Costs of treatment for elderly women with advanced ovarian cancer in a Medicare population

G.K. Fordea,⁎, J. Changb, A. Ziogasc, K. Tewari, R.E. Bristowa

a Division of Gynecologic Oncology, Department of Obstetrics and Gynecology, University of California, Irvine-Medical Center, Orange, CA USA
b Department of Epidemiology, University of California, Irvine, CA USA

HIGHLIGHTS

• NACT and PDS are comparable in cost for women with stage IIIC EOC.
• PDS is 12% more expensive for women with stage IV EOC.
• Increasing Charlson score was associated with an increase in 7-month cost of care in both stages.

ABSTRACT

Objective. To analyze the cost of treating women with advanced stage epithelial ovarian cancer (EOC) undergoing primary debulking surgery (PDS) or neo-adjuvant chemotherapy (NACT).

Methods. The Surveillance, Epidemiology, and End Results (SEER) — Medicare database (1992 to 2009) was used to evaluate the 7-month cost of care following PDS and NACT for advanced EOC. Multivariate analyses were used to evaluate differences between women treated by PDS and NACT on cost and survival.

Results. Of the 4506 women eligible for analysis, 82.4% underwent PDS and 17.6% received NACT. Eighty-five percent with stage IIIC and 78.5% with stage IV EOC underwent PDS (p < 0.0001). No significant difference in the median cost of care between PDS and NACT existed in women with stage IIIC EOC ($59,801 vs. $59,905). There was a 12% increase in adjusted cost of care for stage IV patients ($63,131 vs. $55,302) who received PDS (p < 0.0001). Increasing Charlson score was associated with an increase in 7-month cost of care in both stages. NACT was associated with a decreased 5-year overall survival in women with stage IIIC EOC (HR = 1.27, 95% CI: 1.10–1.47) and stage IV EOC (HR = 1.19, 95% CI: 1.03–1.37) compared to PDS.

Conclusion. NACT and PDS are comparable in cost for women with stage IIIC EOC, and PDS is minimally more expensive for women with stage IV EOC. PDS was associated with an increase 5-year overall survival. Future investigations should include cost-effectiveness analyses where additional measures such as quality adjusted life years and propensity scored survival are included.

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1. Introduction

In 2014 the incidence of ovarian cancer in the United States is expected to exceed 21,000 and over 14,000 women are projected to succumb to this disease [1]. Currently, primary debulking surgery (PDS) followed by doublet chemotherapy with a platinum based agent and a taxane is the first line therapy and offers the greatest survival advantage for women with advanced stage epithelial ovarian cancer (EOC) [2]. PDS is intended to remove as much tumor as possible because the quantity of residual tumor is inversely proportional to improvement in 5-year progression free survival and 5-year overall survival (OS) [3–11]. In contrast, the results of a European Organization for Research and Treatment of Cancer (EORTC) trial demonstrate that PDS without optimal tumor resection is not associated with a survival advantage [12]. In patients with significant comorbidities where optimal PDS may be unachievable or carry an unacceptable high morbidity, neo-adjuvant chemotherapy (NACT) is an alternative approach that is extensively described in the literature [3–12]. The results of the CHORUS trial also demonstrated a survival advantage in women undergoing PDS [13]. However, one of the main criticisms of both CHORUS and EORTC are the reported optimal debulking rates of 15% and 41%, respectively, which is much lower than what is published elsewhere. This is significant given the clear survival advantage conveyed following optimal tumor resection compared to sub-optimal resection. Wright et al. recently published a survival analysis encompassing a period from 1990 to 2007 for women with stage II to IV EOC using SEER-Medicare data.
They concluded that survival for PDS and NACT was equivalent. This data is limited in that it encompasses a time period with significant changes in practice standards including the incorporation of taxanes into first-line therapy and the introduction of intra-peritoneal chemotherapy. In summary, the data does not reflect current practice standards [14].

