The Association of the First Surge of the COVID-19 Pandemic with the High- and Low-Value Outpatient Care Delivered to Adults in the USA

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BACKGROUND: The first surge of the COVID-19 pandemic entirely altered healthcare delivery. Whether this also altered the receipt of high- and low-value care is unknown.

OBJECTIVE: To test the association between the April through June 2020 surge of COVID-19 and various high- and low-value care measures to determine how the delivery of care changed.

DESIGN: Difference in differences analysis, examining the difference in quality measures between the April through June 2020 surge quarter and the January through March 2020 quarter with the same 2 quarters' difference the year prior.

PARTICIPANTS: Adults in the MarketScan® Commercial Database and Medicare Supplemental Database.

MAIN MEASURES: Fifteen low-value and 16 high-value quality measures aggregated into 8 clinical quality composites (4 of these low-value).

KEY RESULTS: We analyzed 9,352,569 adults. Mean age was 44 years (SD, 15.03), 52% were female, and 75% were employed. Receipt of nearly every type of low-value care decreased during the surge. For example, low-value cancer screening decreased 0.86% (95% CI, −1.03 to −0.69). Use of opioid medications for back and neck pain (DiD +0.94 [95% CI, +0.82 to +1.07]) and use of opioid medications for headache (DiD +0.38 [95% CI, 0.07 to 0.69]) were the only two measures to increase. Nearly all high-value care measures also decreased. For example, high-value diabetes care decreased 9.75% (95% CI, −10.79 to −8.71).

CONCLUSIONS: The first COVID-19 surge was associated with receipt of less low-value care and substantially less high-value care for most measures, with the notable exception of increases in low-value opioid use.

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INTRODUCTION

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the cause of coronavirus disease 2019 (COVID-19), has infected about 40 million individuals, resulted in more than 2 million hospital admissions, and caused over 700,000 deaths in the USA as of October 2021.[1] The first surge of COVID-19 in the USA began in March 2020 and lasted until June 2020, mostly centered around the Northeast.[2]

The swift uptick in COVID-19 cases put severe strain on healthcare resources.[3–6] Outpatient care was essentially transformed overnight from a facility-centric model to a remote-first model.[7–9] It remains unknown how this shift affected the quality of care delivered to adults.[10] High-value care, or care that is likely to benefit a patient, and low-value care, or care that is considered either inappropriate or of little to no benefit, may have been influenced. Prior work has demonstrated that Americans receive about half the high-value care they should and receive significant care that is wasteful and of low-value, leading to morbidity, mortality, and cost.[11–19] It is plausible that synchronous audio and video connectivity allowed outpatient care teams to maintain a high level of care. For example, due to the inherent barriers of remote care, perhaps teams were incentivized to deliver less care in the realm of low-value care (e.g., fewer colonoscopies in older adults). It is also plausible that these same pressures may have prevented the delivery of high-value care (e.g., fewer colonoscopies in middle-aged adults).[20–22] Therefore, the pandemic's first surge provided a unique opportunity to study the changes in

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high- and low-value care and perhaps identify where changes, when beneficial, might be sustained, or when deleterious, might be stopped. Pinpointing particular care patterns now could improve patient outcomes in the future and optimize value as pandemic conditions fade.[23]

We sought to measure how the pandemic's first surge was associated with high- and low-value care in a national population of employed and recently retired adults. We hypothesized that both high-value care and low-value care delivery would be reduced.

METHODS

Data Source

We performed a retrospective analysis of the IBM® MarketScan® Commercial Database and Medicare Supplemental Database from January 2018 to June 2020, representing the most recently available data. MarketScan® is one of the country's largest de-identified longitudinal patient-level databases that includes information on over 40 million active employees, early retirees, and COBRA (Consolidated Omnibus Budget Reconciliation Act) continuers and their dependents, insured by approximately 150 employer-sponsored plans representing all 50 states. We also accessed the IBM® MarketScan® Medicare Supplemental Database, which includes Medicare-eligible individuals with employer-sponsored Medicare Supplemental plans. Our analyses incorporated the following files, which were available for both Commercial and Medicare enrollees: (1) enrollment, (2) inpatient admissions, (3) inpatient services, (4) facility header (to identify individual service records), (5) outpatient claims, and (6) outpatient drug. The study protocol was deemed exempt by the Mass General Brigham institutional review board.

