


The Value of Community Oncology

Site of Care Cost Analysis

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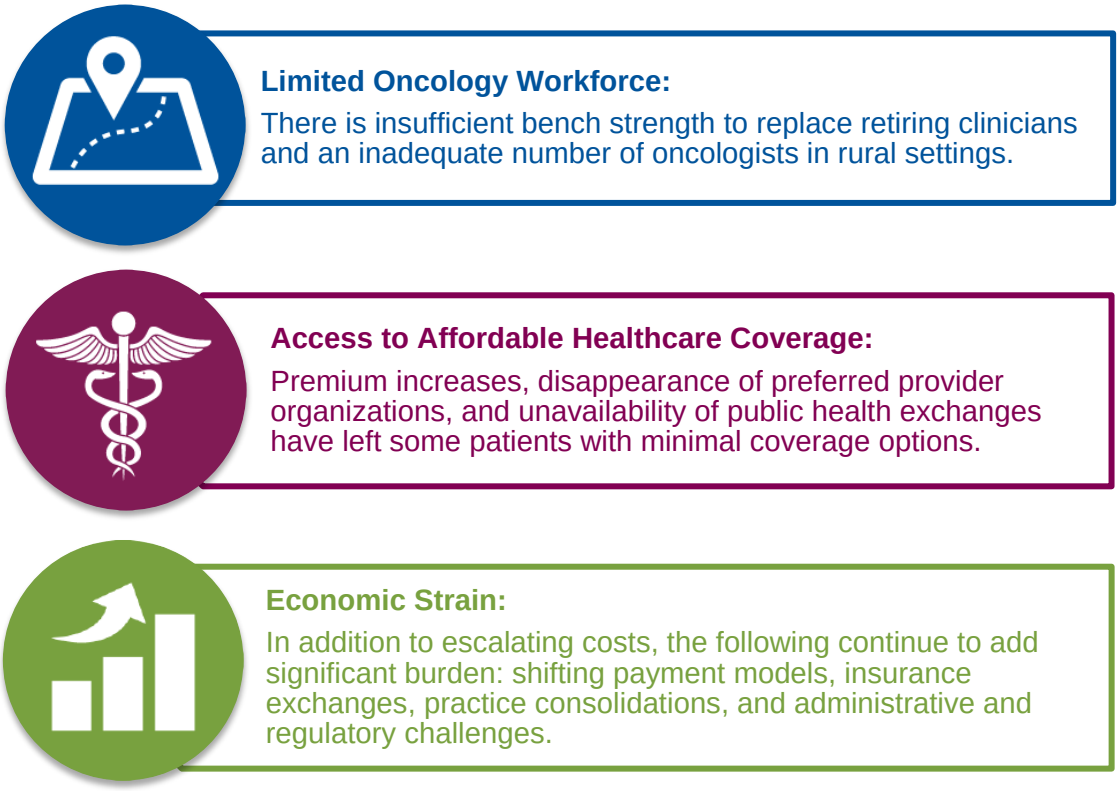
1.0 OBJECTIVES

- Review the evolution of outpatient oncology practices and current shifts in site of oncology care delivery.
- Evaluate cost and outcome differences between outpatient hospital and community-based practices for breast, lung, and colorectal cancer.
- Understand the practical implications of cost and outcomes differences for key oncology stakeholders.

2.0 INTRODUCTION

Access to affordable, high-quality cancer care delivered by a multidisciplinary specialist team is essential for optimal outcomes (ASCO 2017). However, access to such care remains a significant challenge for many cancer patients (Parsons 2016). Several factors are limiting patient access to high-quality cancer care (Nardi 2016):



Notably, annual cancer care costs are estimated to surpass $170 billion by the year 2020 (Nardi 2016). One of the emerging reasons for the escalating costs of cancer care has been the shift of care delivery from community-based to hospital-owned oncology practices. Since 2008, there has been a 121% increase in community-based practice clinic closures and 172% increase in community practices being acquired by hospitals (COA 2016). The acquisition of community-based practices by hospitals has led to a significant increase in the overall volume of chemotherapy claims in hospital-owned oncology practices (Vandervelde 2014). This trend is particularly worrisome when the cost of cancer care is considered, as a recent systematic literature review revealed that the costs of cancer care for patients treated

in hospital-based practices were substantially higher compared with those treated in community-based practices (Winfield 2017). Further, an analysis utilizing a commercial claims database found the following (Hayes 2015):

Mean per member per month cost of care, depending on diagnosis, was 20% to 39% lower for those receiving chemotherapy in a community oncology clinic compared with the hospital outpatient setting.

