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The Impact of COVID-19 on Cancer Care

How the pandemic is delaying cancer diagnosis and treatment for American Seniors

Authors: Debra Patt*¹, Lucio Gordan², Michael Diaz², Ted Okon³, Lance Grady⁴, Merrill Harmison⁴, Nathan Markward⁴, Milena Sullivan⁴, Jing Peng⁴, Anan Zhou⁴

1 Texas Oncology

2 Florida Cancer Specialists & Research Institute LLC

3 Community oncology alliance

4 Avalere Health

* Corresponding Author

Texas Oncology

6204 Balcones

Austin, TX 78703

UNITED STATES

5127443615

Debra.Patt@USONCOLOGY.COM;pattdebra@yahoo.com

Context Summary

Key Objective:

The COVID-19 pandemic is causing catastrophic changes to cancer care. This study including over 6 million Medicare beneficiaries utilized a large claims database representing 5-7% of the Medicare FFS population to characterize changes in cancer care and gain insight into the impact of COVID-19 on the US cancer population.

Knowledge generated:

In March-July 2020 in comparison to 2019 there is a substantial decrease in cancer screening, biopsies, surgery, office visits, and therapy with variation by cancer type and site of service. At the peak of the pandemic in April, screening for breast, colon, prostate, and lung cancer were lower by 85%, 75%, 74%, and 56%, respectively.

Relevance:

Significant utilization reductions were observed in April for hospital outpatient Evaluation and Management (E&M) visits (-74%), new patient E&M visits (-70%), and established patient E&M visits (-60%). A decrease was observed in utilization of top physician-administered oncology products, dropping in both April (-26%) and July (-31%).

Abstract:

Purpose: While the immediate care and access disruptions associated with the COVID-19 pandemic have received growing attention in certain areas, the full range of gaps in cancer screenings and treatment are not yet well understood or well documented throughout the country comprehensively.

Methods: The study utilized a large medical claims clearinghouse database representing 5-7% of the Medicare FFS population to characterize changes in utilization of cancer care services and gain insight into the impact of COVID-19 on the US cancer population, including identification of new patients, gaps in access to care, and disruption of treatment journeys.

Results: In March-July 2020 in comparison to the baseline period of March-July 2019 there is a substantial decrease in cancer screening, visits, therapy, and surgeries, with variation by cancer type and site of service. At the peak of the pandemic in April, screening for breast, colon, prostate, and lung cancer were lower by 85%, 75%, 74%, and 56%, respectively. Significant utilization reductions were observed in April for hospital outpatient Evaluation and Management (E&M) visits (-74%), new patient E&M visits (-70%), and established patient E&M visits (-60%). A decrease in billing frequency was observed for the top physician-administered oncology products, dropping in both April (-26%) and July (-31%). Mastectomies was reduced consistently April through July, with colectomies similarly reduced in April and May and prostatectomies dipping in April and July.

Conclusions: The current impact of the COVID-19 pandemic on cancer care in the United States has resulted in decreases and delays in identifying new cancers and delivery of treatment. These problems, if unmitigated, will increase cancer morbidity and mortality for years to come.

Introduction:

In late January 2020, the first cases of COVID-19 were diagnosed by the medical community in the United States, with 7-day moving average number of new daily cases in the United States peaking in mid-April.¹ In response to the increase in COVID-19 prevalence in the United States, the Centers for Disease Control and Prevention (CDC) implemented guidelines to diminish exposure, several states issued stay-at-home orders to reduce transmission risk, and across the country, individuals were encouraged to shelter-in-place, particularly those considered high-risk for COVID-19, such as the elderly and immunocompromised.² Many healthcare providers accommodated short-term adjustments to cancer care delivery, such as temporarily discontinuing non-emergent cancer screenings, shifting delivery of care to telehealth, and delaying surgeries and other in-office cancer services to reduce transmission risk, build hospital capacity in anticipation of increasing rates of coronavirus infections, and comply with state regulations and guidelines from CDC, Centers for Medicare and Medicaid Services (CMS) and professional societies.^{3, 4, 5, 6, 7} Professional societies have released guidance to amend care guidelines to compensate for these changes, such as beginning systemic therapy first to permit surgery to be delayed.⁸

By the end of September 2020, over seven million people in the United States had been infected with COVID-19.⁹ Given the focus on preserving health system capacity and also protecting high risk patients from exposure to the virus, oncology patients have faced increased challenges in accessing care. The pandemic has resulted in substantial decreases in cancer screening, cancer management visits, and cancer surgeries, though variably by disease type, across the country.^{10, 11, 12, 13, 14} An April analysis of 20 healthcare institutions part of the COVID and Cancer Research Network (CCRN) reported decreases in cancer encounters by 40-50% for lung, colorectal, hematologic, breast, prostate cancers, as well as melanoma.¹⁵ Cancer patients have reported delays in receiving cancer care, including follow-up clinic

appointments and cancer therapies, such as radiation, infusion therapies, and surgical tumor removal.^{16,}

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Although the stay-at-home orders were lifted across the country in May and June, the utilization of certain oncology services continues to lag behind 2019 levels, and the lasting impact on disease progression, cancer morbidity, and mortality remains unclear. The United Kingdom recently projected that delays in diagnosis and treatment may increase mortality from breast, colorectal, and lung cancer by as much 9.6%, 16.6%, and 5.3% after five years.¹⁸

How pervasive these changes are throughout the country is under-appreciated. Our analysis sought to describe these trends more broadly across settings of care and explore the degree to which in later months' utilization of cancer services continues to lag behind what was seen in cancer management in 2019. In particular, by characterizing trends in cancer screening and treatment, we hope to gain insight into potential solutions to better support seniors with cancer in the United States during the COVID-19 pandemic.

Methods: This retrospective analysis assessed whether variation in health service utilization was significantly impacted by COVID-19 stay-at-home orders during the first half 2020. To accomplish this task, data were sourced from a proprietary provider clearinghouse registry comprised of approximately 5-7% of all Medicare Fee for Service (FFS) claims that were submitted for adjudication between January 1, 2019 and July 31, 2020, inclusive. Included in the database are CMS-1450 claims from Institutional providers, such as hospital-based cancer centers and hospital outpatient departments, and CMS-1500 claims from Non-Institutional or Professional providers, such as independent physician offices. Due to the additional regulatory and billing flexibilities finalized by CMS during the Public Health Emergency (PHE), setting of care was determined using the claim type, rather than the site of service modifier,

particularly for services delivered via telehealth. The full data set was then limited to claims that were 1) incurred during the first seven (7) months (January-July) of each year, and 2) specific to targeted cancer-related services of interest, including diagnostic screening (breast, colon, etc.), physician office visits, hospitalizations, surgeries, and infusion therapies administered in an outpatient setting. For each procedure or service category, the number of procedures billed by each rendering provider was tracked and trended, and the mean change in volume (2019 vs. 2020) was estimated and compared, statistically, using a Wilcoxon rank-sum test (See Appendix A-E). All data manipulation and statistical analyses were carried out using SAS 9.4 (SAS Institute, Cary, NC), assuming a p-value (α) of 0.05.