Participants

We included all patients aged 18 years old and older who were continuously enrolled in MarketScan during the study period: January 2018 to June 2020. We examined the time period across 10 quarters: January to March 2018 ("Q1 2018"), April to June 2018 ("Q2 2018"), July to September 2018 ("Q3 2018"), October to December 2018 ("Q4 2018"), January to March 2019 ("Q1 2019"), April to June 2019 ("Q2 2019"), July to September 2019 ("Q3 2019"), October to December 2019 ("Q4 2019"), January to March 2020 ("Q1 2020"), and April to June 2020 ("Q2 2020"; the first surge). We identified patients with COVID-19 based on the emergency diagnosis code U07.1 that was activated February 2020. This code had rapid uptake nationally.[24]

Outcomes

We conducted a narrative review of medical literature focused on both high- and low-value ambulatory care to collect outpatient quality measures. We initially included measures from multiple studies that had been developed by Schwartz and colleagues,[11,12] then broadened our search to include other literature that had also cited these works.[13–16] All service measures considered were originally derived from the American Board of Internal Medicine Foundation's Choosing Wisely initiative,[25] the US Preventive Services Task Force recommendations,[26] and the Healthcare Effectiveness Data and Information Set (HEDIS) measures.[27]

We excluded duplicate services, ensured that chosen measures were applicable to our study population (excluded pediatric-oriented measures), and eliminated measures that could not be accurately constructed and assessed using the MarketScan® database (e.g., preoperative pulmonary function testing was eliminated due to its requirement of Berenson-Eggers Type of Service codes, which are not included in the MarketScan® database). Additionally, we excluded services that required claims history to be available for individual patients prior to our study period of January 1, 2018–June 30, 2020. For example, we required up to 10 years of historical claims data to identify patients who were undergoing sufficiently frequent colorectal cancer screenings. Our final analysis includes 15 low-value measures and 16 high-value measures (Table 1; eTable 1). We grouped these measures using a prior process to reflect the clinical domain covered by each measure.[15]

After applying the exclusion criteria, we updated measure definitions to reflect changes in International Classification of Diseases (ICD) and Current Procedural Terminology (CPT) codes. This work included converting International Classification of Diseases, Ninth Revision diagnostic codes (ICD-9) to ICD-10 diagnostic codes, updating CPT codes (for example, in 2015 several CPT codes for vertebroplasty were removed from use but were used by prior literature), and creating a dataset of prescription medications and their National Drug Codes (NDC) based on measure criteria.

To calculate performance for each measure, we first identified individuals who were eligible for the measure (e.g., those with diabetes) and then whether they received the particular care (e.g., eye examination). For each measure, we applied the exclusion criteria across the entire time period. If an exclusion was present at any time, they were excluded from the denominator of that measure. The numerator was on the person level for each interval. An individual could have had the measure of interest in any interval, in multiple intervals, and even multiple times in an interval. We constructed a patient-level flag for each interval that indicated whether the patient met criteria. From the service measures, we constructed 4 low-value composites, where delivery of the service is considered either inappropriate or of little to no benefit, and 4 clinically meaningful high-value composites, where delivery of the service is likely of benefit to the patient. To calculate composites, we identified all instances in which recommended care was delivered (for high-value measures) or avoided (for low-value measures) and divided them by the number of times participants were eligible for care.