The cost differential was consistent across diagnosis, geography, patient age, and number of chemotherapy sessions.

As a larger proportion of oncology services are being provided in the hospital outpatient setting, policy makers and payers should be aware that shifts in sites of service may negatively impact cancer spending.

Given the shift in oncology care away from community-based and toward hospital-based settings, we sought to examine the financial ramifications associated with this trend in patients diagnosed with 1 of 3 common tumor types. We conducted a matched analysis of patients treated in the community or hospital setting for breast, lung, or colorectal cancer, evaluating differences in cost, emergency department (ED), and inpatient care.

Breast Cancer

Lung Cancer

Colorectal Cancer

3.0 METHODS

3.1 Data Source

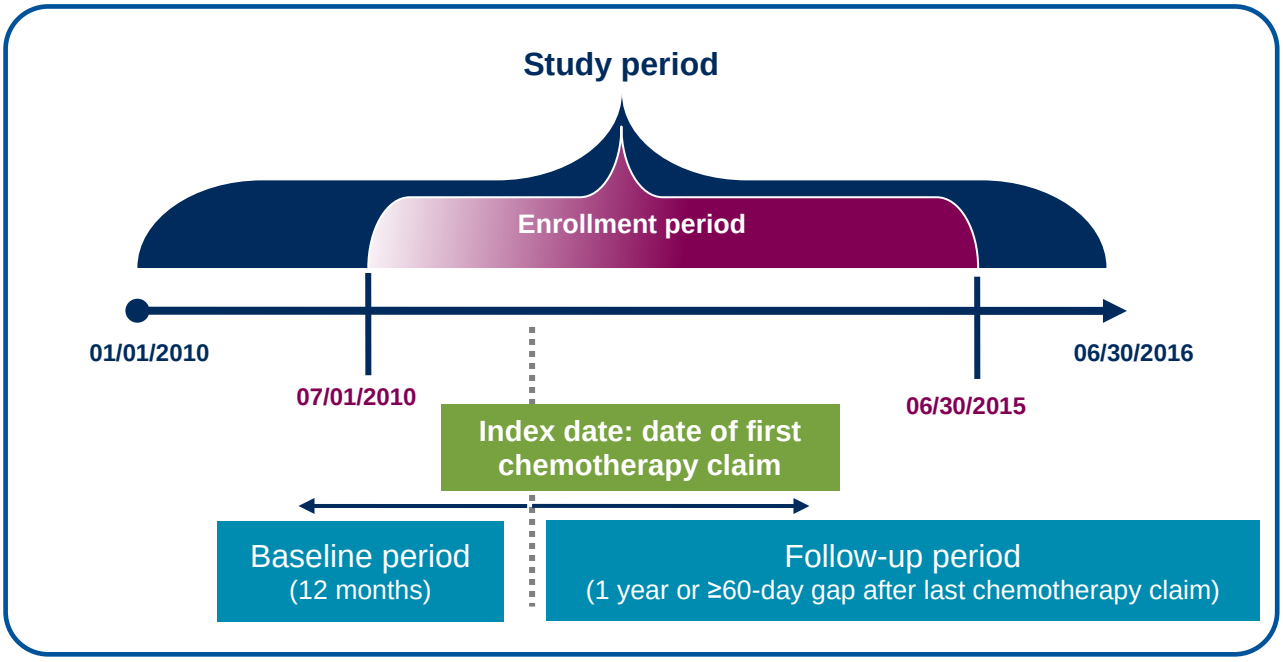
A 10% random sample of medical and pharmacy claims was obtained from the IMS LifeLink database. This database includes longitudinal, integrated, patient-level medical and pharmaceutical claims for over 80 million patients from 70 health plans. The database includes inpatient and outpatient diagnoses (in International Classification of Diseases, 9th Revision, Clinical Modification format) and procedures (in Current Procedural Terminology, 4th Edition, and in Healthcare Common Procedure Coding System formats). Both paid and charged amounts are available for all services rendered, as well as dates of services for all claims. The payer type distribution for this data source is 80% commercial, 3% Medicaid, and 1.7% Medicare risk, with the rest categorized as "other." Because all patient information in this database is encrypted and de-identified and no patient contact was involved, no informed consent or approval by an institutional review board was required (the data source is fully compliant with the Health Insurance Portability and Accountability Act).