Results: A total of 6,227,474 Medicare FFS claims were captured by the analysis. Significant decreases in screening for breast, colon, prostate, and lung cancer were observed in 2020 compared to 2019, with the most significant reduction occurring in April for mammograms (-85%) and lung (-75%), colon (-74%), and prostate screenings (-56%) (See table and figure 1). A decrease in billing frequency was observed for the top physician-administered oncology products, dropping in both April (-26%) and July (-31%) (See table and figure 2). Similarly, billing for chemotherapy administration services in both the professional and institutional setting dropped in April and May, as well as July (-28% and -21% in April, -30% and -21% in May, -31% and -31% in July, respectively) (See table and figure 2). Reductions in cancer biopsies were also observed in both April and July for breast (-71% and -31%), colon (-79% and -33%), and lung biopsies (-58% and -47%) (See table and figure 3). Mastectomies were reduced consistently April through July, with colectomies similarly reduced in April and May and prostatectomies dipping in April and July (See table and figure 3).

Significant utilization reductions were observed in patient evaluation and management (E&M) visits, with the greatest reduction in April hospital outpatient E&M visits (-74%) (See table and figure 4). Drops

in utilization were higher for new patient E&M visits (-70% in April) than established patient E&M visits (-60% in April) (See table and figure 4). Cancer-related hospitalizations also declined in March (-30%), April (-41%), May (-36%), June (-31%), and July (-38%). Institutional providers experienced greater reductions in delivery of cancer care, with the greatest reduction in E&M visits in April among institutional providers versus professional providers (-71% and -61%, respectively) (See table and figure 5). Moreover, even with the expanded use of telemedicine, the delivery of E&M services via telehealth was only able to mitigate the drop in E&M utilization in April from -73% to -58% (See table and figure 6). Utilization of telehealth has been almost entirely driven by professional providers, who delivered approximately 95% of telehealth E&M services in April through July.

Discussion: The COVID-19 pandemic and associated stay-at-home orders established across the U.S. limited patient access to in-person care and, in turn, impacted patients' ability to receive cancer care. Reduced access caused significant short-term disruptions in care delivery and, as an unintended consequence, may have long-term morbidity and survival implications for patients who missed cancer screenings and surgeries during this period. Delays in diagnosis can allow cancer to grow and progress to a more advanced stage, resulting in higher mortality rates.

Institutional providers have had greater reductions in delivery of cancer care, likely due to more limited supply of hospital resources caused by an influx of acutely ill COVID-19 patients, as well as patient reluctance to visit hospital outpatient clinics amid concerns regarding transmission of COVID-19. Similarly, physician offices and other non-institutional provider settings have struggled to adapt to state-specific re-opening requirements and overcome patient fears about COVID-19 exposure. Overall, institutional settings of care experienced greater decreases in care delivery and were unable to adopt

telehealth services to the same extent as providers in professional settings of care. This difference could be due to, among other factors, the overwhelming strain of COVID-19 on limited hospital resources, as well as the ability of smaller community oncology providers to adapt quickly to changing care dynamics while maintaining connections with existing patients.

The COVID-19 pandemic has therefore impacted cancer care delivery. Fewer patients are undergoing screening, with many providers and patients choosing to reschedule or completely forego screening during the months of the pandemic, leading to fewer cancer diagnoses. This is particularly true for cancers that rely on routine preventive screenings to detect a large portion of asymptomatic tumors.

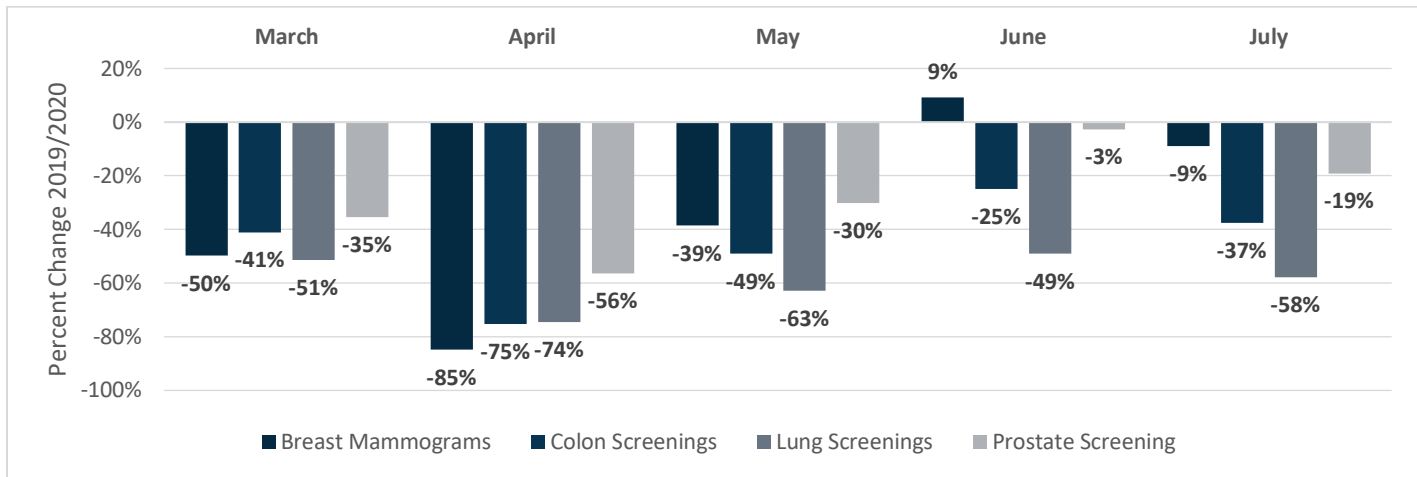
The natural consequence of disruption in cancer screening and delays in diagnosis and treatment is that cancer will present at a later stage and often require more complex care, lowering the likelihood that patients will respond to therapy and be cured of the disease. In the years post pandemic, we anticipate the effects of COVID-19 on access to cancer care will result in a stage migration to higher stages of disease and an overall increase in cancer mortality.

