PCR114

Utilizing Time-Driven Activity Based Costing to Explore Variation in the Value of Hip Arthroscopy for Acetabular Labral Repair

Michael C. Dean,[1] Ana P. Etges,[2] Nathan J. Cherian,[1] Zachary L. LaPorte,[1] Kieran S. Dowley,[1] Kaveh A. Torabian,[1] Christopher T. Eberlin,[1] Matthew J. Best,[3] and Scott D. Martin[1]

[1]Massachusetts General Hospital, Boston, MA. [2]Avant-garde Health, Boston, MA. [3]Johns Hopkins University, Baltimore, MD.

BACKGROUND

- Given the unsustainable growth of US health expenditures, value-based initiatives have garnered significant attention – especially in the field of orthopedic surgery[1-4]
- Hip arthroscopy is an effective, increasingly popular procedure used to address labral pathologies and/or bony abnormalities (femoroacetabular impingement)[5,6]
- While hip arthroscopy has been shown to reduce pain, improve function, and delay/prevent hip replacement, little is known regarding its associated costs. Furthermore, previous studies have assessed costs independent of outcomes[7,8]
- **Time-driven activity-based costing (TDABC)** is an accurate costing methodology that calculates costs by synthesizing the quantity and per-unit cost of each resource required to deliver care[9,10]

- **This study integrated patient-reported outcome measures (PROMs) and TDABC to evaluate the variability and drivers of patient value following hip arthroscopy**

OBJECTIVES

1. **Characterize variation in the value of hip arthroscopy for symptomatic labral tears**
2. **Explore associations between value and patient-specific demographics, comorbidities, PROMs, and intraoperative variables**

METHODS

- Following IRB approval, prospectively collected data for patients undergoing hip arthroscopy by a single, fellowship-trained surgeon (S.D.M) from 2015 – 2020 were retrospectively reviewed
- **PROMs were collected at baseline and 2 years postoperatively**
  - included International Hip Out-come Tool-33 (iHOT-33), Hip Outcome Score–Activities of Daily Living (HOS-ADL), and Hip Outcome Score–Sports Subscale (HOS-SS)
- **Exclusion criteria**
  - patient <18 years old, missing baseline or 2-year PROMs, previous ipsilateral hip surgery, or radiographic evidence of hip dysplasia or advanced hip osteoarthritis (Tönnis grade >1)
- 198 cases were initially identified; following exclusion, **161 cases were included in our final analysis**
- **TDABC was performed** in accordance with guidelines established by Kaplan, Anderson, and other experts.[9-11] Briefly, applying TDABC entails:
  1. Constructing process maps that involve all relevant steps in the care pathway
  2. Determining the time and supplies required for each step
  3. Multiplying the quantity of each resource used with its per-unit cost
  4. Summing these products across all expended resources
- **Individual process maps were constructed** for the preoperative, intraoperative, & postoperative phases and are available online
- **Patient value was normalized** to protect confidentiality. **Linear mixed-effects models (with surgery center as a random effect) were used to identify factors underlying variation in value**

RESULTS

- ***Patient demographics, comorbidities, and operative characteristics***

- **Gender**
  - 76 women (47.2%) and 85 men
- **Age**
  - 36.0 (10.9) years [mean (SD)]
- **BMI**
  - 25.8 (4.3) kg/m^2
- **Race**
  - 3.1% Asian
  - 1.2% Black or African American
  - 92.5% White
  - 3.1% other/unavailable
- **Use of bone marrow aspirate concentrate (BMAC) or microfracture**
  - 64.0%
- **Osteoplasty type**
  - 47.8% acetabuloplasty
  - 5.6% femoroplasty
  - 43.5% both
  - 3.1% neither
- **Labrum procedure**
  - 87.6% labral augmentation with capsular autograft
  - 8.1% repair
  - 4.3% debridement

