

# Use of Partial Nephrectomy after Acquisition of a Surgical Robot: A Population Based Study

Aaron C. Weinberg, Jason D. Wright, Michael J. Whalen, David J. Paulucci,  
Solomon L. Woldu, Stephanie A. Berger, Christopher M. Deibert, Ruslan Korets,  
Dawn L. Hershman, Alfred I. Neugut and Ketan K. Badani\*

*From the Department of Urology (ACW, SLW, SAB), Herbert Irving Comprehensive Cancer Center (JDW, DLH, AIN), Division of Gynecologic Oncology, Department of Obstetrics and Gynecology (JDW), and Department of Medicine (DLH, AIN), Columbia University College of Physicians and Surgeons, Department of Epidemiology, Mailman School of Public Health (DLH, AIN), Columbia University, Department of Urology, Icahn School of Medicine at Mount Sinai Hospital (MJW, DJP, KKB), New York, New York, Division of Urologic Surgery, University of Nebraska Medical Center, Omaha, Nebraska (CMD), and Surgical Service, Veterans Affairs Boston Healthcare System, Harvard Medical School, Boston, Massachusetts (RK)*

## Abstract

**Introduction:** The advent of robotics may promote the dissemination of partial nephrectomy, and allow patients to experience survival and functional benefits compared to radical nephrectomy. Therefore, we assessed the impact of hospital acquisition of a robotic surgery platform on the rate of partial nephrectomy recorded in a nationwide database.

**Methods:** We identified 53,364 patients with a diagnosis of localized renal cell carcinoma who underwent extirpative surgery from 2006 to 2012 using the Perspective database. Procedures were categorized based on extent of surgery (radical nephrectomy vs partial nephrectomy), approach (open, laparoscopic, robotic) and hospital ownership of a surgical robot. Changes in the proportion of partial nephrectomies performed over time and the effect of acquiring a surgical robot on the proportion of partial nephrectomies performed were assessed with multivariable logistic regression.

**Results:** Overall 40,147 (75.2%) radical nephrectomies and 13,217 (24.8%) partial nephrectomies were performed between 2006 and 2012. The proportion of hospitals using a surgical robot for renal cancer surgery increased from 1.8% in the first quarter of 2006 to 47.7% by the end of 2012. Partial nephrectomy use ranged from 19.1% to 31.2%. More robotic hospitals performed partial nephrectomy than nonrobotic hospitals (29.6% vs 18.0%,  $p < 0.001$ ). After acquisition of a surgical robot the partial nephrectomy rate increased from 16.4% to 34.3% ( $p < 0.001$ ). Hospitals with a robot were more likely to use partial nephrectomy than radical nephrectomy (OR 1.464, CI 1.39–1.54,  $p < 0.001$ ).

## Abbreviations and Acronyms

CCI = Charlson comorbidity index

LPN = laparoscopic partial nephrectomy

PN = partial nephrectomy

RAPN = robot-assisted partial nephrectomy

RCC = renal cell carcinoma

RN = radical nephrectomy

Submitted for publication July 28, 2015.

No direct or indirect commercial incentive associated with publishing this article.

The corresponding author certifies that, when applicable, a statement(s) has been included in the manuscript documenting institutional review board, ethics committee or ethical review board study approval; principles of Helsinki Declaration were followed in lieu of formal ethics committee approval; institutional animal care and

use committee approval; all human subjects provided written informed consent with guarantees of confidentiality; IRB approved protocol number; animal approved project number.

\* Correspondence: Department of Urology, Icahn School of Medicine at Mount Sinai Hospital, 5 E. 98th St., New York, New York 10029 (telephone: 212-241-3919; e-mail address: Ketan.badani@mountsinai.org).

**Conclusions:** While laparoscopic partial nephrectomy remains a challenging operation, this study demonstrates that hospital ownership of a surgical robot is associated with increased use of partial nephrectomy in the treatment of localized renal masses.