Table 1 High- and Low-Value Quality Measure Definitions

Quality measure	Numerator	Denominator
Low-value quality measures		
Cancer screening		
Cervical cancer screening for women ages 65+[11, 12, 15]	Cervical screening	Inclusion Women aged ≥65 years Exclusion Cervical and other relevant cancers, abnormal Papanicolaou finding, human papillomavirus positivity, history of cervical cancer, other relevant cancers, dysplasias, subtotal hysterectomy
Colorectal cancer screening for adults ages 85+[11, 12, 15]	Colorectal cancer screening (colonoscopy, sigmoidoscopy, barium enema, CT colonography, FIT-DNA, or fecal occult blood testing)	Inclusion Patients aged ≥85 years Exclusion History of colon cancer
PSA testing for men ages 75+[11, 12, 15]	PSA testing	Inclusion Men aged ≥75 years Exclusion History of prostate cancer, prostate dysplasia
Imaging		
Head imaging in the evaluation of syncope[12, 15, 16]	CT or MRI of head or brain	Inclusion Syncope Exclusion Epilepsy or convulsions, cerebrovascular diseases, including stroke/TIA and subarachnoid hemorrhage, head or face trauma, altered mental status, nervous and musculoskeletal system symptoms, including gait abnormality, meningismus, disturbed skin sensation, speech deficits, personal history of stroke/TIA
Head imaging (CT/MRI) for uncomplicated headache[12, 13, 15, 16]	CT or MRI of head or brain	Inclusion Headache or migraine Exclusions Post-traumatic or thunderclap headache, cancer, migraine with hemiplegia or infarction, giant cell arteritis, epilepsy or convulsions, cerebrovascular diseases, including stroke/TIA and subarachnoid hemorrhage, head or face trauma, altered mental status, nervous and musculoskeletal system symptoms, including gait abnormality, meningismus, disturbed skin sensation, speech deficits, personal history of stroke/TIA, or visual disturbances
Procedures		
Renal artery angioplasty or stenting[12]	Renal artery angioplasty or stenting	Inclusion Diagnosis of renal atherosclerosis or renovascular hypertension noted in procedure claim
Vertebroplasty or kyphoplasty for osteoporotic vertebral fractures[12]	Vertebroplasty, kyphoplasty for vertebral fracture	Inclusion No bone cancers, myeloma, or hemangioma noted in procedure claim
Arthroscopic surgery for knee [11, 12, 16]	Knee arthroscopy with chondroplasty	Inclusion Chondromalacia, osteoarthritis Exclusion Meniscal tear
Treatments		
Opioids for back/neck [13, 15]	Prescription of any opioid-containing medication	Inclusion Any visit with a diagnosis or reason for visit involving back or neck pain Exclusion Any diagnosis or reason for visit including "red flags": fever, weight loss, malaise, night sweats, anemia not due to blood loss, cachexia, neurologic impairment, cancer, spinal fracture, myelopathy, neuritis, and radiculopathy
Opioids for headache[13, 15]	Prescription of any opioid-containing medication	Inclusion Any visit with a diagnosis or reason for visit of headache or migraine Exclusion Any diagnosis or reason for visit of human immunodeficiency virus, pregnancy, neurologic impairment, cancer, head or face trauma, or epilepsy or convulsions
Antibiotics for influenza[15]	Antibiotic prescription during visit	Inclusion Any Influenza visit
Anxiolytics, sedatives, and hypnotics in older adults[15]	Anxiolytic, sedative, or hypnotic prescription	Inclusion Patient age >65 years
Benzodiazepine for depression[15]	Benzodiazepine prescription	Inclusion Patients diagnosed with depression
Antidepressant monotherapy in bipolar disorder[14]	Antidepressant prescription	Inclusion

(*continued on next page*)

Table 1. (continued)

Quality measure	Numerator	Denominator
		Patients with diagnosis of bipolar disorder within 3 days prior to prescription Exclusion Patient with prescription for mood stabilizers within 90 days prior to antidepressants monotherapy
NSAID use for hypertension, heart failure, or kidney disease[15]	NSAID prescription	Inclusion Patients diagnosed with hypertension, heart failure, or kidney disease
High-value quality measures		
Cancer screening		
Cervical cancer screening[15]	Papanicolaou smear within past 3 years	Inclusion Women, age 21–65 years Exclusion Patient who have had a hysterectomy, vaginal vault prolapse after hysterectomy, acquired absence of uterus/cervix, cervical agenesis
Breast cancer screening[15]	Mammogram within past 2 years	Inclusion Women, age 50–74 years Exclusion Patients with bilateral mastectomy
Diagnostic and preventive measures		
Influenza vaccine[15]	Influenza vaccine within 1 year	Inclusion Age ≥50 years
Diabetes care		
A1c measurement[15]	HgA1c measurement at least twice within 365 days	Inclusion Patients with diabetes
Eye exam[15]	Retinal examination within 1 year	Inclusion Patients with diabetes
Medical treatment		
Anticoagulation for atrial fibrillation[13, 15]	Prescription of heparin-family drug, warfarin, novel anticoagulant, aspirin or aspirin dipyridamole	Inclusion Any visit with a diagnosis of atrial fibrillation or atrial flutter Exclusion Any diagnosis or reason for visit of gastrointestinal bleeding, gastritis, alcoholism or drug abuse, gait disorder, dementia, central nervous system bleeding, seizures, central nervous system malignancy, or thrombocytopenia
ACE/ARB for heart failure[13, 15]	Prescription of an ACE or ARB	Inclusion Any diagnosis or chronic illness code of congestive heart failure Exclusion Any diagnosis of hyperkalemia or angioedema
Beta blocker for heart failure[13, 15]	Prescription of a beta blocker	Inclusion Any diagnosis or chronic illness code of congestive heart failure Exclusion Any diagnosis of heart block, asthma or chronic obstructive pulmonary disease
Salicylates and/or platelet aggregation inhibitors for CAD/MI[13, 15]	Salicylates and/or platelet aggregation inhibitor prescription	Inclusion Patients with CAD/MI
Beta blocker for CAD/SASMI[13, 15]	Prescription of a beta blocker	Inclusion Any visit with a diagnosis or reason for visit or chronic illness code for coronary artery disease Exclusion Any diagnosis of heart block, asthma or chronic obstructive pulmonary disease
Statin for CAD/MI[13, 15]	Prescription of a statin	Inclusion Any visit with a diagnosis or reason for visit or chronic illness code for coronary artery disease Exclusion Any diagnosis of liver disease or alcoholism
Statin for dyslipidemia[15]	Statin prescription	Inclusion Patients with dyslipidemia
ACEi/ARB for diabetes and hypertension[15]	ACEi/ARB prescription	Inclusion Patients diagnosed with diabetes + hypertension
Statin for CVA[15]	Statin prescription	Inclusion CVA
Controller medication for poorly controlled asthma[15]	ICS or ICS+LABA	Inclusion Asthma + systemic steroid in past year
Controller medication for poorly controlled COPD[15]	ICS+LABA or LAMA+LABA or ICS+LAMA+LABA	Inclusion COPD + systemic steroid in past year

