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Review of Cancer-Specific Quality Measures Promoting the Avoidance of Low-Value Care

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ABSTRACT

Background. With rising healthcare costs and campaigns aimed at avoiding low-value care, reducing cancer overtreatment has emerged as an important measure of cancer care quality. The extent to which avoidance of low-value care has been incorporated in cancer-specific quality measures is unknown. We aimed to identify and characterize cancer quality measures that promote the avoidance of low-value care, and identify gaps that may guide future measure development.

Methods. We systematically identified cancer-specific quality measures from leading quality measure organizations [e.g., National Quality Forum (NQF), National Quality Measures Clearinghouse (NQMC)]. We reviewed measures promoting the avoidance of low-value cancer care and subclassified them into disease site- or non-disease site-specific categories and the phase of care they targeted.

Results. We reviewed 313 quality measures from six organizations. Of these, 18% ($n = 55$) focused on avoidance of low-value care. Quality measures focused on end-of-life care were most likely to focus on low-value care [$n = 13$ (50%)], followed by breast [$n = 12$ (18%)], lung [$n = 9$ (31%)], colon [$n = 8$ (20%)], prostate [$n = 5$ (38%)], general cancer care [$n = 4$ (3%)], symptoms and toxicities [$n = 2$ (40%)], and palliative cancer care [$n = 2$ (11%)] measures. The phases of care quality measures targeted included low-value screening [$n = 5$ (9%)], diagnostic testing and staging [$n = 7$ (13%)], treatment [$n = 19$ (34%)], surveillance [$n = 6$ (11%)], and clinical outcomes [$n = 18$ (33%)]. All categories had a treatment-specific quality measure, but no category had a representative measure for every phase of care.

Discussion. A minority of cancer quality measures are aimed at avoiding low-value care, and multiple evidence-based recommendations targeting low-value care have not been incorporated.

Quality measures are increasingly used to guide clinicians' treatment decisions and benchmark hospitals against national averages and peer institutions.[1,2] Implementation and high performance on these measures are required for hospital and program accreditation and pay-for-performance reimbursement.[3–7] They also allow for standardization of care and the ability to evaluate outcomes across providers and institutions.[8] Historically, cancer quality measures have focused on the active provision of care and adherence to guidelines for recommended therapies (i.e., delivering adjuvant chemotherapy or offering genetic testing when indicated). More recently, there has been increasing recognition of cancer overtreatment and the financial toxicities associated with low-value cancer care in the USA.[5–8] In response, organizations such as the Center for Medicare & Medicaid Services (CMS) are now prioritizing the identification of quality measures that will reduce low-value care through their value-based programs centered on lowering costs and unnecessary care for patients.[9]

There is clear importance for improving patient care in the understanding and appropriate implementation of quality measure in healthcare. Whether this prioritization

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has resulted in identification of more quality measures aimed at avoiding low-value care is still unknown. Previous studies evaluating cancer quality measures only used a subset of measures or were not focused on measures promoting the avoidance of low-value care. Cancer quality measures have previously been evaluated to identify the most impactful measures[10,11] and assess their reliability[12], implementation[13,14], practicality[15], or cost-effectiveness.[16] One study described the utility of quality measures aimed at avoiding low-value care but only cited a few measures.[17]

Our objective was to evaluate to what degree avoiding overtreatment or low-value care is viewed as a quality indicator by major quality organizations and accrediting bodies. Through review of leading quality measure organizations, we aimed to identify, classify, and review cancer-specific quality measures centered on the avoidance of low-value care. Secondarily, we aimed to identify gaps in current measures that may focus efforts for development of future quality measures.

METHODS

We conducted a review of published cancer-specific quality measures from August 2019 to February 2020. We obtained an initial list of measures from a recently published comprehensive review of cancer quality measures,[1] which included 300 measures from the National Quality Forum (NQF) or the National Quality Measures Clearinghouse (NQMC). The NQF and NQMC quality measure databases were reviewed to ensure this list of quality measures was accurate.[18,19] To expand our review, we also reviewed four other quality measure programs to find additional cancer-specific quality measures: the CMS Merit-based Incentive Payment System (MIPS), the National Committee for Quality Assurance's (NCQA) Healthcare Effectiveness Data and Information Set (HEDIS), the American Society of Clinical Oncology's (ASCO) Quality Oncology Practice Initiative (QOPI), and the Commission on Cancer (CoC) quality measures.[20–23] We included an additional 35 measures following this process. We felt this was an expansive search since the NQF-endorsed quality measures make up approximately 50% of quality measures used by federal healthcare programs and more than 30% of private payer programs.[24] The remaining organizations were commonly referenced quality measure programs.[11,25,26]

Two members of the study team (B.L.E. and A.K.M.) reviewed and classified the quality measures. Classification categories included non-disease site-specific (e.g., general oncologic care, symptoms and toxicities, end-of-life care, and palliative care) and disease site-specific (e.g., breast cancer, colorectal cancer, lung cancer, prostate cancer, etc.)

measures. The grouping of non-disease site-specific quality measures follows ASCO's categorization of nonspecific quality measures.[23] End-of-life care quality measures were specific to the last 30 days of life. Measures were additionally classified on the basis of the phase of care they targeted, which included: screening, diagnostic testing and staging, treatment, surveillance, and clinical outcomes.