Notably, the considerable drops in screenings in April have subsequent implications for the number of new patient E&M visits, biopsies, and treatment dynamics in later months, as these patients could now have delayed diagnoses until their next scheduled cancer screening or until their disease becomes symptomatic. Due to the extended timeline of a patient's cancer treatment journey, there is an expected lag of up to three months between when a patient is screened for cancer and is subsequently scheduled for a biopsy and then eventually receives treatment. Coupled with delays in surgeries in April and May, a second wave of decreased utilization of cancer services in the following months should be anticipated, as observed in the July figures reported in this study and likely to be continued in subsequent months. This second wave is characterized in the trends in delivery of chemotherapy administration, which first dropped in April and May in response to stay-at-home orders, patient hesitancy to seek care, and providers struggling to adapt to CDC guidelines for remaining open, followed

by a secondary drop in July, possibly attributable to the after-effect of delayed or postponed screenings and biopsies, resulting in delayed therapy initiation or failure to identify cancer patients with asymptomatic disease. Fewer patients are also undergoing surgeries, receiving physician-administered treatment, and seeking chronic follow-up for existing cancers.

While cancer screening has improved in much of the United States, routine testing was disrupted for at least six months of 2020, and most rates remain diminished today. In order to effectively diagnose and manage cancer, stakeholders should consider how to heighten awareness of the dangers of medical distancing and recover seniors' confidence in their ability to seek safe and appropriate care. This care includes routine cancer screening and appropriate treatment required to avoid significant negative impacts on cancer mortality in the United States. Decline in cancer screening rates, physician E&M visits, and administration of cancer therapies will likely translate into both a stage migration to more advanced cancer at diagnosis and higher cancer mortality among senior citizens in the United States. Policies to promote access to cancer care and support the cancer ecosystem have the potential to reduce the expected morbidity and mortality in this patient population. Further studies should be conducted to understand the impact on specific patient populations.

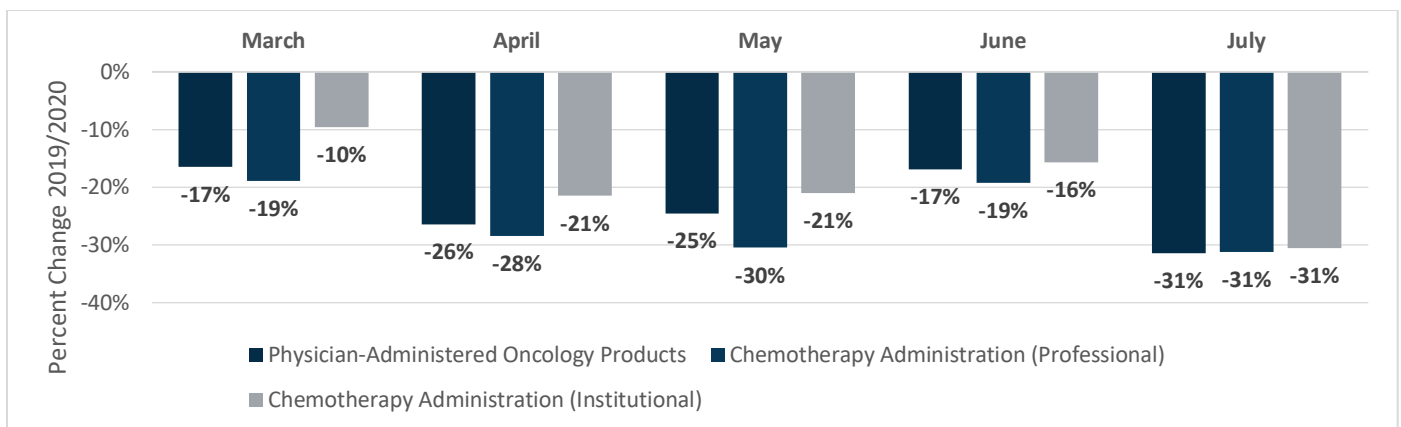
Figure 1. Relative Change in Billing Frequencies for Select Cancer Screening Procedures (March-July 2019/2020)



	March	April	May	June	July
Breast Mammograms	-49.83%	-84.77%	-38.59%	9.19%	-8.91%
Colon Screenings	-41.05%	-75.24%	-49.10%	-24.96%	-37.48%
Lung Screenings	-51.50%	-74.41%	-62.80%	-49.10%	-57.72%
Prostate Screening	-35.40%	-56.34%	-30.13%	-2.62%	-19.10%

Billing frequencies were determined by the following procedure codes: Breast Mammograms (77061, 77062, 77063, 77065, 77066, 77067); Colon Screening (45330, 81528, 82270, 82272, 82274, G0104, G0105, G0121, G0328); Lung Screening (31624, G0296, G0297); Prostate Screening (G0103)

Figure 2. Relative Change in Billing Frequencies for Select Physician-Administered Oncology Products (at any site of services), and Relative Change in Chemotherapy Administration (by site of service) (March-July 2019/2020)

