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Access to high-volume surgeons and the opportunity cost of performing radical prostatectomy by low-volume providers

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Abstract

Background: Evidence suggests that redirecting surgeries to high-volume providers may be associated with better outcomes and significant societal savings. Whether such referrals are feasible remains unanswered.

Methods: Medicare Provider Utilization and Payment Data, SEER 18, and US Incidence data were used to determine the geographic distribution and radical prostatectomy volume for providers. Access was defined as availability of a high-volume provider within driving distance of 100 miles. The opportunity cost was defined as the value of benefits achievable by performing the surgery by a high-volume provider that was forgone by not making a referral. The savings per referral were derived from a published Markov model for radical prostatectomy.

Results: A total of 14% of providers performed >27% of the radical prostatectomies with >30 cases per year and were designated high-volume providers. Providers with below-median volume (≤16 prostatectomies per year) performed >32% of radical prostatectomies. At least 47% of these were within a 100-mile driving distance (median = 22 miles), and therefore had access to a high-volume provider (>30 prostatectomies per year). This translated into a discounted savings of more than $24 million per year, representing the opportunity cost of not making a referral. The average volume for high- and low-volume providers was 55 and 13, respectively, resulting in an annual experience gap of 43 and a cumulative gap of 125 surgeries over 3 years. In 2014, the number of surgeons performing radical prostatectomy decreased by 5% while the number of high- and low-volume providers decreased by 25% and 11% showing a faster decline in the number of high-volume providers compared with low-volume surgeons.

Conclusions: About half of prostatectomies performed by surgeons with below-median annual volume were within a 100-mile driving distance (median of 22 miles) of a high-volume surgeon. Such a referral may result in minimal additional costs and substantially improved outcomes.

Keywords: Radical prostatectomy; Oncologic outcomes; High-volume providers; Opportunity cost; Access

1. Introduction

Evidence supports the role of experience in improving surgical and oncological outcomes of radical prostatectomy in early-stage prostate cancer [1–4]. This effect is not limited to prostate cancer and is observed in bladder cancer and even noncancer surgeries [5,6]. Despite these data, more than 80% of surgeons nationwide have an annual volume of less than 10, and perform approximately 40% of prostatectomies [7]. A cost-effectiveness analysis estimated that there is a $1,800 savings, per referral, associated with performing radical prostatectomies at high-volume centers based only on reduced downstream costs of management of treatment failure [8]. Better oncological outcomes and reduced societal costs make a persuasive case for referral; however, it is unclear what proportion of radical prostatectomy candidates has access to a more experienced surgeon, and therefore feasibility and costs of such referrals remain difficult to estimate.

This study aimed to investigate the geography of radical prostatectomies in the United States to determine the

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distribution of the providers and the patients in need of radical prostatectomy. Building on prior modeling for the societal benefits of performing radical prostatectomies at high-volume centers [8], this study estimates the effect of maintaining status quo for opportunity costs where there is access and where referral is possible within driving distance.

2. Methods

The opportunity cost [9] of performing a radical prostatectomy by a low-volume provider was defined as the value of benefits achievable by performing the surgery by a high-volume provider that was forgone by not making a referral. Assuming that the travel distance was the main determinant of access and the referral costs, access was defined as availability of a high-volume provider within a driving distance of 100 miles, and the referral cost for travel within this range was considered negligible. Therefore, the opportunity costs were calculated for radical prostatectomy cases performed by providers in the lower 50 and 75 percentiles of volume where there was a surgeon in the top 10 percentile of volume within a 100-mile driving distance.

Medicare Provider Utilization and Payment Data for 2012 to 2014 were used to determine the geographic distribution and radical prostatectomy volume for providers [10,11]. Geographic distribution was determined by provider zip code, and volume was determined by the total number of radical prostatectomies per provider per year. SEER 18 data were used to determine the number of radical prostatectomies in 2012 and 2013 in the United States by applying the ratio of surgery to incidence to the US incidence data provided by the American Cancer Society [12–14]. The SEER data for 2012 and 2013 were used to extrapolate (linear extrapolation) the expected numbers for 2014. Using the Medicare data, projections were made for the geographic distribution and provider volume in the United States.

Providers were grouped based on surgical volume. Using the provider zip codes and Google application programming interface [15], the travel distance required for referral to a provider in the top 10 percentile of surgical volume was calculated for providers with below-median volume (lower 50 percentile) as well as the lower 3 quartiles (lower 75 percentile) of volume.

2.1. Measuring the benefits of performing radical prostatectomy by high-volume providers

We previously measured and published the projected benefits of preferentially performing radical prostatectomy by high-volume providers using a Markov model to represent the natural history of prostate cancer after radical prostatectomy [8] (Fig.). Using projections on the number of surgeries within driving distance of a high-volume provider, the Markov model estimated the benefits if these surgeries were redirected to a high-volume provider.

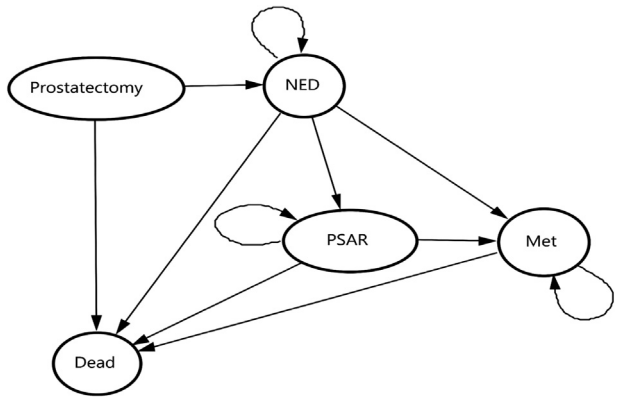

Fig. States of disease in the Markov model. NED = no evidence of disease; Met = metastatic disease; PSAR = PSA recurrence.

For the purpose of estimating the benefits of surgeries by high- vs. low-volume providers, the reduction in the rates of prostate specific antigen (PSA) recurrence (PSAR) (biochemical failure) was modeled using published data [1,2]. In keeping with standards of care, patients with PSAR were managed in a manner consistent with the rates of salvage therapy and development of metastatic disease [1,2,16–19]. Individual preferences for compliance with treatment were modeled using published data [16–19]. Mortality rates were modeled using disease-specific mortality for prostate cancer [20–22], and US life tables [23].

The total costs of care, exclusive of the costs of prostatectomy and management of short-term and long-term complications and side effects of radical prostatectomy, were calculated. The savings per referral to a high-volume provider were calculated. The reduction in the use of resources, such as shortened length of stay and transfusions, was calculated. Additional improvements in outcomes associated with greater experience, such as lower rates of impotence and incontinence, would give further advantage to radical prostatectomy by high-volume providers. These differences, although modeled, were excluded from monetary calculations [24].

The sums of these benefits (as projected by the Markov model) for referring surgeries performed by the lower 50 and 75 percentile providers within 100-mile driving distance to a top 10 percentile provider were calculated. The sum of the monetary value of these benefits was designated as the opportunity costs of performing radical prostatectomies by lower-volume providers where a higher level of experience was readily available.

2.2. Trends over time

Providers were followed over time with respect to the number of radical prostatectomies over the 3 consecutive years. Providers entering or exiting the prostatectomy segment of the Medicare Provider Utilization and Payment