*Key Words:* nephrectomy, robotic surgical procedures, laparoscopy, surgical equipment, database management systems

The use of PN has been shown to reduce the risk of chronic kidney disease, cardiovascular events and mortality compared to RN,<sup>1–5</sup> and is recommended by the 2009 American Urological Association guideline for the treatment of stage cT1 renal masses.<sup>6</sup> PN is reportedly underused at the national level and its use varies widely from 28.5% to 90% at centers across the U.S. (15% to 20% of amenable tumors).<sup>5,7,8</sup> While the use of minimally invasive surgery has increased across surgical specialties in recent years, the technical challenges associated with LPN (ie complex renal reconstruction and suturing) likely underlie the underuse of PN and have impeded the dissemination of a minimally invasive approach to PN.<sup>9</sup> The technical advantages offered by the robotic surgery platform overcome these limitations and may make PN more accessible to surgeons.

Two reports have demonstrated an increase in the use of PN in the last decade as a consequence of the rapid promulgation of the surgical robot in the last decade. In an analysis of PN and robotic technology trends in Maryland, Patel et al found that PN use increased from 8.6% to 27% from 2000 to 2011.<sup>9</sup> In a similar analysis using the Healthcare Cost and Utilization Project State Inpatient Databases, Sivarajan et al found that the proportion of PN increased from 14.1% in 2001 to 28.5% in 2008.<sup>5</sup> Both studies concluded that the uptake of robotic technology underlies the proliferation of PN.

The present study builds on this evidence and to our knowledge is the largest series to date investigating the effects of surgical robot acquisition on trends in renal surgery using a national database. In contrast to the studies by Patel<sup>9</sup> and Sivarajan<sup>5</sup> et al, we specifically investigated trends in the approach to PN (open, laparoscopic, robotic) to understand whether the increased number of PNs was performed robotically.

## Materials and Methods

### *Study Design*

We conducted a retrospective cohort study of a national subset of hospitals and patients with a diagnosis of localized RCC who underwent extirpative surgery from 2006 to 2012. We assessed the trends in nephrectomy extent (ie PN vs RN) and surgical approach (ie open, laparoscopic, robotic), and identified factors associated with the receipt of PN. All data

were de-identified and deemed exempt from review by the Columbia University institutional review board.

### *Data Source*

We used the Perspective database (Premier, Charlotte, North Carolina), a prospective, nationwide database hosting data on inpatient hospital admissions from more than 500 acute care hospitals that represent all regions of the United States.<sup>10,11</sup> These hospitals serve a primarily urban population. The data set links de-identified, patient level medical and pharmacy files through unique identifiers, and contains all billed items including primary and secondary diagnoses, medications, laboratory and diagnostic procedures, and therapeutic services. Regular audits are performed for quality control of the source data.

### *Patient Selection*

We identified 53,364 eligible patients (older than age 18) at 317 hospitals by a primary diagnostic ICD-9 code for renal cell cancer (189.0) who underwent elective PN or RN by any surgical approach (open, laparoscopic or robotic) from 2006 to 2012. Surgical procedures were identified using ICD-9 codes for RN (55.5–55.54) or PN (55.4) and by open and laparoscopic (54.21, 54.51) approaches. To identify patients undergoing robotic assisted radical nephrectomy and partial nephrectomy we examined the case files to determine the presence of robotic surgical instruments during the previously identified operation. Perspective collects data and provides queries on all items charged to a patient during a hospital admission, including surgical supplies. This technique of identifying robotic assisted surgery has been previously validated and reported.<sup>12,13</sup> The data set has been validated and used in previous outcomes studies.<sup>10,13</sup>

### *Patient and Hospital Characteristics*

Patient and hospital characteristics were used to analyze the likelihood of a patient undergoing PN. Patient predictors included age (less than 60, 60 to 70, greater than 70 years), gender, race, year of surgery (2006 to 2012), primary payer (Medicare, Medicaid, commercial insurance, uninsured), marital status (married, single) and comorbidity as estimated

Download English Version:

<https://daneshyari.com/en/article/8830414>

Download Persian Version:

<https://daneshyari.com/article/8830414>

[Daneshyari.com](https://daneshyari.com)