Due to many cancer types having a low number of quality measures, a threshold for cancer type inclusion was set at ten unique quality measures. This resulted in the inclusion and review of four cancer types: breast, colorectal, lung, and prostate cancer. Lung cancer measures included those specific to non-small cell (NSCLC) and small cell lung cancer (SCLC) as well as general lung cancer treatment.

Starting with a previously described definition of low-value care,[27] measures promoting avoidance of low-value care were defined as having significant evidence validating their effectiveness at reducing unnecessary care and decreasing healthcare resource utilization (examples included in Table 1). Quality measures were independently reviewed, and any disagreements in classification were discussed until a consensus was reached. Descriptive statistics were used in analysis. The University of Michigan Institutional Review Board deemed this project not regulated (not human subjects research).
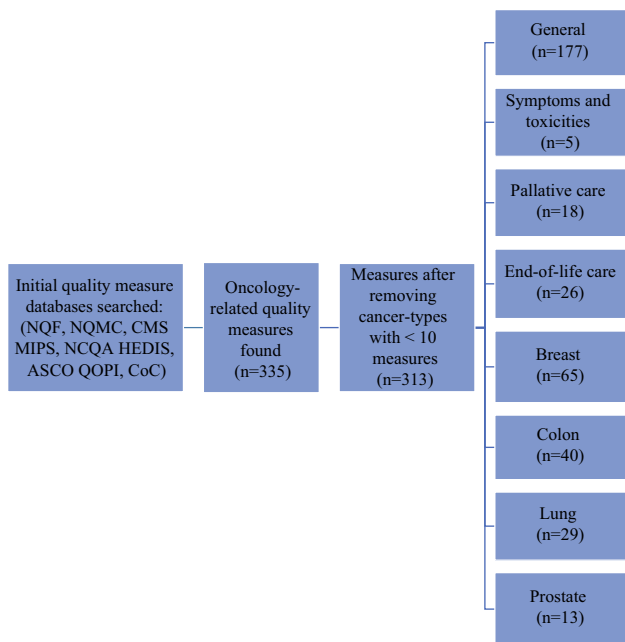
RESULTS

A total of 313 quality measures met inclusion criteria (Fig. 1). Overall, 18% ($n = 55$) of the measures promoted the avoidance of low-value care, 73% ($n = 230$) promoted implementation of some aspect of care, and the remaining 9% ($n = 28$) were classified as "other." The largest percentage of non-disease site quality measures involved general cancer care [$n = 117$ (37%)], followed by end-of-life care [$n = 26$ (8%)], palliative care [$n = 18$ (6%)], and symptoms and toxicities [$n = 5$ (2%)]. Breast cancer had the most disease site-specific quality measures [$n = 65$ (21%)], followed by colon [$n = 40$ (13%)], lung [$n = 29$ (9%)], and prostate [$n = 13$ (4%)] cancer. A list of quality measures promoting the avoidance of low-value care is provided in Appendix 1.

For non-disease site-specific quality measures, end-of-life care had the most quality measures promoting the avoidance of low-value care ($n = 13$), followed by general care ($n = 4$), palliative care ($n = 2$), and symptoms and toxicities ($n = 2$). Breast cancer had the most disease site-specific low-value care avoiding quality measures ($n = 12$), superseding lung ($n = 9$), colon ($n = 8$), and prostate ($n = 5$) cancer.

TABLE 1 The number and percentages of cancer-specific quality measures promoting the avoidance of low-value care. Further categorized into the phase of care the measures target, with examples

| Cancer type	Categories and percentages	Examples
General [n = 4 of 117 measures (3%)]	Treatment (n = 1)	GCSF administered to patients who received chemotherapy for metastatic cancer (lower score is better)
	Outcomes (n = 3)	Number of hospital admissions per chemotherapy patient per year
Symptoms and toxicities [n = 2 of 5 measures (40%)]	Treatment (n = 1)	Antiemetic therapy for low- and minimal-emetic-risk antineoplastic agents— avoidance of overuse (lower score is better)
	Outcomes (n = 1)	Number of hospitalizations for treatment-related symptoms
Palliative care [n = 2 of 18 measures (11%)]	Treatment (n = 2)	Chemotherapy administered to patients with metastatic solid tumor with performance status of 3, 4, or undocumented (lower score is better)
End-of-life care [n = 13 of 26 measures (50%)]	Treatment (n = 2)	Chemotherapy administered within the last 2 weeks of life (lower score is better)
	Outcomes (n = 11)	Percentage of patients who died from cancer admitted to the intensive care unit (ICU) in the last 30 days of life (lower score is better)
Breast [n = 12 of 65 measures (19%)]	Screening (n = 1)	Diagnostic imaging: inappropriate use of "probably benign" assessment category in screening mammograms
	Diagnostic testing and staging (n = 4)	PET, CT, or radionuclide bone scan ordered by practice within 60 days after diagnosis to stage I, IIA, or IIB breast cancer (lower score is better)
	Treatment (n = 3)	Patients with breast cancer and negative or undocumented human epidermal growth factor receptor 2 (HER2) status who are spared treatment with trastuzumab
	Surveillance (n = 4)	Serum tumor marker surveillance ordered by practice between 30 days and 365 days after diagnosis of breast cancer in patients who received treatment with curative intent for breast cancer (lower score is better)
Colon [n = 8 of 40 measures (20%)]	Screening (n = 3)	Preventive services for adults: percentage of patients over age 86 years who are screened for colorectal cancer
	Treatment (n = 3)	Patients with metastatic colorectal cancer and KRAS gene mutation spared treatment with anti-epidermal growth factor receptor monoclonal antibodies
	Surveillance (n = 1)	Avoid surveillance PET and PET–CT scanning in patients with asymptomatic colon cancer treated with curative intent
	Outcomes (n = 1)	Outpatient colonoscopy: facility-level rate of risk-standardized, all-cause, unplanned hospital visits within 7 days of an outpatient colonoscopy
Lung [n = 9 of 29 measures (31%)]	Treatment (n = 6)	Bevacizumab received by patients with initial AJCC stage IV or distant metastatic NSCLC with squamous histology (lower score is better)
	Surveillance (n = 1)	PET or PET–CT ordered by the practice between 0 and 12 months after treatment with curative intent for patients with stage I or stage II NSCLC (lower score is better)
	Outcomes (n = 2)	Risk-adjusted morbidity: length of stay > 14 days after elective lobectomy for lung cancer
Prostate [n = 5 of 13 measures (38%)]	Screening (n = 1)	Not recommended prostate-specific antigen (PSA)-based screening in older men: percentage of men 70 years and older who were screened unnecessarily for prostate cancer using PSA-based screening
	Diagnostic testing and staging (n = 3)	Avoidance of overuse of bone scan for staging low-risk prostate cancer patients
	Treatment (n = 1)	Percentage of patients, regardless of age, with a diagnosis of clinically localized prostate cancer receiving interstitial prostate brachytherapy, OR external beam radiotherapy to the prostate, OR radical prostatectomy, OR cryotherapy who received counseling on, at a minimum, the following treatment options for clinically localized disease prior to initiation of treatment: active surveillance, AND interstitial prostate brachytherapy, AND external beam radiotherapy, AND radical prostatectomy

