



Regional Cost Variations of Robot-Assisted Radical Prostatectomy Compared With Open Radical Prostatectomy

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Abstract

Robot-assisted radical prostatectomy (RARP) has been shown to be as effective as open radical prostatectomy (ORP), however at a higher cost. In this study we used a nationally representative database to evaluate regional cost variation in the United States for patients who undergo RARP versus ORP and found that in the Northeast region, ORP is more costly than RARP.

Introduction: The purpose of the study was to evaluate the cost differences between robot-assisted radical prostatectomy (RARP) and open radical prostatectomy (ORP) in various census regions of the United States because RARP has been reported to be more expensive than ORP with significant regional cost variations in radical prostatectomy (RP) cost across the United States. **Patients and Methods:** International Classification of Diseases, Ninth Revision, Clinical Modification codes were used to identify patients with prostate cancer who underwent RARP or ORP from the Nationwide Inpatient Sample (NIS) database from 2009 to 2011. Hospital costs were compared using the Wilcoxon rank sum test and multivariable linear regression analysis adjusting for age, sex, race, comorbidities, and hospital characteristics. **Results:** From the NIS database, 24,636 RARP and 13,590 ORP procedures were identified and evaluated. The lowest cost overall was in the South; the highest cost RARP was in the West and for ORP in the Northeast. In multivariable analysis, adjusted according to patient and hospital characteristics, RARP was 43.3% more costly in the Midwest, 37.2% more costly in the South, and 39.1% more costly in the West ($P < .0001$ for all). In contrast, the cost for RARP in the Northeast was 12.8% less than for ORP ($P < .0001$). **Conclusion:** Cost for RP significantly varies within the nation and in most regions it is significantly greater for RARP than for ORP. ORP in the Northeast is more costly than RARP. Further research is needed to delineate the reason for these differences and to optimize the cost of RP.

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Introduction

Prostate cancer (PCa) in the United States will be responsible for an estimated 233,000 new diagnoses and 29,480 deaths in 2014.¹

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Although open radical prostatectomy (ORP) has long been the mainstay of treatment for localized PCa, the advent of the da Vinci robotic system (Intuitive Surgical, Sunnyvale, CA) has led to rapid and widespread adoption of robot-assisted radical prostatectomy (RARP). Most radical prostatectomy (RP) procedures are now performed with robotic assistance, with recent estimates as high as 85%.² This widespread adoption has occurred despite the lack of high-quality evidence of superiority of RARP over ORP. The only benefits of RARP that have been shown consistently are shorter length of stay, decreased blood loss, and lower rates of transfusion. More recently, a minimally invasive approach has been shown to have a lower positive surgical margin rate, although functional and long-term oncologic outcomes remain essentially equal between RARP and ORP.³⁻⁵

Regional Cost Variations of RARP Compared With ORP

A common criticism of RARP is its significantly higher cost compared with ORP. Studies have shown RARP to be from \$200 to \$2000 more expensive than ORP.^{6,7} Many factors contribute to the high overall cost of RARP including the initial capital expenditure of purchasing the robotic system, maintenance cost, disposable equipment, and longer operating room time.⁸⁻¹⁰ With the increased focus on controlling health care expenditures, the costs of PCa care has been scrutinized and there is a need for better understanding of the elements of RARP that drive this high cost. A previously published population-based study has identified regional variation as a significant contributor to the variance in RP cost in the United States.¹¹ In the present study we used contemporary data and focused primarily on evaluation of total hospital costs for RP overall and separately for RARP and ORP and their comparison between different US census regions to identify possible discrepancies and underlying contributors to cost across the country.

Patients and Methods

Data Source

After obtaining the institutional review board approval of the Rutgers University (IRB# 2014004118), we examined

the Nationwide Inpatient Sample (NIS) database for the years 2009 to 2011. The NIS is the largest US publicly available all-payer database containing information on approximately 20% of all hospital stays in the US community hospitals, which translates to an average of 8 million observations annually. Detailed information about NIS is available at <http://www.hcupus.ahrq.gov/db/nation/nis/nisdbdocumentation.jsp>.

Study Population

All men of age 18 years of age and older who were admitted to acute care hospitals with a principal diagnosis of PCa (International Classification of Diseases, Ninth Revision, Clinical Modification [ICD-9-CM] diagnosis code 185) and underwent RP (ICD-9-CM procedure code 60.5 for principal procedure) were evaluated initially. Among them, patients who underwent RARP (ICD-9-CM procedure code 17.42 in any procedure position) or ORP were selected. To identify the ORP group, we excluded from the initial cohort those with codes for RARP, other robotic-assisted procedures (ICD-9-CM codes 17.41, 17.43-17.49), or laparoscopy (ICD-9-CM procedure code 54.21).

Table 1 Characteristics of the Study Population

Characteristic	Procedure		P	Total
	RARP	ORP		
Mean Age ± SD, Years	61.4 ± 7.2	61.3 ± 7.1	.66	61.34 ± 7.2
Age Group				
18-55 Years	5290 (21.5)	2869 (21.1)	.41	8159
56-60 Years	5357 (21.7)	2947 (21.7)	.89	8304
61-65 Years	6238 (25.3)	3650 (26.9)	.001	9888
66-70 Years	5368 (21.8)	2884 (21.2)	.20	8252
≥71 Years	2383 (9.7)	1240 (9.1)	.08	3623
Race				
White	17,594 (71.4)	9199 (67.7)	<.0002	26,793
Black	2543 (10.3)	1755 (12.9)	<.0002	4298
Hispanic	1262 (5.1)	720 (5.3)	.46	1982
Other and missing	3237 (13.2)	1916 (14.1)	.01	5153
Comorbidities				
Congestive heart failure	113 (0.5)	89 (0.7)	.01	202
Hypertension	12,160 (49.4)	7027 (51.7)	<.0002	19,187
Chronic pulmonary disease	1832 (7.4)	1161 (8.5)	<.0002	2993
Diabetes	3079 (12.5)	1894 (13.9)	<.0002	4973
Renal failure	312 (1.3)	249 (1.8)	<.0002	561
Obesity	1962 (7.9)	1039 (7.7)	.27	3001
Insurance				
Medicare	7613 (30.9)	4238 (31.2)	.57	11,851
Medicaid	417 (1.7)	387 (2.9)	<.0002	804
Private	15,708 (63.8)	8146 (59.9)	<.0002	23,854
Uninsured	277 (1.1)	284 (2.1)	<.0002	561
Other and missing	621 (2.5)	535 (3.9)	<.0002	1156
Total, n	24,636	13,590		38,226

Data are presented as n (%) except where otherwise noted. Abbreviations: ORP = open radical prostatectomy; RARP = robot-assisted radical prostatectomy.

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