Original Study

Resource Use in the Last Year of Life Among Patients Who Died With Versus of Prostate Cancer

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Abstract

We conducted a retrospective analysis of Surveillance, Epidemiology, and End Results-Medicare data of men with prostate cancer. Among 34,727 patients, those who died of their prostate cancer had more hospice and outpatient use, less inpatient and intensive care unit use, and lower overall costs. Efforts to shift care toward the outpatient setting might provide more efficient and judicious care for patients during the end of life.

Background: Prostate cancer poses a significant financial burden in the United States. However, most men with prostate cancer will die from noncancer causes. Concerns about increased resource utilization at the end of life have not been appropriately examined in this context. **Materials and Methods:** We conducted a retrospective analysis of Surveillance, Epidemiology, and End Results-Medicare data of men who were diagnosed with and died of, as opposed to with, prostate cancer between 2000 and 2007. Within these 2 populations, we compared changes in the use of medical interventions, hospice, and overall health care costs to Medicare in the last year of life. **Results:** Among 34,727 patients, those who died of prostate cancer had lower costs ($43,572 vs. $45,830; $P < .001$), largely because of lower mean inpatient costs ($20,769 vs. $29,851) and fewer hospitalizations (1.8 vs. 2.1), inpatient days (12.2 vs. 15.7), intensive care unit (ICU) days (1.4 vs. 3.4), and skilled nursing facility days (11.7 vs. 14.7; $P < .001$ for all). Outpatient and hospice costs were significantly greater among patients who died of prostate cancer, as was use of chemotherapy and androgen deprivation therapy. Patients who died of prostate cancer had approximately 12% lower costs than patients who died from other causes in adjusted analyses (fold-change, 0.88; 95% confidence interval [CI], 0.85-0.92). The single strongest predictor of increased costs at the end of life was receipt of multiple invasive procedures (fold increase in costs, 2.39; 95% CI, 2.22-2.58). **Conclusion:** Patients who died of prostate cancer rather than from other causes had more hospice and outpatient use, less inpatient and ICU use, and lower overall costs. Efforts to shift care toward outpatient settings might provide more efficient and judicious care for patients during the end of life.

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Introduction

Prostate cancer and end of life care are 2 major sources of overall costs among the United States population and both are expected to increase in coming years. End of life inpatient care for all Medicare beneficiaries has intensified in recent decades[1] and out of pocket costs have increased fourfold.[2] Among all men, prostate cancer is the most commonly diagnosed cancer in the United States,[3] and is a leading source of overall costs for cancer care.[4] We now know that most men who are diagnosed with prostate cancer die from other causes,[5] however, and it is not clear how costs and end of life resource use compare between men who die with versus of their cancer.

The total costs of end of life care and prostate cancer are high. Costs among Medicare beneficiaries in the last year of life constitute approximately one-quarter of all Medicare costs, a figure that has been stable for 20 years.[6] Among older patients diagnosed with cancer in 2004, aggregate 5-year costs of cancer care totaled $21

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billion and were highest in the year after the initial cancer diagnosis and in the last year of life. In the initial 5 years after a cancer diagnosis, Medicare beneficiaries incur $20,000 to $40,000 in additional costs, compared with beneficiaries without a cancer diagnosis who were matched by sex, age, geography, and phase of care.[4]

Although costs during the earlier phases of care have been well characterized,[7-10] the burden of costs for men with prostate cancer at the end of life are known to be substantial and have been estimated at 3 to 4 times the costs accrued in the year after diagnosis but remain less well understood.[11] Several factors might unnecessarily increase end of life costs of care in patients who die of prostate cancer, including pathologic factures and associated complications,[12] the use of invasive procedures, radiation,[13] or systemic chemotherapy and emerging agents.[14] However, a key component of end of life care in patients with prostate cancer is the acknowledgement that most men do not die of their prostate cancer, and that competing risks of mortality might also pose competing financial risks, might increase or decrease end of life care costs, and might also affect the receipt of less resource-intensive care such as hospice.[15]

In this study, we characterized medical resource use and costs to Medicare among patients who died of prostate cancer and patients with prostate cancer who died from other causes between 2000 and 2007.

