

By Ishani Ganguli, Maia L. Crawford, Benjamin Usadi, Kathleen L. Mulligan, A. James O'Malley, Ching-Wen Wendy Yang, Elliott S. Fisher, and Nancy E. Morden

DOI: 10.1377/hlthaff.2022.01319  
HEALTH AFFAIRS 42,  
NO. 8 (2023): 1128–1139  
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The People-to-People Health  
Foundation, Inc.

# Who's Accountable? Low-Value Care Received By Medicare Beneficiaries Outside Of Their Attributed Health Systems

**Ishani Ganguli** (iganguli@bwh.harvard.edu), Brigham and Women's Hospital, Boston, Massachusetts.

**Maia L. Crawford**, Dartmouth College, Lebanon, New Hampshire.

**Benjamin Usadi**, Dartmouth College.

**Kathleen L. Mulligan**, Brigham and Women's Hospital.

**A. James O'Malley**, Dartmouth College.

**Ching-Wen Wendy Yang**, Dartmouth College.

**Elliott S. Fisher**, Dartmouth College.

**Nancy E. Morden**, UnitedHealthcare, Minnetonka, Minnesota.

**ABSTRACT** Policy makers and payers increasingly hold health systems accountable for spending and quality for their attributed beneficiaries. Low-value care—medical services that offer little or no benefit and have the potential for harm in specific clinical scenarios—received outside of these systems could threaten success on both fronts. Using national Medicare data for fee-for-service beneficiaries ages sixty-five and older and attributed to 595 US health systems, we describe where and from whom they received forty low-value services during 2017–18 and identify factors associated with out-of-system receipt. Forty-one percent of low-value services received by attributed beneficiaries originated from out-of-system clinicians: 35 percent from specialists, 5 percent from primary care physicians, and 1 percent from advanced practice clinicians. Recipients of low-value care were more likely to obtain that care out of system if age 75 or older (versus ages 65–74), male (versus female), non-Hispanic White (versus other races or ethnicities), rural dwelling (versus metropolitan dwelling), more medically complex, or experiencing lower continuity of care. However, out-of-system service receipt was not associated with recipients' health systems' accountable care organization status. Health systems might improve quality and reduce spending for their attributed beneficiaries by addressing out-of-system receipt of low-value care—for example, by improving continuity.

**P**olicy makers and payers increasingly hold health systems accountable for the cost and quality of the care received by their attributed beneficiaries, regardless of where the care originates. Low-value care—medical services that offer little or no benefit and have the potential for harm in specific clinical scenarios—remains common and could threaten success on both fronts.<sup>1,2</sup> Beneficiaries receiving low-value care outside of their attributed systems are a particular challenge for systems seeking to reduce spending and improve health outcomes.

Understanding the scope and origins of out-of-

system low-value care use may help health system leaders design and implement effective interventions to reduce spending and harms for their attributed beneficiaries.<sup>1–4</sup> For example, the low-value services most often ordered by out-of-system specialists might best be reduced through referral network management, patient education, and increased access to high-value within-system specialists. Yet no study, to our knowledge, has examined out-of-system low-value care receipt or spending.

In this study we sought to answer two main questions. First, how much of low-value care use and spending by health system-attributed

fee-for-service Medicare beneficiaries originates outside of health system walls, and from which categories of clinicians? Second, which beneficiaries are at greater risk of receiving out-of-system low-value care? To this end, we analyzed 100 percent national Medicare administrative data for beneficiaries ages sixty-five and older who were attributed to 595 US health systems based on Centers for Medicare and Medicaid Services (CMS) Medicare Shared Savings Program attribution methodology.<sup>5</sup> For each of forty low-value services, we determined the share of service use and spending attributable to out-of-system clinicians over the course of a two-year period. We then identified beneficiary- and system-level factors associated with low-value service receipt and receipt out of system.

## Study Data And Methods

**OVERVIEW** We studied fee-for-service Medicare beneficiaries ages sixty-five and older attributed to US health systems. For each of forty potentially low-value services, we determined the share of received services (and associated Medicare spending) during the period 2017–18 that originated from (ordered or referred for by) an out-of-system primary care physician, a specialist physician, or an advanced practice clinician. Then, among beneficiaries eligible for low-value services (that is, those for whom receipt would be considered low value—for example, prostate cancer screening is considered low value for men older than age seventy-five without a history of prostate cancer), we identified beneficiary and health system factors associated with receiving the thirty most common low-value services and (among recipients) with receiving these thirty services out of system.

**DATA** We used 2016–18 Medicare fee-for-service administrative data, including 100 percent Part A (inpatient) and Part B (outpatient) claims and Part D (prescription) data for a random 40 percent sample of beneficiaries.<sup>6</sup>

**STUDY POPULATION** Our sample included US-residing fee-for-service Medicare beneficiaries who were age sixty-five or older as of January 1, 2016; who had no hospice claims during 2017–18; and who were continuously enrolled in Medicare Parts A and B through 2018 or until death. For study measures using prescription data, we required continuous Part D enrollment through 2018 or until death.

**BENEFICIARY AND CLINICIAN ATTRIBUTION** We identified health systems using the 2018 Agency for Healthcare Research and Quality (AHRQ) Compendium of U.S. Health Systems<sup>7</sup> and attributed each beneficiary to the system that provided the plurality of their primary care services across

2017 and 2018, consistent with CMS Medicare Shared Savings Program attribution methodology.<sup>5</sup> We excluded pediatric health systems (based on a compendium indicator) and systems with fewer than 250 attributed beneficiaries. We determined clinicians' health system affiliations using the IQVIA OneKey database,<sup>8</sup> which describes the relationships among providers, medical practices, and systems.

**LOW-VALUE CARE MEASURES** We operationalized forty claims-based, low-value care definitions for services relevant to older adults, leveraging our prior work and the Milliman MedInsight Health Waste Calculator, version 8.0,<sup>9</sup> as previously described.<sup>1</sup> We used 2016–18 data to identify beneficiaries eligible for each service and to measure the receipt of each service among eligible beneficiaries in 2017–18 (see online appendix exhibits 1 and 2 for details).<sup>10</sup>

To ascribe each low-value service to its originating clinician, we used the National Provider Identifier (NPI) on the claim as follows: “referring NPI” (for nondrug services identifiable using the Medicare Professional claims file), “attending NPI” (for nondrug inpatient and outpatient facility claims), or “prescribing NPI” (for drugs), based on consultation with experts in CMS clinical coding. We determined clinician categories using self-reported Provider Enrollment, Chain and Ownership System data (updated every five years) in the Medicare Data on Provider Practice and Specialty file.<sup>11</sup> Specifically, primary care physicians were defined by specialty in general practice, family practice, internal medicine, pediatric medicine, and geriatric medicine. We defined specialist physicians as those with any other physician specialty and advanced practice clinicians as nurse practitioners, certified clinical nurse specialists, and physician assistants.