General
(n=177)

Symptoms and
toxicities
(n=5)

Pallative care
(n=18)

End-of-life care
(n=26)

Breast
(n=65)

Colon
(n=40)

Lung
(n=29)

Prostate
(n=13)

Initial quality measure
databases searched:
(NQF, NQMC, CMS
MIPS, NCQA HEDIS,
ASCO QOPI, CoC)

Oncology-
related quality
measures
found
(n=335)

Measures after
removing
cancer-types
with < 10
measures
(n=313)

FIG. 1 Flow diagram showing the phases of quality measure identification and selection

Of the 55 quality measures promoting the avoidance of low-value care, 5 (9%) measures focused on screening, 7 (13%) on diagnostic testing and staging, 19 (34%) on treatment, 6 (11%) on surveillance, and 18 (33%) on clinical outcomes. Results are summarized in Table 1 and Figs. 2, 3, 4, 5.

Current gaps in quality measures promoting the avoidance of low-value care are presented in Table 2. There was no category where a representative quality measure was found for all phases of care, and breast cancer was the only category where four of the five phases were represented. For each category, a treatment-specific quality measure was found. Non-disease site-specific categories only had quality measures focused on treatment and/or clinical
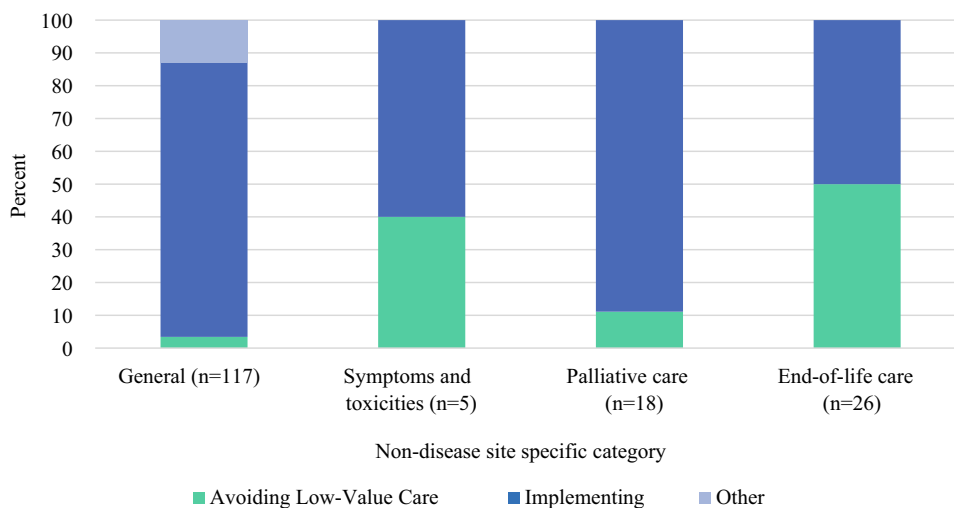
outcome phases of care. Diagnostic testing and staging-specific quality measures were found in the least number of categories, appearing in only breast and prostate cancer.
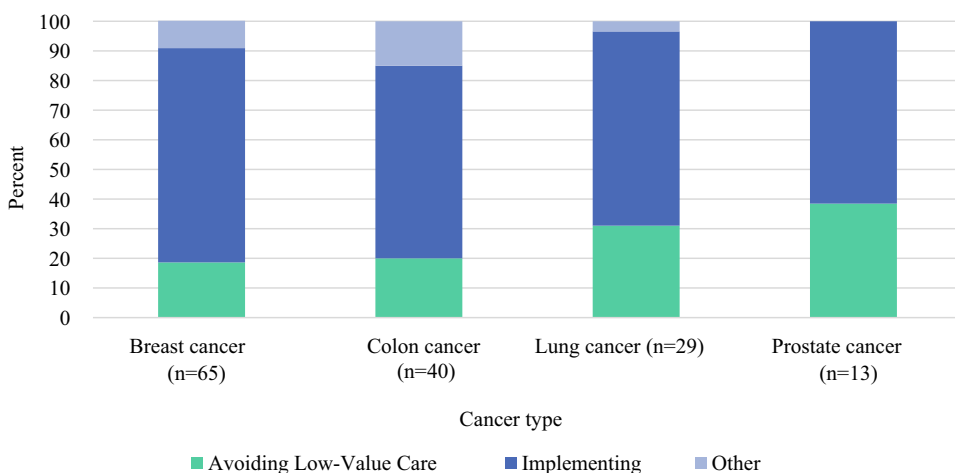
Non-Disease Site-Specific Cancer Quality Measures