Prior studies have not considered differences in the treatment costs for women undergoing PDS and NACT. A cost analysis may provide additional insights into this highly debated topic and help guide clinical decision-making. An important concept in healthcare delivery is that of value, which is defined as measured outcomes obtained per the cost of care. One of the benefits of using value to compare treatment options is that it allows for a more accurate comparison of treatment modalities. In particular, the cost benefits of PDS and NACT should be characterized to ensure that patients are not undergoing more costly procedures that do not significantly improve their overall survival or the quality of their remaining years of life. The purpose of this investigation is to compare 7-month cost of care in women with advanced epithelial ovarian cancer who underwent PDS or NACT using SEER-Medicare data.

2. Methods

The study design was a retrospective population based study using the linked Surveillance, Epidemiology, and End Results (SEER) — Medicare database. IRB approval was obtained (HS # 2012-9076). The SEER program of the National Cancer Institute (NCI) contains approximately 97% of all incident cancer cases from tumor registries that covered 14% of U.S. population in 1995 to 28% currently [15,17]. The SEER Program registries collect data on patient demographics, primary tumor site, tumor morphology and stage, first course of treatment, and follow-up for vital status. Among patients older than 65 years old in SEER data, 93% were identified in the Medicare enrollment file and their records were successfully matched to SEER cases in the linkage process performed by NCI and Center for Medicare and Medicaid Services [16,17]. Medicare claims database includes all inpatient hospitalizations, outpatient, physician/supplier data, durable medical equipment, hospice and home health care. All claims are longitudinal from the time of a person’s Medicare eligibility until death. Our analysis data include SEER cases from 1992 to 2009 and their Medicare claims from 1991 to 2010.

2.1. Study population

A total of 38,792 patients diagnosed between January 1, 1992 and December 31, 2009 with invasive ovarian cancer (SEER primary site code C569) as their only tumor or first primary tumor and second tumor was at least two years after the first ovarian cancer were identified in SEER data. We sequentially removed 287 cases with missing tumor histology information, 117 with germ cell or sex cord tumor, 820 with autopsy or death certificate only, 10,468 with age at diagnosis less than 66 years old, 3,337 with missing tumor stage information, 8,731 with early stage (stage IIB and below), 36 with missing diagnosis month, 12 with missing median income in census tract and 4,696 without continuous enrollment of Medicare Part A and Part B or ever enrolled in a HMO from the 12 month prior to diagnosis. Out of 10,300 cases that were identified from SEER data, 10,097 patients who were Medicare beneficiaries and had claims in the Medicare database were identified. Using International Classification of Disease 9th Revision, Clinical Modification (ICD-9-CM) procedure and diagnosis code in claims data (Supplemental Table 1. Procedure and diagnosis codes), 4,714 patients were identified having both ovarian cancer surgery and chemotherapy. In order to account for survival bias, patients observed for less than 5 months after the cancer diagnosis were excluded, which resulted in excluding 196 patients, and the final study population consists of 4,506 stage IIC or IV ovarian cancer patients that received both surgery and chemotherapy. By limiting the study to those who had at least 5 months of data we attempted to capture the entire primary treatment duration whether PDS preceded chemotherapy or chemotherapy preceded interval-debulking surgery.

2.2. Outcomes

Cost of care was calculated as the sum of the amount that Medicare reimbursed for all inpatient, outpatient, physician/supplier, durable medical equipment, home health care and hospice claims during 7 month period after diagnosis of ovarian cancer. A 7-month time horizon was selected to represent costs associated with the initial treatment by PDS or NACT and to exclude downstream costs related to second-line treatment, palliation or end of life care. Costs were inflation adjusted and presented in 2010 dollars using consumer price index for medical care services from the Bureau of Labor Statistics [18]. Another outcome, survival time was defined as the time between diagnosis and death or last follow-up date.