**COVARIATES** We examined factors that were potentially associated with a beneficiary's likelihood of receiving low-value care<sup>1,2,12,13</sup> and the likelihood that this occurred outside of their attributed health system.

**BENEFICIARY VARIABLES** The following variables were determined using 2016 data: age (65–74, 75–84, and 85 and older); sex (male and female); race and ethnicity (Research Triangle Institute race codes: non-Hispanic White, non-Hispanic Black, Hispanic, and non-Hispanic other);<sup>14</sup> CMS Hierarchical Condition Categories (CMS-HCC) score (a higher score indicates greater medical complexity);<sup>15</sup> continuity of care (estimated using the Bice-Boxerman Continuity of Care Index among beneficiaries with four or more visits in the year to allow stable estimates,<sup>16,17</sup> with the index ranging from 0 if each visit was with a different clinician to 1 if all visits

were with the same clinician); rural-urban residence (based on rural-urban commuting area codes: metropolitan, micropolitan, small town, and rural);<sup>18</sup> and hospital referral region (HRR)-level standardized risk-adjusted per capita Medicare spending based on residential ZIP code (Dartmouth Atlas).<sup>19</sup>

**ATTRIBUTED HEALTH SYSTEM VARIABLES** We used measures from the AHRQ Compendium to assess health system size (number of physicians), specialty mix (proportion of all physicians who specialize in primary care), accountable care organization (ACO) status (proportion of system physicians participating in an ACO contract), and teaching hospital status (whether or not the system had at least one major teaching hospital), all using 2018 data. We used 2017 Medicare claims to determine a health system's market share, defined as the proportion of all Medicare fee-for-service beneficiaries ages sixty-five and older living in a beneficiary's HRR in 2017 who were attributed to the beneficiary's attributed system that year. See appendix exhibit 3 for details.<sup>10</sup>

**ANALYSES** For each of the forty low-value services examined, we determined the share originating from clinicians outside of the beneficiary's health system by clinician type: primary care physician, specialist physician, and advanced practice clinician.

We calculated total and out-of-system Medicare spending on low-value services received by system-attributed beneficiaries, excluding any nondrug services provided in inpatient and skilled nursing facility settings because individual service charges are not itemized on these claims. Given uncertainty about the portion of a total payment attributable to a low-value service, we measured spending using narrow and broad definitions to provide a range of estimates;<sup>20</sup> we defined *narrow* as claim line-level spending (counting only payments associated with a claim line identified as low value) and *broad* as case-level spending (counting the entire claim payment if a component claim line was identified as low value).

Next, we assessed factors associated with low-value service receipt and (among recipients) out-of-system receipt. We restricted these analyses to the thirty low-value services received by at least 2,500 eligible beneficiaries in our sample, and we excluded beneficiaries with missing covariate values (see appendix exhibit 4).<sup>10</sup> We built two repeated measures linear probability models at the beneficiary-service level, such that each person appeared as many times as they were eligible for any of the thirty services. The first model included all beneficiaries eligible for the low-value services, and the outcome was receipt of

## We estimate that out-of-system low-value care accounted for 40–55 percent of all low-value care spending.

these services (binary for each beneficiary-service). The second model included all beneficiaries who received low-value services, and the outcome was out-of-system receipt of these services (binary for each beneficiary-service). The models included indicators for eligibility for each service, the above covariates, and health system random effects. We accounted for nonindependence of observations, as a result of correlation of binary outcomes, by clustering standard errors at the health system level.

In a post hoc analysis, we examined whether health systems in which attributed beneficiaries received less low-value care overall were more likely to receive that care out of system. In an exploratory analysis to assess whether factors associated with out-of-system low-value care receipt differed by the type of clinician who usually ordered or referred for the service, we stratified the multivariable repeated measures model by services in the lowest and highest quartiles of primary care physician ordering or referring (that is, services that were least often and most often ordered or referred for by primary care physicians, respectively) (see appendix exhibit 4).<sup>10</sup>

We constructed claims-based measures and ran analyses using SAS, version 9.4, and Stata, version 17.0. Reported *p* values were two sided, and *p* < 0.05 represented statistical significance. This study followed Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines and was approved by the Dartmouth College Committee for the Protection of Human Subjects.

**LIMITATIONS** We acknowledge several limitations. First, although we used forty widely accepted claims-based low-value care definitions, these services represent only a portion of all low-value care, and claims data lack clinical details to aid the adjudication of value. Identifying these services is also sensitive to clinicians' coding practices.<sup>21</sup>

# Interpersonal relationships, and perhaps primary care physician access, may be protective against low-value care receipt.

Second, although our claims-based approach to identifying which clinicians ordered or referred for services was informed by clinical experience and by coding experts, misattribution could have occurred as a result of coding errors, inconsistencies in how institutions assign NPIs on claims, or inaccurate specialty designation. Also, the clinicians identified as ordering or referring for services might not be the primary decision makers. For example, some surgeons may compel primary care physicians to order low-value preoperative testing before low-risk procedures via “medical clearance” forms.<sup>22</sup>

Third, this analysis focused on the 47 percent of all fee-for-service Medicare beneficiaries ages sixty-five and older attributed to one of 595 large US health systems identified by the AHRQ Compendium. Its findings might not generalize to Medicare Advantage enrollees, to younger fee-for-service beneficiaries, or to beneficiaries attributed to unexamined systems. Further, we did not focus on in-system low-value care, nor did we assess use of or spending on high-value care.

## Study Results

In our full sample of 10,937,519 beneficiaries, mean age was 74.6 years (standard deviation: 7.4), and 57.7 percent were female (appendix exhibit 5).<sup>10</sup> In aggregate, 42.6 percent of all forty low-value services originated from out-of-system clinicians. Overall, 4.7 percent originated from primary care physicians outside beneficiaries’ attributed health systems (range by service: 0.3–25.9 percent), 35.5 percent from out-of-system specialists (range by service: 4.6–66.6 percent), and 0.9 percent from out-of-system advanced practice clinicians (range by service: 0.0–4.3 percent) (exhibit 1, appendix exhibit 6).<sup>10</sup> For most health systems studied, one-third to one-half of the low-value services received by their attributed beneficiaries originated out of system (median: 43.2 percent; inter-

quartile range: 36.2–50.6) (data not shown).