General Of 117 general cancer quality measures, 4 promoted the avoidance of low-value care. The was only one treatment-specific quality measure, which focused on reducing administration of granulocyte colony-stimulating factor (GCSF) to patients receiving chemotherapy for metastatic cancer. GCSF is currently overused as prophylaxis against febrile neutropenia in patients receiving chemotherapy.[28–31] For the cancers included in this study, metastatic breast, lung, and colon cancer treatment protocols do not endorse the routine use of GCSF.[29,32,33] For potentially curable metastatic prostate cancer, GCSF is included in some guidelines, but its uses in these scenarios are limited.[34] Three of the measures targeted clinical outcomes. One measured the number of emergency room visits per chemotherapy patient per year, the other two measured all-cause readmission rates for patients being treated for cancer.

Symptoms and Toxicities

Of five quality measures related to symptoms and toxicities, two promoted the avoidance of low-value care. One measure targeted treatment, specifically avoiding overuse of antiemetic therapy for low-risk antineoplastic agents. Many cancer treatment protocols include antiemetic regimens, but overuse of antinausea medications is common in low-risk chemotherapy regimens.[35,36] The remaining measure centered on clinical outcomes, quantifying the number of cancer patients hospitalized for treatment-related symptoms.

FIG. 2 The percentage of quality measures promoting the avoidance of low-value care, implementing care, or other for each category of non-disease site-specific cancer quality measures

Non-disease site specific category

■ Avoiding Low-Value Care ■ Implementing ■ Other

FIG. 3 The percentage of quality measures promoting the avoidance of low-value care, implementing care, or other for each category of disease site-specific cancer quality measures

FIG. 4 The number of quality measures promoting the avoidance of low-value cancer care for each non-disease site-specific category, separated by the phase of care the measures target
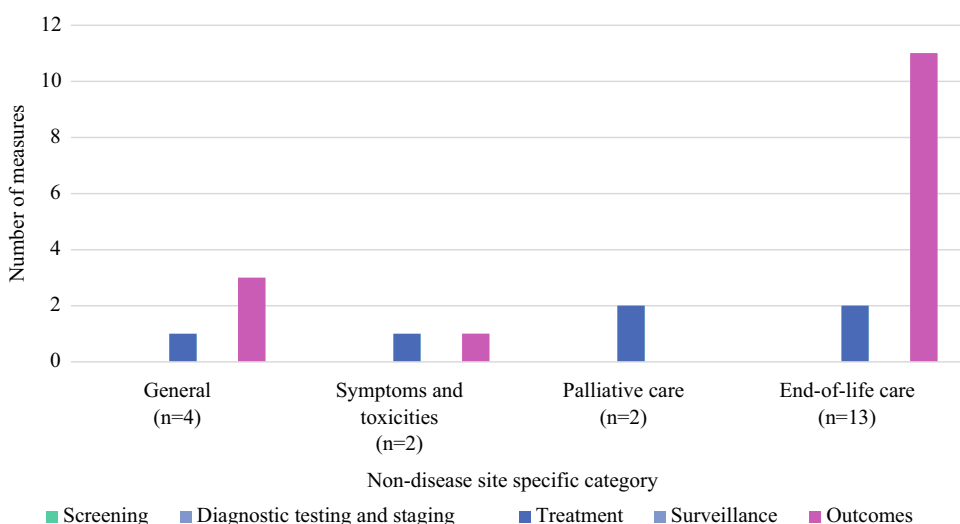
FIG. 5 The number of quality measures promoting the avoidance of low-value cancer care for each disease site-specific category, separated by the phase of care the measures target
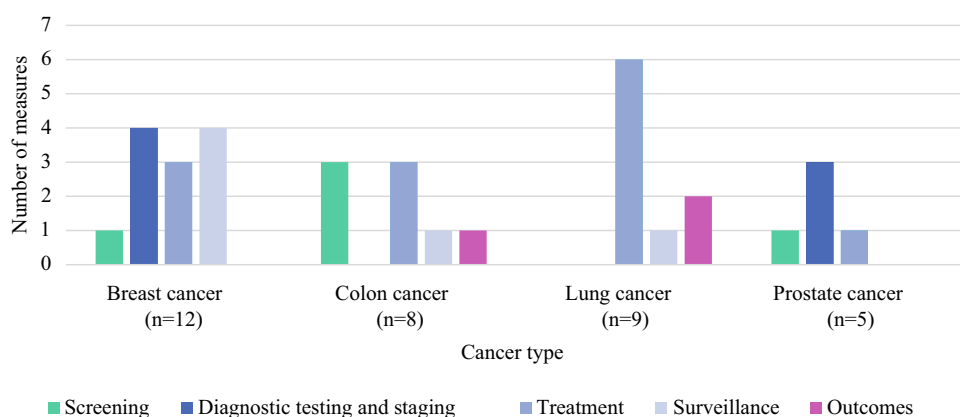
Palliative Care

