

**CANCER TREATMENT COSTS
ARE CONSISTENTLY LOWER
IN THE COMMUNITY SETTING
VERSUS THE HOSPITAL
OUTPATIENT DEPARTMENT:
A SYSTEMATIC REVIEW OF THE EVIDENCE**

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ABSTRACT

Nearly 1.7 million new cancer diagnoses in the United States are projected for 2017. Controlling the cost of treating cancer is an important consideration for curbing the overall cost of health care. We conducted a systematic review of the literature on the cost of treating cancer in the two most common cancer treatment locations, the physician's office/community oncology clinic and the hospital outpatient department. Ten studies that fit the inclusion criteria were identified and analyzed. The studies differed in the cancers examined, datasets used, and methods employed. Despite these differences, all identified studies found cancer treatment costs were higher in the hospital outpatient department. On average, costs in the hospital outpatient department were 38 percent higher than in the physician office.

INTRODUCTION

Health care is amid a transformation seeking to improve quality and lower costs. In 2015, health care spending represented 17.8 percent of the overall U.S. economy and reached \$3.2 trillion, or \$9,990 per person.¹ These figures represent an increase from 2014 when health care spending totaled \$3 trillion.² As those numbers are projected to increase, every sector of health care is under scrutiny for how to control spending while maintaining or improving quality. Cancer is the second leading cause of death for Americans behind heart disease. Therefore, evaluating the cost of treating cancer represents an opportunity for understanding how to reduce health care costs.

Cancer patients potentially receive treatment at several sites of care. These locations include a physician's office or community oncology clinic, a hospital outpatient department, or a hospital inpatient department, generally reserved for the sickest patients. In 2016, the Community Oncology Alliance reported that more patients were receiving care in a hospital outpatient department rather than a physician's office or other community setting.³ The report also found that since 2008, 1,581 community practices and or clinics have either closed, been acquired by a hospital, or been involved in a corporate merger.² As community clinics close, more patients receive cancer treatment in the hospital outpatient department.

The Cost of Cancer in the United States

- 1,688,780 new cancer cases are projected for the year 2017
- Cancer is the second leading cause of death in the United States behind heart disease
- The Agency for Healthcare Research and Quality (AHRQ) estimates that direct medical costs for cancer in the United States in 2014 were \$87.8 billion

An important policy question to address is whether a cost difference exists for treating patients in the community setting compared to the hospital outpatient department. We conducted a systematic review of the literature to understand how cancer treatment costs differ in the community (hereafter described as physician's office) versus the hospital outpatient department setting. A comprehensive review of the literature demonstrated that the cost of treating cancer was significantly lower in the physician office setting compared to the hospital outpatient department.

METHODS

A thorough search was conducted to identify studies that examined the cost of treating cancer in the physician office versus the hospital outpatient department. To identify studies, we used Google, Google Scholar, PubMed, and each identified study's citations. Search terms used included variations of "cost of cancer care physician office vs. hospital outpatient department," and "cancer costs site of care." Studies that compared the cost of treating cancer in the physician office vs. the hospital outpatient department were selected for inclusion in the systematic review. Both peer-reviewed and gray literature studies were included. Studies were excluded if they examined hospital outpatient compared to hospital inpatient departments or if they did not match the research question.

RESULTS

Literature Search

Thirteen total relevant studies were identified for potential inclusion. Of those, ten were selected for the systematic review. The included studies were published between 2001 and 2016; however, 9 of the 10 studies were published between 2011 and 2016. The ten studies included in the systematic review all compared the cost of care for cancer patients treated in the physician office versus the hospital outpatient department. Four of the studies were privately published and six were peer-reviewed.