**SPENDING** Estimated total Medicare spending for the forty measured low-value services over the course of the two-year study period was between \$584,795,508 (narrow definition of claim line-level spending) and \$2,331,900,566 (broad definition of case-level spending), of which \$237,495,852 (40.6 percent of total low-value care spending, narrow definition) to \$1,246,809,870 (53.5 percent of total low-value care spending, broad definition) was spent out of system (appendix exhibit 7).<sup>10</sup> Estimated out-of-system spending, by the narrow and broad definitions, respectively, was highest for eye disease imaging (range, \$86,290,371–951,166,342), percutaneous coronary intervention in asymptomatic patients (range, \$28,466,462–29,438,936), and injection for low back pain (range, \$23,805,701–27,039,275) (appendix exhibit 7).<sup>10</sup>

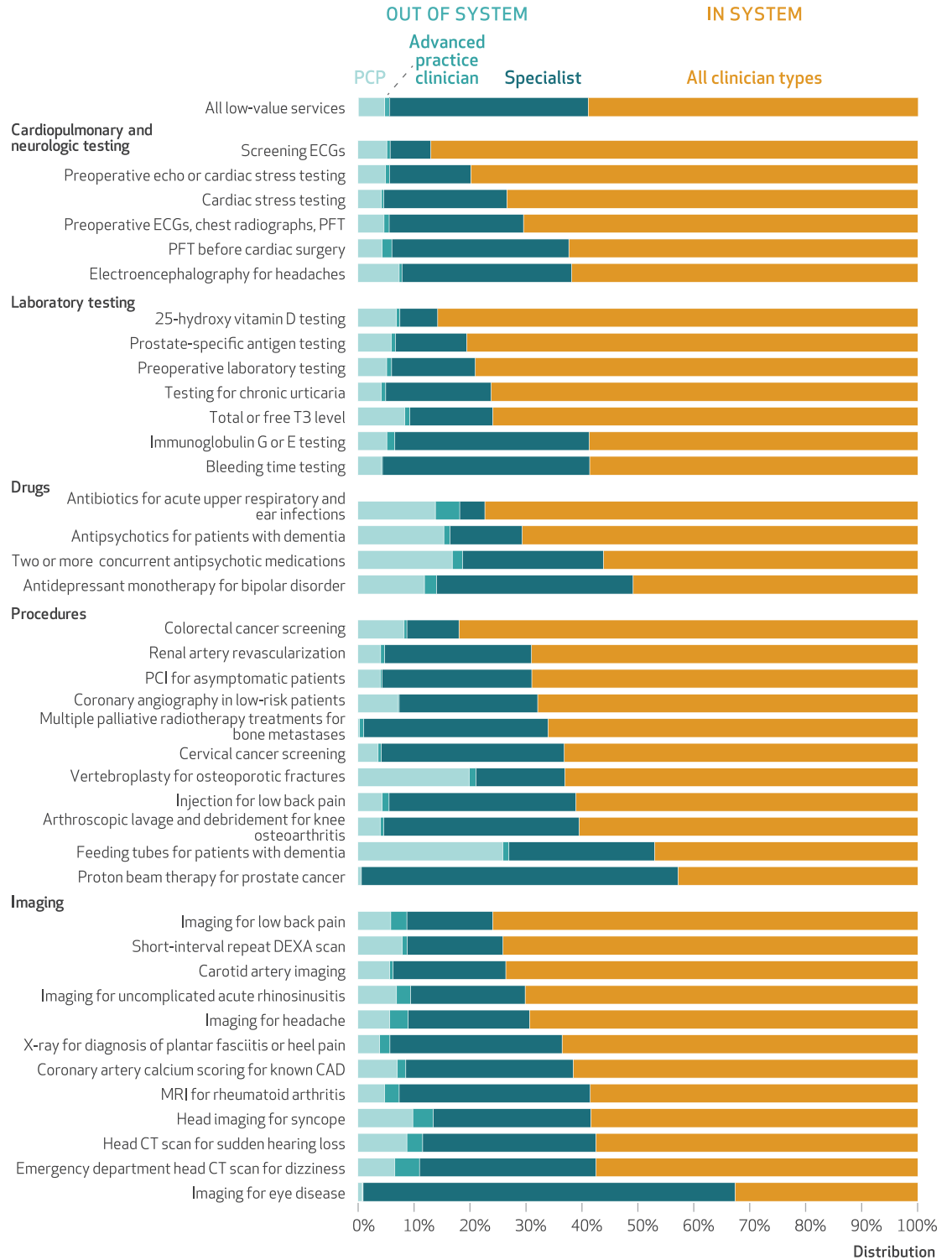
**FACTORS ASSOCIATED WITH LOW-VALUE CARE RECEIPT AND OUT-OF-SYSTEM RECEIPT** Beneficiaries were more likely to receive any of the thirty most common low-value services (appendix exhibit 4)<sup>10</sup> if they were younger, female, or non-Hispanic White or other race or ethnicity; had a lower CMS-HCC score; had a lower continuity-of-care score; resided in an area that was metropolitan or had higher per capita health care spending; or were attributed to a system with a smaller proportion of physicians specializing in primary care or without a major teaching hospital (exhibit 2, appendix exhibit 8).<sup>10</sup> Among beneficiaries who received any low-value services, factors associated with receiving that care out of system included older age (seventy-five or older), male sex, White race, higher CMS-HCC score, lower continuity-of-care score, rural residence, and attribution to a system in the highest size quartile or with lower market share (exhibit 2, appendix exhibit 8).<sup>10</sup> There was no association between out-of-system receipt and the ACO status of one’s attributed system. For systems in which attributed beneficiaries had a lower likelihood of receiving any low-value care, the beneficiaries who did receive low-value care were more likely to receive that care out of system (appendix exhibit 9).<sup>10</sup>

**STRATIFICATION BY PRIMARY CARE VERSUS SPECIALIST ORIENTATION** We examined how the association between the aforementioned factors and out-of-system receipt differed for low-value services predominantly originating from primary care physicians and those predominantly originating from specialists (associations with beneficiary- and health system-level factors are shown in exhibits 3 and 4, respectively; see appendix exhibit 4 for services).<sup>10</sup> We found that beneficiaries who were from racial or ethnic minority groups and women were less likely to



EXHIBIT 1

Distribution of clinicians ordering or referring for 40 low-value services in five categories received by Medicare fee-for-service beneficiaries ages 65 and older, by type of clinician and in-system status, 2017-18



**SOURCE** Authors' analysis of Medicare fee-for-service administrative data from the period 2016-18, including 100% Parts A (inpatient) and B (outpatient) claims and Part D (prescription) data for a random 40% sample of beneficiaries. **NOTES** PCP is primary care physician. ECG is electrocardiogram. Echo is echocardiography. PFT is pulmonary function testing. T3 is triiodothyronine. PCI is percutaneous coronary intervention. DEXA is dual-energy x-ray absorptiometry. CAD is coronary artery disease. MRI is magnetic resonance imaging. CT is computed tomography.