3.2 Sample Selection

Patients receiving chemotherapy, radiation therapy, and/or surgery and diagnosed with breast, lung, or colorectal cancer between July 1, 2010, and June 30, 2015, were identified for this study (Figure 1).

- The first date of chemotherapy served as the index date for each patient. Patients were required to have continuous eligibility for 6 months in the pre-index period through end of follow-up and to have received all of their chemotherapy in the community or outpatient hospital setting.
- Patients were followed for up to 1 year post-index date or until discontinuation of first-line chemotherapy episode (defined as a 60-day period with no record of chemotherapy administration), whichever occurred first.

Figure 1. Study Timeline



Since previous studies indicated that patients treated in the hospital setting may be inherently different than patients treated in the community practice, a matched analysis of community vs hospital patients was subsequently conducted. Patients were matched (2 to 1, those treated in a community setting to those treated in a hospital-owned outpatient clinic) based on:

- Cancer type (breast vs colon vs lung cancer)
- Specific chemotherapy regimen received
- Receipt of radiation therapy during treatment
- Presence of metastatic disease (Y / N)
- Gender
- Prior surgery
- Geographical region (2 categories: East/Midwest vs South/West)

3.3 Outcomes of Interest

- To examine cost differentials between patients treated in the community clinic vs hospital clinic setting:
  - Patients were placed into either the community clinic cohort or the hospital-based clinic cohort based on the site where patients received their chemotherapy (community clinic vs hospital-based clinic).
  - Costs during treatment with first-line chemotherapy episode were defined as the amount paid for all services rendered over the patient's treatment and follow-up time. All costs were standardized to 2015 US dollars ($) and analyzed as cost per patient per month (PPPM).
  - Chemotherapy-specific costs were defined as the cost paid for chemotherapy treatment plus any costs incurred on the same day that the chemotherapy was administered.

- To examine select differences in quality of care outcomes between patients treated in the community clinic vs hospital clinic setting:
  - Hospitalizations occurring within 10 days after each chemotherapy visit and ED visits occurring both 72 hours after each chemotherapy visit and within 10 days after each chemotherapy visit were captured during the entire follow-up period and evaluated as secondary outcomes of care.

3.4 Statistical Analysis

Categorical measures were presented as counts and percentages of patients in each category, while means and standard deviations (SDs) were presented for continuous outcomes. Wilcoxon signed rank sum test was conducted using SAS® v9.2 (SAS Institute; NC, US).

4.0 RESULTS

After applying exclusion criteria and employing a 2:1 match, there were 4,450 patients included from the community practice setting (community care [CC] cohort) and 2,225

included from the hospital-based clinic setting (HC cohort). There were no differences in patient characteristics after matching (Table 1).

Table 1. Patient and Disease-related Characteristics of All Matched Patients (N=6,675)