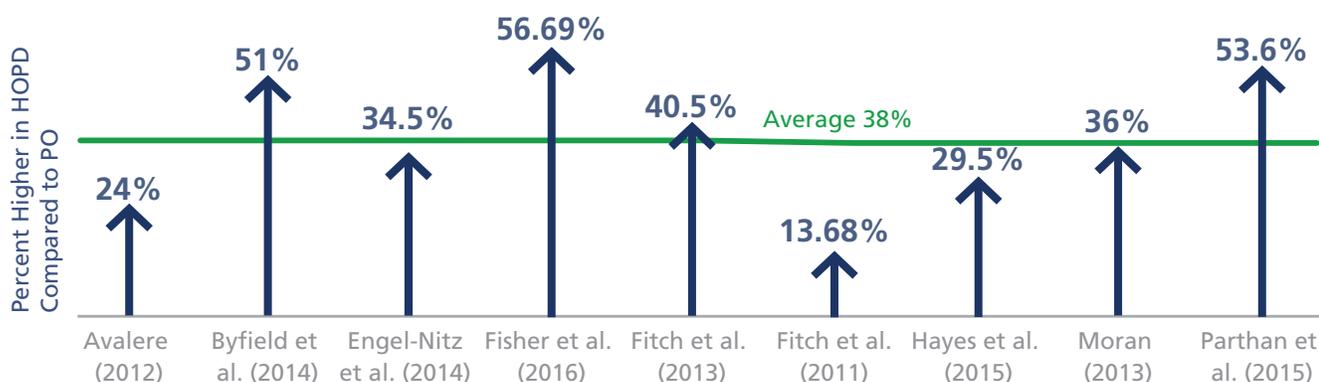
Three related studies did not fit the inclusion criteria. In the first study, Robinson and Beyer (2010) examined outcomes rather than costs and found that of the 140 women with ovarian cancer included in the study, more adverse events were associated with treatment in the hospital compared to the office-based setting.⁴ In the second study, Higgins et al. (2016) compared the cost of seven common, but not cancer specific, services in the physician office and the hospital outpatient department. The services included a 15-minute office visit, a 40-minute office visit, a CT scan, an MRI, a chest radiography, an upper gastrointestinal endoscopy, and a colonoscopy. The study found that costs for all seven services were higher in the hospital outpatient department than the physician office, with a chest radiography in 2013 costing 258 percent more.⁵ The third excluded study, conducted by KNG Health Consulting and commissioned by the American Hospital Association in 2014, examined

patient demographics between the physician office and hospital outpatient department. The study found that compared to the physician office, patients treated in the hospital outpatient department were more likely to be black or Hispanic; self-pay, charity care, or on Medicaid; from high-poverty, low-education areas; and ailed by more severe chronic conditions.⁶ These three studies contribute important information on cancer care generally, but not costs specifically, between the two settings.

Aggregate Study Findings

Despite different datasets, years studied, cancers and treatments examined, and methods used, all ten studies found higher cancer treatment costs in the hospital outpatient department compared to the physician office (see Figure 1). Three studies used Medicare claims data and seven used commercial datasets. Chen et al. (2001)⁷ analyzed Medicare data from 1992-1995, Moran (2013)⁸ examined Medicare claims from 2009-2011, and Fitch et al. (2011)⁹ used Medicare claims from 2006-2009. Fisher et al. (2016)¹⁰ used the HealthCore Integrated Research Database of 14 commercial insurers for patients aged 18-64 years from 2006-2012 and Fitch et al. (2013)¹¹ analyzed the Truven Health Analytics MarketScan data for patients aged 18-64 from years 2009-2010. The remaining five studies used commercial datasets that included the Medicare Advantage population. Across all dates and datasets, the studies found higher treatment

Figure 1: Percent higher cost for cancer treatment in the hospital outpatient versus community setting



This chart includes nine of the ten studies included in the systematic review. Chen et al. (2001) was excluded due to its age. When a study examined multiple cancers and gave a range of cost differences, the average was calculated and included in this graph. Some studies represented here included total health care costs while others included only cancer-specific costs.

costs in the hospital outpatient department. Higher costs in the hospital outpatient department were found when both total health care costs and cancer-specific costs were examined. The one exception is seen in Byfield et al. (2014),¹² which found that for a single subpopulation, Medicare Advantage patients, there were slightly lower hospital outpatient department treatment costs despite the total population of the study having 51 percent higher infusion day hospital outpatient department costs.¹²

Many of the studies also examined duration of treatment between the two settings. Seven of the studies (Avalere,¹³ Byfield et al., Engel-Nitz et al.,¹⁴ Fisher et al., Fitch et al. 2011, Hayes et al.,¹⁵ and Parthan et al.¹⁶) found that length of treatment was longer for patients who received care in the physician office. Avalere (2012) found that the average chemotherapy episode lasted 3.8 months in the physician office compared to 3.4 months in the hospital outpatient department. Byfield et al. (2014) found that on average patients received 5.6 rituximab infusions in the physician office compared to 7.5 in the hospital outpatient department. Engel-Nitz et al. (2014) found that the average length of treatment for patients in the physician office was 208 days compared to 191 days in the hospital outpatient department. Fisher et al. (2016) found that on average patients treated in the physician office had 21.8 office visits compared to 21.2 office visits for patients receiving treatment in the hospital outpatient department. Finally, Parthan et al. (2015) found that on average patients received 343 trastuzumab treatments in the physician office compared to 325 in the hospital outpatient department. Due to limitations with claims data, only one study (Byfield et al. 2014) posited a reason for longer treatment lengths in the physician office by suggesting that patients may form stronger relationships with their caregivers in the smaller physician office setting and may be more inclined to complete their treatments. Only one study (Moran 2013)