**EXHIBIT 2**
**Beneficiary- and health system-level characteristics associated with receipt of any low-value care and out-of-system low-value care by Medicare fee-for-service beneficiaries ages 65 and older, 2017-18**

Characteristics	Difference in receipt of any low-value care <sup>a</sup>	Among low-value care recipients, difference in out-of-system receipt <sup>a</sup>
<b>BENEFICIARY LEVEL (2016)</b>		
Age, years		
65-74	Ref	Ref
75-84	-0.22****	0.56****
85+	-0.59****	1.38****
Sex		
Male	Ref	Ref
Female	0.17****	-3.18****
Race and ethnicity		
Non-Hispanic White	Ref	Ref
Non-Hispanic Black	-0.30****	-2.63****
Hispanic	-0.10****	-2.12****
Non-Hispanic other	0.11***	-2.30****
Medical complexity (CMS-HCC score)		
Quartile 1 (≤0.44)	Ref	Ref
Quartile 2 (>0.44 to ≤0.72)	-0.64****	1.55****
Quartile 3 (>0.72 to ≤1.28)	-1.05****	2.56****
Quartile 4 (>1.28)	-1.86****	4.05****
Continuity of care (Bice-Boxerman Continuity of Care Index), change per 10% increase	-0.10****	-0.22****
Rural-urban residence		
Metropolitan	Ref	Ref
Micropolitan	-0.04	1.48****
Small town	-0.08**	3.81****
Rural	-0.11****	4.25****
<b>HEALTH SYSTEM LEVEL</b>		
Share of health system physicians participating in ACO contract (2018)		
Quartile 1 (≤0.00)	Ref	Ref
Quartile 2 (>0.00 to ≤0.18)	0.26***	0.09
Quartile 3 (>0.18 to ≤0.57)	0.06	0.07
Quartile 4 (>0.57)	-0.02	0.32
Market share <sup>b</sup> (2017)		
Quartile 1 (≤0.04)	Ref	Ref
Quartile 2 (>0.04 to ≤0.10)	0.05	-11.15****
Quartile 3 (>0.10 to ≤0.20)	-0.03	-15.78****
Quartile 4 (>0.20)	0.00	-18.53****

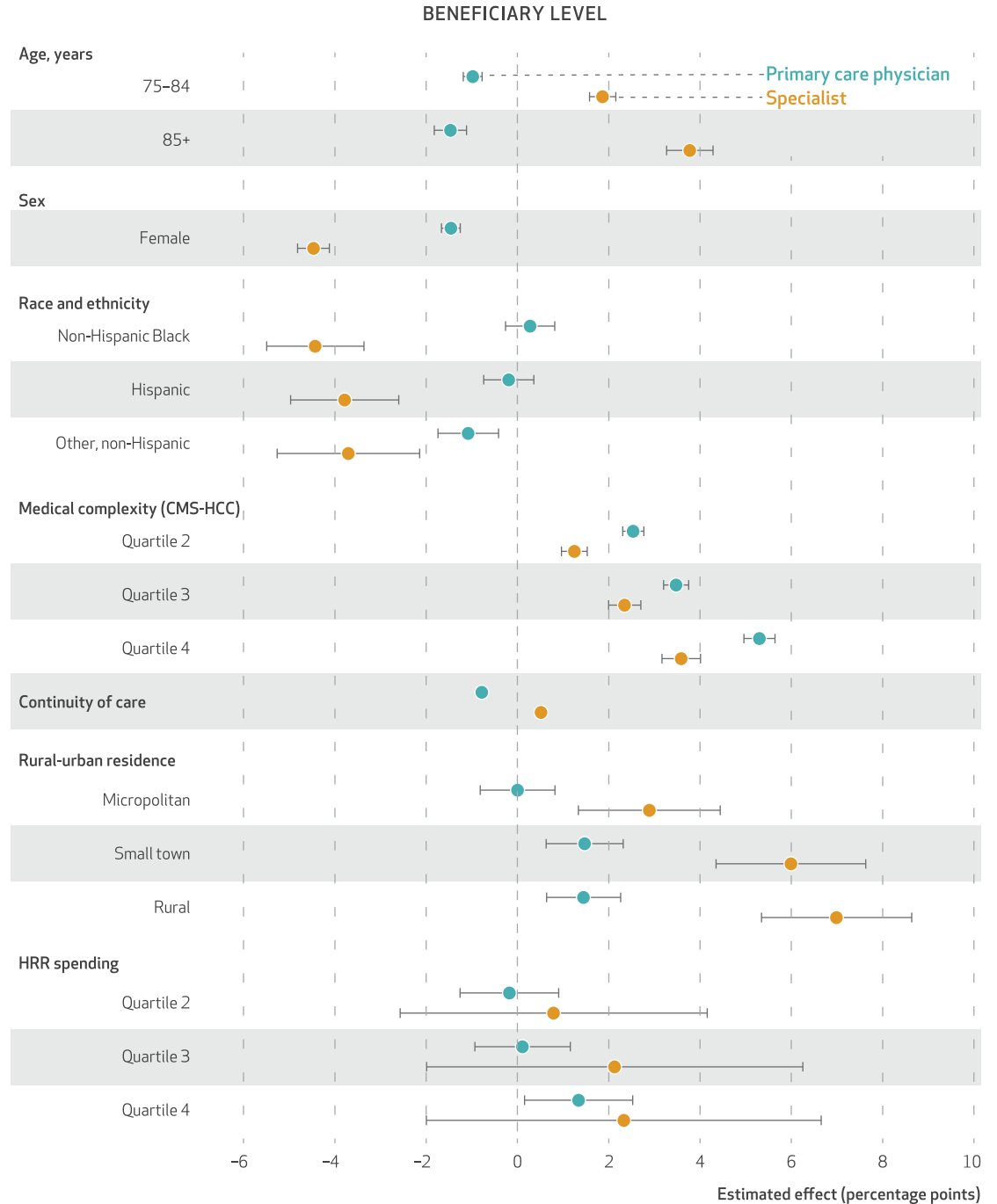
**SOURCE** Authors' analysis of Medicare fee-for-service administrative data, from the period 2016-18, including 100% Parts A (inpatient) and B (outpatient) claims and Part D (prescription) data for a random 40% sample of beneficiaries. **NOTES** Analysis included the 30 most common low-value services of the 40 examined (details are in appendix exhibit 4; see note 10 in text). Number of observations is 32,483,881 and 3,547,673 for the low-value care receipt and out-of-system receipt models, respectively. Further details on characteristic specifications are in appendix exhibit 3. CMS-HCC is Centers for Medicare and Medicaid Services Hierarchical Condition Categories. ACO is accountable care organization. <sup>a</sup>Percentage points. <sup>b</sup>Proportion of all Medicare fee-for-service beneficiaries ages 65 and older living in a beneficiary's hospital referral region in 2017 who were attributed to the beneficiary's attributed system in 2017. \*\*\*\*p < 0.01 \*\*\*\*\*p < 0.001

receive out-of-system low-value services predominantly originating from specialists, whereas older beneficiaries and those in nonmetropolitan (that is, rural, small town, and micropolitan) areas were more likely to receive out-of-system low-value services predominantly originating from specialists (exhibit 3). Greater continuity of care was associated with lower likelihood of out-of-system receipt for services

typically originating from primary care physicians and higher likelihood of out-of-system receipt for services typically originating from specialists (exhibit 3). Beneficiaries in systems with greater market share were less likely to receive out-of-system low-value services, regardless of the originating physician type (exhibit 4).

