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The end of life costs for Medicare patients with advanced ovarian cancer☆

Renata R. Urban [a,*], Hao He [b], Raphael Alfonso [b], Melissa M. Hardesty [c], Barbara A. Goff [a]

[a] Division of Gynecologic Oncology, Department of Obstetrics and Gynecology, University of Washington, Seattle, WA, United States
[b] Surgical Outcomes Research Center, University of Washington, Seattle, WA, United States
[c] Alaska Women's Cancer Care, Anchorage, AK, United States

HIGHLIGHTS

- This provides a benchmark for end of life costs for women with advanced ovarian cancer.
- The administration of chemotherapy at the end of life was common and significantly contributed to the cost of care.
- The mean total cost of end of life care increased over time, and hospital admissions were a significant driver of costs.

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ABSTRACT

Objective. To describe the Medicare payments at the end of life for patients with advanced ovarian cancer, and assess factors responsible for payment variation

Methods. Using the linked Surveillance, Epidemiology and End Results (SEER)-Medicare database, we identified a cohort of women with stage III/IV epithelial ovarian cancer diagnosed between 1995 and 2007. We defined the end of life as the last 90 days prior to death. Total medical costs were estimated from overall Medicare payments, and adjusted for geography and for inflation to the 2009 U.S. dollar. A generalized linear regression was performed to assess factors associated with variability in cost.

Results. Of 5509 patients, 78.9% died from ovarian cancer. In the 90 days prior to death, 65.2% of patients had an inpatient admission, 53.7% received chemotherapy, 19.3% had a palliative procedure, and 62.5% had hospice services. The mean total payment per patient in the last 90 days of life was $24,073 (range 0–$484,119) over the study time period. The mean cost of inpatient admissions was $14,529 (range 0–$483,932). On a multivariate analysis, costs at the end of life did not vary based on length of patient survival ($p = 0.77$). Factors associated with significantly increased costs in the last 90 days of life were medical comorbidity, chemotherapy, time spent as an inpatient, and admissions associated with emergency room visits.

Conclusions. Reducing the prescription of chemotherapy and increasing the use of hospice services for ovarian cancer patients at the end of life will aid in lowering costs.

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1. Introduction

End of life care is often associated with a considerable expenditure of resources and cancer patients have been shown to have even higher costs than non-cancer patients [1,2]. As part of a physician-driven investigation for payment reform, the American Society for Clinical Oncology developed a bundled payment model for the treatment of colon cancer patients [1,3]. The model includes accountability for practices that "follow evidence-based guidelines for high quality care near the end of a patient's life," yet does not include payments specifically geared towards caring for a cancer patient at the end of life. This discrepancy is noteworthy, especially as cancer patients may require increasingly intense management of clinical symptoms, as well as time to discuss advance care planning and end of life wishes.

Ovarian cancer accounts for the most deaths of any of the gynecologic cancers, with an estimated 14,000 deaths in 2016. Although the survival for patients with ovarian cancer has improved over time [4], the majority of patients with advanced ovarian cancer will ultimately die of their disease [5], and patients often have a slow, progressive decline

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* Corresponding author at: Department of Obstetrics & Gynecology, University of Washington Medical Center, 1959 NE Pacific Street, Campus Box 356460, Seattle, WA 98195-6460, United States.
E-mail address: urbanr@u.washington.edu (R.R. Urban).

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in functional status. Prior studies have noted increased resource utilization as well as increased costs for care of ovarian cancer at the end of life [6,7], and a recent review of SEER/Medicare revealed that the use of hospital-based services was increasing over time [8]. Such studies that have investigated the costs of care at the end of life for ovarian cancer patients however have specifically assessed the cost-effectiveness of specific interventions, such as palliative care consultation [9].

As oncologists look towards the use of a disease-based payment system, the importance of assessing the baseline costs of care for ovarian cancer patients at the end of life will be crucial in assessing the cost-effectiveness of treatment interventions [10]. Our objectives were to use the SEER/Medicare data set to describe the payments at the end of life for patients with advanced ovarian cancer and to assess factors responsible for variation in payments.

2. Methods

2.1. Data source

Institutional Review Board approval for this study was obtained by the Fred Hutchison Cancer Research Consortium (FHCRC # 9270). This was a retrospective, population-based cohort study using the linked Surveillance Epidemiology, End Results (SEER)-Medicare database. This database consists of data from the SEER registry provided by the National Cancer Institute (NCI) linked to patient records in the Medicare claims records provided by the Centers for Medicare and Medicaid Services (CMS). The SEER database is composed of records from national cancer registries that served 14% of the U.S. population in 1995 and 26% in 2004; approximately 97% of incident cancer cases in these areas are included in SEER. For patients over the age of 65 in the SEER database, 93% have been able to be identified in the Medicare enrollment file and have their records successfully matched to SEER records in the linkage process [11].

