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The Effects of Length of Stay and Readmissions on Total Charges of Total Knee Arthroplasty and Total Hip Arthroplasty Patients

Tyler Wright

Academic Advisor: Fatma Pakdil, Ph.D., MBA

Eastern Connecticut State University



Presentation plan

- Introduction
- Literature review
- Hypotheses
- Data collection
- Data analysis
- Results
- Conclusion
- Q&A



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Introduction

- Huge advancements in the medical field
- Long/dangerous procedures now more routine
- Total Knee Arthroplasty/Total Hip Arthroplasty (TKA/THA)
- Big improvements in quality and effectiveness
- Hospital Readmission Reduction Program (HRRP)





Literature Review – Systematic literature review

Criteria	Items
Inclusion Criteria	Full-text articles published in scholarly journals, theses, book chapters, and books
	Published in English between 1994 and 2020
	The publications found in selected digital databases in primary search
	The articles including identified key words
	The articles used in the previous literature reviews (secondary search)
Exclusion Criteria	Articles in non-scholarly journals
	Not full-text articles
	Materials published in other languages
	Duplicated studies
	Conference proceedings

Web of Science, Business Source Premier (EBSCO), and ScienceDirect



Literature Review

- Williams et al. (2017) -> increased LOS increases risk of readmission
- Saucedo et al. (2014) -> increased LOS increases likelihood of readmission
- Makela et al. (2011) -> shorter LOS decreases costs
- Barad et al. (2008) -> as LOS decreased, patient savings increased



Hypotheses

- **Hypothesis 1:** As LOS increases, patient total charges are likely to increase among THA/TKA patients.
- **Hypothesis 2:** As the readmission rates of TKA/THA patients increase, total charges is likely to increase among THA/TKA patients.
- **Hypothesis 3:** Age, gender, comorbidity, the location of the hospital, hospital ownership, type of insurance and payee are impactful on total charges of TKA/THA patients.



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Data Collection

- Healthcare Cost and Utilization Project (HCUP) Datasets
- National Readmission Database (NRD) – 2010 - 2017
- DRG coding system



**Agency for Healthcare
Research and Quality**



Variables

Dependent variable:

- Discharge Cost

Independent variables:

- Length of Stay (LOS)
- Age
- Gender
- Charlson Comorbidity Index (CCI)
- Hospital urban-rural designation
- Hospital ownership
- Insurance type
- Payee type
- Readmissions



Data Analysis

- Descriptive statistics on preliminary data
- LOS filtered to 0-26 days for regression analysis
- Tests of assumptions
- Eleven regression models
- SPSS 26.0



Assumptions

- Assumption 1: Independent Observations (Chi-squared test)
- Assumption 2: Normality (Kolmogorov-Smirnov and Shapiro-Wilk tests)
- Assumption 3: Linearity (scatterplot)
- Assumption 4: Homoscedasticity (scatterplot)
- Assumption 5: No multicollinearity (collinearity diagnostics)



Results

LOS Data (Days)

Year	Mean	Std. Dev.	Minimum	Maximum	Q1	Q3
2010	4.22	3.878	3.00	4.00	280	0
2011	4.08	3.702	3.00	4.00	239	0
2012	3.92	3.626	3.00	4.00	332	0
2013	3.63	3.407	2.00	4.00	365	0
2014	3.41	3.143	2.00	3.00	193	0
2015	3.16	3.072	2.00	3.00	364	0
2016	2.84	2.765	2.00	3.00	244	0
2017	2.57	2.580	1.00	3.00	349	0
All Years	3.35	3.251	2.00	3.00	365	0

Results

HCUP Readmission Data

Year	0 (Not Readmitted)	1 (Readmitted)
2010	94.5%	5.5%
2011	94.7%	5.3%
2012	94.8%	5.2%
2013	95.3%	4.7%
2014	95.4%	4.6%
2015	95.6%	4.4%
2016	95.7%	4.3%
2017	96.0%	4.0%
All Years	95.4%	4.6%



Results

Table 8: HCUP Total Charges Data (Dollars)

Year	Mean	Std. Dev.	Minimum	Maximum	Q1	Q3
2010	56531.38	33028.271	35544.50	68020.00	1140552	118
2011	59186.32	35207.865	36671.00	71742.00	1487006	291
2012	61164.72	37303.822	37422.00	74174.00	2578194	100
2013	62206.06	39280.136	38213.00	75344.00	3426366	111
2014	61975.09	38867.323	37511.00	75825.00	4061378	106
2015	62086.24	38409.678	37287.00	76396.75	3972042	177
2016	62961.42	39346.987	37590.00	77757.00	5012724	103
2017	64040.20	43932.038	38273.00	78523.00	4840795	152
All Years	61682.75	38936.393	37446.00	75301.00	5012724	100



Results

- **Hypothesis 1:** As LOS increases, patient total charges are likely to increase among THA/TKA patients.
- **Hypothesis 2:** As the readmission rates of TKA/THA patients increase, total charges is likely to increase among THA/TKA patients.
- **Hypothesis 3:** Age, gender, comorbidity, the location of the hospital, hospital ownership, type of insurance and payee are impactful on total charges of TKA/THA patients.
- Three hypothesis was supported in NRD data sets.



Conclusion

- As LOS increases total charges of TKA/THA patients increase, and as LOS decreases total charges decrease.
- Readmitted TKA/THA patients experienced higher total charges than patients who were not readmitted.
- Finally, age, gender, CCI, hospital urban-rural designation, hospital ownership, insurance type, and payee type were all impactful upon the total charges of TKA/THA patients.



References

- Williams J, Benjamin S. Kester, Joseph A. Bosco, James D. Slover, Richard Iorio, Ran Schwarzkopf (2017). The Association Between Hospital Length of Stay and 90-Day Readmission Risk Within a Total Joint Arthroplasty Bundled Payment Initiative. *The Journal for Arthroplasty Volume 32, Issue 3, March 2017, pages 714-718.*
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