EXHIBIT 3

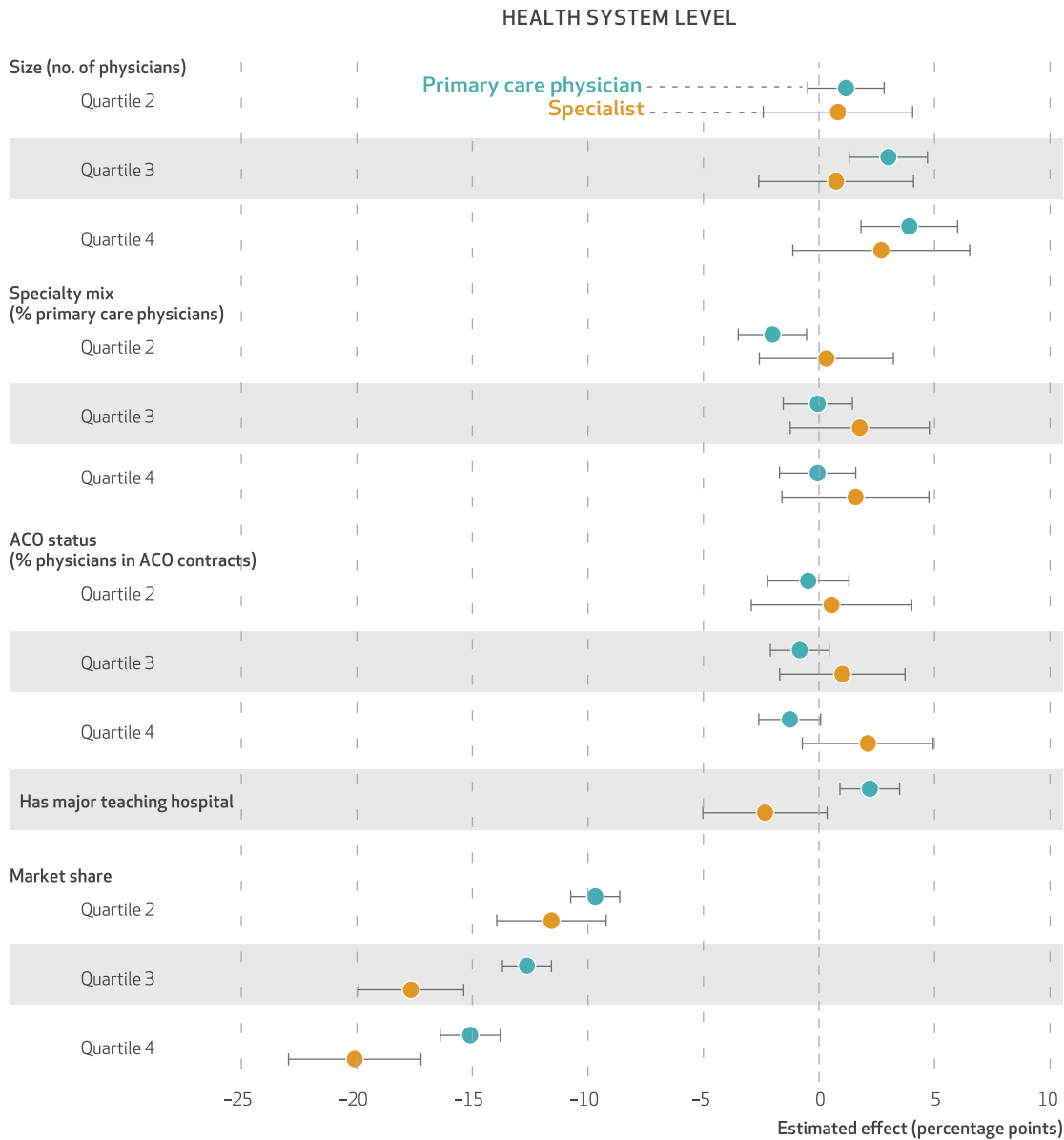
Among Medicare fee-for-service beneficiaries ages 65 and older receiving low-value care, association of beneficiary characteristics with out-of-system receipt, stratified by services usually originating from primary care physicians versus specialists, 2017-18



**SOURCE** Authors' analysis of Medicare fee-for-service administrative data from the period 2016-18, including 100% Parts A (inpatient) and B (outpatient) claims and Part D (prescription) data for a random 40% sample of beneficiaries. **NOTES** Services usually originating from primary care physicians and specialists are in appendix exhibit 4 (see note 10 in text). Number of observations: 1,619,026 and 1,285,471 for the lowest and highest quartiles of primary care physician ordering and referring, respectively. Error bars indicate 95% confidence intervals. Reference groups are as follows: age, 65-74; sex, male; race and ethnicity, non-Hispanic White; Centers for Medicare and Medicaid Services Hierarchical Condition Categories (CMS-HCC) score, quartile 1 (least complex); urban or rural residence group, metropolitan; and hospital referral region (HRR) spending, quartile 1 (lowest spending). Continuity of care is shown as change per 10% increase in Bice-Boxerman Continuity of Care index (see the text for details).

**EXHIBIT 4**

**Among Medicare fee-for-service beneficiaries ages 65 and older receiving low-value care, association of health system characteristics with out-of-system receipt, stratified by services usually originating from primary care physicians versus specialists, 2017-18**



**SOURCE** Authors' analysis of Medicare fee-for-service administrative data from the period 2016-18, including 100% Parts A (inpatient) and B (outpatient) claims and Part D (prescription) data for a random 40% sample of beneficiaries. **NOTES** Services usually originating from primary care physicians and specialists are in appendix exhibit 4 (see note 10 in text). Numbers of observations are in the exhibit 3 notes. Error bars indicate 95% confidence intervals. Reference groups are as follows: size, quartile 1 (smallest number of physicians); specialty mix, quartile 1 (lowest percent of primary care physicians); accountable care organization (ACO) status, quartile 1 (lowest percent of physicians in ACO contract); teaching hospital status, no major teaching hospital; and market share, quartile 1 (lowest market share).

**Discussion**

In this national Medicare claims analysis of forty low-value services, we found that most health systems' attributed beneficiaries received one-third to one-half of low-value services outside of these systems, at a measurable direct cost of

\$237 million-\$1.2 billion during 2017-18. Although most of this use and spending originated from out-of-system specialists, the proportions of low-value care originating from distinct clinician types varied across the low-value services studied (exhibit 1). Recipients of low-value care



who were older, male, White, rural-residing, or more medically complex; had less continuity of care; or were attributed to a system with lower market share were more likely than other beneficiaries to receive that low-value care outside of their systems. However, the ACO status of a beneficiary's attributed system (that is, the percentage of that system's physicians participating in an ACO contract) was not associated with the beneficiary's likelihood of receiving low-value care out of system. These findings suggest the potential to improve care quality and lower spending for system-attributed beneficiaries by targeting out-of-system low-value care.