Characteristic	Community Practice (CC Cohort) N=4,450	Hospital-based Clinic (HC Cohort) N=2,225
Female gender, n (%)	3,606 (81%)	1,803 (81%)
Mean age, years (SD)	56 (10)	54.9 (10)
Age group in years, n (%)		
<25	12 (0%)	3 (0%)
25–34	91 (2%)	54 (2%)
35–44	435 (10%)	303 (14%)
45–54	1,418 (32%)	662 (30%)
55–64	1,714 (39%)	885 (40%)
65–74	624 (14%)	261 (12%)
75–84	156 (4%)	57 (3%)
Geographic region, n (%)		
East	898 (20%)	627 (28%)
Midwest	1,716 (39%)	680 (31%)
South	1,584 (36%)	748 (34%)
West	252 (6%)	170 (8%)
Cancer type, n (%)		
Breast	2,996 (68%)	1,498 (68%)
Lung	952 (21%)	476 (21%)
Colorectal	502 (11%)	251 (11%)
Presence of metastatic condition, n (%)	2,468 (55%)	1,234 (55%)
Surgery during pre-index period, n (%)	2,378 (53%)	1,189 (53%)
Radiation treatment during pre-index period, n (%)	667 (15%)	323 (15%)
Surgery during pre-index period, n (%)	34 (1%)	16 (1%)
Radiation treatment during post-index period, n (%)	504 (11%)	252 (11%)
Required inpatient service, n (%)	504 (11%)	252 (11%)
Required ED service, n (%)	449 (10%)	292 (13%)
Mean Charlson comorbidity index, n (SD)	4.7 (2.3)	4.8 (2.4)
Mean unique drugs prescribed at baseline, n (SD)	4.4 (3.8)	4.3 (3.7)
Mean chemotherapy agents filled at baseline, n (SD)	7.9 (5.5)	9.1 (6.1)
Mean eligible days at baseline, n (SD)	180 (0)	180 (0)
Mean paid medical cost at baseline, n (SD)	$4,604.10 ($4,406.00)	$5,278.40 ($4,868.80)
Mean allowed medical cost at baseline, n (SD)	$5,434.00 ($4,803.80)	$6,038.30 ($5,126.80)
Mean duration of therapy, days (SD)	99.6 (61.0)	95.7 (57.0)
Mean total cycles of treatment, n (SD)	5.2 (4.2)	4.8 (4.4)

Key: ED – emergency department; SD – standard deviation.

4.1 Cost of Care

Across all cancers, the mean total cost paid per month was significantly lower in patients who were treated in a community-based practice compared with those who were treated in a hospital-owned practice ($12,548 [SD: $10,507] vs $20,060 [SD: $16,555]; *P*<0.0001).

Table 2. PPPM Total Costs in Community Practice vs Hospital-based Practice

	Community Practice N=4,450		Hospital-based Practice N=2,225		*P*-value
	Mean	SD	Mean	SD	
Mean Total Costs	$12,548	$10,507	$20,060	$16,555	<0.0001
Total Medical Costs	$12,103	$10,504	$19,471	$16,476	<0.0001
Chemotherapy	$4,933	$4,983	$8,443	$10,391	<0.0001
Branded agents only	$6,674	$5,046	$10,900	$10,712	<0.0001
Generic agents only	$2,936	$2,585	$5,134	$6,306	<0.0001
Combination regimen[a]	$11,080	$5,889	$19,412	$13,869	<0.0001
Physician visits	$765	$1,607	$3,316	$4,399	<0.0001
Radiation	$1,095	$4,153	$1,430	$4,904	<0.0001
Inpatient	$1,178	$6,229	$1,498	$7,193	0.0095
ED visits	$121	$501	$168	$620	<0.0001
Outpatient	$3,838	$3,681	$3,912	$5,698	<0.0001
Other	$174	$2,405	$704	$3,353	<0.0001
Total Pharmacy Costs	$445	$1,239	$589	$1,934	0.2708

[a]Combination = chemotherapy regimen contained both branded and generic drugs.
Key: ED – emergency department; PPPM – per patient per month; SD – standard deviation.

The major driver of this cost differential between the community cohort and the hospital cohort was lower PPPM medical costs ($12,103 [SD: $10,504] vs $19,471 [SD: $16,476]) in the community cohort compared with the hospital cohort, although the mean pharmacy PPPM costs were also slightly lower in the community cohort vs the hospital cohort (Table 2) ($445 [SD: $1,239] vs $589 [SD: $1,934]).