2.3. Treatment groups

Surgery date was estimated by admission date of inpatient stay for the surgery. Starting date of chemotherapy was estimated by the date of first chemotherapy claim after cancer diagnosis. Patients who had an earlier surgery date or the same surgery and chemotherapy dates were placed in the PDS arm and patients with earlier chemotherapy start dates were placed in the NACT arm. Patients who started chemotherapy during the hospital stay for the surgery were identified as belonging to the PDS arm.

2.4. Covariates

Other covariates used in cost and survival comparisons included patient, tumor, and clinical characteristics. Patient characteristics were race/ethnicity (White or Non-white), age at diagnosis (66–69, 70–74, 75–79, 80 + years old), year of diagnosis (1992–1995, 1996–2000, 2001–2005, 2006–2010), quartile of median household income in census tract, residence area (metropolitan, non-metropolitan), and marital status (married/ unmarried or unknown). Patient’s comorbidity was measured by Deyo adaptation of the Charlson Comorbidity Index. Comorbidity score was calculated by using all ICD-9 diagnosis codes, procedure codes, and HCPCS procedure codes included in the inpatient, outpatient and physician claims in 12 months before the cancer diagnosis [19,20]. To prevent over-estimation of the comorbidity when using physician or outpatient claims a patient’s diagnoses must appear on at least two different claims that were more than 30 days apart. Conditions that did not appear on two different claims were not counted as comorbid conditions [21]. Tumor characteristic included tumor stage (stage IIC or IV), tumor grade (grade I or II, III, IV or not stated), tumor histology (serous or non-serous), and tumor size (≤5 cm, 5–10 cm, ≥10 cm or unknown size).

2.5. Statistical analysis

Frequency distributions of patients’ demographic, clinical characteristic were analyzed with the $\chi^2$ test or Fisher’s exact test for categorical variables in bivariate analysis. Descriptive summary statistics of 7-month cost of care was presented and analyzed with Kruskal–Wallis test for each subcategory in each stage. After checking the distribution of the cost, natural log transformation of the cost was used as the outcome in multivariate linear regression model. Stepwise selection was used for final model. Estimates of the regression model were transformed back for interpretation. Patient’s survival time was defined as the time between diagnosis and death or last follow-up. Five-year survival curves and log rank tests were performed using Kaplan-Meier estimates of survival probability for each stage. After verifying proportionality assumptions, proportional hazards model was fitted to evaluate the effect of treatment on survival after controlling for patient demographic and tumor characteristics. In multivariate survival analysis,
non-significant factors were removed from the final model using stepwise selection. All p values are two sided. Statistical analysis was performed on SAS 9.2.

3. Results

3.1. Cohort characteristics

Of the 4506 women deemed eligible for this analysis, 82.4% underwent PDS and 17.6% received NACT (Table 1). Women with stage IV EOC were more likely to receive NACT than those with stage IIIC EOC (p < 0.0001). No significant difference in age distribution in two treatment group with 32% of patients in 70–74 age group. Of women with stage IIIC and IV EOC, 85.4% and 78.5% received PDS, respectively. Serous histology was the most common (66%). There were significant differences in tumor histology, grade tumor size and Charlson scores in women who received PDS and NACT. The trend towards NACT increased from 6.9% to 23.7% from the year range 1992–1995, to 2006–2009, respectively (p < 0.0001) and with increasing Charlson score.

3.2. Stage IIIC EOC

For stage IIIC EOC there was a significant difference in cost of care between age groupings (Tables 2 and 3). Median treatment costs for patients’ age 80+ was 8% less than for patients 66–69 years of age ($58,179 vs. $63,370). Compared to serous histology, other histology...
was associated with a 6% increase in cost of care, respectively. A Charlson scores ≥2 was associated with a 13% higher cost of care when compared to patients with Charlson scores equal to zero. Year of diagnosis groupings 1996–2000 and 2001–2005 were associated with a statistically significant increase in adjusted cost of care compared to the referent 1992–1995 group, 11% and 19%, respectively. The adjusted cost of care was 3% lower during 2006–2009 compared to the referent, which may be an artifact of the 2006 to 2009 recession. For stage IIIC EOC the adjusted median cost of care was $59,801 for PDS and $59,905 which may be an artifact of the 2006 to 2009 recession. For stage IIIC EOC the adjusted median cost of care was $59,801 for PDS and $59,905 for NACT (p = 0.9462). NACT was associated with a decreased survival in women with stage IIIC EOC (HR = 1.27, 95% CI: 1.10–1.47).