Abbreviations: ACEi, angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; CAD/MI, coronary artery disease/myocardial infarction; COPD, chronic obstructive pulmonary disease; CVA, cerebral vascular accident; ICS, inhaled corticosteroid; IVC, inferior vena cava; LABA, long-acting beta agonist; LAMA, long-acting muscarinic antagonist; NSAID, nonsteroidal anti-inflammatory drug; PSA, prostate-specific antigen
Note: Additional details on codes used for each measure in eTable 1

Statistical Analysis

To determine the association of the first surge with high- and low-value quality, we performed a difference in differences (DiD) analysis. We compared the difference between the initial surge quarter (Q2 2020) and the previous quarter (Q1 2020) with the difference between those same quarters of the prior year (Q2 2019 and Q1 2019). We calculated *p*-values using generalized estimating equations, clustered by location using the 'egeoloc' variable, which is the geographic location (state regional level) of the primary beneficiary's residence. The generalized estimating equations used the linear link function to calculate the DiD estimates, regardless of whether the outcome was continuous or dichotomous. A linear link function (instead of logistic or log links) is preferred in DiD analyses in which the goal is to evaluate absolute changes because the interaction between year (2019, 2020) and quarter (Q1, Q2) can be directly interpreted as the DiD.[28,29] The generalized estimating equations with the linear link function are robust since the outcome does not need to be normally distributed nor have constant variance, and thus are appropriate for continuous or discrete data.[30]

We considered $p<0.05$ to be significant. We used SAS statistical programming software version 9.4 (Cary, NC) for all the analyses.

RESULTS

Patient Characteristics

Between January 2018 and June 2020, there were 9,352,569 continuously enrolled adults in MarketScan® (Table 2). Mean age was 44 years (SE, 0.01), 52% were female, 43% lived in the South, 73% lived in an urban area, and 75% were employed. About 93% had commercial insurance, and 98% had a Charlson comorbidity score of 1 or less.

Table 2 Characteristics of Adults in the USA Continuously Enrolled in MarketScan®, January 2018 to June 2020

	All adults (*n*=9,352,569)
Age, mean (SD)	44.43 (15.03)
Gender, *n* (%)	
Male	4,451,125 (47.59)
Female	4,901,444 (52.41)
Region, *n* (%)	
Northeast	1,937,504 (20.72)
Midwest	2,101,944 (22.47)
South	4,027,759 (43.07)
West	1,256,562 (13.44)
Unknown	28,800 (0.31)
Charlson comorbidity score	
0–1	9,197,979 (98.35)
2+	154,590 (1.65)
Rural-urban status, *n* (%)	
Urban	6,844,946 (73.19)
Rural	2,507,623 (26.81)
Insurance plan type, *n* (%)	
Commercial	8,727,583 (93.32)
Medicare supplement	624,986 (6.68)
Employment, *n* (%)	
Employed	6,967,955 (74.50)
Unemployed/retired	2,384,614 (25.50)

Provision of Low-Value Care

Receipt of nearly every type of measured low-value care decreased during the surge when comparing the quarter prior to the surge with the same quarters a year earlier (Table 3; Fig. 1a; eTable 2). Receipt of low-value cancer screening decreased the most (overall DiD, −0.86% [95% CI, −1.03 to −0.69]). While all low-value cancer screening decreased, prostate cancer screening for older men (DiD, −0.82% [95% CI, −1.03 to −0.60]) and cervical cancer screening for older women (DiD, −0.79% [95% CI, −0.91 to −0.66]) had large significant reductions.

