Determining Cause of Death in Prostate Cancer: Are Death Certificates Valid?

David F. Penson, Peter C. Albertsen, Peter S. Nelson, Michael Barry, Janet L. Stanford

Accurate assessment of cause of death (COD) is important for determining cause-specific survival in cancer research. It is possible to reliably ascertain COD by meticulous review of inpatient and outpatient medical records with the use of predetermined clinical algorithms (1). Unfortunately, this method, although useful for small retrospective studies, is impractical for large datasets and national tumor registries that are commonly used for cancer research. When these large databases are used, COD is assigned with a standardized decision algorithm that uses International Classification of Diseases, ninth revision (2), codes to assign both immediate underlying COD (3). However, this methodology is unreliable (4,5), particularly when patients are older or have considerable comorbidity, as is the case in prostate cancer (6,7). In a study of mortality trends, Grulich et al. (8) estimated that inaccuracies in death certification and coding accounted for up to 46% of the noted increase in prostate cancer mortality seen in England and Wales from 1970 through 1990. By contrast, in men with prostate cancer identified through the Connecticut Tumor Registry, Albertsen et al. (9) found a high level of agreement between the underlying COD, determined by a review of the medical records, and death certificate data. It is important that prostate cancer-related mortality ascertained by death certificate be reliable because studies that use large datasets, such as the Surveillance, Epidemiology, and End Results (SEER)1 Program, may be used to determine whether interventions (e.g., screening, radical prostatectomy, or radiotherapy) are effective.

This study assessed whether the underlying COD on death certificates for men with prostate cancer agreed with an independent review of inpatient medical records in a sample of prostate cancer patients who died in King County, WA, in 1995. Our goal was to assess the validity of the coding system currently used by each state for determining underlying COD from death certificate data that are submitted to the National Center for Health Statistics, Hyattsville, MD. All study procedures were approved by the Institutional Review Board of the Fred Hutchinson Cancer Research Center, Seattle, WA.

With the use of the Seattle–Puget Sound SEER Cancer Registry, we identified all 538 men (aged 58–98 years at time of death) in King County who were diagnosed with prostate cancer from 1973 through 1995 and who died during 1995. Any subject who died at one of 11 selected hospitals in King County was eligible for the study. Of the 171 men diagnosed with prostate cancer who died in any hospital in King County, 133 (78%) died in one of the 11 selected hospitals included in the study. Of these 133 case subjects, medical records could be reviewed for 128 (96%). A trained abstractor used a standardized data form developed for a previous study (9) to review medical records and evaluate clinical course before death and comorbidity. Although autopsies were performed on 12 (9%) case subjects, these reports were not available for review by the abstractor. Following abstraction of the medical records, three clinicians (a medical oncologist and two urologists), all of whom were blinded to the COD assigned by the death certificate, independently reviewed the abstraction forms and assigned an underlying COD to one of three prospectively defined categories: 1) related to prostate cancer, 2) unrelated to prostate cancer, or 3) uncertain. Disagreements in assignments were resolved by consensus among the clinicians. The assignment by the clinicians of underlying COD was then compared with that of the death certificate, using the National Center for Health Statistics algorithm for International Classification of Diseases coding of underlying COD (3). Agreement between the clinicians’ impressions and death certificate determination of COD was measured by the \( \kappa \) statistic (10).

All three clinicians agreed on the underlying COD in 113 (88%) of 128 case subjects. After consensus was reached for the remaining 15 case subjects, all underlying CODs were compared with those from the death certificates (Table 1). After two case subjects with uncertain CODs were excluded, the \( \kappa \) statistic was 0.91, with agreement between the death certificate COD and clinician-assigned COD (related to or unrelated to prostate cancer) in 122 (97%) of 126 case subjects.

Of the two case subjects in which the clinicians were uncertain of COD, one had metastases detected by a bone scan 1 year before death. This case subject also had clinically significant cardiovascular disease and increasing respiratory difficulty on final hospital admission. Because the clinicians were unable to determine the etiology of these respiratory problems, they coded the COD as uncertain, whereas the death certificate-assigned COD was prostate cancer. The second case subject was diabetic and had metastatic disease detected by a bone scan 1 year before death. He also had increasing renal failure, poor mental status, and general debilitation. The death certificate-assigned COD was not prostate cancer.

In the single case where the clinicians thought that the COD was unrelated to prostate cancer and the death certificate-assigned COD was prostate cancer, the subject had respiratory failure as a result of staphylococcal pneumonia. The only reference to prostate cancer was a brief mention in the admitting history.

For the three case subjects where the clinicians believed that the COD was related to prostate cancer and the death certificate-assigned COD was not prostate cancer, the medical records clearly stated that the treating providers thought that the deaths were directly related to prostate cancer. For one case subject, the immediate COD was respiratory failure...
as a result of pulmonary embolus; for the second, it was respiratory failure as a result of myocardial infarction, chronic obstructive pulmonary disease, and metastatic prostate cancer; and for the third, the immediate COD was ventricular tachycardia and respiratory failure.

This study shows that there is excellent agreement between the COD methodology currently used by large data systems, such as SEER or Medicare, and COD from meticulous review of medical records. This result leads to the conclusion that, at least for prostate cancer patients who die in the hospital, underlying COD stated on death certificates appears to reflect adequately what is occurring clinically and, therefore, can be used when calculating cause-specific survival. This conclusion is important both to the researchers, who use large administrative databases, and to the clinical community, which applies the findings of these studies to regular practice.

Our findings support the results of Albertsen et al. (9), who used a similar research design, and contrast with those of Steenland et al. (11). However, the lack of agreement between clinical assessment of COD and death certificate report noted by Steenland et al. (11) may, in part, be caused by the fact that all records examined were of men who had benign or malignant prostate disease. Although several studies (6,7,12) have questioned the validity of death certificate-assigned COD in other cancers, this methodology appears fairly accurate for prostate cancer.

It is worth noting that, in our study, in the cases in which there was disagreement between clinician assessment and death certificate assignment of COD, there was always clinically significant respiratory and cardiac comorbidity, which may have affected the coding algorithm for assigning COD using death certificates. This observation is consistent with the findings of Satariano et al. (13), who noted that prostate cancer patients with concurrent cardiovascular disease were less likely to be coded as having died of prostate cancer than if they had other comorbidities. This observation underscores the need for health care providers to carefully document all relevant details when completing death certificates, particularly in men with multiple comorbidities (14).

Our study is limited, in that only 32% of all men who died in 1995 of prostate cancer in King County did so in a hospital. However, because medical records pertaining to death are only available in the inpatient setting, the validity of underlying COD assigned by death certificate to inpatients who died at home or in a nursing home remains unclear. This should be an area of further research.

In summary, this study indicates that there is an excellent agreement between the underlying COD from death certificates and medical records in prostate cancer patients. Researchers and clinicians alike should be comfortable accepting the validity of disease-specific mortality rates derived from datasets that use death certificate data to evaluate these outcomes.

REFERENCES


NOTES

1Editor’s note: SEER is a set of geographically defined, population-based, central cancer registries in the United States, operated by local non-profit organizations under contract to the National Cancer Institute (NCI). Registry data are submitted electronically without personal identifiers to the NCI on a biannual basis, and the NCI makes the data available to the public for scientific research.

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