### 3.3. Stage IV EOC

For patients with stage IV EOC there was a significant difference in cost of care between age groupings (Tables 2 and 3). Patients age 75–79 and 80+ incurred a 6% and 4% lower median cost of care than patients 66–69 years of age respectively ($61,264 and $62,782 vs.

### Table 2

Summary statistics of 7 month treatment cost in study population.

| Characteristics | Stage IIIC | Kruskal-Wallis test p-value | Stage IV | Kruskal-Wallis test p-value |
|----------------|------------|-----------------------------|---------|-----------------------------|
|                | Median     | Minimum | Maximum | Std dev | Median     | Minimum | Maximum | Std dev |
| Total          | 2531       | 60,154 | 68,673 | 463 | 583,672 | 40,069 | 0.0001 | 0.0001 |
| Age at Dx      |            |         |         |       |           |         |         |         |
| 1 = 65–69      | 676        | 63,370 | 69,943 | 14,566 | 354,014 | 36,869 | 0.0001 | 0.0001 |
| 2 = 70–74      | 775        | 59,207 | 68,824 | 14,960 | 409,260 | 42,524 | 0.0001 | 0.0001 |
| 3 = 75–79      | 694        | 60,176 | 69,603 | 463 | 583,672 | 43,765 | 0.0001 | 0.0001 |
| 4 = 80–84      | 317        | 58,887 | 65,150 | 11,201 | 275,671 | 31,351 | 0.0001 | 0.0001 |
| 5 = 85+ History | 69        | 59,595 | 61,382 | 14,650 | 276,482 | 37,861 | 0.0001 | 0.0001 |
| Serous         | 1769       | 58,883 | 67,243 | 11,201 | 583,672 | 38,913 | 0.0001 | 0.0001 |
| Mucinous       | 36         | 66,277 | 74,569 | 24,643 | 583,672 | 38,250 | 0.0001 | 0.0001 |
| Endometrioid   | 157        | 57,889 | 65,288 | 17,238 | 211,638 | 31,793 | 0.0001 | 0.0001 |
| Clear cell     | 37         | 47,661 | 53,648 | 24,762 | 142,241 | 24,932 | 0.0001 | 0.0001 |
| Adenocarcinoma | 184        | 67,112 | 76,144 | 463 | 469,260 | 48,177 | 0.0001 | 0.0001 |
| Other          | 348        | 65,144 | 74,521 | 17,478 | 503,575 | 44,644 | 0.0001 | 0.0001 |
| Grade          |            |         |         |       |           |         |         |         |
| Grade 1 or 2   | 412        | 60,612 | 67,181 | 17,238 | 275,671 | 32,737 | 0.0001 | 0.0001 |
| Grade III      | 1320       | 59,554 | 68,265 | 21,120 | 583,672 | 39,791 | 0.0001 | 0.0001 |
| Grade IV       | 399        | 59,844 | 64,721 | 14,960 | 409,260 | 39,938 | 0.0001 | 0.0001 |
| Unknown grade  | 400        | 62,859 | 73,506 | 463 | 503,575 | 47,129 | 0.0001 | 0.0001 |
| Tumor size     |            |         |         |       |           |         |         |         |
| <5 cm          | 408        | 58,847 | 67,188 | 14,566 | 288,979 | 37,515 | 0.0001 | 0.0001 |
| 5–10 cm        | 471        | 57,428 | 65,253 | 20,096 | 354,014 | 34,966 | 0.0001 | 0.0001 |
| ≥10 cm         | 483        | 58,161 | 66,572 | 14,670 | 583,672 | 40,033 | 0.0001 | 0.0001 |
| Size unknown   | 1169       | 62,527 | 71,438 | 463 | 503,575 | 42,649 | 0.0001 | 0.0001 |
| Charlson score |            |         |         |       |           |         |         |         |
| 0              | 1799       | 59,200 | 66,688 | 463 | 583,672 | 39,212 | 0.0001 | 0.0001 |
| ≥2             | 542        | 60,993 | 71,546 | 14,566 | 416,596 | 41,826 | 0.0001 | 0.0001 |
| Race           |            |         |         |       |           |         |         |         |
| White          | 2289       | 59,646 | 68,003 | 463 | 583,672 | 39,811 | 0.0001 | 0.0001 |
| African American | 114    | 64,421 | 75,290 | 20,400 | 255,688 | 39,933 | 0.0001 | 0.0001 |
| Asian          | 73         | 57,518 | 68,697 | 20,718 | 156,159 | 31,380 | 0.0001 | 0.0001 |
| Hispanic       | 28         | 66,300 | 64,217 | 25,257 | 577,102 | 41,402 | 0.0001 | 0.0001 |
| Other/unknown  | 42         | 63,188 | 76,590 | 22,523 | 276,482 | 50,748 | 0.0001 | 0.0001 |
| Year of DX     |            |         |         |       |           |         |         |         |
| 1992–1995      | 273        | 55,431 | 66,572 | 463 | 272,768 | 41,000 | 0.0001 | 0.0001 |
| 1996–2000      | 511        | 60,642 | 71,273 | 14,670 | 409,260 | 42,915 | 0.0001 | 0.0001 |
| 2001–2005      | 987        | 65,060 | 73,666 | 14,566 | 583,672 | 42,112 | 0.0001 | 0.0001 |
| 2006–2009      | 780        | 53,063 | 61,197 | 11,201 | 288,797 | 33,368 | 0.0001 | 0.0001 |
| Quartile of median household income in census tract | 0.0723 | 0.0803 |