We estimate that out-of-system low-value care accounted for 40–55 percent of all low-value care spending. Extrapolating from prior work, this likely represents a small percentage of total Medicare spending; in a 2014 study, twenty-six low-value care services accounted for 0.6–2.7 percent of total Medicare spending.<sup>23</sup> However, these approximations deserve further investigation. For example, these and most existing estimates did not account for often substantial spending on care cascades that follow low-value services.<sup>24,25</sup> They also did not capture patient harms and the opportunity costs of low-value care provision, which may have crowded out effective care.<sup>26</sup>

The patterns of out-of-system low-value care use shown in exhibit 1 add to prior evidence that specialists drive a large share of low-value care spending,<sup>27</sup> and they reveal potential targets for intervention. For low-value services often provided by out-of-system primary care physicians and advanced practice clinicians in acute care settings, such as antibiotics for upper respiratory infection, improved within-system acute care access (for example, by adding or extending after-hours capacity and telehealth) may be helpful. For low-value services primarily originating from out-of-system specialists (for example, percutaneous coronary interventions and eye imaging), high-value referral management may be a viable reduction strategy.<sup>28</sup> Of note, we found that one-third of low-value cervical cancer screenings (that is, those performed in women older than age sixty-five with adequate prior screening and not otherwise at high risk) originated from out-of-system specialists,<sup>29</sup> suggesting that for women without complex gynecological conditions, it may be helpful to encourage transition from routine gynecologist visits to comprehensive in-system primary care.

The associations between beneficiary factors and out-of-system low-value care receipt in this study are consistent with the broader literature on access to health care. Patients who are older, White, or male tend to have greater access to care

## For health systems held accountable by payers for care quality and spending for attributed beneficiaries, out-of-system low-value care is a triple threat.

than their counterparts and are more likely to have exposure to outside physicians (especially specialists);<sup>30</sup> our findings suggest that this exposure also increases beneficiaries' risk of receiving low-value care outside of their systems. In this study, non-Hispanic Black and Hispanic beneficiaries were less likely than White beneficiaries to receive low-value care overall, and when they received low-value care, they were less likely than White beneficiaries to receive it outside of their health systems. This may reflect lower rates of referral or self-referral to outside specialists.<sup>31</sup> Although this could be viewed as “protective” in the case of low-value care, this finding also likely reflects barriers to needed care that warrant further investigation.

Beneficiaries with higher CMS-HCC scores (the measure for medical complexity) had greater receipt of out-of-system low-value care, perhaps because sicker patients (or those who accrued more diagnostic codes during health care interactions that in turn increased their CMS-HCC scores) had greater exposure to out-of-system clinicians.

Continuity of care was inversely associated with receipt of any low-value care. It was also inversely associated with receiving that care out of system among all thirty common services and among services predominantly originating from primary care physicians. These results suggest that interpersonal relationships, and perhaps primary care physician access, may be protective against low-value care receipt and may help ensure that any low-value services that a beneficiary receives are provided within that relationship (or within the system).<sup>32</sup> Although prior work has found that continuity of care is inversely associated with receipt of radiology and diagnostic tests overall,<sup>33–35</sup> ours is the first

study, to our knowledge, to specifically examine the association between continuity and low-value care receipt.

Nonmetropolitan residence was strongly associated with lower probability of any low-value care, which is consistent with prior findings,<sup>36</sup> and higher probability of receiving low-value care out of system. This may reflect the higher prevalence of independent physicians and relative lack of specialists in rural areas, and it suggests that expanding access to high-value in-system specialists through telemedicine may be beneficial.

We found no clear relationship between beneficiaries' attribution to systems with greater physician ACO participation and any low-value care receipt, consistent with earlier work,<sup>37</sup> nor were beneficiaries attributed to systems with greater physician ACO participation any less likely to receive low-value care out of system. These results suggest that ACOs might not prioritize the reduction of low-value care<sup>38</sup> (especially if a minority of their patients are covered under value-based contracts<sup>39</sup> or if low-value screenings confer net financial advantage to the ACO because they increase the beneficiary risk scores used to adjust Medicare spending targets) or that ACOs have limited influence on patients' decisions to seek out-of-system care. Unsurprisingly, the market share of the beneficiary's health system was inversely associated with the probability of receiving low-value care out of system. Future research should explore these dynamics further, clarify the relationship between low- and high-value care provided inside and outside of health systems, and identify effective system strategies to reduce low-value care specifically.<sup>40</sup>

### Clinical And Policy Implications

For health systems held accountable by payers for care quality and spending for attributed beneficiaries, out-of-system low-value care is a triple threat, representing not only poor-quality care that may cause patients harm but also higher spending against the benchmark, without fee-for-service revenue gains to offset this downside contract performance impact. In this context, our results suggest that health system leaders need to be aware of out-of-system low-value care use and consider cost-effective strategies to mitigate low-value care that extend beyond their walls.

The broader literature on low-value care reduction suggests that health system leaders might reduce out-of-system (as well as within-system) low-value care use through educational, behavioral, and structural interventions.<sup>4,41</sup> Because many patients often seek out-of-system care

without their primary care physicians' input, health systems might consider providing general education to patients about low-value care and the harms it presents.<sup>42,43</sup> Primary care physicians can use shared decision-making tools and targeted educational materials to help patients make more informed decisions about specialty care.<sup>42</sup> Leaders might also reduce low-value care by supporting continuity—for example, through after-hours primary care access, telemedicine, and the use of online patient scheduling with a default setting to book with one's own primary care physician.<sup>44</sup> Finally, health systems could adopt behavioral economic nudges and clinical decision support to help primary care physicians reduce referrals or, when referrals are needed, to encourage referrals to high-value in-system specialists based on cost and quality data.<sup>28,45</sup>

The role of payers and policy makers in aiding local efforts to address out-of-system low-value care is less clear and merits further research on the impact of such care and effective strategies to reduce it. Because ACO contract participation has had limited impact on low-value care receipt to date,<sup>37,38,46</sup> one such strategy may be for payers and policy makers to include specific low-value care services or a global low-value care index<sup>47</sup> in performance measures for future alternative payment models. Payers and policy makers may also consider providing low-value care feedback reports or peer comparison letters,<sup>48,49</sup> supporting clinicians (especially those in rural areas) with high-value specialist guidance, and rewarding top performers through public reporting or inclusion in high-value networks.<sup>28</sup> All of these efforts would need to target the decision makers ultimately responsible for specific low-value services (for example, to reduce preoperative testing before cataract surgery, target the ophthalmologists requiring the tests rather than the primary care physicians who ordered them).<sup>22</sup>

