Published in final edited form as:

J Urol. 2009 December ; 182(6): 2677–2679. doi:10.1016/j.juro.2009.08.034.

Low annual caseloads in US surgeons conducting radical prostatectomy

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Abstract

Purpose—It has been clearly demonstrated that surgeons with increased yearly caseloads have lower complication rates. Moreover, it has been shown that a surgeon needs to conduct at least 250 radical prostatectomies to maximize cancer control (the “surgical learning curve”).

Material and methods—To determine typical annual radical prostatectomy caseloads of surgeons in the US, we analyzed data from two independent datasets for 2005: a nationally representative sample (Nationwide Inpatient Sample) and a complete record of all discharges from New York State (Statewide Planning and Research Cooperative System).

Results—More than 25% of US surgeons conducting a radical prostatectomy in 2005 performed only a single procedure. Approximately 80% of surgeons performed fewer than 10 procedures per year, and are thus unlikely to reach the plateau of the learning curve during their surgical career.

Conclusions—The current pattern of surgical treatment for prostate cancer leads to many patients being treated by surgeons with extremely low annual caseloads, with likely poorer outcomes as a result.

Keywords

radical prostatectomy; prostate cancer; annual volume

Introduction

There is extensive evidence that increased surgeon volume is associated with improved patient outcomes¹. In the case of radical prostatectomy, Begg and colleagues demonstrated a strong association between volume and complication rates, with complications rates falling by 20% between the highest and lowest quartiles of annual caseload². Work from our own group has indicated that a surgeon’s lifetime experience of radical prostatectomy is strongly associated with cancer control, the surgical “learning curve”. After adjusting for tumor severity, a typical patient treated by a surgeon who had reached the plateau of the learning curve (250 prior surgeries) had a 10.9% risk of recurrence at 5 years, compared to a risk of 17.7% for patients treated by a less experienced surgeon with only 10 prior cases³. For patients with organ-confined disease, who constitute approximately 75% of contemporary cohorts, recurrence rates for the most highly experienced surgeons (~1500 prior surgeries) were less than 1%, suggesting that recurrence is largely dependent on surgical technique⁴. Furthermore, we recently independently replicated these findings in a study of the learning curve for laparoscopic radical prostatectomy⁵. We found that the learning curve was slower for laparoscopic surgery than for open surgery: the risk of recurrence decreased from 17% to

16% to 9% for a patient treated by a surgeon with 10, 250 and 750 prior laproscopic cases. Given the importance of surgical volume to outcome in radical prostatectomy, we sought to determine the typical annual radical prostatectomy caseloads of US surgeons.

Methods

We used two independent datasets in our analysis. The first dataset was a nationally representative sample of hospitals obtained from the 2005 Nationwide Inpatient Sample (NIS) available from the Agency for Healthcare Research and Quality (AHRQ)⁶. The NIS sample excludes some hospitals, such as long-term psychiatric facilities, or residential substance abuse programs, at which radical prostatectomy would not be performed. As the sampling unit of the NIS is the hospital, we have information on every patient's discharge from participating institutions. The second dataset, from the Statewide Planning and Research Cooperative System (SPARCS) database, includes all patient discharge records for New York State in 2005⁷. The accuracy of the SPARCS data was validated by comparing caseloads for surgeons at Memorial Sloan Kettering Cancer Center against the institutional surgery database.

The International Classification of Diseases (ICD-9) procedure code of 60.5 was used to abstract men who underwent a radical prostatectomy. Using the unique surgeon identifier, we calculated the annual caseload of radical prostatectomies for surgeons conducting at least one radical prostatectomy, as well as the proportion of patients treated by surgeons at various caseload levels.

Results

We identified 6621 patients who were treated with radical prostatectomy in 2005 by one of 933 surgeons from the NIS. The distribution of surgeons' annual radical prostatectomy caseload is summarized in Table 1. Nationally, the most common number of radical prostatectomies performed in 2005 was 1 (more than 25% of surgeons). More than 80% of surgeons had an annual volume of 10 or fewer procedures. Assuming a typical surgeon operates for 25 – 30 years, and that volumes do not fluctuate greatly from year to year, it is unlikely that many of these surgeons would reach a level of experience associated with adequate cancer control during their career.

Less than 4% of surgeons had an annual caseload that would allow them to reach the learning curve plateau within approximately 10 years (at least 25 surgeries). As some of these surgeons are likely to be on the early part of the learning curve, it seems reasonable to suppose that a majority of prostate cancer patients attempting a surgical cure receive treatment from a surgeon with inadequate experience.