Within the category of medical costs, the mean PPPM cost for chemotherapy was significantly lower in the community setting ($4,933 [SD: $4,983] vs $8,443 [SD: $10,391]; *P*<0.0001) (Table 2). The lower cost of chemotherapy in the community practice setting was observed regardless of whether a branded, generic, or combination of brand and generic chemotherapy regimen was used (branded regimen: $6,674 [SD: $5,046] vs $10,900 [SD:

$10,712]; generic regimen: $2,936 [SD: $2,585] vs $5,134 [SD: $6,306]; combination branded plus generic: $11,080 [SD: $5,889] vs $19,412 [SD: $13,869]). Further, the use of branded vs generic chemotherapy was similar in both the community outpatient and the hospital outpatient settings across all 3 cancer types; however, the distribution varied by cancer type. Nevertheless, in both settings, >60% of patients received generic-only chemotherapy (Table 3).

Table 3. Chemotherapy Regimen by Cancer Type

	Breast		Lung		Colorectal	
	Community N=2,996	Hospital N=1,498	Community N=952	Hospital N=476	Community N=502	Hospital N=251
Chemotherapy Regimen						
Generic agents only	73%	73%	63%	63%	67%	74%
Branded agents only	10%	10%	3%	3%	17%	17%
Combination[a]	17%	17%	33%	33%	16%	9%

[a]Combination = chemotherapy regimen contained both branded and generic drugs.

When presenting results by tumor type, total cost PPPM was significantly lower in patients treated in the community setting compared with the hospital-owned practice setting across all 3 tumor types (breast: $11,599 [SD: $8,129] vs $19,279 [SD: $14,358]; lung: $17,566 [SD: $17,436] vs $26,980 [SD: $25,386]; colorectal cancer: $15,629 [SD: $15,489] vs $22,893 [SD: $21,479]; *P*<0.0001 for all analyses) (Table 4).

Table 4. PPPM Total Costs in Community vs Hospital-based Practice Settings for Breast, Lung, and Colorectal Patients

	Community Practice N=4,450		Hospital-based Practice N=2,225		*P*-value
	Mean	SD	Mean	SD	
Breast Cancer Patients	N=2,996		N=1,498		
Mean Total Costs	$11,599	$8,129	$19,279	$14, 358	<0.0001
Total Medical Costs	$11,139	$8,139	$18,667	$14,403	<0.0001
Chemotherapy	$4,671	$4,577	$8,206	$9,719	<0.0001
Branded agents only	$5,608	$4,273	$9,279	$7,805	<0.0001
Generic agents only	$2,982	$2,275	$5,084	$5,591	<0.0001
Combination regimen[a]	$11,511	$5,647	$21,240	$13,356	<0.0001
Physician visits	$820	$1,813	$3,499	$4,564	<0.0001
Radiation	$378	$1,305	$440	$1,493	0.0561

	Community Practice N=4,450		Hospital-based Practice N=2,225		*P*-value
	Mean	SD	Mean	SD	
Breast Cancer Patients	N=2,996		N=1,498		
Inpatient	$735	$4,230	$874	$3,804	0.0415
ED visits	$120	$516	$162	$638	0.0045
Outpatient	$4,318	$3,835	$4,735	$6,322	0.2696
Other	$97	$718	$752	$3,461	<0.0001
Total Pharmacy Costs	$461	$1,361	$612	$1,699	0.1084
Lung Cancer Patients	N=952		N=476		
Mean Total Costs	$17,566	$17,436	$26,980	$25,386	<0.0001
Total Medical Costs	$17,168	$17,380	$26,389	$25,090	<0.0001
Chemotherapy	$5,095	$5,916	$8,430	$11,143	<0.0001
Branded agents only	$7,969	$4,967	$7,881	$5,974	0.8408
Generic agents only	$1,856	$1,829	$3,964	$5,248	<0.0001
Combination regimen[a]	$10,937	$6,422	$16,938	$14,378	<0.0001
Physician visits	$709	$1,130	$3,015	$4,217	<0.0001
Radiation	$3,255	$7,845	$4,343	$8,798	<0.0001
Inpatient	$2,767	$10,612	$3,413	$12,982	0.4836
ED visits	$140	$509	$219	$670	0.0026
Outpatient	$3,137	$3,155	$2,404	$3,538	<0.0001
Other	$133	$947	$506	$2,120	<0.0001
Total Pharmacy Costs	$398	$950	$591	$2,828	0.7058
Colorectal Cancer Patients	N=502		N=251		
Mean Total Costs	$15,629	$15,489	$22,893	$21,279	<0.0001
Total Medical Costs	$15,237	$15,448	$22,330	$21,117	<0.0001
Chemotherapy	$6,189	$5,176	$9,881	$12,518	<0.0001
Branded agents only	$9,862	$6,041	$17,603	$16,676	<0.0001
Generic agents only	$4,573	$4,224	$7,322	$10,171	0.0006
Combination regimen[a]	$8,971	$4,606	$16,428	$13,153	0.2151
Physician visits	$538	$894	$2,791	$3,596	<0.0001
Radiation	$1,274	$3,770	$1,820	$5,597	0.0119
Inpatient	$802	$4,212	$1,593	$6,637	0.0207
ED visits	$94	$384	$107	$358	0.1927
Outpatient	$2,306	$2,979	$1,864	$3,619	<0.0001
Other	$711	$6,799	$790	$4,431	0.0019
Total Pharmacy Costs	$393	$856	$564	$2,784	0.7512