### Conclusion

We found that older, health system-attributed fee-for-service Medicare beneficiaries commonly received low-value care outside of their attributed systems during 2017–18. Our results provide insights on the magnitude and sources of out-of-system low-value care, which could inform health systems' efforts to reduce the use of these often costly, potentially harmful, and generally avoidable services. Given the threat of out-of-system low-value care to accountable care goals, health system leaders might consider extending low-value care reduction interventions outside of system walls. ■

A previous version of this research was presented at the AcademyHealth Annual Research Meeting in Washington, D.C., June 4–7, 2022. This work was supported by Arnold Ventures (Grant No. 19-02548 to Ishani Ganguli, Maia Crawford, A. James O'Malley, Ching-Wen Wendy Yang, Elliott S. Fisher, and Nancy E. Morden); the National Institute on Aging, National Institutes of Health (Grant No. K23AG068240 to Ganguli and Kathleen L. Mulligan); and the Agency for Healthcare Research and Quality's Comparative Health System

Performance Initiative, which studies how health care delivery systems promote evidence-based practices and patient-centered outcomes research in delivering care (Grant No. 1U19HS024075 to Crawford and Fisher). Ganguli reports receiving consultant fees from F-Prime. Morden is employed by UnitedHealthcare, which played no role in the development or publication of the manuscript. The authors thank Emma D. Chant of Brigham and Women's Hospital for her assistance with manuscript preparation.

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## NOTES

- Ganguli I, Morden NE, Yang CWW, Crawford M, Colla CH. Low-value care at the actionable level of individual health systems. *JAMA Intern Med.* 2021;181(11):1490–500.
- Segal JB, Sen AP, Glanzberg-Krainin E, Hutfless S. Factors associated with overuse of health care within US health systems: a cross-sectional analysis of Medicare beneficiaries from 2016 to 2018. *JAMA Health Forum.* 2022;3(1):e214543.
- Schwartz AL, Zaslavsky AM, Landon BE, Chernew ME, McWilliams JM. Low-value service use in provider organizations. *Health Serv Res.* 2018;53(1):87–119.
- Cliff BQ, Avanceña ALV, Hirth RA, Lee SD. The impact of Choosing Wisely interventions on low-value medical services: a systematic review. *Milbank Q.* 2021;99(4):1024–58.
- Centers for Medicare and Medicaid Services. Medicare Shared Savings Program: shared savings and losses and assignment methodology specifications [Internet]. Baltimore (MD): CMS; 2017 Apr [cited 2023 May 31]. Available from: <https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/shared-savingsprogram/Downloads/Shared-Savings-Losses-Assignment-Spec-V5.pdf>
- First Databank. FDB MedKnowledge [Internet]. San Francisco (CA): FDB; [cited 2023 Jul 17]. Available from: <https://www.fdbhealth.com/solutions/medknowledge-drug-database>
- Agency for Healthcare Research and Quality. Compendium of U.S. health systems, 2018 [Internet]. Rockville (MD): AHRQ; 2019 Nov [last updated 2021 Mar; cited 2023 May 31]. Available from: <https://www.ahrq.gov/chsp/data-resources/compendium-2018.html>
- IQVIA. OneKey reference assets [Internet]. Durham (NC): IQVIA; [cited 2023 May 31]. Available from: <https://www.iqvia.com/locations/united-states/solutions/life-sciences/information-solutions/essential-information/onekey-reference-assets>
- Milliman. MedInsight: Health Waste Calculator [Internet]. Seattle (WA): Milliman; [cited 2023 Jul 5]. Available from: <https://medinsight.com/wp-content/uploads/2023/08/medinsight-health-waste-calculator.pdf>
- To access the appendix, click on the Details tab of the article online.
- University of Minnesota, Research Data Assistance Center. Medicare Data on Provider Practice and Specialty (MD-PPAS) [Internet]. Minneapolis (MN): ResDAC; [cited 2023 May 31]. Available from: <https://resdac.org/cms-data/files/md-ppas>
- Schwartz AL, Jena AB, Zaslavsky AM, McWilliams JM. Analysis of physician variation in provision of low-value services. *JAMA Intern Med.* 2019;179(1):16–25.
- Chalmers K, Smith P, Garber J, Gopinath V, Brownlee S, Schwartz AL, et al. Assessment of overuse of medical tests and treatments at US hospitals using Medicare claims. *JAMA Netw Open.* 2021;4(4):e218075.
- University of Minnesota, Research Data Assistance Center. Research Triangle Institute (RTI) race code [Internet]. Minneapolis (MN): ResDAC; [cited 2023 May 31]. Available from: <https://resdac.org/cms-data/variables/research-triangle-institute-rti-race-code>
- Centers for Medicare and Medicaid Services. Detailed methodology for the 2018 Value Modifier and the 2016 Quality and Resource Use Report [Internet]. Baltimore (MD): CMS; [last updated 2017 Sep; cited 2023 May 31]. Available from: <https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/PhysicianFeedbackProgram/Downloads/Detailed-Methodology-for-the-2018-Value-Modifier-and-2016-Quality-and-Resource-Use-Report.pdf>
- Nyweide DJ, Bynum JPW. Relationship between continuity of ambulatory care and risk of emergency department episodes among older adults. *Ann Emerg Med.* 2017; 69(4):407–415.e3.
- Nyweide DJ, Anthony DL, Bynum JPW, Strawderman RL, Weeks WB, Casalino LP, et al. Continuity of care and the risk of preventable hospitalization in older adults. *JAMA Intern Med.* 2013;173(20):1879–85.
- WWAMI Rural Health Research Center. Rural-urban commuting area (RUCA) codes [Internet]. Seattle (WA): University of Washington; [cited 2023 May 31]. Available from: <https://familymedicine.uw.edu/rhrc/ruca/>
- Dartmouth Atlas Project. The Dartmouth atlas of health care [Internet]. Lebanon (NH): Dartmouth Atlas; [cited 2023 May 31]. Available from: <https://www.dartmouthatlas.org/>
- Mafi JN, Reid RO, Baseman LH, Hickey S, Totten M, Agniel D, et al. Trends in low-value health service use and spending in the US Medicare fee-for-service program, 2014–2018. *JAMA Netw Open.* 2021;4(2):e2037328.
- Cohen GR, Friedman CP, Ryan AM, Richardson CR, Adler-Milstein J. Variation in physicians' electronic health record documentation and potential patient harm from that variation. *J Gen Intern Med.* 2019; 34(11):2355–67.
- Mafi JN, Godoy-Travieso P, Wei E, Anders M, Amaya R, Carrillo CA, et al. Evaluation of an intervention to reduce low-value preoperative care for patients undergoing cataract surgery at a safety-net health system. *JAMA Intern Med.* 2019;179(5): 648–57.
- Schwartz AL, Landon BE, Elshaug AG, Chernew ME, McWilliams JM. Measuring low-value care in Medicare. *JAMA Intern Med.* 2014; 174(7):1067–76.
- Ganguli I, Lupo C, Mainor AJ, Raymond S, Wang Q, Orav EJ, et al.