found that chemotherapy days per beneficiary were 9-12 percent higher in the hospital outpatient department, but did not offer an explanation. Two studies (Chen et al. 2001 and Fitch et al. 2013) did not include differences in treatment duration. These results suggest that the lower cost of cancer treatment in the physician office is not due to a shorter duration of treatment.

Several studies captured the trend toward patients increasingly receiving treatment in the hospital outpatient department. Fitch et al. (2011) demonstrated that between 2006 and 2009, patients receiving treatment in the physician office declined from 70 to 65 percent. Byfield et al. 2014 found that between 2007 and 2012, the percentage of patients receiving treatment in the hospital outpatient department increased from 22 percent to 39 percent. Similarly, Engel-Nitz et al. 2014 showed that in 2006, 84 percent of patients received treatment in the physician office and in 2012, that number declined to 61 percent.

Population, Cancers, and Treatments Studied

Table 1 captures the dataset, cancers and treatments, and inclusion criteria used in each study. Seven of the ten studies examined commercial health care datasets. Of these, two studies (Fisher et al. 2016 and Fitch 2013 et al.) did not include the Medicare Advantage population and only looked at individuals aged 18-64. Three studies exclusively used Medicare claims data in their analysis.

The number and treatment of cancers varied between studies. Avalere (2012) examined the 11 most common cancers¹ and analyzed claims data for both chemotherapy and radiation; Hayes et al. (2015) looked at nine types of cancer² treated with chemotherapy; and Fitch et al. (2011) examined 10 cancer types³ treated with chemotherapy. Moran (2013) did not select specific

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1. Avalere (2012) examined the 11 types of cancer that account for 90 percent of chemotherapy episodes. These cancers include lung cancer, prostate cancer, genitourinary system cancer, breast cancer, Hodgkin's lymphoma, colon cancer, digestive system cancer, leukemia, colon cancer, ovarian cancer, and myeloma rectal cancer.
 2. Hayes et al. (2015) examined nine types of cancer, including lung cancer, colon cancer, rectal cancer, pancreatic cancer, ovarian cancer, multiple myeloma, lymphoma, breast cancer, and prostate cancer.
 3. Fitch et al. (2011) examined 10 types of cancer, including lung cancer, colon cancer, rectal cancer, pancreatic cancer, ovarian cancer, myeloma, Hodgkin's, breast cancer, chronic lymphocytic leukemia, and prostate cancer.

Table 1:
Dataset, cancers and treatment, and inclusion criteria of the studies identified in the systematic review

STUDY	DATASET	CANCERS AND TREATMENT	INCLUSION CRITERIA
AVALERE (2012)	4 commercial carriers; 2008-2010; 22,204 patients	11 cancers; radiation and chemo	6+ mos. enrollment in plan pre index date; 12 or fewer mo. chemo/3 or fewer mo. radiation; 20+ yrs.
BYFIELD ET AL. (2014)	Commercial; 2007-2012; 4,441 patients	Non-Hodgkin's Lymphoma and Chronic Lymphocytic Leukemia treated w/ rituximab	2+ claims on separate days for rituximab; 2+ claims with NHL, CLLL diagnosis; 18+ yrs.
CHEN ET AL. (2001)	Medicare Current Beneficiary Study 1992-1995	Nonmelanoma skin; total cost of care	
ENGEL-NITZ ET AL. (2014)	Commercial; 2006-2012; 2,919 patients	Metastatic colorectal, lung treated w/ bevacizumab	6+ mos. pre and post index; 18+ yrs.
FISHER ET AL. (2016)	HealthCore Integrated Research Database (14 commercial); 2006-2012; 18,740 patients	Early or metastatic breast, metastatic lung, metastatic colorectal, non-Hodgkin's Lymphoma, chronic lymphocytic leukemia; IV chemo or biologics	2+ claims with ICD-9 codes for included cancers; 6+ mo. enrollment pre index date; 18-64 yrs.
FITCH, ET AL. (2013)	Truven Health Analytics MarketScan; 2009-2010; ~ 12m patients each year	Non-small lung cancer, colorectal cancer, breast cancer; treated w/ chemo for adjuvant or metastatic	2+ claims w/ relevant ICD-9 code; 2+ chemo codes ; 18-64 yrs.
FITCH, ET AL. (2011)	Medicare limited dataset ; 2006-2009 ; 1.7m patients	10 cancer types, chemo treatment	1+ chemo claim w/ chemo J code ; not in HMO ; beneficiaries under 65, duals
HAYES, ET AL. (2015)	Truven Health Analytics MarketScan; 2008-2010; 70,984 patients	9 types of cancer receiving chemo	1 facility or 2 physician claims w/ relevant ICD-9 code + 1 chemo drug claim; all ages included
MORAN (2013)	Medicare claims; 2009-2011	Payments associated with drug and chemo administration	Treatment claims for only one site of care
PARTHAN, ET AL. (2015)	Optum Research Database; 2006-2012	Adult, female non-metastatic breast cancer patients treated w/ trastuzumab	2+ claims for both trastuzumab and breast; 6 mo. pre-index baseline period; 18+ yrs.