[a]Combination = chemotherapy regimen contained both branded and generic drugs.

Key: ED – emergency department; PPPM – per patient per month; SD – standard deviation.

The decreases in monthly costs in community practice were detected for both medical and pharmacy costs paid per month regardless of cancer type. In addition, the PPPM chemotherapy costs were significantly lower in community practice for all 3 cancer types (breast: $4,671 [SD: $4,577] vs $8,206 [SD: $9,719]; lung: $5,095 [SD: $5,916] vs $8,430 [SD: $11,143]; colorectal cancer: $6,189 [SD: $5,176] vs $9,881 [SD: $12,518]; *P*<0.0001 for all analyses). The lower cost of chemotherapy in the CC cohort was observed regardless of whether a branded, generic, or combination of brand and generic chemotherapy regimen was used across all 3 tumor types. The PPPM costs for physician visits were also significantly higher for patients treated in the hospital-owned practices vs community practices, irrespective of cancer type (Table 4).

4.2 ED Visits and Hospitalizations

When comparing patients treated in the community vs hospital setting, the rates of ED visits and hospital admissions were lower in the community vs the hospital setting; this was statistically significant for ED visits within 72 hours or 10 days of chemotherapy administration (Table 5).

Further, of the 114 patients who had an ED visit from the community clinic setting, a lesser proportion had ≥2 ED visits compared with 80 patients with at least 1 ED visit treated in the hospital clinic setting (7.9% vs 16.3% of the patients with at least 1 ED visit).

Table 5. Rates of Hospitalizations and ED Visits Among Patients Treated in the Community vs Hospital-based Setting Within 72 Hours and 10 Days of Each Chemotherapy Visit

	Community Practice N=4,450	Hospital-based Practice N=2,225	*P*-value[a]
72 hours			
ED visits	2.6%	3.6%	0.0055
10 days			
Hospitalizations	7.0%	7.3%	0.6198
ED visits	7.9%	9.8%	0.0022

[a]McNemar's test was used for testing the difference in frequencies.

Key: ED – emergency department.

5.0 DISCUSSION

Previous studies indicated that the cost of treating cancer in an outpatient hospital setting was substantially higher than the cost of treating cancer in the community setting. This study looked to validate these findings by examining if cost differences would still exist if disparities in patient profiles were minimized. Our study suggests that the cost of cancer care for patients with breast, lung, or colorectal cancer treated in the community clinic setting was approximately $8,000 less expensive per month than for those patients treated in the hospital-based practice setting. Further, the lower costs associated with patients treated in community practices were observed irrespective of treatment regimen, branded vs generic agents used, or tumor type. Importantly, we found that the cost differential is largely driven by lower chemotherapy costs and physician visits in community-based practices.