Low-value imaging decreased during the surge (overall DiD, −0.78% [95% CI, −0.88 to −0.69]; Table 3; Fig. 1a). For example, head imaging for evaluation of syncope dropped significantly (DiD, −1.11% [95% CI, −1.34 to −0.89]). Some low-value procedures had small but significant decreases during the surge, such as vertebroplasty (DiD, −1.61% [95% CI, −2.93 to −0.28]).

Low-value treatments decreased during the surge (overall DiD, −0.52% [95% CI, −0.67 to −0.38]; Table 3; Fig. 1a). Large decreases occurred for antibiotic administration for influenza (DiD, −1.93% [95% CI, −2.37 to −1.5]) and the use of anxiolytics, sedatives, and hypnotics in older adults (DiD, −0.84% [95% CI, −0.97 to −0.72]). In contrast, use of opioid medications for back and neck pain (DiD +0.94 [95% CI, +0.82 to +1.07]) and use of opioid medications for headache (DiD +0.38 [95% CI, 0.07 to 0.69]) were the only two observed low-value care measures to increase during the surge.

Provision of High-Value Care

Receipt of nearly all measured high-value care decreased during the surge (Table 3; Fig. 1b; eTable 2). High-value cancer screening decreased significantly (overall DiD, −4.07% [95% CI, −4.66 to −3.49]), with large differential decreases in both cervical cancer screening (DiD, −5.04% [95% CI, −5.71 to −4.36]) and breast cancer screening (DiD, −2.38% [95% CI, −2.77 to −1.98]). Decreases in high-value diabetes care were the largest noted among all measures (overall DiD, −9.75% [95% CI, −10.79 to −8.71]). For example, A1c measurement decreased significantly (DiD, −7.95% [95% CI, −9.11 to −6.78]).

Most high-value treatments decreased during the surge (overall DiD, −0.55% [95% CI, −0.75 to −0.36]; Table 3; Fig. 1b). ACEI/ARB use for heart failure (DiD, −1.89% [95% CI, −2.23 to −1.55]) and diabetes and hypertension (DiD, −2.31% [95% CI, −2.55 to −2.07]) fell most notably. In contrast, statin use for CAD/MI (DiD, 0.85% [95% CI, 0.36 to 1.34]) and dyslipidemia (DiD, 0.4% [95% CI, 0.04 to 0.76]) increased. Beta blocker use for heart failure, statin use for CVA, and controller medication for poorly controlled COPD were not significantly different.

Table 3 The Quality of Outpatient Care Delivered to Adults During the first Surge of the COVID-19 Pandemic