cancers but used Medicare claims data to examine payments associated with drug and chemotherapy administration for all cancer types. While these studies analyzed a broad range of cancers, they did not account for the severity or stage of the cancer. Three studies examined specific cancers treated with a specific drug. Byfield et al. (2014) looked at the treatment of non-Hodgkin's lymphoma and chronic lymphocytic leukemia with rituximab. The treatment of metastatic colorectal cancer and lung cancer treated with bevacizumab was studied in Engel-Nitz et al. (2014). Parthan et al. (2015) looked at using trastuzumab to treat adult female, non-metastatic breast cancer patients. These studies examined certain cancers at a specific stage using a

particular drug for treatment to control for differences in severity or treatments between sites of care.

Study Methods

Table 2 captures the methods used in the included studies. The three studies (Byfield, Engel-Nitz, and Parthan) that examined a limited number of specific cancers treated with a particular drug used similar methods. Each study identified patients to include based on two or more cancer claims, identified with ICD-9 codes, and two or more claims for the specific drug examined in the study. Each of these studies analyzed differences between the physician office cohort and the

Table 2: Methods used in each of the included 10 studies

STUDY	METHODS
AVALERE (2012)	Total episode costs incl (including? Included?) plan payments and patient liability (copays/co-insurance) for all services received. Controlled for patient’s age, gender, and prior cancer history
BYFIELD ET AL. (2014)	Cohort differences calculated with chi-square test and t-test; captured total HC costs and infusion day costs; adjusted for age, gender, insurance type, baseline Charlson comorbidity score
CHEN ET AL. (2001)	Cost in each setting divided by the number of procedures performed in each setting (physician office, outpatient surgery centers, inpatient settings)
ENGEL-NITZ ET AL. (2014)	Differences by site of service analyzed by chi-square and t tests (bevacizumab administrations, dose) and general linear model adjusted for demographic and clinical characteristics
FISHER ET AL. (2016)	Comparisons between cohorts performed using t tests for continuous data and chi tests for categorical data. Multivariate generalized linear models w/ log links and y error distribution to obtain adjusted overall HC cost; adjust for demographic and clinical characteristics and comorbidities
FITCH ET AL. (2013)	Both adjuvant and metastatic cohorts, patients followed for 24 mos. or until 1) eligibility lost or 2) 3 mo. gap in chemo. Calculated avg. costs (paid by payer and patient) per chemo episode and per chemo session
FITCH ET AL. (2011)	Identified patients with ICD-9 codes, identified chemo session using CPT codes. Reported on the average of four snapshot years
HAYES ET AL. (2015)	PMPM costs extracted from database included amounts paid by payer and patient; statistical analysis for difference in mean PMPM cost performed w/ Mann-Whitney U test; linear regression to determine covariates impacted cost
MORAN (2013)	Five percent Outpatient and Carrier Medicare SAFs from 2005-2011 to ID claims for Medicare FFS chemo admin procedures and drugs. Examined Medicare FFS payment for chemo administrations and drugs
PARTHAN ET AL. (2015)	Differences in treatment patterns by setting assessed by t-test and chi-square test. Relationship between site of care and HC costs modeled with generalized linear model w/ gamma distribution and log link; number of trastuzumab infusions modeled w/ negative binomial regression controlling for log follow-up time. Adjusted for age, baseline comorbidity score, and insurance type

hospital outpatient department cohort using chi-square and t-tests. All three studies adjusted for age, gender, and insurance type.