Of 18 palliative care quality measures, 2 promoted the avoidance of low-value care, both measures focused on low-value treatment. One aimed to reduce administration of chemotherapy to patients with metastatic cancer and an undocumented Eastern Cooperative Oncology Group (ECOG) performance status or a score of 3 or 4. The other measure intended to reduce the number of cancer patients with bone metastases receiving multiple-fraction radiation therapy, which is associated with higher complications

TABLE 2 The different phases of care with a representative quality measure promoting the avoidance of low-value care for each quality measure category

Category of quality measure	Screening	Diagnostic testing and staging	Treatment	Surveillance	Outcomes
General			✔		✔
Symptoms and toxicities			✔		✔
Palliative care			✔		
End-of-life care			✔		✔
Breast cancer	✔	✔	✔	✔	
Colon cancer	✔		✔	✔	✔
Lung cancer			✔	✔	✔
Prostate cancer	✔	✔	✔		

For some of these categories, quality measures promoting the avoiding of low-value care may not be applicable

rates than and equivalent outcomes to single-fraction radiotherapy.[37]

End-of-Life Care

Of 26 end-of-life care quality measures, 13 promoted the avoidance of low-value care. Two measures were treatment-specific, with both measuring the number of patients receiving chemotherapy near the end of life, one at 14 days and the other at 30 days before death. The other 12 measured clinical outcomes. Five quality measures emphasized early enrollment of cancer patients with limited life expectancy into hospice care. Hospice enrollment was measured by determining the average number of days a patient was enrolled in hospice care, the proportion of patients enrolled into hospice care at a predetermined number of days before death, or the proportion of patients not admitted to hospice care before death. Four measures intended to reduce the number of cancer patients going to the emergency room, being admitted to the hospital, or dying in an acute care setting in the last 30 days of life. Three measures assessed chemotherapy administration in the final 30 days of life to reduce its use during this time. Lastly, one measure evaluated the overall costs for a cancer patient in the last 30 days of life.

Disease Site-Specific Cancer Quality Measures

Breast Cancer Of 65 breast cancer quality measures, 12 promoted the avoidance of low-value care. One of 12 measures targeted screening, specifically referring to avoiding the inappropriate use of "probably benign" [otherwise known as Breast Imaging Reporting and Data System-3 (BI-RADS-3)] in the assessment of breast imaging as this term has been shown to result in unnecessary referrals to breast cancer practitioners and to induce patient anxiety.[38] Diagnostic testing and staging-related measures accounted for 33% (n = 4) of the measures. Staging considerations consists of avoiding positron emission tomography (PET), computed tomography (CT), or radionuclide bone scans within 60 days after diagnosis of early stage (stage I, IIA, or IIB) breast cancer. Diagnostic testing measures encouraged avoiding excisional biopsies in favor of needle biopsies, and measured the percentage of clinically node negative patients with stage T1–T2 disease who received a sentinel lymph node biopsy (SLNB) with the goal of reducing complete axillary lymph node dissection (ALND). SLNB has been shown to have equivalent overall survival and recurrence rates with less morbidity when compared with ALND.[39,40] Treatment-related measures (n = 3) included not administering GCSF to patients who received chemotherapy for metastatic breast cancer, sparing patients with negative or undocumented human epidermal growth factor receptor 2 (HER2) status from trastuzumab treatment, or sparing patients with negative or undocumented estrogen/progesterone receptor status treatment from tamoxifen/aromatase inhibitor therapy. Surveillance measures (n = 4) focused on minimizing the use of PET, CT, or radionuclide bone scans and serum tumor markers within a year following diagnosis of breast cancer in patients who received treatment with curative intent. Both of these practices have been shown to have no clinical benefit and are not recommended in asymptomatic patients who are followed with the recommended frequency of examinations and mammography.[41]

Colon Cancer Of 40 colon cancer quality measures, 8 (20%) promoted the avoidance of low-value care. Three measures involved low-value screening practices. Screening quality measures encouraged consideration of life expectancy and risks before screening patients aged 76–85 years with colonoscopy, withdrawing patients aged ≥ 86 years from screening, and ensuring patients aged 50–75 years who had a colonoscopy without biopsy or polypectomy have a recommended follow-up interval of at

least 10 years before repeat colonoscopy. Treatment-specific measures ($n = 3$) involved not administering GCSF to patients who received chemotherapy for metastatic colon cancer and sparing patients with metastatic or nonmetastatic disease and positive KRAS or NRAS mutations treatment with anti-epidermal growth factor receptor monoclonal antibodies (Anti-EGFR MoAb). The one surveillance quality measure promoted the avoidance of PET or PET–CT scans in asymptomatic patients treated with curative intent. The one clinical outcomes-based measure assessed the facility rate of risk-standardized, all-cause, unplanned hospital visits within 7 days of an outpatient colonoscopy motivated by research suggesting clinicians performing colonoscopy commonly underestimate their complication rates.[42,43]