2.2. Cohort selection, patient characteristics and treatment identification

This study identified all women over the age of 65 diagnosed with American Joint Cancer Committee (AJCC) ovarian cancer ($n = 26{,}379$) in SEER cancer registries from January 1, 1995 to December 31, 2007. Patients classified as AJCC unstaged in SEER, but who were classified as advanced disease, were also included. Women were excluded if they had a diagnosis based on autopsy or death certificate only ($n = 784$), non-epithelial malignancies, borderline or non-invasive pathology ($n = 1384$), multiple malignancies ($n = 2897$), or Stage I, II or unknown disease ($n = 2739$). Women were excluded if they did not have continuous eligible Medicare coverage (Part A and B without HMO) in the last 90 days before death ($n = 5719$). Lastly, patients who died within 90 days of diagnosis ($n = 2979$) were excluded from the analysis. Given that our previous work [12] showed that the majority of such patients did not have any cancer therapy, we felt that this cohort of patients may skew the results. All patients in this cohort were followed through December 2009 until the end of data or death.

Demographic characteristics included age at diagnosis, race, sex, geographic location and marital status. Clinical variables included stage, grade, and histology. Comorbidities were assessed using claims for the 6 months prior to diagnosis to calculate the Deyo adaptation [13] of the Charlson comorbidity index [14].

2.3. Outcomes

Medicare claims data were used to identify treatments; claims with a diagnosis code for ovarian cancer (183.0) were included as our outcome of interest. Receipt of chemotherapy was identified if either the inpatient record, outpatient facility file or physician claims indicated that chemotherapy was given within 90 days before death (Supplement A). Palliative procedures to relieve symptoms from malignant ascites or pleural effusions, including paracenteses, thoracenteses and/or the placement of intraperitoneal or pleural drains, were identified in the MEDPAR files using ICD-9 procedural codes and in the physician claims using CPT codes indicating surgical procedures consistent with surgery for ovarian cancer (Supplement A).

Total medical costs were estimated from Medicare facility and provider claims, and adjusted for inflation and geography [15]. In this analysis, costs refers to the amount reimbursed by Medicare. Because 2009 was the most recent year for which we had Medicare reimbursements records, all costs were converted in terms of 2009 dollars according to the claim services time. For inpatient facility costs (Medicare Part A), inflation was adjusted by CMS Prospective Payment System Hospital Price [16]. Index and geography was adjusted by 2009 CMS Geographic Adjustment Factor [17]; for outpatient facility costs and carrier/physician/supplier costs (Medicare Part B), inflation was adjusted by Medicare Economic Index [18] and geography was adjusted by 2009 CMS Geographic Practice Cost Index [19].

2.4. Statistical analysis

In the unadjusted analyses, χ^2 tests were used to assess the associations between patient survival length, and demographic and clinical factors. Given the wide range of survival length for the cohort, patient survival was categorized to display the relationship between patient survival and other factors. The generalized linear model with gamma distribution assumption fit the data best according to the multivariate model goodness of fit assessments, and was used to interpret the associations between the exploratory factors and the cost outcome. As a supplemental explanation of cost analyses, the logistic regression was used to assess the significant factors of chemotherapy in the last 30 days. All analyses in this study were conducted at a server environment using SAS 9.3 software (SAS Institute Inc., Cary, NC).

3. Results

Of the 5509 patients with stage III/IV ovarian cancer identified from 1995 to 2007 who fit our inclusion criteria (Supplement C), 1419 (25.8%) died after 90 days of diagnosis but in the first year after diagnosis, 1562 (28.4%) died in the second year, 2004 (36.4%) died in years 3–5 after diagnosis, and 524 (9.5%) died six years or more after diagnosis. Demographic, clinical and pathologic characteristics of these groups are shown in Table 1. Within the cohort, 4348 (78.9%) of patients died of ovarian cancer. The most common medical comorbidities besides ovarian cancer noted during the last 90 days of life were diabetes, congestive heart failure and chronic obstructive pulmonary disease.

The use of medical services was common among patients in the last 90 days of life (Table 2). Inpatient admissions occurred for 3590 (65.2%) patients, and two-thirds of these occurred in the last 30 days of life ($n = 2380$). The mean number of admissions per patient in the last 90 days was 2 (range 0–11). >50% of patients ($n = 2956$) received chemotherapy during the study period, and 1166 (21.2%) received chemotherapy in the last 30 days of life. The mean number of chemotherapy encounters was 4.9 (SD 5.6, maximum 76).

>60% of patients were noted to have had hospice services ($n = 3445$), however the majority of such patients had hospice noted in the last 30 days of life. Of the patients who had hospice services, 733 (21.2%) received them for 7 or fewer days before the date of death. Those patients who had hospice services for >7 days had fewer inpatient admissions, fewer emergency visits resulting in admission, and had fewer visits associated with charges for chemotherapy (Table 3).

The mean adjusted costs of all health care related to ovarian cancer care in the last 90 days of life was $24,073 (SD 23,528; range 0–$484,119). The components of the costs are listed in Table 4. Inpatient admissions made up >50% of the costs in the last 90 and last 30 days of life. Costs related to palliative procedures accounted for approximately 10% of costs, both in the last 90 and last 30 days of life. We assessed

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