- Prevalence and cost of care cascades after low-value preoperative electrocardiogram for cataract surgery in fee-for-service Medicare beneficiaries. *JAMA Intern Med.* 2019; 179(9):1211–9.
- 25 Ganguli I, Lupo C, Mainor AJ, Wang Q, Orav EJ, Rosenthal MB, et al. Assessment of prevalence and cost of care cascades after routine testing during the Medicare annual wellness visit. *JAMA Netw Open.* 2020;3(12): e2029891.
- 26 Ganguli I, Thakore N, Rosenthal MB, Korenstein D. Longitudinal content analysis of the characteristics and expected impact of low-value services identified in US Choosing Wisely recommendations. *JAMA Intern Med.* 2022;182(2):127–33.
- 27 Baum A, Bazemore A, Peterson L, Basu S, Humphreys K, Phillips RL. Primary care physicians and spending on low-value care. *Ann Intern Med.* 2021;174(6):875–8.
- 28 DeCamp M, Lehmann LS. Guiding choice—ethically influencing referrals in ACOs. *N Engl J Med.* 2015; 372(3):205–7.
- 29 Gerend MA, Bradbury R, Harman JS, Rust G. Characteristics associated with low-value cancer screening among office-based physician visits by older adults in the USA. *J Gen Intern Med.* 2022;37(10):2475–81.
- 30 Cook NL, Ayanian JZ, Orav EJ, Hicks LS. Differences in specialist consultations for cardiovascular disease by race, ethnicity, gender, insurance status, and site of primary care. *Circulation.* 2009;119(18):2463–70.
- 31 Johnston KJ, Hammond G, Meyers DJ, Joynt Maddox KE. Association of race and ethnicity and Medicare program type with ambulatory care access and quality measures. *JAMA.* 2021;326(7):628–36.
- 32 Ellenbogen MI, Wiegand AA, Austin JM, Schoenborn NL, Kodavarti N, Segal JB. Reducing overuse by healthcare systems: a positive deviance analysis. *J Gen Intern Med.* 2023 Feb 13. [Epub ahead of print].
- 33 Kern LM, Seirup JK, Casalino LP, Safford MM. Healthcare fragmentation and the frequency of radiology and other diagnostic tests: a cross-sectional study. *J Gen Intern Med.* 2017;32(2):175–81.
- 34 Amjad H, Carmichael D, Austin AM, Chang CH, Bynum JPW. Continuity of care and health care utilization in older adults with dementia in fee-for-service Medicare. *JAMA Intern Med.* 2016;176(9):1371–8.
- 35 Tam K, Williamson T, Ma IWY, Ambasta A. Association between health system factors and utilization of routine laboratory tests in clinical teaching units: a cohort analysis. *J Gen Intern Med.* 2022;37(6): 1444–9.
- 36 Barreto TW, Chung Y, Wingrove P, Young RA, Petterson S, Bazemore A, et al. Primary care physician characteristics associated with low value care spending. *J Am Board Fam Med.* 2019;32(2):218–25.
- 37 Schwartz AL, Cherner ME, Landon BE, McWilliams JM. Changes in low-value services in year 1 of the Medicare Pioneer accountable care organization program. *JAMA Intern Med.* 2015;175(11):1815–25.
- 38 Haverkamp MH, Peiris D, Mainor AJ, Westert GP, Rosenthal MB, Sequist TD, et al. ACOs with risk-bearing experience are likely taking steps to reduce low-value medical services. *Am J Manag Care.* 2018; 24(7):e216–21.
- 39 Muhlestein D, Saunders RS, de Lisle K, Bleser WK, McClellan MB. Growth of value-based care and accountable care organizations in 2022. *Health Affairs Forefront* [blog on the Internet]. 2022 Dec 2 [cited 2023 May 31]. Available from: <https://www.healthaffairs.org/content/forefront/growth-value-based-care-and-accountable-care-organizations-2022>
- 40 Cliff BQ, Hirth RA, Fendrick AM. Spillover effects from a consumer-based intervention to increase high-value preventive care. *Health Aff (Millwood).* 2019;38(3):448–55.
- 41 Colla CH, Mainor AJ, Hargreaves C, Sequist T, Morden N. Interventions aimed at reducing use of low-value health services: a systematic review. *Med Care Res Rev.* 2017;74(5): 507–50.
- 42 Sypes EE, de Grood C, Whalen Browne L, Clement FM, Parsons Leigh J, Niven DJ, et al. Engaging patients in de-implementation interventions to reduce low-value clinical care: a systematic review and meta-analysis. *BMC Med.* 2020; 18(1):116.
- 43 Morden NE, Colla CH, Sequist TD, Rosenthal MB. Choosing Wisely—the politics and economics of labeling low-value services. *N Engl J Med.* 2014;370(7):589–92.
- 44 Ganguli I, Orav EJ, Lupo C, Metlay JP, Sequist TD. Patient and visit characteristics associated with use of direct scheduling in primary care practices. *JAMA Netw Open.* 2020; 3(8):e209637.
- 45 Sorenson C, Japinga M, Crook H. Low-value care de-implementation: practices for systemwide reduction. *NEJM Catalyst* [serial on the Internet]. 2022 Apr 20 [cited 2023 May 31]. Available from: <https://catalyst.nejm.org/doi/abs/10.1056/CAT.21.0387>
- 46 Fowler L, Rawal P, Fogler S, Waldersen B, O’Connell M, Quinton J. The CMS Innovation Center’s strategy to support person-centered, value-based specialty care. *CMS Blog* [blog on the Internet]. 2022 Nov 7 [cited 2023 May 31]. Available from: [https://www.cms.gov/blog/cms-innovation-centers-strategy-support-person-centered-value-based-specialty-care#\\_ftn3](https://www.cms.gov/blog/cms-innovation-centers-strategy-support-person-centered-value-based-specialty-care#_ftn3)
- 47 Segal JB, Nassery N, Chang H-Y, Chang E, Chan K, Bridges JFP. An index for measuring overuse of health care resources with Medicare claims. *Med Care.* 2015;53(3):230–6.
- 48 Sacarny A, Barnett ML, Le J, Tetkoski F, Yokum D, Agrawal S. Effect of peer comparison letters for high-volume primary care prescribers of quetiapine in older and disabled adults: a randomized clinical trial. *JAMA Psychiatry.* 2018;75(10): 1003–11.
- 49 Albertini JG, Wang P, Fahim C, Hutfless S, Stasko T, Vidimos AT, et al. Evaluation of a peer-to-peer data transparency intervention for Mohs micrographic surgery overuse. *JAMA Dermatol.* 2019;155(8): 906–13.