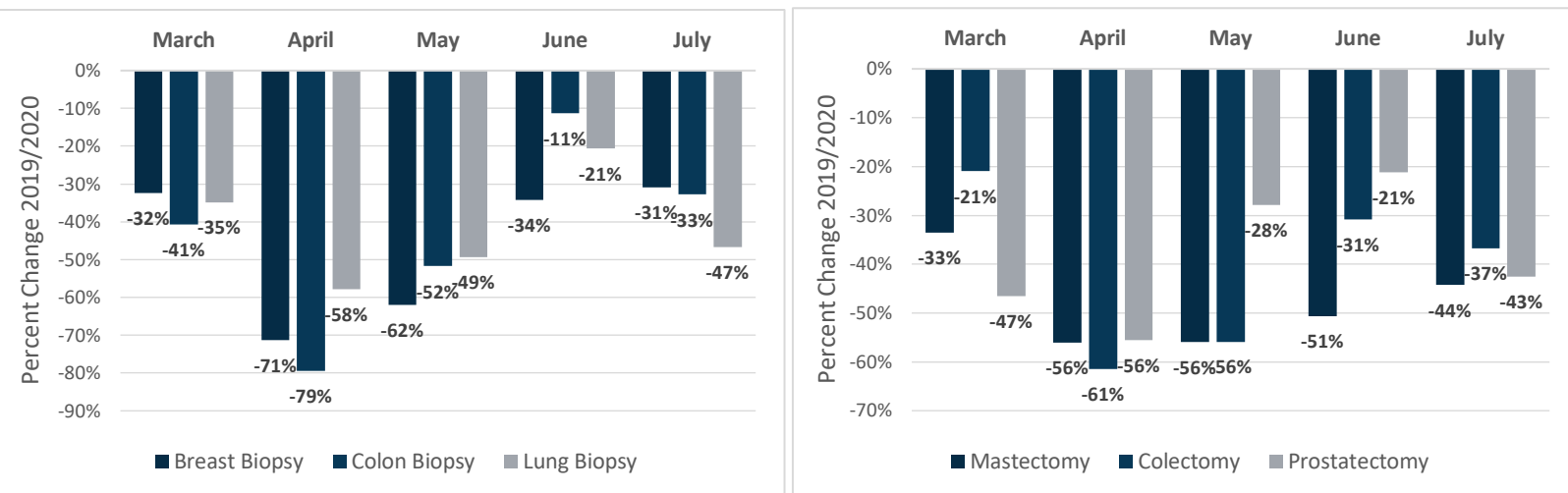


	March	April	May	June	July
Physician-Administered Oncology Products	-16.50%	-26.42%	-24.52%	-16.85%	-31.46%
Chemotherapy Administration (Professional)	-18.86%	-28.47%	-30.49%	-19.20%	-31.18%
Chemotherapy Administration (Institutional)	-9.58%	-21.49%	-21.05%	-15.65%	-30.51%

Billing frequency of the top 23 physician-administered oncology products (and respective biosimilars) as determined by 2018 Medicare Part B spend: Prolia/Xgeva, Neupogen (Zarxio, Nivestym), Somatuline Depot, Aloxi, Neulasta (Fulphila, Udenyca, Ziextenzo), Tecentriq, Bendeka, Avastin (Mvasi, Zirabev), Velcade, Adcetris, Kyprolis, Erbitux, Cyclophosphamide, Darzalex, Yervoy, Abraxane, Keytruda, Opdivo, Alimta, Perjeta, Rituxan (Truxima, Ruxience), Kadcyta, Herceptin (Ontruzant, Hersuma, Ogivri, Trazimera, Kanjinti)

Billing frequencies for chemotherapy administration were classified by type of claim and identified by the following procedure codes: Chemotherapy Injection (96401, 96402, 96405, 96409); Chemotherapy Infusion (96413, 96415-96417); and Chemotherapy Administration (96420, 96425)

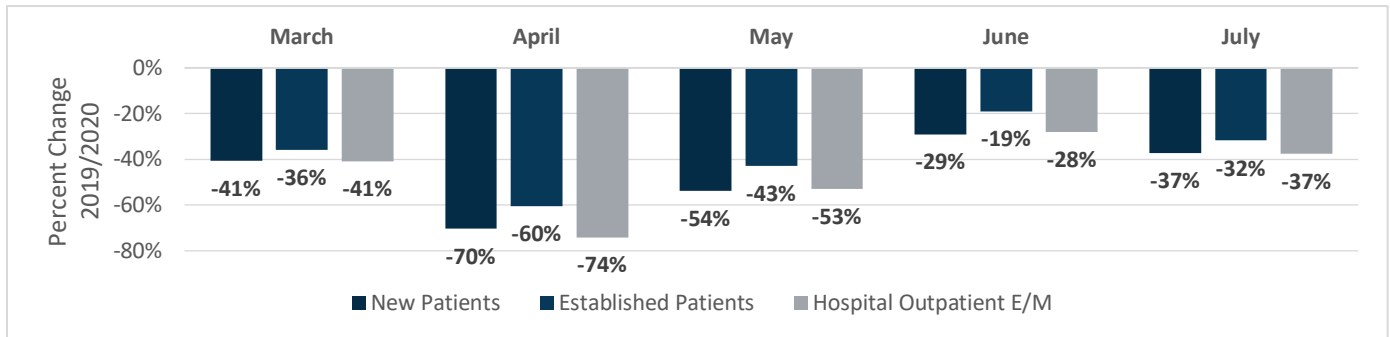
Figure 3. Relative Change in Billing Frequencies for Cancer-Related Biopsies and Surgeries (March-July 2019/2020)



	March	April	May	June	July
Breast Biopsy	-32.33%	-71.37%	-61.92%	-34.22%	-30.87%
Colon Biopsy	-40.75%	-79.41%	-51.74%	-11.23%	-32.79%
Lung Biopsy	-34.82%	-57.88%	-49.32%	-20.65%	-46.68%
Mastectomy	-33.49%	-56.02%	-55.96%	-50.63%	-44.28%
Colectomy	-20.95%	-61.50%	-55.87%	-30.86%	-36.77%
Prostatectomy	-46.55%	-55.54%	-27.93%	-21.13%	-42.55%

Billing frequencies were determined using a subset of highest-volume procedure codes for each of the following services: Breast Biopsy (19081-19085); Colon Biopsy (44389, 45380); Lung Biopsy (32405, 39402); Mastectomy (19301-19303, 19307); Colectomy (44139, 44140, 44143, 44160, 44204, 44205, 44207, 44213); Prostatectomy (52601, 52648, 55821, 55840, 55866)

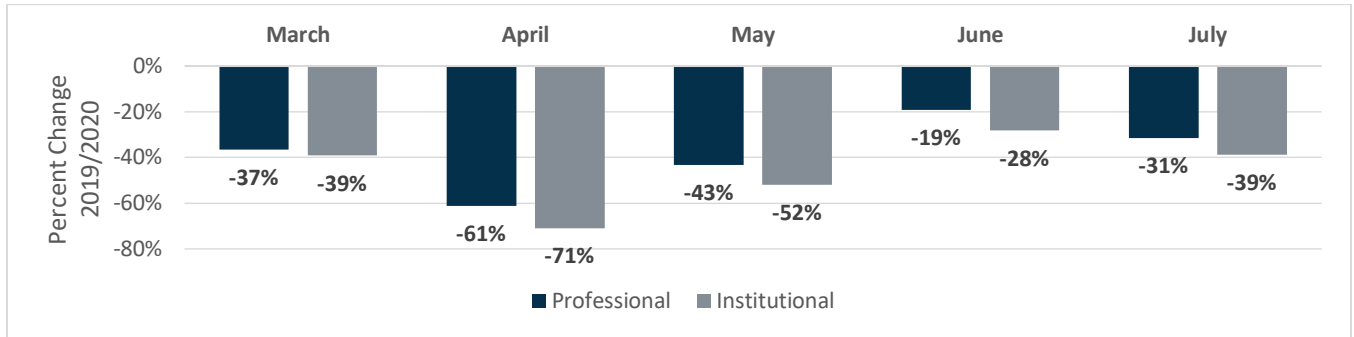
Figure 4. Relative Change in Billing Frequencies for Cancer-Related Evaluation and Management (E&M) Services (March-July 2019/2020)



