THE JOURNAL OF
SEXUAL MEDICINE

Analysis of Hospital Readmissions After Prosthetic Urologic Surgery in the United States: Nationally Representative Estimates of Causes, Costs, and Predictive Factors

Filippo Pederzoli, MD,[1,2] Meera R. Chappidi, MPH,[2] Sarah Collica, BS,[2] Max Kates, MD,[2] Gregory A. Joice, MD,[2] Nikolai A. Sopko, MD, PhD,[2] Francesco Montorsi, MD,[1] Andrea Salonia, MD, PhD,[1] and Trinity J. Bivalacqua, MD, PhD[2]

ABSTRACT

Background: The surgical treatment of urinary incontinence and erectile dysfunction by prosthetic devices has become part of urologic practice, although sparse data exist at a national level on readmissions and hospital costs.

Aim: To assess causes and costs of early (≤30 days) and late (31−90 days) readmissions after implantation of penile prostheses (PPs), artificial urinary sphincters (AUSs), or PP + AUS.

Methods: Using the 2013 and 2014 US Nationwide Readmission Databases, sociodemographic characteristics, hospital costs, and causes of readmission were compared among PP, AUS and AUS + PP surgeries. Multivariable logistic regression models tested possible predictors of hospital readmission (early, late, and 90 days), increased hospital costs, and prolonged length of stay at initial hospitalization and readmission.

Outcome: Outcomes were rates, causes, hospital costs, and predictive factors of early, late, and any 90-day readmissions.

Results: Of 3,620 patients, 2,626 (73%) had PP implantation, 920 (25%) had AUS implantation, and 74 (2%) underwent PP + AUS placement. In patients undergoing PP, AUS, or PP + AUS placement, 30-day (6.3% vs 7.9% vs <15.0%, $P = .5$) and 90-day (11.6% vs 12.8% vs <15.0%, $P = .8$) readmission rates were comparable. Early readmissions were more frequently caused by wound complications compared with late readmissions (10.9% vs <4%, $P = .03$). Multivariable models identified longer length of stay, Charlson Comorbidity Index score higher than 0, complicated diabetes, and discharge not to home as predictors of 90-day readmissions. Notably, hospital volume was not a predictor of early, late, or any 90-day readmissions. However, within the subset of high-volume hospitals, each additional procedure was associated with increased risk of late (odds ratio = 1.06, 95% CI = 1.03−1.09, $P < .001$) and 90-day (odds ratio = 1.03 95% CI = 1.02−1.05, $P < .001$) readmissions. AUS and PP + AUS surgeries had higher initial hospitalization costs ($P < .001$). A high hospital prosthetic volume decreased costs at initial hospitalization. Mechanical complications led to readmission of all patients receiving PP + AUS.

Clinical Implications: High-volume hospitals showed a weaker association with increased initial hospitalization costs. Charlson Comorbidity Index, diabetes, and length of stay were predictors of 90-day readmission, showing that comorbidity status is important for surgical candidacy.

Strengths and Limitations: This is the first study focusing on readmissions and costs after PP, AUS, and PP + AUS surgeries using a national database, which allows ascertainment of readmissions to hospitals that did not perform the initial surgery. Limitations are related to the limited geographic coverage of the database and lack of surgery- and surgeon-specific variables.

Conclusions: Analysis of readmissions can provide better care for urologic prosthetic surgeries through better preoperative optimization, counseling, and resource allocation. **Pederzoli F, Chappidi MR, Collica S, et al. Analysis of Hospital Readmissions After Prosthetic Urologic Surgery in the United States: Nationally Representative Estimates of Causes, Costs, and Predictive Factors. J Sex Med 2017;XX:XXX−XXX.**

Received April 12, 2017. Accepted June 15, 2017.