	Q1 2020 (%)	Q2 2020 (%)	2020 difference (%)	Q1 2019 (%)	Q2 2019 (%)	2019 difference (%)	Difference in difference, % (95% CI)
Low-value care measures							
Cancer screening	1.54	1.05	−0.49	1.93	2.30	0.37	−0.86 (−1.03, −0.69)
Cervical cancer screening for women ages 65+	1.21	0.70	−0.51	1.55	1.83	0.28	−0.79 (−0.91, −0.66)
Colorectal cancer screening for adults ages 85+	0.78	0.46	−0.32	1.05	1.16	0.11	−0.43 (−0.62, −0.24)
PSA testing for men ages 75+	2.17	2.02	−0.15	2.54	3.21	0.67	−0.82 (−1.03, −0.60)
Imaging	1.96	1.30	−0.66	2.13	2.25	0.12	−0.78 (−0.88, −0.69)
Head imaging in the evaluation of syncope	3.89	2.70	−1.19	3.19	3.39	0.2	−1.11 (−1.34, −0.89)
Head imaging for uncomplicated headache	1.87	1.22	−0.65	2.04	2.14	0.1	−0.76 (−0.85, −0.66)
Procedures	0.01	0.01	0	0.01	0.01	0	0 (0, 0)
Renal artery angioplasty or stenting	0.21	0.16	−0.05	0.22	0.20	−0.02	−0.02 (−0.14, 0.09)
Vertebroplasty or kyphoplasty for osteoporotic vertebral fractures	4.47	3.24	−1.23	3.71	4.09	0.38	−1.61 (−2.93, −0.28)
Arthroscopic surgery for knee osteoarthritis	0.06	0.04	−0.02	0.06	0.07	0.01	−0.02 (−0.03, −0.01)
Treatments	10.28	9.42	−0.86	11.03	10.69	−0.34	−0.52 (−0.67, −0.38)
Opioids for back/neck pain[a]	2.54	3.39	0.85	2.68	2.58	−0.1	0.94 (0.82, 1.07)
Opioids for headache[a]	3.27	3.78	0.51	3.63	3.76	0.13	0.38 (0.07, 0.69)
Antibiotics for influenza[a]	11.55	7.03	−4.52	15.76	18.20	2.44	−1.93 (−2.37, −1.5)
Anxiolytics, sedatives, and hypnotics in older adults	21.90	21.30	−0.6	21.59	21.84	0.25	−0.84 (−0.97, −0.72)
Benzodiazepine for depression	11.59	11.02	−0.57	12.23	12.19	−0.04	−0.53 (−0.63, −0.43)
Antidepressant monotherapy in bipolar disorder	11.99	11.95	−0.04	11.03	11.23	0.2	−0.24 (−0.5, 0.02)
NSAID use for hypertension, heart failure, or kidney disease	8.03	7.23	−0.8	9.17	8.85	−0.32	−0.48 (−0.62, −0.34)
High-value care measures							
Cancer screening	10.83	7.02	−3.81	12.19	12.45	0.26	−4.07 (−4.66, −3.49)
Cervical cancer screening	6.60	4.30	−2.3	7.53	7.61	0.08	−5.04 (−5.71, −4.36)
Breast cancer screening	12.20	7.66	−4.54	13.86	14.36	0.5	−2.38 (−2.77, −1.98)
Diagnostic and preventive measures	1.92	0.76	−1.16	1.59	1.31	−0.28	−0.87 (−1.01, −0.73)
Influenza vaccine	4.23	1.67	−2.56	3.52	2.88	−0.64	−1.93 (−2.37, −1.49)
Diabetes care	39.40	31.05	−8.35	40.42	41.82	0.4	−9.75 (−10.79, −8.71)
Hemoglobin a1c measurement	34.52	27.60	−6.92	35.39	36.41	1.02	−7.95 (−9.11, −6.78)
Eye exam	7.81	5.19	−2.62	8.24	8.86	0.62	−3.24 (−4.30, −2.19)
Treatment	38.02	37.05	−0.97	39.55	39.13	−0.42	−0.55 (−0.75, −0.36)
Anticoagulation for atrial fibrillation[a]	2.53	2.49	−0.04	2.31	2.45	0.14	−0.18 (−0.31, −0.04)
ACEI/ARB for heart failure	45.99	44.59	−1.4	45.44	45.93	0.49	−1.89 (−2.23, −1.55)
Beta blocker for heart failure	43.73	44.25	0.52	43.44	44.06	0.62	−0.09 (−0.59, 0.40)
Salicylates and/or platelet aggregation inhibitors for CAD/MI	4.40	4.18	−0.22	3.72	4.00	0.28	−0.50 (−0.61, −0.39)
Beta blocker for CAD/MI	34.95	34.60	−0.35	35.89	36.42	0.53	−0.89 (−1.19, −0.59)
Statin for CAD/MI	39.86	38.84	−1.02	46.69	44.82	−1.87	0.85 (0.36, 1.34)
Statin for dyslipidemia	31.18	30.37	−0.81	35.74	34.52	−1.22	0.40 (0.04, 0.76)
ACEi/ARB for diabetes and hypertension	55.07	53.14	−1.93	54.30	54.68	0.38	−2.31 (−2.55, −2.07)
Statin for CVA	31.64	30.84	−0.8	36.19	35.18	−1.01	0.20 (−0.19, 0.59)
Controller medication for poorly controlled asthma	5.48	4.76	−0.72	4.79	4.69	−0.1	−0.62 (−0.76, −0.47)
Controller medication for poorly controlled COPD	7.28	6.59	−0.69	8.57	8.03	−0.54	−0.15 (−0.51, 0.21)

[a]These measures are on the encounter level. All other measures are on the patient level
Purple indicates DiD is not statistically significant (p>0.05)
Abbreviations: ACEi, angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; CAD/MI, coronary artery disease/myocardial infarction; CI, confidence interval; COPD, chronic obstructive pulmonary disease; CVA, cerebral vascular accident; IVC, inferior vena cava; NSAID, nonsteroidal anti-inflammatory drug; and PSA, prostate-specific antigen
Note: Additional details in eTable 2