	March	April	May	June	July
New Patients	-40.52%	-70.25%	-53.73%	-29.09%	-37.35%
Established Patients	-35.90%	-60.45%	-42.80%	-19.00%	-31.75%
Hospital Outpatient E&M	-40.85%	-74.15%	-52.84%	-27.90%	-37.47%

Billing frequencies were determined by the following procedure codes: New Patient E&M (99201-99205); Established Patient E&M (99211-99215); Hospital Outpatient (G0463)

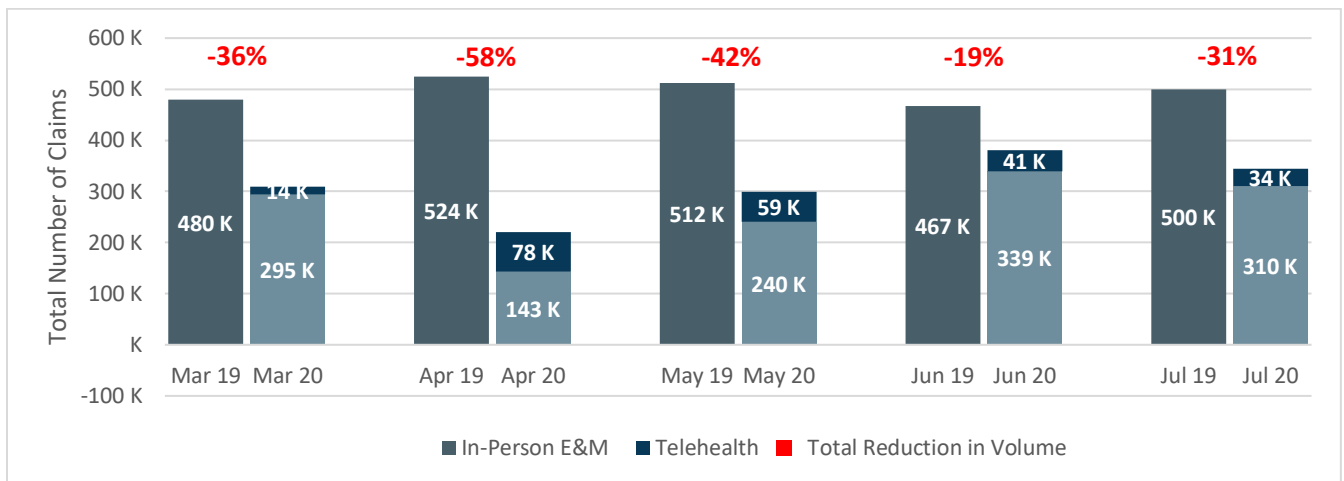
Figure 5. Relative Change in Billing Frequencies for Cancer-Related E&M Services by Setting of Care (March-July 2019/2020)



	March	April	May	June	July
Professional	-36.53%	-61.33%	-43.39%	-19.21%	-31.43%
Institutional	-39.17%	-70.97%	-51.96%	-28.20%	-38.74%

Billing frequencies were classified by type of claim and identified by the following procedure codes: New Patient E&M (99201-99205); Established Patient E&M (99211-99215); Hospital Outpatient (G0463)

Figure 6. Total Number of Claims for Cancer-Related In-Office E&M vs. Telehealth E&M services and Relative Change in Billing Frequencies (March-July 2019/2020)



	March	April	May	June	July
In-Person E&M Visits 2019	480011	524453	512151	466604	499747
In-Person E&M Visits 2020	294880	142562	240260	339250	310111
Telehealth Visits 2020	14031	78326	58712	40955	34212
% Change in E&M (without telehealth)	-38.57%	-72.82%	-53.09%	-27.29%	-37.95%
% Change in Total E&M (with telehealth)	-35.65%	-57.88%	-41.62%	-18.52%	-31.10%

Billing frequencies were determined by the following procedure codes: New Patient E&M (99201-99205); Established Patient E&M (99211-99215); Hospital Outpatient (G0463); Telehealth (99441-99449, 99451, 99452, and E&M claims with POS 02-Telehealth or CPT codes modifier -95)

Appendix A. Number of Screening Services Billed by Each Rendering Provider and Mean Change in Volume (2019 vs. 2020)

Breast Cancer Screenings	2019 N = 629							2020 N = 629							P-value
	Mean	Std dev	Median	25 percentile	75 percentile	Min	Max	Mean	Std dev	Median	25 percentile	75 percentile	Min	Max	
By Month															
Jan 2019 vs Jan 2020	12.51	25.67	3	1	11	0	260	14.00	27.75	3	1	14	0	287	0.1033
Feb 2019 vs Feb 2020	11.35	22.76	3	1	10	0	203	11.89	24.38	3	1	12	0	215	0.5300
Mar 2019 vs Mar 2020	12.69	25.37	3	1	12	0	239	8.01	16.10	2	0	7	0	145	0.0002
Apr 2019 vs Apr 2020	13.26	27.82	3	1	12	0	325	2.16	5.28	0	0	2	0	51	<.0001
May 2019 vs May 2020	13.43	28.40	3	1	13	0	335	8.63	20.55	2	0	6	0	242	<.0001
Jun 2019 vs Jun 2020	12.81	25.73	3	1	13	0	295	14.67	31.67	3	0	13	0	332	0.1661
July 2019 vs July 2020	13.87	26.54	4	1	15	0	293	13.41	29.96	3	0	13	0	332	0.0004
By Year															
Jan - Jul 2019 vs Jan - Jul 2020	89.92	178.88	21	7	90	1	1,936	72.78	150.32	16	5	72	0	1,587	0.0033
By Quarter															
Jan - Mar 2019 vs Jan - Mar 2020	36.55	73.08	8	3	35	0	688	33.90	67.26	8	3	34	0	640	0.9368
Apr - Jun 2019 vs Apr - Jun 2020	39.50	80.95	9	3	40	0	955	25.46	55.40	5	1	23	0	615	<.0001
Jun - Jul 2019 vs Jun - Jul 2020	26.69	51.84	6	2	28	0	588	28.09	61.16	5	1	26	0	664	0.0101