Materials and Methods

Data Source

Data were from the Surveillance, Epidemiology, and End Results (SEER)-Medicare linked data set, a collaborative project of the National Cancer Institute and the Centers for Medicare and Medicaid Services that links routinely collected population-based data from SEER cancer registries to Medicare administrative claims data. SEER data represent approximately 25% of the US population with cancer. SEER-Medicare data have been used to examine factors that affect cancer care quality, including socio-demographic characteristics, physician and hospital characteristics, treatment, comorbid conditions, complications, screening, relapse, and costs.[16-18] We used SEER data from 1992 through 2007 to identify prostate cancer diagnoses, disease stage, patient demographic characteristics, and cause of death. Medicare is the health insurer for 97% of persons 65 years and older in the United States.[18] We used linked Medicare claims from 1991 through 2007 to confirm Medicare enrollment and to capture Medicare payments associated with end of life care. The study was approved by the institutional review board of the Duke University Health System.

Study Population

From the 12 SEER registries that were continuously active from 1992 onward, we identified all patients who had a diagnosis of prostate cancer between 1992 and 2007. To identify patients likely to have complete Medicare claims related to prostate cancer care, we required that patients have a primary diagnosis of prostate cancer on an inpatient, outpatient, durable medical equipment, hospice, home health, or carrier-based Medicare claim within 2 months of the SEER-reported diagnosis (International Classification of Diseases, Ninth Revision, Clinical Modification [ICD-9-CM] code 185). We limited the study population to men who were 66 years of age or older at diagnosis and died between 2000 and 2007. We excluded patients who were diagnosed at the time of autopsy or death or had another diagnosis of malignancy in the year before the prostate cancer diagnosis. We also excluded patients who had a diagnosis of 1 or more malignancies in the 2 years before death and patients who had discontinuous Medicare Part A and Part B coverage (ie, fee for service Medicare) from the year before diagnosis until death.

Study Outcomes

The primary outcomes included resource use in the last year of life and mean costs to Medicare according to claim type. Measures for resource use in the last year of life included all-cause hospitalizations, inpatient days, intensive care unit (ICU) days, use of skilled nursing facilities, hospice, home health, durable medical equipment, and physician visits. Use of selected tests and procedures associated with treatment or complications of prostate cancer was based on Current Procedural Terminology and ICD-9-CM codes (Supplemental Table 1 in the online version). We calculated mean costs to Medicare by summing Medicare reimbursement amounts by claim source (ie, inpatient, outpatient, physician, hospice, home health, and durable medical equipment). Costs represent Medicare payments and were adjusted for inflation using the US Consumer Price Index for Medical Care to 2008 US dollars.[19]

We obtained demographic variable data from the SEER Patient Entitlement and Diagnosis Summary File, including age at diagnosis, age at death, time from diagnosis to death, sex, race, ethnicity, marital status, and local census tract characteristics (ie, metropolitan urban or rural status, proportion of the population not finishing high school, proportion below the poverty line, and proportion with black race). We identified comorbid conditions using inpatient, outpatient, and carrier Medicare claims[20] in the year before diagnosis and 1 year before death.

Surveillance, Epidemiology, and End Results-recorded baseline patient characteristics at diagnosis, age at death, and time from diagnosis to death, were all compared between patients whose cause of death was prostate cancer versus another cause. We used the SEER-recorded cause of death to identify deaths of prostate cancer and deaths from other causes. Patient baseline characteristics included age at diagnosis, race, marital status, disease stage at diagnosis, and receipt of surgery or radiation.

Statistical Analysis

We examined the distribution of common comorbid conditions (ie, those with $> 2\%$ frequency) at 1 year before death, and baseline characteristics of patients who died of prostate cancer compared with patients with prostate cancer who died from other causes. To help investigate potential heterogeneity in this population of patients who died from causes other than prostate cancer, we also examined the most common causes of death other than prostate cancer, which included diseases of the heart, cerebrovascular disease, pneumonia and influenza, and chronic obstructive pulmonary disease (COPD) and related conditions. We also examined mean costs to Medicare, resource use in the last year of life, and procedures. We plotted total, inpatient, and hospice claims payments to compare costs in the year before death.

We compared patients who died of prostate cancer and patients with prostate cancer who died from other causes using χ^2 tests for