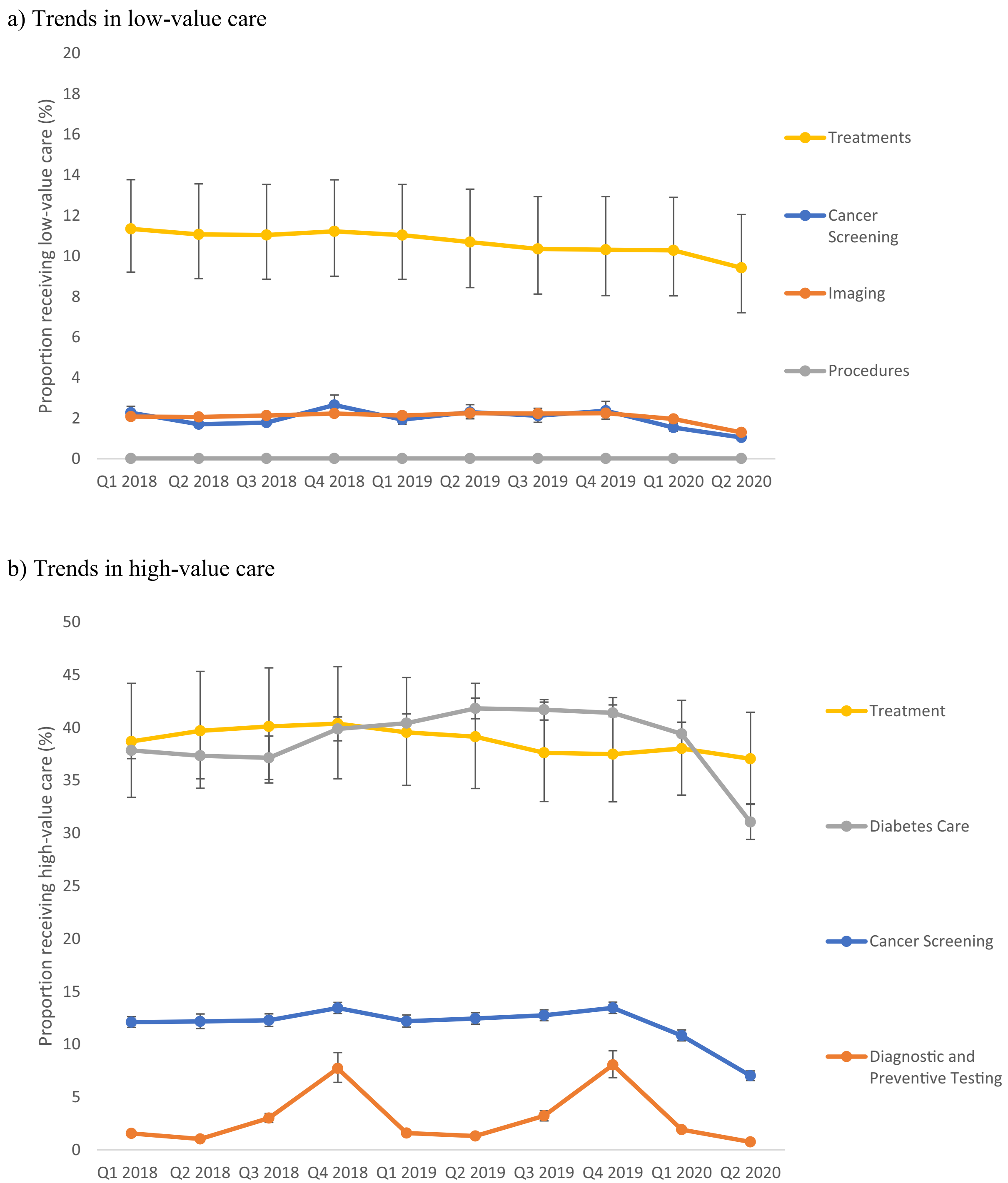

Fig. 1 Trends in low- and high-value care. Error bars represent 95% confidence intervals. a Trends in low-value care. b Trends in high-value care.

DISCUSSION

In this large national sample of mostly commercially insured adults who received outpatient care during the first COVID-19 surge, we characterize the changes in high- and low-value care delivery associated with the surge. We demonstrate that the first COVID-19 surge was associated with a marked decrease in nearly all high-value care and a smaller but significant decrease in low-value care.