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* 7 month total cost = Medicare payments for inpatient, outpatient, physician claims, durable medical equipment, home health, hospice claims within 7 month after DX and adjusted for inflation.

* n = 12 had missing information.
fixed percentage of malignant cells are killed with chemotherapy. In addition to the biochemical factors, practice patterns may play a role in the survival in patients with EOC. Provider bias may be related to their clinical training and the practice patterns within their local community.

The results of the only two prospective trials to date failed to show a survival benefit and demonstrated that morbidity was increased in patients who underwent PDS [12,13]. The first, the European Organization for Research and Treatment of Cancer (EORTC) compared optimal debulking rates, operative times, post-operative complications, length of hospital stay, progression free survival (PFS), and 5-year survival differences between patients who underwent PDS and received NACT and found that NACT was associated with a lower mortality, morbidity and equivalent PFS and overall survival than PDS [12]. These results are met with criticism. Chi et al., conducted an analysis on patients at Memorial Sloan Kettering Cancer Center (MSKCC) treated during the same time period as the EORTC trial and demonstrated a higher PFS and OS than reported in the EORTC trial. They proposed the following confounders regarding these findings; 1) the improved outcomes in the PDS arm may be related to selection biasing sicker patients to the trial arm and 2) substandard surgical technique [8]. Though the disposition of patients to NACT who are thought to be poor surgical candidates makes sense, it also significantly limits the ability to compare certain aspects of these treatment options. We attempted to account for this in our study by controlling for Charlson score and other patient characteristics.

