Survival of Men with Prostate Cancer Undergoing Radical Prostatectomy in Ontario

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Purpose: Radical prostatectomy is traditionally reserved for men with at least 10-year life expectancy. Numerous studies show that survival estimates by physicians are inaccurate. We determined how well men undergoing radical prostatectomy for cancer are prognosticated by comparing observed and expected survival.

Materials and Methods: We performed an observational cohort study using population based data sets to identify each man in Ontario, Canada between 1992 and 2011 who was diagnosed with prostate cancer and underwent radical prostatectomy within 6 months. Observed 10-year survival rates were calculated using the Kaplan-Meier method. Two expected 10-year survival rates were calculated using 1) population life tables and 2) the ADG® score, an accurate, validated index that predicts mortality risk based on patient comorbidities.

Results: A total of 36,045 men with a median age of 62 years were included in the study. Median observation time was 8.1 years. Observed 10-year survival was 88.9% (95% CI 88.4–89.3), significantly greater than the expected 10-year survival of 83.3% according to life tables and 76.0% according to ADG score. The observed-to-expected death ratio was 0.66 (range 0.64–0.68) and 0.46 (range 0.45–0.48) using life tables and the ADG score, respectively.

Conclusions: Ontario men who undergo radical prostatectomy for cancer have 10-year survival that significantly exceeds that of the population and individuals with similar comorbidities. This indicates that physicians and patients involved in deciding who should undergo radical prostatectomy have done an excellent job at identifying patients with prostate cancer with high survival. We are uncertain how these results apply to patients and physicians outside Ontario.

Key Words: prostate, prostatic neoplasms, mortality, prostatectomy, prognosis

Abbreviations and Acronyms

DAD = Discharge Abstract Database

NACRS = National Ambulatory Care Reporting System

OCR = Ontario Cancer Registry

RPDB = Registered Persons Database

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Prostate cancer is the most common solid malignancy in men with an estimated 238,590 new diagnoses and 29,720 deaths in the United States in 2013.[1] Radical prostatectomy is considered by many to be the gold standard treatment for localized prostate cancer.[2] The 10-year rule states that patients who undergo radical prostatectomy should usually have at least 10-year life expectancy to derive any benefit from surgery and this is advocated by most organizations.[3,4] Surgery in most patients expected to live less than 10 years is considered overtreatment since it

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exposes them to surgical complications without improving survival.[5–8] This 10-year rule is especially true for patients with low risk disease since most die of a competing cause.[6]

It can be difficult to estimate the life expectancy of a particular patient. Survival estimates have been labeled inaccurate in patients with end stage cancer[9–11] and patients treated in critical care units.[12,13] However, physician survival estimates were strongly associated with actual survival in several oncological studies[9,11,14] and they were more accurate than validated multivariate survival indexes used in critical care.[15] The urological literature acknowledges the difficulty of estimating the 10-year death risk in patients with prostate cancer. Several groups surveyed physicians to compare predicted and actual life expectancy in particular prostate cancer cases and reported variable accuracy in life expectancy prediction.[16–18] Prediction rules and nomograms have been created to help clinicians and patients identify men who might benefit from radical prostatectomy.[19–21]

It is known that men selected for radical prostatectomy are generally younger and have fewer comorbidities than men who receive other prostate cancer treatments. However, population based data are lacking on whether men treated with radical prostatectomy truly live long enough to benefit from surgery. The importance of properly selecting men for surgery was recently highlighted by results from a large trial in which men with a mean age of 67 years randomized to radical prostatectomy had an almost 40% 10-year all-cause death rate.[5]

In this population based study we determined how well survival was prognosticated in all Ontario men who underwent radical prostatectomy for prostate cancer between 1992 and 2011. We reasoned that proceeding with radical prostatectomy indicates a surgeon decision that the patient has an excellent survival prognosis. The accuracy of this assessment was determined by comparing the actual 10-year survival of our study population to expected 10-year survival.

METHODS

Study Databases

We used several population based health administrative databases that were linked deterministically using encrypted health care numbers. OCR records all diagnosed cancers identified from histology and pathology reports supplemented with data from hospital discharge records, same day surgery abstracts, regional cancer center diagnostic and treatment records, and death certificates. DAD records demographic, diagnostic and procedural data on all hospital and day surgery encounters. RPDB provides basic demographic information, including dates of death and the last encounter with the health care system, on anyone who has ever received an Ontario health card number. The Physicians Services Database records all physician services remunerated by the provincial health plan. Finally, NACRS records all visits to emergency departments. Each of these data sets is complete from 1991 and thereafter except NACRS, which started in 2002.

Patient Cohort and Outcome

We identified all men in OCR with prostate cancer between January 1, 1992 and December 31, 2011 inclusive. We then linked to DAD to identify which of these men underwent radical prostatectomy within 180 days of the cancer diagnosis date.

The primary study outcome was time to all-cause death and whether death occurred within 10 years of radical prostatectomy. The death date was determined by linking to RPDB.

Expected Survival Estimates

We determined the expected risk of death in 10 years at the time of radical prostatectomy using 2 methods. 1) We used survival estimates from age and year stratified Ontario life tables. For each man in our study these tables provided an annual risk of all-cause death that was a function of the age and year. Life table data are collated by Statistics Canada and considered the gold standard for determining population based mortality estimates.

2) We generated survival estimates based on the ADG score.[22] The ACG® System was developed by faculty at The Johns Hopkins University Bloomberg School of Public Health to facilitate risk adjustment using health administrative data. It uses diagnoses in patient claims found in DAD, the Physicians Services Database or NACRS during the previous 2 years to group patients into 32 nonexclusive categories to help account for patient comorbidity. The ADG score was derived using these categories to predict the annual risk of all-cause death based on patient age, gender and the 32 ADG categories. The ADG score had excellent discrimination (c-statistic 0.913) and calibration in an external validation cohort.[22]

Analysis

Patient observation started at radical prostatectomy. Observation ended at the date of patient death or was censored at the date of the patient last encounter with the health care system using RPDB. To account for men observed for less than 10 years we used the Kaplan-Meier method to determine the proportion of these men alive 10 years after prostatectomy.

We calculated the expected 10-year risk of death in this patient group using life table estimates and the ADG score. In each method we calculated the expected annual risk of death of each man for each of the 10 years following prostatectomy. In the life table method we determined the annual risk of all-cause death of each man using the age and year appropriate life table. In the ADG score method we calculated the annual risk of death based on the ADG score model for each year of observation. The ADG score was derived from health care claims of each individual in the previous 2 years.[22]