Studies differed in whether they examined a specific stage of cancer. For example, the 2011 privately published Milliman study (Fitch, et al.) analyzed the cost of treating 10 cancers without addressing severity. Milliman’s second study (Fitch et al., 2013) attempted to control for severity by identifying patients receiving adjuvant chemotherapy or chemotherapy specific for metastatic cancer. Despite the differences in patient populations, both studies yielded the same result that treatment costs were lower in the physician office.

The most recent study, published in November 2016 by Fisher et al., used data from 14 commercial insurers over a six-year period (2006-2012) for 18,740 patients. This study chose a middle path between examining nine or more

cancers and studying two or three cancers treated with a specific drug. Fisher et al. (2016) looked at early and metastatic breast cancer, metastatic colorectal cancer, non-Hodgkin’s Lymphoma, and chronic lymphocytic leukemia treated with intravenous chemotherapy or biologics. The Fisher study also differentiated itself from the previous literature by adjusting for more factors, including baseline health care costs and the inclusion of a larger and more diverse patient population.

DISCUSSION

All ten studies identified in this systematic review found that costs for treating cancer were lower in the physician office compared to the hospital outpatient department. We calculated the difference between costs for all studies conducted between 2011 and 2016 and found that on average, the cost of care was 38 percent higher in the hospital outpatient department. Lower physician office costs were found regardless of cancers examined,

treatments used, datasets, and years studied and across both privately published and peer reviewed studies.

All studies used claims data, which incurs certain limitations. Claims data allows for identification of patients diagnosed with cancer or receiving treatment. However, claims data does not include the physician or patient rationale for receiving treatment in the physician office or hospital outpatient department setting, the selection of the initial treatment program, or any change in the patient's status or the disease progression.

This systematic review only identified studies that examined cost differences between sites of care. Studies that solely focused on cancer outcomes between the physician office and hospital outpatient department were not included. Amidst health care's transition from fee-for-service to value, cost and quality both should be considered when evaluating sites of care for cancer treatment.

Although claims data does not indicate why costs are higher in the hospital outpatient department, several studies discussed possible reasons for the difference. For example, Avalere (2012) found that 66 percent of hospital outpatient department managed episodes submitted claims using a revenue code, which are associated with higher costs, rather than a J-code for chemotherapy. Fisher et al. (2016) also found that hospital systems often use billing codes that differ from the physician office. Fitch et al. (2013) found that the unit reimbursement in the hospital outpatient department is often at least twice the amount of the physician office. Hayes et al. (2015) suggested that treatment costs differed between the sites of care based on differing reimbursement rates for the physician office compared to the hospital outpatient department but called for future research to elaborate on reimbursement.

Inpatient hospitalizations and cancer severity were also discussed as possible factors in determining cost difference. Four studies (Avalere, Byfield et al., Fisher et al., and Parthan et al.) found that patients treated in the hospital outpatient department had a higher rate of inpatient hospitalizations than the physician office patients. Byfield et al. (2014) and

Fisher et al. (2016) found that patients treated in the hospital outpatient department also had higher rates of emergency room visits. However, Parthan et al. (2015) found a lower rate of emergency room visits for patients treated in the hospital outpatient department compared to the physician office. Byfield et al. (2014) suggested that patients may be treated in the hospital outpatient department due to a more severe diagnosis. Although the studies discussed possible reasons for the difference in cost between sites of care, each study did so cautiously as claims data does not allow for concrete explanations for why treatment costs are lower in the physician office setting.

Finally, patient demographics may influence costs as well. A study commissioned by the American Hospital Association (Demiralp, et al. 2014) found that patients treated in the hospital outpatient department were more likely to be black, Hispanic, lower income, less educated, on Medicaid or lacking insurance, and experiencing more chronic conditions. Further research is needed to understand why the cost of care differs between the two sites of care.

CONCLUSION

All ten studies identified and discussed in this systematic review examined the cost of cancer care in the physician's office or community oncology clinic compared to the hospital outpatient department. The studies differed in the type and amount of cancers examined, treatments used, and patient populations included. Some studies looked only at cancer-related costs while others also considered total health care costs between the two settings. Despite these variations in datasets and methodologies, all ten studies found that the cost of treating cancer in the hospital outpatient department was higher than in the physician office or community oncology clinic.

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