Lung Cancer Screenings	2019 N = 348							2020 N = 348							P-value
	Mean	Std dev	Median	25 percentile	75 percentile	Min	Max	Mean	Std dev	Median	25 percentile	75 percentile	Min	Max	
By Month															
Jan 2019 vs Jan 2020	1.88	3.44	1	0	2	0	32	1.95	3.29	1	0	2	0	27	0.4443
Feb 2019 vs Feb 2020	1.69	3.53	1	0	2	0	38	1.70	3.08	1	0	2	0	26	0.5245
Mar 2019 vs Mar 2020	1.85	3.76	1	0	2	0	40	1.20	2.58	0	0	1	0	29	0.0014
Apr 2019 vs Apr 2020	1.89	3.36	1	0	2	0	30	0.48	1.35	0	0	0	0	12	<.0001
May 2019 vs May 2020	2.13	3.74	1	0	3	0	35	1.02	2.34	0	0	1	0	21	<.0001
Jun 2019 vs Jun 2020	1.87	3.73	1	0	2	0	41	1.67	3.29	0	0	2	0	32	0.1814
July 2019 vs July 2020	2.02	3.79	1	0	2	0	33	1.39	2.64	0	0	2	0	23	<.0001
By Year															
Jan - Jul 2019 vs Jan - Jul 2020	13.33	23.76	6	2	15	0	246	9.42	16.57	4	2	10	0	162	0.0006
By Quarter															
Jan - Mar 2019 vs Jan - Mar 2020	5.42	10.25	2	1	6	0	110	4.85	8.25	2	1	5	0	75	0.9090
Apr - Jun 2019 vs Apr - Jun 2020	5.89	10.32	3	1	7	0	106	3.18	6.38	1	0	4	0	64	<.0001
Jun - Jul 2019 vs Jun - Jul 2020	3.89	7.27	2	1	4	0	71	3.07	5.62	1	0	4	0	55	0.0006

Colon Cancer Screenings	2019 N = 1,402							2020 N = 1,402							P-value
	Mean	Std dev	Median	25 percentile	75 percentile	Min	Max	Mean	Std dev	Median	25 percentile	75 percentile	Min	Max	
By Month															
Jan 2019 vs Jan 2020	3.51	20.28	1	0	2	0	503	3.17	17.94	1	0	2	0	464	0.9252
Feb 2019 vs Feb 2020	3.21	19.07	1	0	2	0	499	2.88	17.07	1	0	2	0	445	0.5336
Mar 2019 vs Mar 2020	3.56	20.67	1	0	2	0	492	2.14	12.97	0	0	1	0	333	<.0001
Apr 2019 vs Apr 2020	3.59	20.54	1	0	2	0	529	0.99	7.19	0	0	1	0	208	<.0001
May 2019 vs May 2020	3.60	19.91	1	0	2	0	482	1.68	10.75	0	0	1	0	295	<.0001
Jun 2019 vs Jun 2020	3.26	17.82	1	0	2	0	431	2.50	14.17	0	0	2	0	356	<.0001
July 2019 vs July 2020	3.43	18.43	1	0	2	0	443	2.36	12.82	0	0	2	0	290	<.0001
By Year															
Jan - Jul 2019 vs Jan - Jul 2020	24.15	136.09	6	2	15	1	3,379	15.71	91.97	4	2	10	1	2,391	<.0001
By Quarter															
Jan - Mar 2019 vs Jan - Mar 2020	10.28	59.83	2	1	6	0	1,494	8.18	47.79	2	1	5	0	1,242	0.0182
Apr - Jun 2019 vs Apr - Jun 2020	10.45	58.07	2	1	7	0	1,442	5.17	31.80	1	0	3	0	859	<.0001
Jun - Jul 2019 vs Jun - Jul 2020	6.68	36.16	2	0	4	0	874	4.86	26.87	1	0	3	0	646	<.0001

Prostate Cancer Screenings	2019 N = 522							2020 N = 522							P-value
	Mean	Std dev	Median	25 percentile	75 percentile	Min	Max	Mean	Std dev	Median	25 percentile	75 percentile	Min	Max	
By Month															
Jan 2019 vs Jan 2020	10.43	43.70	2	0	5	0	783	10.03	38.87	2	1	5	0	668	0.5563
Feb 2019 vs Feb 2020	9.06	37.98	2	0	5	0	696	8.49	34.15	2	0	4	0	604	0.8931
Mar 2019 vs Mar 2020	9.36	37.29	2	0	5	0	655	6.48	27.40	1	0	3	0	502	0.0001
Apr 2019 vs Apr 2020	10.02	41.05	2	0	6	0	742	4.26	19.53	1	0	2	0	366	<.0001
May 2019 vs May 2020	9.94	39.78	2	0	5	0	691	7.11	28.99	1	0	4	0	533	0.0004
Jun 2019 vs Jun 2020	9.06	35.40	2	0	5	0	608	9.63	36.62	2	0	5	0	632	0.8277
July 2019 vs July 2020	9.45	36.26	2	0	5	0	619	8.31	31.35	1	0	5	0	524	0.0064
By Year															
Jan - Jul 2019 vs Jan - Jul 2020	67.32	270.34	13	5	36	1	4,794	54.31	215.06	10	4	26	1	3,829	0.0138
By Quarter															
Jan - Mar 2019 vs Jan - Mar 2020	28.85	118.69	5	2	14	0	2,134	25.00	100.06	5	2	12	0	1,774	0.3360
Apr - Jun 2019 vs Apr - Jun 2020	29.02	115.91	6	2	15	0	2,041	21.00	84.41	4	1	10	0	1,531	0.0004
Jun - Jul 2019 vs Jun - Jul 2020	18.51	71.53	4	1	10	0	1,227	17.94	67.83	3	1	9	0	1,156	0.1155

Appendix B. Number of Evaluation and Management (E&M) Visits Billed by Each Rendering Provider and Mean Change in Volume (2019 vs. 2020)

	2019 N = 15,323						2020 N = 15,323						P-value		
	Mean	Std dev	Median	25 percentile	75 percentile	Min	Max	Mean	Std dev	Median	25 percentile	75 percentile		Min	Max
Total Patient E&M															
By Month															
Jan 2019 vs Jan 2020	29.69	199.07	3	0	14	0	9,142	29.50	195.17	4	1	15	0	9,982	<.0001
Feb 2019 vs Feb 2020	25.96	171.58	3	0	12	0	7,349	24.52	166.76	3	1	12	0	8,514	<.0001
Mar 2019 vs Mar 2020	27.54	182.51	3	0	13	0	8,670	19.18	123.93	3	0	10	0	6,298	<.0001
Apr 2019 vs Apr 2020	30.21	203.05	3	0	14	0	10,737	12.06	72.58	1	0	7	0	3,443	<.0001
May 2019 vs May 2020	29.67	200.24	3	0	13	0	11,356	17.67	134.53	2	0	9	0	8,131	<.0001
Jun 2019 vs Jun 2020	27.21	182.40	3	0	12	0	10,167	23.16	180.86	2	0	11	0	11,513	<.0001
July 2019 vs July 2020	29.37	196.63	4	1	14	0	10,816	20.95	170.48	2	0	9	0	11,415	<.0001
By Year															
Jan - Jul 2019 vs Jan - Jul 2020	199.66	1329.60	24	5	90	0	68,237	147.05	1029.49	20	5	73	0	58,801	<.0001
By Quarter															
Jan - Mar 2019 vs Jan - Mar 2020	83.20	552.62	9	1	38	0	25,161	73.20	483.33	10	2	37	0	24,794	<.0001
Apr - Jun 2019 vs Apr - Jun 2020	87.09	584.29	10	2	39	0	32,260	52.89	383.79	6	1	26	0	22,592	<.0001
Jun - Jul 2019 vs Jun - Jul 2020	56.58	378.75	7	2	26	0	20,983	44.11	350.84	5	1	20	0	22,928	<.0001