The second, the CHORUS trial, was conducted in the UK and compared upfront surgery to chemotherapy in patients newly diagnosed with clinical stage III and IV ovarian cancer. They concluded that PDS and NACT groups experienced a similar OS, and that NACT was associated with decreased mortality and increased optimal debulking rates [13]. One of the main criticisms is that the optimal debulking rate from PDS in the CHORUS trial was 15%, which is several times lower than rates typically reported in the US.

In the current study, patient demographics are consistent with that of other analyses comparing PDS to NACT for Stage IIC and IV EOC. Whites comprised more than 90% of the total study population and the average age of our population was between 70 and 74 years of age. Our OS results are in agreement with other retrospective analyses of other analyses comparing PDS to NACT for Stage IIC and IV EOC. Whites comprised more than 90% of the total study population and the average age of our population was between 70 and 74 years of age. Our OS results are in agreement with other retrospective analyses.
comparing PDS to NACT. We found that PDS was associated with an increased 5-year OS in women with stage IIIC and IV EOC, however, we acknowledge that the survival advantage observed in retrospective analyses is highly confounded.

PDS was also associated with a comparable 7-month cost of care across the entire population. A sub-analysis revealed that no significant cost differences exist between PDS and NACT for stage IIIC EOC. In patients with stage IV EOC there is a statistical difference between the costs of care favoring NACT. In patients with both stage IIIC EOC and IV EOC, age, histology, Charlson score and year of diagnosis were all associated with differences in 7-month cost of care.

Even after excluding patients from the original pool for age <65, early stage disease and lack of continuous enrollment in Medicare A and B, one of the strengths of this investigation is the large sample size and that SEER database is known for its accuracy and completeness. One of the limitations of this study is that it is retrospective and based on information extracted from claims data in a fee-for-service population. In addition, our analysis was performed on women ≥65 years of age and may not accurately predict costs of care or survival in younger women. Also death due to other causes may be underreported. Furthermore, patients treated with NACT may represent a more complex baseline disease that is difficult to capture. Other limitations include the possibility for staging differences favoring more accurate staging in women undergoing PDS over NACT and an inability to accurately determine if sicker patients were biased to NACT. The difficulty in identifying patients treated by providers with substandard surgical technique or accurately quantify the amount of residual disease is also one of the limitations. Despite these limitations, the survival advantage associated with PDS in our investigation is consistent with what has been shown in other retrospective analyses.

5. Conclusion

In conclusion, there was no cost savings associated with NACT for stage IIIC. Patients with stage IV EOC treated with PDS had an incremental cost increase over NACT. These data can inform the discussion about appropriate management for patients with advanced ovarian cancer by bringing cost discussions into the equation. Future studies should investigate the cost effectiveness of PDS when compared to NACT and include quality of life measures.

Conflict of interest statement

The authors have no disclosures.

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Appendix A. Supplementary data