It is plausible that some surgeons perform radical prostatectomies in more than one institution. As the NIS sampling unit is the hospital, this practice could lead to an underestimate of the annual caseload of some surgeons. This is not true of the SPARCS database, which lists every discharge in New York State. Table 1 shows that the results from New York State are very similar to those obtained nationally. There are slightly more very high volume surgeons (~4% vs. ~2%), likely because New York City includes several high volume hospitals. Although we cannot exclude the possibility that surgeons in New York State worked in institutions outside of New York, we think that such practices would have only a minimal impact on our results. If we treated surgeons operating at different hospitals within New York as independent surgeons, thereby underestimating case load, our results were not importantly changed: we would have concluded that 84% of surgeons performed 10 or fewer cases and 3.4% performed 50 or more. Far fewer surgeons would operate across

state borders that at different hospitals within New York, thus it is unlikely cross-border practice would substantively alter our results.

As a sensitivity analysis, we analyzed two ICD 9 codes that might in some cases have been used for radical prostatectomy: retropubic prostatectomy (ICD 9 code 60.4, which is defined as excluding radical prostatectomy) or “other” prostatectomy (ICD 9 code 60.69). Only a small number of patients were coded as receiving either procedure: on the SPARCS data set there were only 286 and 1 cases respectively, compared to 4081 for ICD 9 60.5.

Accordingly, inclusion of these codes had very little influence on our results, with a slight increase in the proportion of surgeons with low volumes.

Discussion

The majority of surgeons performing radical prostatectomies in the US have extremely low annual caseloads. Given that caseload and overall experience are associated with improved outcomes, this is likely to lead to suboptimal outcomes.

As high volume surgeons, by definition, treat many patients each year, a small shift in the distribution of high volume surgeons can have a large effect on patient care. The slightly greater proportion of very high volume surgeons (50 or more cases per year) in New York (~4%) compared to nationally (~2%), led to a large difference in the number of patients receiving care from the highest volume surgeons (~20% to ~40%).

Our estimate of experience is based on only one year’s annual caseload. We cannot link multiple years of the NIS data because the sampling frame changes each year; however, it seems unlikely that a surgeon’s volume would fluctuate dramatically between years. To check this assumption, we compared the average volume over a 3 year period (2003-2005) with that from 2005 using the SPARCS data. There were 204 surgeons who performed 10 or fewer surgeries in 2005 and whose cases were also included in the SPARCS dataset in 2004 and 2003. Of these surgeons, only 11 had an average annual caseload above 10 (and all but one of these had a volume of 7 or higher in 2005). Furthermore, we only found one surgeon whose average caseload differed qualitatively from that in 2005 (‘average volume’ of 28 versus ‘2005 volume’ of 9 cases). Thus we feel confident that our estimate of volume is a good reflection of most surgeons’ typical annual caseloads. We are also confident in our conclusion that most surgeons will not reach 250 radical prostatectomy cases in their surgical careers.

We acknowledge that using 250 prior surgeries as a criterion for reaching the plateau of the learning curve is a somewhat arbitrary cut point open to discussion. However, the majority of surgeons have such low annual volumes that our conclusions would not change even if we, say, halved the minimum number of surgeries considered to be adequate. Moreover, we see 250 as somewhat as a minimum: for organ-confined disease, the learning curve continues to lead to improving results until well above 1000 surgeries.

We also acknowledge that annual volume is not deterministic of patient outcome. Even among high volume surgeons, there is significant variation in patient outcomes⁸, and it seems highly plausible that a talented, low volume surgeon could have results superior to that of higher volume counterpart. Yet something similar may be true when comparing two drugs: even if drug A has a higher response rate than drug B, it is plausible that some patients may do better on drug B than drug A. On average though, in the absence of further information, we would advise patients to take drug A. Analogously, higher volume surgeons have on average lower complication rates and improved cancer control and, in the absence of other information, annual caseload must be seen as a useful surrogate of surgical proficiency.

Conclusions

In conclusion, almost all surgeons conducting radical prostatectomy in the United States have extremely low annual caseloads. These low surgical volumes are known to be associated with increased complication rates and decreased cancer control.

Acknowledgments

Supported by: The Sidney Kimmel Center for Prostate and Urologic Cancers. This research was also funded in part by a P50-CA92629 SPORE grant from the National Cancer Institute and in part by funds from David H. Koch provided through the Prostate Cancer Foundation

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Table 1

Percentage of surgeons with various annual caseloads of radical prostatectomies, and the percentage of patients being seen by those surgeons.

Annual Caseload	Nationwide Inpatient Sample (NIS)		New York State (SPARCS)	
	% surgeons N=933	% patients seen by surgeon with caseload N=6621	% surgeons N=393	% patients seen by surgeon with caseload N=4081
1	26.9%	3.8%	27.0%	2.6%
2	16.2%	4.6%	16.5%	3.2%
3	9.4%	4.0%	8.4%	2.4%
4	6.3%	3.6%	6.6%	2.5%
5	7.1%	5.0%	4.8%	2.3%
6-10	16.9%	18.4%	15.3%	11.3%
10 or fewer	82.9%	39.3%	78.6%	24.4%
11 - 24	13.3%	28.2%	13.0%	18.7%
25 or more	3.9%	32.4%	8.4%	56.9%
50 or more	1.8%	22.8%	4.1%	42.9%