Lung Cancer (NSCLC, SCLC, and General)   Of 29 lung cancer quality measures, 9 promoted the avoidance of low-value care. Overall, seven addressed NSCLC, one focused on SCLC, and one targeted general lung cancer care. Six measures focused on treatment. As with measures for breast and colon cancer, one measure focused on refraining from administering GCSF to patients who received chemotherapy for metastatic NSCLC. Other NSCLC treatment-specific measures included avoiding adjuvant chemotherapy for patients with stage IA disease; avoiding adjuvant radiation for patients with stage IB or II cancer; not giving bevacizumab to patients with the American Joint Committee on Cancer (AJCC) stage IV or distant metastatic disease and squamous histology; and not prescribing EGFR tyrosine kinase inhibitor or ALK inhibitor therapy in patients with stage IV disease with negative or undocumented EGFR or ALK mutations. The one measure regarding treating SCLC focused on avoiding overtreatment with platinum-based chemotherapy. While, traditionally, recommendations for the number of cycles of platinum-based chemotherapy in SCLC have ranged from 4 to 6, recent evidence has shown that four cycles may be ideal at balancing effectiveness and risk.[44] The one measure that targeted surveillance was to avoid PET or PET–CT within 12 months after treatment with curative intent for patients with stage I or II NSCLC. Two clinical outcomes-related measures were identified, which emphasized the reduction of readmissions and overall complications after elective lobectomy, respectively.

Prostate Cancer   Of 13 prostate cancer quality measures, 5 promoted the avoidance of low-value care. The one screening quality measure identified was to avoid PSA screening in men aged ≥ 70 years. Most measures focused on diagnostic testing and staging ($n = 3$). All were related to avoiding low-value imaging (PET, CT, or radionuclide scans) for staging purposes within certain time frames after

diagnosis in low-risk patients. The one treatment-specific metric encouraged counseling patients on the risks and benefits of engaging in an active surveillance program for their prostate cancer before offering procedures like interstitial prostate brachytherapy, external bean radiotherapy, radical prostatectomy, or cryotherapy. These procedures are commonly overused in the treatment of prostate cancer and may expose patients to potentially unnecessary risks.[45]

DISCUSSION

This is the first article to the authors' knowledge identifying, quantifying, and categorizing cancer quality measures promoting the avoidance of low-value care. Since healthcare quality measures were first implemented in the USA in the late 1990s, increasing the value of healthcare has been a top priority.[46] Multiple studies and quality measure organizations have reported the need for quality measures targeting avoidance of low-value care to support this mission.[17,47,48] In this review, we demonstrate that 18% of cancer-specific quality measures promote the avoidance of low-value care and identify gaps in phases of care where quality measures focusing on low-value care were not found.

We identified several gaps where evidence-based recommendations supporting the avoidance of low-value care are not represented in quality measures. For example, no quality measures promoted the avoidance of low-value diagnosis or staging practices for lung cancer; however, since the early 2000s, multiple institutions, including the National Comprehensive Cancer Network (NCCN) and American College of Chest Physicians, have recommended against routine brain imaging in patients with lower stages of NSCLC owing to the low rates of brain metastases in patients lacking neurologic symptoms.[49,50] The Society of Thoracic Surgeons and the American Board of Internal Medicine (ABIM) have now endorsed a recommendation to raise awareness of this low-value test as part of the Choosing Wisely campaign.[51] Despite these recommendations, the use of this unnecessary staging test persists, with a study demonstrating that one in eight patients in the National Lung Screening Trial with Stage IA NSCLC underwent brain imaging.[49] None of these patients was found to have intracranial metastases, and all subsequently underwent the standard of care treatment.

Other areas not currently represented with low-value quality measures include prostate cancer surveillance, colon cancer staging, and breast cancer clinical outcomes. In prostate cancer, 35–70% of patients have low-risk disease and would be best managed with an active surveillance program, versus a more costly and riskier

intervention (i.e., prostatectomy).[52,53] The overtreatment of prostate cancer, however, remains prevalent.[54] Colon cancer staging is recommended in most newly diagnosed patients with a CT of the chest, abdomen, and pelvis. PET imaging in combination with CT has been shown to significantly increase costs without improving diagnostic accuracy, but its use has been increasing.[55] In breast cancer, patients whose surgical specimen after a lumpectomy procedure shows cancers cells only close to the edge of the surgical margin should not receive a reoperation.[56] The number of patients receiving a reoperation after pathology shows cancer cells near the surgical margin could be a measurable clinical outcome that has been demonstrated by the American Society of Breast Surgeons to be a low-value but commonly performed service.[57] These three examples also have representative Choosing Wisely recommendations,[51,58–60] but none has a representative quality measure. Broader incorporation of these types of recommendations into quality measures could help with the dissemination of these recommendations and serve as a strategy in achieving de-implementation.