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References

[1] American Cancer Society. http://www.cancer.org/cancer/ovariancancer/detailedguide/ ovarian-cancer-key-statistics.
[2] National Comprehensive Cancer Network. Clinical Practice Guidelines for Ovarian Cancer; 2012 13.
[3] Hoskins WJ, McGuire WP, Brady MF, Creasman WT, Berman M. The effect of diameter of largest residual disease on survival after primary cytoreductive surgery in patients with suboptimal residual epithelial ovarian carcinoma. Am J Obstet Gynecol 1994;170:974–9.
[4] Chang S, Bristow RE. Evolution of surgical treatment paradigms for advanced-stage ovarian cancer: redefining ‘optimal’ residual disease. Gynecol Oncol 2012;125: 483–92.
[5] Chi DS, Eisenhauer EL, Zivinovic O, Sonoda Y, Abu-Rustum NR, Levine DA, Guile MW, Bristow RE, Aghajanian C, Barakat RR. Improved progression-free and overall survival in advanced ovarian cancer as a result of a change in surgical paradigm. Gynecol Oncol 2009;114:26–31.
[6] Chi DS, Bristow RE, Armstrong DK, Karlan BY. Neoadjuvant chemotherapy is rarely the easy way out reply journal of clinical oncology. J Clin Oncol 2012;30:1563–6.
[7] Chi DS, Bristow RE, Armstrong DK, Karlan BY. Is the easier way ever the better way? J Clin Oncol 2011;29:4073–5.
[8] Chi DS, Musa F, Diao F, Zivinovic O, Sonoda Y, Leitao MM, Levine DA, Gardner GJ, Abu-Rustum NR, Barakat RR. An analysis of patients with bulky advanced stage ovarian, tubal, and peritoneal carcinoma treated with primary debulking surgery (PDS) during an identical time period as the randomized EORTC-NCIC trial of PDS vs neoadjuvant chemotherapy (NACT). Gynecol Oncol 2012;124:10–4.
[9] Hoskins PJ. Which is the better surgical strategy for newly diagnosed epithelial ovarian cancer: primary or interval debulking? Curr Opin Obstet 2011;23:301–6.
[10] Robinson WR. Neoadjuvant chemotherapy is rarely the easy way out. J Clin Oncol 2012;30:1563.
[11] Tiersten D, Liu PY, Smith HO, Wilczynski SR, Robinson WR, Markman III M, Alberts DS. Phase II evaluation of neoadjuvant chemotherapy and debulking followed by intraperitoneal chemotherapy in women with stage III and IV epithelial ovarian, fallopian tube or primary peritoneal cancer: Southwest Oncology Group Study 00099. Gynecol Oncol 2009;112:44–9.
[12] Vergote IG, Trope F, Amant F, Kristensen GB, Ehlen T, Johnson N, Verheijen RH, van der Burg ME, Lacave AJ, Panici PB, Kenter GG, Casado A, Mendiola C, Coens C, Verleye L, Stuart GCE, Pecorelli S, Reed NS, C. European Org Res Treatment and N C, T. GCP. 2010. Neoadjuvant chemotherapy or primary surgery in stage IBC or IV ovarian cancer. N Engl J Med 2010;363:943–93.
[13] Reheo S, Hook J, Nankivell MJ, Jayson CG, Kitchener HC, Lopes T, Luesley D, Perren T, Banno S, Mascarenhas M, Dobbs S, Essapen S, Twigg J, Herod J, McCulloge W, Parmar M, Swart AM. Chemotherapy or upfront surgery for newly diagnosed advanced ovarian cancer: results from the MRC CHORUS trial. 2013 ASCO Annual Meeting; 2013 (Abstract 5500. Presented June 1).
[14] Wright JD, Cande AV, Tsai J, Gled SA, Burke WM, Yu-Shiang I, Neugut Al, Herszog TJ, Hershman DL. Comparative effectiveness of upfront treatment strategies in elderly women with ovarian cancer. Cancer 2014;120:1246–54.
[15] Overview of the SEER program. http://seer.cancer.gov/about/overview.html.
[16] Brief description of the SEER-Medicare database. http://appliedresearch.cancer.gov/ seermedicare/overview/.
[17] Warren J, Klabunde CN, Schrag D, Bach PB, Riley GF. Overview of the SEER-Medicare data: content, research applications, and generalizability to the United States elderly population. Med Care 2002;40:3–8.
[18] U.S. Department of Labor. Bureau of Labor Statistics Consumer Price Index—all urban consumers — U. Medical Care Services. http://data.bls.gov/cgi-bin/surveymost?cu.
[19] Deyo RA, Cherkin DC, Deyo MA. Adapting a clinical comorbidity index for use with ICD-9-CM administrative databases. J Clin Epidemiol 1992;45:613–9.
[20] Charlson ME, Pompepi P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidit in longitudinal studies: development and validation. J Chronic Dis 1987;40:373–83.
[21] Klabunde CN, Potosky AL, Legler JM, Warren JL. Development of a comorbidity index using physician claims data. J Clin Epidemiol 2000;53:1258–67.