vs. rehab stays
- Selectively applied precautions
- No DME needs?

Final thoughts

- Increased demands for rehab services following TJA continues to grow as the number of procedures grows
- Future research needed regarding hip precautions post-THR as opposed to the current blanket provision of movement restrictions; relates to DME needs
- There is no cookie cutter approach
- Communication is essential!
- Do no harm; also do not be afraid to push people to return to the "best version of themselves"
- Use data analytics for best practice staffing solutions (when demand is highest, staff accordingly, projections based on census)
- Continually re-evaluate pathways for care delivery; individualize optimally within overall pathway parameters; record variances and modify as needed

Thank you!

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