	2019 N = 7,141						2020 N = 7,141						P-value		
	Mean	Std dev	Median	25 percentile	75 percentile	Min	Max	Mean	Std dev	Median	25 percentile	75 percentile		Min	Max
New Patient E&M															
By Month															
Jan 2019 vs Jan 2020	5.40	42.63	1	0	3	0	2,193	4.99	38.56	1	0	3	0	2,052	<.0001
Feb 2019 vs Feb 2020	4.70	35.85	1	0	3	0	1,728	4.27	36.12	1	0	3	0	1,914	0.0246
Mar 2019 vs Mar 2020	4.77	36.99	1	0	3	0	1,998	3.14	26.18	1	0	2	0	1,386	<.0001
Apr 2019 vs Apr 2020	5.06	41.25	1	0	3	0	2,340	1.64	13.35	0	0	1	0	569	<.0001
May 2019 vs May 2020	4.98	41.09	1	0	3	0	2,416	2.51	24.87	0	0	1	0	1,337	<.0001
Jun 2019 vs Jun 2020	4.58	38.76	1	0	2	0	2,383	3.50	34.52	1	0	2	0	2,066	<.0001
July 2019 vs July 2020	5.08	43.32	1	0	3	0	2,623	3.38	34.41	0	0	2	0	2,121	<.0001
By Year															
Jan - Jul 2019 vs Jan - Jul 2020	34.59	278.37	6	2	17	1	15,681	23.43	205.73	4	2	13	1	11,408	<.0001
By Quarter															
Jan - Mar 2019 vs Jan - Mar 2020	14.87	115.20	2	1	8	0	5,919	12.40	100.46	2	1	7	0	5,352	0.1573
Apr - Jun 2019 vs Apr - Jun 2020	14.63	120.86	3	1	7	0	7,139	7.65	71.89	1	0	4	0	3,935	<.0001
Jun - Jul 2019 vs Jun - Jul 2020	9.67	82.01	2	1	5	0	5,006	6.89	68.80	1	0	4	0	4,187	<.0001

	2019 N = 12,873						2020 N = 12,873						P-value		
	Mean	Std dev	Median	25 percentile	75 percentile	Min	Max	Mean	Std dev	Median	25 percentile	75 percentile		Min	Max
Existing Patient E&M															
By Month															
Jan 2019 vs Jan 2020	25.74	161.63	4	1	15	0	6,949	25.80	159.73	5	1	16	0	7,930	<.0001
Feb 2019 vs Feb 2020	22.57	139.89	4	1	13	0	5,621	21.39	134.89	4	1	13	0	6,600	<.0001
Mar 2019 vs Mar 2020	23.93	148.94	4	1	14	0	6,672	16.90	100.34	3	1	11	0	4,912	<.0001
Apr 2019 vs Apr 2020	26.49	169.00	4	1	15	0	8,397	11.47	65.02	2	0	7	0	3,073	<.0001
May 2019 vs May 2020	25.88	166.93	4	1	15	0	8,940	16.14	117.92	2	0	10	0	6,794	<.0001
Jun 2019 vs Jun 2020	23.53	148.16	4	1	13	0	7,784	20.63	155.84	3	0	12	0	9,447	<.0001
July 2019 vs July 2020	25.31	157.61	5	1	15	0	8,193	18.41	145.40	3	0	10	0	9,294	<.0001
By Year															
Jan - Jul 2019 vs Jan - Jul 2020	173.45	1088.74	29	8	98	1	52,556	130.72	867.85	25	7	80	1	47,393	<.0001
By Quarter															
Jan - Mar 2019 vs Jan - Mar 2020	72.23	449.99	12	3	41	0	19,242	64.08	392.83	13	4	40	0	19,442	<.0001
Apr - Jun 2019 vs Apr - Jun 2020	75.90	483.58	12	3	43	0	25,121	48.23	335.16	8	2	29	0	18,657	<.0001
Jun - Jul 2019 vs Jun - Jul 2020	48.85	305.58	9	2	28	0	15,977	39.04	300.90	6	1	22	0	18,741	<.0001

	2019 N = 387						2020 N = 387						P-value		
	Mean	Std dev	Median	25 percentile	75 percentile	Min	Max	Mean	Std dev	Median	25 percentile	75 percentile		Min	Max
Outpatient E&M															
By Month															
Jan 2019 vs Jan 2020	207.04	540.25	25	2	149	0	5,791	211.22	540.91	32	3	151	0	6,195	0.0852
Feb 2019 vs Feb 2020	179.24	465.28	21	2	126	0	5,055	175.16	464.04	27	3	121	0	5,336	0.2419
Mar 2019 vs Mar 2020	194.49	501.16	23	2	139	0	5,096	134.64	348.94	18	2	88	0	3,776	0.4126
Apr 2019 vs Apr 2020	208.36	517.71	23	3	140	0	4,301	62.26	144.29	10	1	50	0	1,055	<.0001
May 2019 vs May 2020	209.38	498.18	28	3	145	0	3,270	112.04	304.37	14	1	74	0	3,517	0.0012
Jun 2019 vs Jun 2020	198.74	493.17	26	2	140	0	4,503	160.29	430.26	17	1	105	0	4,656	0.0931
July 2019 vs July 2020	215.16	543.36	30	3	154	0	5,719	149.05	407.69	15	1	95	0	4,725	0.0009
By Year															
Jan - Jul 2019 vs Jan - Jul 2020	1412.41	3524.21	203	19	987	1	32,427	1004.66	2589.37	163	22	722	1	29,260	0.3536
By Quarter															
Jan - Mar 2019 vs Jan - Mar 2020	580.76	1505.08	70	6	430	0	15,942	521.02	1347.54	80	9	375	0	15,307	0.2658
Apr - Jun 2019 vs Apr - Jun 2020	616.49	1495.85	83	9	433	0	10,766	334.59	865.93	45	5	228	0	9,228	0.0035
Jun - Jul 2019 vs Jun - Jul 2020	413.90	1034.95	60	7	291	0	10,222	309.34	835.13	35	3	206	0	9,381	0.0115