Our work builds on others. Chen and colleagues showed that screenings for breast, colorectal, and prostate cancer declined sharply during the initial surge of the COVID-19 pandemic and then nearly recovered by July 2020.[22] Heintzman and colleagues reported that cervical cancer, breast cancer, and diabetes screening declined in community health centers.[31] Our work adds a national insured cohort, a set of 31 high- and low-value metrics, and a difference in differences approach.

There were likely several reasons for these observations. First, initial surge conditions increased the risk level of in-person care for both patients and clinicians. This led to widespread substitution of remote care, estimated in the commercial population to have increased from 0.8 to 17.8 visits per 1000 enrollees.[9] In-person care dropped from 102.7 to 76.3 visits per 1000 enrollees. This change in modality made it harder to deliver many kinds of high-value care, including in-office procedures such as cervical cancer screening (5% reduction) and laboratory tests such as A1c measurement (8% reduction).[9,32] Remote care likely drove an approximately 1% reduction in low-value in-office procedures such as cervical cancer screening for women ages 65+, laboratory tests such as PSA testing, and imaging such as head imaging for uncomplicated headache. Clinicians were less likely to prescribe in low-value manners such as antibiotics for influenza, benzodiazepines for depression, and nonsteroidal anti-inflammatory drugs in patients with hypertension, heart failure, or kidney disease. In short, commercially insured Americans missed out on significant life-saving care, particularly Americans with diabetes, and they saw some reductions in care that could harm them. The long-term impact of this is yet to be determined.

Second, due to the significant system focus on managing COVID-19 during the initial surge, other medical problems were likely deprioritized, with clinicians focusing less on high-value preventive and maintenance care and patients seeking care less frequently for minor concerns that might result in low-value care.

The increase in use of opioids for pain and headache is a concerning outlier for low-value treatments, given the increase in opioid overdoses observed during the pandemic.[33,34] Perhaps shifts in policy allowing for remote prescribing of opioids, or perhaps a lack of access resulting in more automatic refills from prescribers, made inappropriate opioid use more common.[35]Another possibility is that pandemic stressors increased the number of patient concerns regarding pain and headache resulting in additional prescriptions.

Our study has limitations. First, the study is observational; our findings do not imply causation. Second, the MarketScan® database does not contain detailed sociodemographic variables such as race or ethnicity data, precluding us from performing important analyses on any disparate impact on various groups.[36] We also examined a continuously enrolled population, which limits generalizability, particularly given employment shifts during the pandemic. Third, our quality measures do not reflect all outpatient care, as MarketScan® does not contain granular clinical data necessary to estimate some measures. Fourth, at the time of analysis, data were not available beyond the first surge that could have served to demonstrate additional trend in the following surges that occurred. Data were similarly not available before 2018, precluding us from measuring some measures that required additional years of historical data. This specifically limits our low-value cancer screening measures when there may have been a prior reason to continue screening in older adults. Fifth, we were not able to partition the population to examine just those areas most affected by the first surge, which may have shown even larger associations, although this represents an opportunity for future work.

Our findings were a clear result of both the pandemic and the policy response to the pandemic. They point toward changes in healthcare system design that might enhance high-value care delivery while maintaining reductions in low-value care. It has been estimated that cost savings for such system redesign could lead to an estimated $12.8 billion to $28.6 billion in savings annually.[37] First, creating a home-first approach would enable several diagnostics to continue. For example, mobile phlebotomy, mail-in blood spots for A1c monitoring, and kitted cervical cancer screening could all maintain a high level of screening despite pandemic conditions. Second, ensuring delivery and drive-through pharmacies can maintain access to high-value treatments.[38] The appearance of this delivery model throughout the country likely prevented a large drop in high-value treatments. Third, maintaining telehealth reimbursement allows for continued evaluation and management, perhaps without access to some of the lower-value care that often comes with in-person evaluation, such as head imaging and vertebroplasty. Taken together, the pandemic presents an opportunity to reevaluate the health system to eliminate services that provide little or no benefit, and to embrace and enhance services that provide the most value in order to create a better system that is more resilient, coordinated, equitable, and sustainable.[39]

CONCLUSIONS

Commercially insured Americans received less high-value care and less low-value care during the first surge of the COVID-19 pandemic, although low-value opioid use increased. Our analysis allows health systems, payors, practitioners, and policymakers to identify the gaps created by surge conditions and design solutions to bolster high-value care while maintaining the benefits from reduced low-value care.

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- *Acquisition, analysis, or interpretation of data: all authors.*
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