[1]Division of Experimental Oncology, Unit of Urology, URI, Vita-Salute San Raffaele University, IRCCS Ospedale San Raffaele, Milan, Italy;

[2]James Buchanan Brady Urological Institute, The Johns Hopkins School of Medicine, Baltimore, MD, USA

http://dx.doi.org/10.1016/j.jsxm.2017.06.003

Key Words: Penile Prosthesis; Erectile Dysfunction; Artificial Urinary Sphincter; Urinary Incontinence; Patient Readmission; Postoperative Care

INTRODUCTION

Prosthetic surgery has gained a fundamental role in the management of multiple urologic conditions. Penile prostheses (PPs) represent a high-value treatment for patients with severe erectile dysfunction (ED) unresponsive to pharmacotherapy and for patients who aim for a permanent solution.[1] Moreover, artificial urinary sphincters (AUSs) are the gold standard for the treatment of moderate-to-severe urinary incontinence (UI) and are most commonly used for UI after prostatectomy.[2,3] Notably, PPs and AUSs can be implanted simultaneously in the same patient to treat ED and UI, respectively.[4,5]

Many previous studies on clinical outcomes and surgical techniques after PP and AUS implantation are single-surgeon or single-institution series, and the results of these studies are not generalizable to the larger, more heterogeneous patient population currently undergoing urologic prosthetic surgery. Although there are some regional and national studies conducted in more diverse cohorts,[3,6,7] there has been very limited analysis of the burden and costs of short-term readmissions. As a result, there is a need for large national studies to better inform our understanding of current patterns of care after urologic prosthetic surgery. Such studies would provide generalizable results to help identify patients at the greatest risk for readmission, optimize postoperative patient care, improve preoperative patient counseling, potentially influence decisions related to surgical candidacy of patients, and help with an overall more efficient allocation of economic resources.

Therefore, using a nationally representative database, we aimed to (i) report the rate and causes of 30-day and 90-day readmissions after implantation of PP, AUS, and PP + AUS and (ii) evaluate the presence of predictive factors for readmission. In addition, we performed costs analysis and identified predictors of cost increases during the primary surgical procedure, follow-up, and at time of readmission.

METHODS

Data Source

The Nationwide Readmissions Database (NRD) is a stratified, single-stage, clustered sample of hospital discharges and contains data from 21 (2013) and 22 (2014) State Inpatient Databases.[8] The 2013 and 2014 NRD data when weighted estimate approximately 35 million discharges amounting to a total of 70 million discharges across the 2 years, accounting for approximately 50% of the US resident population.[8,9] The NRD can track all inpatient encounters for a patient within a given state. This study received an exemption from the institutional review board of the Johns Hopkins Medical Institutions (Baltimore, MD, USA). Because of the data agreement, it was not possible to report clear values when the number of observations was no larger than 10.

Patient Cohort

Using *International Classification of Diseases, Ninth Revision* (ICD-9) procedure codes, the 2013 and 2014 NRD were retrospectively queried for patients who underwent placement of inflatable PP (IPP; 64.97), non-IPP (NIPP; 64.95), and AUS (58.93). Exclusion criteria included non-residents of the state the surgery was performed in, because they would be more likely to be readmitted in their state of residence, which would not be captured in the NRD.[10] Patients who died during initial hospitalization were excluded.[10] Patients who underwent surgery in October 2013 or 2014 or later were excluded, because they did not have 90-day follow-up in the database.[10] Patients who underwent another PP or AUS placement during their 90-day follow-up were excluded.

Covariates

Patient-level covariates included age (categorized into decades), sex, insurance status (Medicare vs non-Medicare), patient location, patient income level based on patient's home ZIP code, and patient disposition at discharge to home or other facility.[8] In addition, patients who were overweight or obese (ICD-9 codes 278, 278.0, 278.00, 278.01, 278.02) were identified. The Charlson Comorbidity Index (CCI) was calculated[11,12] and was modified as follows. Points for diabetes diagnoses were subtracted from this score and a new variable of diabetes (yes with complications, yes without complications, or no diabetes) was created given the importance of this variable in the literature.[13]

Hospital-level covariates included bed size (small, medium, or large), location, and teaching status. The categories are defined using regions of the United States, the urban vs rural designation of the hospital, and teaching status.[8]

Main Outcome Measures

The primary outcomes were early hospital readmission (≤30 days of discharge) or late hospital readmission (31−90 days of discharge).[14] The causes of readmission were determined by the primary ICD-9 diagnosis code (eTable 1).[10]

Secondary outcomes included overall cost of initial hospitalization and of early and late readmissions. Additional outcomes included prolonged length of stay (PLOS) or elevated hospital cost (EHC) during initial hospital stay and readmission.[15] These binary variables were defined at a threshold higher than the 75th