By demonstrating that a minority of quality measures promote the avoidance of low-value care, this article adds to the body of knowledge showing the US healthcare system's current definition of quality is skewed towards the active provision of care. One of the three aims for the US healthcare system is reducing the trillions of dollars we spend yearly on low-value care[61], and identifying the causal problems is a critical step to accomplishing this goal. A next step includes identifying and studying the multiple barriers that are hindering the creation and application of measures targeting low-value care. One frequently cited barrier is the difficulty to accurately measure many low-value services.[17,27,48] For example, colon cancer screening at least every 10 years is accepted as being high-value care in patients aged 50–75 years,[62] and compliance with this recommendation is relatively straightforward to measure using administrative or claims data. After age 75 years, the USPSTF recommends engaging in shared decision-making (SDM) with the patient prior to offering screening.[62] As SDM is normally reported in the medical record, but not in claims data, SDM-focused quality measures can be far more difficult to measure.[63]

Another barrier to broader incorporation is the lack of consensus around what constitutes a low-value service.[17] Currently, many cancer tests and treatments are deemed low value because they have associated costs or risks to the patient and provide no overall survival benefit. However, providers and patients may value different outcomes than overall survival benefit (e.g., disease-specific survival, reduction in risk of recurrence, peace of mind). For example, this has been observed in older breast cancer patients undergoing SLNB. Several sources of data demonstrate this test has no overall survival benefit.[64] The Society of Surgical Oncology recommends against SLNB in women aged ≥ 70 years diagnosed with early-stage, hormone-receptor-positive breast cancer. However, this recommendation has not led to complete de-implementation of this procedure.[65] Qualitative studies suggest this discrepancy could stem from older patients' preference to accept a low-value procedure in exchange for prognostic information and peace of mind, regardless of the lack of a survival benefit.[66]

To help reduce the significant number of low-value services provided in the USA, the concept of quality must include not only the active provision of care, but also avoiding tests and treatments that are unlikely to benefit or could potentially harm patients. Organizations like CMS have had success reducing the utilization of some low-value services through quality measures within their value-based programs[9], but these types of programs are not represented throughout most quality and accreditation bodies.[67] Lastly, to improve the measurability of low-value tests and treatments, attention should be placed on the development of appropriateness measures by quality collaboratives—with outcomes centered on what is important to patients and providers.

This study has limitations that warrant consideration. First, we only included cancer types with at least ten quality measures. However, the four cancer types we included are the most diagnosed and treated in adults in the USA,[68] and we feel the overall principles may be generalizable to other cancer types as they pertain to low-value care reduction. Second, this review did not apply the austere search criterion needed for a systematic review that may have identified other quality-measure-producing organizations. There may be other measures created by less commonly referenced organizations not included in this manuscript. Since the organizations we included provide most of the quality measures used by hospitals and clinics, we do not believe this is a major threat to generalizability.

CONCLUSION

Quality measures have been shown to be effective at changing provider practices and hospital policies, and serving as a measurement tool to track our improvement when implemented.[69–71] Quality measure programs are also calling for the development of measures that increase the value of healthcare. Broader incorporation of quality measures promoting the avoidance of low-value care could reduce harm to patients and decrease costs.

APPENDIX

See Table 3.

TABLE 3 List of quality measures that promote the avoidance of low-value care with the category and phase of care they represent

Category	Quality measure	Phase of care
Breast	PET, CT, or radionuclide bone scan ordered by practice within 60 days after diagnosis of stage I, IIA, or IIB breast cancer (lower score is better) (top 5)	Diagnostic testing and staging
Breast	PET, CT, or radionuclide bone scan ordered outside of practice within 60 days after diagnosis of stage I, IIA, or IIB breast cancer (lower score is better) (top 5)	Diagnostic testing and staging
Breast	Image or palpation-guided needle biopsy [core or fine-needle aspiration (FNA)] of the primary site is performed to establish diagnosis of breast cancer	Diagnostic testing and staging
Breast	The percentage of clinically node negative (clinical stage T1N0M0 or T2N0M0) breast cancer patients before or after neoadjuvant systemic therapy who undergo a sentinel lymph node (SLN) procedure	Diagnostic testing and staging
Breast	Diagnostic imaging: inappropriate use of "probably benign" assessment category in screening mammograms	Screening
Breast	PET, CT, or radionuclide bone scan ordered by practice between day 61 and day 365 after diagnosis of breast cancer in patients who received treatment with curative intent (lower score is better) (top 5)	Surveillance
Breast	PET, CT, or radionuclide bone scan ordered outside of practice between day 61 and day 365 after diagnosis of breast cancer in patients who received treatment with curative intent (lower score is better) (top 5)	Surveillance
Breast	Serum tumor marker surveillance ordered by practice between 30 days and 365 days after diagnosis of breast cancer in patients who received treatment with curative intent for breast cancer (lower score is better) (top 5)	Surveillance
Breast	Serum tumor marker surveillance ordered outside of practice between 30 days and 365 days after diagnosis of breast cancer in patients who received treatment with curative intent for breast cancer (lower score is better) (top 5)	Surveillance
Breast	GCSF administered to patients who received chemotherapy for metastatic breast cancer (lower score is better)	Treatment
Breast	Patients with breast cancer and negative or undocumented human epidermal growth factor receptor 2 (HER2) status who are spared treatment with trastuzumab	Treatment
Breast	Tamoxifen or AI received when ER/PR status is negative or undocumented (lower score is better)	Treatment
Colorectal	Anti-EGFR MoAb therapy received by patients with KRAS and NRAS mutation (lower score is better)	Treatment
Colorectal	GCSF administered to patients who received chemotherapy for metastatic colon cancer (lower score is better)	Treatment
Colorectal	Patients with metastatic colorectal cancer and KRAS gene mutation spared treatment with anti-epidermal growth factor receptor monoclonal antibodies	Treatment
Colorectal	Preventive services for adults: percentage of patients aged 76–85 years old who are screened for colorectal cancer, unless there are significant considerations that support screening	Screening
Colorectal	Preventive services for adults: percentage of patients over age 86 years who are screened for colorectal cancer	Screening
Colorectal	Colorectal cancer screening: percentage of patients aged 50–75 years receiving a screening colonoscopy without biopsy or polypectomy who had a recommended follow-up interval of at least 10 years for repeat colonoscopy documented in their colonoscopy report	Screening
Colorectal	Avoid surveillance PET and PET–CT scanning in patients with asymptomatic colon cancer treated for curative intent	Surveillance
Colorectal	Outpatient colonoscopy: facility-level rate of risk-standardized, all-cause, unplanned hospital visits within 7 days of an outpatient colonoscopy	Outcomes
NSCLC	Adjuvant chemotherapy recommended for patients with AJCC stage IA NSCLC (lower score is better)	Treatment
NSCLC	Adjuvant radiation therapy recommended for patients with AJCC stage IB or II NSCLC (lower score is better)	Treatment