TABLE 1. Characteristics independently underlying variation in value

Variable	Mean Difference	95% Confidence Interval		*P* Value*
		Lower	Upper	
Patient characteristics				
Age, per 1-year increase	0.19	-0.34	0.72	0.84
Male gender	-5.37	-16.23	5.49	0.52
Previous contralateral surgery	-17.31	-34.94	0.31	**0.039**
Preoperative iHOT-3 3 score, per 1-point increase	0.52	0.25	0.80	**<0.001**
Pre- or intraoperative findings				
Outerbridge grade	-3.93	-10.03	2.17	0.27
Tönnis grade 1†	-12.15	-22.00	-2.30	**0.025**
Case-specific factors				
Year, per 1-year increase	2.60	-1.81	7.00	0.52
Acetabuloplasty or femoroplasty‡	11.18	0.32	22.03	**<0.001**
No osteoplasty‡	57.59	25.87	89.31	
Labral debridement§	21.60	-4.13	47.34	**0.029**
Simple labral repair§	-3.39	-20.91	14.12	
BMAC or microfracture	-33.77	-45.40	-22.14	**<0.001**

*P values calculated using likelihood-ratio tests. †Reference: Tönnis 0. ‡Reference: acetabular femoroplasty. §Reference: labral repair with capsular augmentation. This model also included surgery center as a random intercept. Marginal $R^2 = 0.420$; conditional $R^2 = 0.423$. Boldface denotes statistical significance.

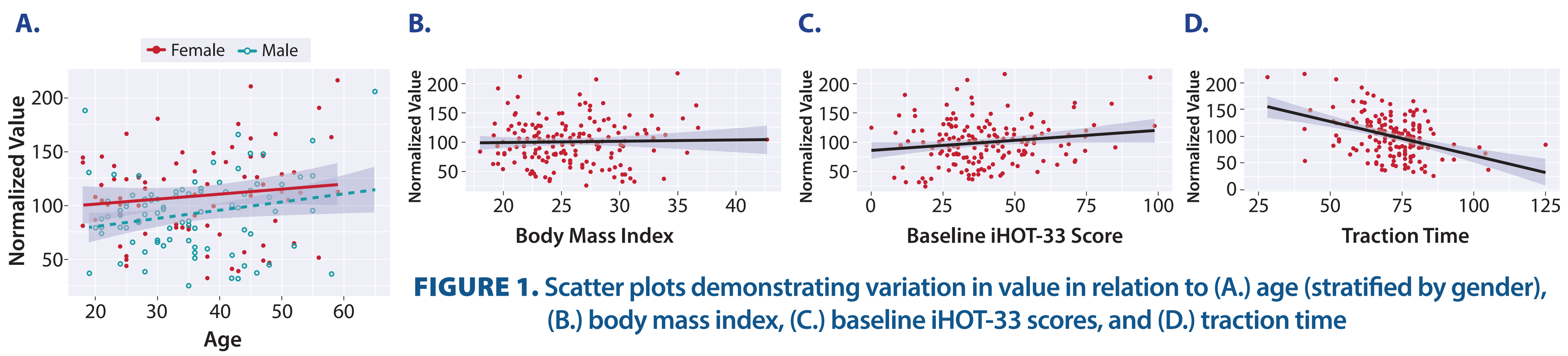

FIGURE 1. Scatter plots demonstrating variation in value in relation to (A.) age (stratified by gender), (B.) body mass index, (C.) baseline iHOT-33 scores, and (D.) traction time

CONCLUSIONS

- We demonstrated **wide variation in the value of hip arthroscopy** that was ***mostly strongly associated with***
  - ***Procedure Type***
    - e.g. osteoplasty type, labral treatment technique, use of BMAC or microfracture
  - ***Preoperative PROMs***
- **Preoperative clinical findings** also predicted the ***2-year value***
  - ***Previous contralateral hip arthroscopy***
  - ***Tönnis grade***
  - Effect of Outerbridge grade remains unclear
- **Surprisingly, many patient demographics were not independently associated with value**
  - *Age*
  - *Gender*
  - *Body mass index*
  - *Race*
  - *Ethnicity*
  - *ASA score*
- **These findings may promote optimization of the hip arthroscopy care pathway to reduce variation and deliver higher-value care**

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