Appendix C. Number of Hospitalizations Billed by Each Rendering Provider and Mean Change in Volume (2019 vs. 2020)

Any Hospitalizations	2019 N = 774							2020 N = 774							P-value
	Mean	Std dev	Median	25 percent	75 percent	Min	Max	Mean	Std dev	Median	25 percent	75 percent	Min	Max	
By Month															
Jan 2019 vs Jan 2020	17.68	47.94	3	1	10	0	757	19.87	51.75	3	1	11	0	818	0.0138
Feb 2019 vs Feb 2020	16.37	43.02	2	1	10	0	677	17.03	46.30	2	1	10	0	741	0.8388
Mar 2019 vs Mar 2020	17.74	46.88	2	1	10	0	695	14.87	39.84	2	0	8	0	593	0.1504
Apr 2019 vs Apr 2020	17.13	48.43	2	1	10	0	822	11.97	31.99	2	0	7	0	460	0.0020
May 2019 vs May 2020	18.09	49.81	3	1	11	0	833	13.79	37.37	2	0	8	0	583	0.0028
Jun 2019 vs Jun 2020	17.65	47.24	2	1	10	0	732	14.70	41.91	2	0	8	0	703	0.0088
July 2019 vs July 2020	18.70	50.99	3	1	11	0	872	13.63	39.99	2	0	8	0	689	<.0001
By Year															
Jan - Jul 2019 vs Jan - Jul 2020	123.36	331.85	16	6	68	1	5,388	105.86	285.91	15	5	63	1	4,587	0.1252
By Quarter															
Jan - Mar 2019 vs Jan - Mar 2020	51.79	137.42	7	2	30	0	2,129	51.78	137.07	8	3	29	0	2,152	0.3563
Apr - Jun 2019 vs Apr - Jun 2020	52.87	144.67	7	2	30	0	2,387	40.46	110.68	5	2	25	0	1,746	0.0010
Jun - Jul 2019 vs Jun - Jul 2020	36.35	97.92	5	2	21	0	1,604	28.33	81.55	3	1	16	0	1,392	<.0001

Appendix D. Number of Telehealth Services Billed by Each Rendering Provider and Mean Change in Volume (2019 vs. 2020)

Telehealth	2019 N = 6,970							2020 N = 6,970							P-value
	Mean	Std dev	Median	25 percent	75 percent	Min	Max	Mean	Std dev	Median	25 percent	75 percent	Min	Max	
By Month															
Jan 2019 vs Jan 2020	0.02	1.20	0	0	0	0	98	0.04	1.49	0	0	0	0	117	<.0001
Feb 2019 vs Feb 2020	0.02	0.78	0	0	0	0	62	0.04	1.57	0	0	0	0	127	<.0001
Mar 2019 vs Mar 2020	0.02	1.05	0	0	0	0	84	2.28	16.26	0	0	1	0	622	<.0001
Apr 2019 vs Apr 2020	0.03	1.47	0	0	0	0	120	12.73	79.63	2	1	7	0	2,636	<.0001
May 2019 vs May 2020	0.03	1.50	0	0	0	0	118	9.95	59.82	2	0	6	0	2,171	<.0001
Jun 2019 vs Jun 2020	0.03	1.35	0	0	0	0	109	7.30	47.85	1	0	4	0	2,032	<.0001
July 2019 vs July 2020	0.03	1.37	0	0	0	0	111	6.09	38.71	1	0	3	0	1,227	<.0001
By Year															
Jan - Jul 2019 vs Jan - Jul 2020	0.18	8.63	0	0	0	0	702	38.44	236.05	7	2	22	0	7,770	<.0001
By Quarter															
Jan - Mar 2019 vs Jan - Mar 2020	0.06	3.01	0	0	0	0	244	2.37	17.99	0	0	1	0	866	<.0001
Apr - Jun 2019 vs Apr - Jun 2020	0.09	4.29	0	0	0	0	347	29.98	183.01	5	2	18	0	6,192	<.0001
Jun - Jul 2019 vs Jun - Jul 2020	0.06	2.71	0	0	0	0	220	13.39	85.70	2	0	7	0	3,259	<.0001

Appendix E. Number of Physician-Administered Oncology Products Billed by Each Rendering Provider and Mean Change in Volume (2019 vs. 2020)

Oncology Products	2019 N = 721							2020 N = 721							P-value
	Mean	Std dev	Median	25 percent	75 percent	Min	Max	Mean	Std dev	Median	25 percent	75 percent	Min	Max	
By Month															
Jan 2019 vs Jan 2020	20.41	66.53	2	0	10	0	1,010	21.16	69.01	2	1	12	0	996	0.0321
Feb 2019 vs Feb 2020	17.93	59.80	1	0	10	0	949	18.22	60.10	2	0	10	0	870	0.1085
Mar 2019 vs Mar 2020	18.65	62.31	2	0	9	0	985	18.95	62.73	2	0	9	0	881	0.9995
Apr 2019 vs Apr 2020	19.57	61.08	2	0	11	0	852	17.23	52.66	1	0	9	0	530	0.0472
May 2019 vs May 2020	19.45	56.06	2	0	11	0	564	17.63	56.78	1	0	9	0	735	0.0233
Jun 2019 vs Jun 2020	18.62	57.48	2	0	12	0	766	18.26	59.93	2	0	10	0	813	0.2771
July 2019 vs July 2020	21.34	67.62	2	0	12	0	1,034	17.25	58.62	1	0	8	0	837	0.0002
By Year															
Jan - Jul 2019 vs Jan - Jul 2020	135.98	425.63	12	3	78	1	5,950	128.69	412.53	12	3	68	1	5,412	0.8021
By Quarter															
Jan - Mar 2019 vs Jan - Mar 2020	56.99	188.28	4	1	31	0	2,944	58.33	191.20	5	1	33	0	2,747	0.0388
Apr - Jun 2019 vs Apr - Jun 2020	57.64	172.28	5	1	34	0	1,972	53.12	166.82	4	1	29	0	1,828	0.0696
Jun - Jul 2019 vs Jun - Jul 2020	39.96	124.82	4	1	23	0	1,800	35.50	118.27	3	0	17	0	1,650	0.0067

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