Table 3 (continued)

Category	Quality measure	Phase of care
NSCLC	Patients with stage IV NSCLC with EGFR mutation status unknown or without an activating EGFR mutation or ALK gene rearrangement who received first-line EGFR tyrosine kinase inhibitor or ALK inhibitor (lower score is better)	Treatment
NSCLC	GCSF administered to patients who received chemotherapy for metastatic NSCLC cancer (lower score is better)	Treatment
NSCLC	Bevacizumab received by patients with initial AJCC stage IV or distant metastatic NSCLC with squamous histology (lower score is better)	Treatment
SCLC	Overtreatment of SCLC patients with platinum-based chemotherapy	Treatment
Lung	Risk-adjusted morbidity and mortality for lung resection for lung cancer	Outcomes
Lung	Risk-adjusted morbidity: length of stay > 14 days after elective lobectomy for lung cancer	Outcomes
NSCLC	PET or PET–CT ordered by the practice between 0 and 12 months after treatment with curative intent for patients with stage I or stage II NSCLC (lower score is better)	Surveillance
Prostate	PET, CT, or radionuclide bone scan ordered by practice within 2 months after diagnosis to stage prostate cancer with low risk of metastases (lower score is better) (test measure)	Diagnostic testing and staging
Prostate	Prostate cancer: avoidance of overuse of bone scan for staging low-risk prostate cancer patients	Diagnostic testing and staging
Prostate	PET, CT, or radionuclide bone scan ordered outside of practice within 2 months after diagnosis of early-stage prostate cancer with low risk of metastases (lower score is better) (test measure, top 5)	Diagnostic testing and staging
Prostate	Nonrecommended prostate-specific antigen (PSA)-based screening in older men: percentage of men 70 years and older who were screened unnecessarily for prostate cancer using PSA-based screening	Screening
Prostate	Prostate cancer: percentage of patients, regardless of age, with a diagnosis of clinically localized prostate cancer receiving interstitial prostate brachytherapy, OR external beam radiotherapy to the prostate, OR radical prostatectomy, OR cryotherapy who received counseling on, at a minimum, the following treatment options for clinically localized disease prior to initiation of treatment: active surveillance, AND interstitial prostate brachytherapy, AND external beam radiotherapy, AND radical prostatectomy	Treatment
End of life	Hospice enrollment within 3 days of death (lower score is better)	Outcomes
End of life	Hospice enrollment within 7 days of death (lower score is better)	Outcomes
End of life	Chemotherapy given within 30 days of end of life	Treatment
End of life	Chemotherapy administered within the last 2 weeks of life (lower score is better)	Treatment
End of life	Percentage of patients who died from cancer with more than one emergency department visit in the last 30 days of life (lower score is better)	Outcomes
End of life	Percentage of patients who died from cancer admitted to the ICU in the last 30 days of life (lower score is better)	Outcomes
End of life	Proportion dying from cancer in an acute care setting	Outcomes
End of life	Proportion not admitted to hospice	Outcomes
End of life	Hospice days for patients who died	Outcomes
End of life	Average number of days under hospice care (home or inpatient) at time of death	Outcomes
End of life	Proportion with more than one hospitalization in the last 30 days of life	Outcomes
End of life	Days from last chemotherapy to death	Outcomes
End of life	Costs in the last 30 days of life	Outcomes
General	Number of emergency room visits per chemotherapy patient per year	Outcomes
General	Number of hospital admissions per chemotherapy patient per year	Outcomes
General	GCSF administered to patients who received chemotherapy for metastatic cancer (lower score is better)	Treatment
General	Admissions for cancer symptoms	Outcomes
Palliative care	Chemotherapy administered to patients with metastatic solid tumor with performance status of 3, 4, or undocumented (lower score is better) (defect-free measure 13a1a, 13a1b)	Treatment
Palliative care	Cancer—pain: percentage of patients with advanced cancer who received radiation treatment for painful bone metastases for whom single-fraction radiation was offered OR there was documentation of a contraindication to single-fraction treatment	Treatment

Table 3 (continued)

Category	Quality measure	Phase of care
Symptom/toxicities	Antiemetic therapy for low- and minimal-emetic-risk antineoplastic agents—avoidance of overuse (lower score is better)	Treatment
Symptom/toxicities	Number of hospitalizations for treatment-related symptoms	Outcomes

NSCLC non-small cell lung cancer, *SCLC* small cell lung cancer

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