Previous studies have reported this same phenomenon, and a systematic literature review of 10 studies using either Medicare or commercial claims datasets consisting of cancer diagnoses between 2011 and 2016 found that the average cost of cancer care was 38% higher for patients treated in hospital-based practices compared with those treated at community clinics (Winfield 2017). Further, a claims analysis of oncology patients treated with intravenous chemotherapy demonstrated that total all-cause healthcare costs were significantly greater in the hospital-based clinic setting compared with the community clinic setting ($143,206 [SD: $116,105] vs $98,071 [SD: $69,236]; $P<0.001$) (Fisher 2017). Finally, another analysis utilizing a commercial claims database demonstrated a 20% to 39% higher mean PPPM cost of care for patients treated at a hospital-based practice, irrespective of cancer type, geographic location, patient age, and number of chemotherapy sessions (Hayes 2015). The higher costs of cancer care in the hospital-based clinic setting appear to be primarily driven by the increased cost of chemotherapy and not due to disproportionate use of chemotherapy agents or chemotherapy sessions (Fitch 2013). Importantly, our findings provide additional evidence in matched cohorts of patients with specific tumor types to support the overall cost differential between sites of care, specifically as both the community and hospital cohorts were matched for numerous possible confounders such as presence of metastatic disease, treatment type, and geographic region.

The cost differential based on site of care delivery is particularly concerning as emerging data have demonstrated a rapidly evolving downward shift in access to community-based oncology care sites. Per the most recent ASCO survey, the distribution of physician-based (ie, community-based) practices has substantially declined since 2014 (ASCO 2017). This reduction in community-owned practices is driven by various factors, including community cancer clinic closures, hospital acquisitions, and corporate mergers. One of the reasons for the trend of community-based practitioners joining hospital or health system-based practices may be related to 340B drug pricing (COA 2017). 340B is a federal program that requires drug manufacturers to provide outpatient drugs at significantly reduced prices to eligible healthcare organizations, known as covered entities, to help treat high numbers of indigent and uninsured patients. This program was originally designed so that participating programs would be able to use the cost savings on drugs for the indigent, uninsured, and underserved patient population (COA 2017). The 340B drug pricing program has seen a substantial increase in the number of participating hospitals/health systems since the implementation of the Medicare Modernization Act (MMA), which changed reimbursement for Medicare Part B drugs from 95% of average wholesale price to average sales price plus 6% (MMA 2003). Further, in 2014 and 2015, 74.5% of the acquisitions of community oncology clinics were by hospitals with 340B drug discount pricing (COA 2017). With the discounted price of drugs under this program, many thought this cost savings would be passed on to the payers and patients; however, current evidence shows that payers' and patients' costs are actually increasing (Conti 2013).

The underlying etiology driving community-based oncology practices to close or merge with larger hospital systems is multifactorial. It includes factors such as lower reimbursement rates for chemotherapy administration, increasing costs of regulatory compliance, rising facility expenses, and payer pressure (ASCO 2017). A recent survey of community oncology practices cited reimbursement rates for drugs (98%), reimbursement rates for chemotherapy administration (90%), and the cost of regulatory compliance (87%) as being "very important" or "extremely important" challenges threatening the ongoing viability of their practices (COA 2016). This survey largely mirrors the ASCO 2017 survey in which increasing financial pressures, such as practice/facility expenses (54%), drug pricing (41%), payer pressures

(38%), and administrative burdens such as electronic health record implementation and use (39%), were cited as the top pressures facing the respondents' oncology practices (ASCO 2017). When respondents were asked to expand on payer pressures, the following were frequently cited as their primary concerns: prior authorizations, coverage issues (eg, formularies), and cost (eg, timeliness, amount, other issues).

Regardless, this shift in site of cancer care provision is particularly concerning as emerging data have demonstrated significantly higher costs of care in hospital-based clinic settings compared with the community setting.

Overall, this study demonstrates that total and chemotherapy-specific costs in breast, lung, and colorectal cancer patients are consistently lower in the community practice setting compared to the hospital setting. Given the increased costs associated with the delivery of chemotherapy in a hospital outpatient environment, it stands to reason that, for these patients, the preferred treatment setting for providers, payers, and patients should be the physician office setting. This may help to influence the site of care locations that patients are referred to for specific, individualized treatment options. These data provide real-world insight to payers, the oncology workforce, and other health-system stakeholders to examine reimbursement differentials across sites of care such that patient access to high-quality cancer care is not diminished by limiting site of care options due to financial pressures. Dissemination of these findings is critical to the ongoing sustainability of community practices. New models of care and performance incentives may be needed to encourage oncology stakeholders to change the trends in support of community outpatient care.

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