

Utilization of Prostate Cancer Quality Metrics for Research and Quality Improvement: A Structured Review

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Background: The shift toward value-based care in the United States emphasizes the role of quality measures in payment models. Many diseases, such as prostate cancer, have a proliferation of quality measures, resulting in resource burden and physician burnout. This study aimed to identify and summarize proposed prostate cancer quality measures and describe their frequency and use in peer-reviewed literature.

Methods: The PubMed database was used to identify quality measures relevant to prostate cancer care, and included articles in English through April 2018. A gray literature search for other documents was also conducted. After the selection process of the pertinent articles, measure characteristics were abstracted, and uses were summarized for the 10 most frequently utilized measures in the literature.

Results: A total of 26 articles were identified for review. Of the 71 proposed prostate cancer quality measures, only 47 were used, and less than 10% of these were endorsed by the National Quality Forum. Process measures were most frequently reported (84.5%). Only 6 outcome measures (8.5%) were proposed—none of which were among the most frequently utilized.

Conclusion: Although a high number of proposed prostate cancer quality measures are reported in the literature, few were assessed, and the majority of these were non-endorsed process measures. Process measures were most commonly assessed; outcome measures were rarely evaluated. In a step to close the quality chasm, a “top 5” core set of quality measures for prostate cancer care, including structure, process, and outcomes measures, is suggested. Future studies should consider this comprehensive set of quality measures.

Variations in prostate cancer care are well documented.¹ Treatment varies by vulnerable populations, geographical regions, hospitals, and individual clinicians.² Quality metrics address concerns about treatment and outcome variations and include measures on the structures, processes, and outcomes of care to address the Donabedian framework of quality measurement.³ Many prostate cancer quality measures have been proposed over the past decade, including an early, comprehensive set of candidate measures for early-stage prostate cancer developed by RAND.⁴

The number of quality measures proposed, endorsed, and/or directed to health care providers in the United States has increased rapidly in the past decade.^{5–7} For prostate cancer care, several quality measures are either used or endorsed by regulatory agencies, such as the Centers for Medicare & Medicaid Services and the Quality Oncology Practice Initiative.^{8–10} As the number of proposed quality measures continues to grow, care communities have difficulty knowing which measures to focus on and often monitor and report on many quality measures, causing a substantial burden, which in turn may increase clinician

burnout.^{11,12} Often measures are developed and proposed based on what data are available rather than their association with actual “quality” of care. Furthermore, measures are often slightly modified to suit specific organizational needs, which limits the ability to compare results across health care settings. This suggests a need to identify a set of core quality measures for focused, comparable, and comprehensive reporting.

As the health care system in the United States transforms to a value-based care system, organizational focus is on improving the quality and efficiency of health care delivery. Quality measures are crucial to improving efficiency because the delivery system cannot improve what cannot be measured.¹³ Appropriate quality measurement can contribute evidence to understand and prevent the overuse, misuse, and underuse of health care resources. This shift to value-based care also emphasizes the need for a comprehensive and parsimonious set of quality measures that should address all the steps of health care, from structure through process and, in the end, outcomes. In fact, according to Donabedian’s health care quality model, improvements in the structure of care should lead to improvements in clinical processes that should in turn, in the end, improve patient-oriented outcomes.^{3,14} Here, we focused on prostate

cancer, which is the most common malignant cancer diagnosis and second leading cause of death in men.¹⁵ The past 20 years witnessed a more than 50% decrease in mortality and a steep increase (up to 80%) in survival for prostate cancer because of better and earlier diagnosis and treatment.¹⁶ It is hence of paramount importance to have a core set of indicators that can appropriately measure structure, processes, and outcomes of care in this particular population.

Given the aforementioned reasons, this study focused on identifying all prostate cancer quality metrics proposed by the scientific community or measurement initiatives and determining their utilization for quality improvement and scientific research purposes. This project had three goals: (1) develop a comprehensive list of all quality measures available to assess prostate cancer care, classified according to Donabedian's model of structure, process, and outcome measures; (2) identify the most widely used prostate quality measures reported in the literature; and (3) understand how these measures were used for actual quality improvement vs. research purposes.

METHODS

Data Sources

A search of all the possible literature was conducted in February 2017 through MEDLINE database, using the following search terms combined into a search string: *((Prostate cancer OR Prostate OR tumor OR tumors OR tumour)) AND ("Quality metrics" OR "Quality measures" OR "Quality care")*. The search string was built up combining the terms related to prostate cancer and quality indicators, using PubMed free-text terms and MeSH terms, and combining them using Boolean operators to optimize specificity. A follow-up search was carried out on April 30, 2018.

Inclusion and Exclusion Criteria

All published articles in English were included. No selection based on type of publication was adopted, and there was no time period restriction. The last search date was April 30, 2018. Any type of primary research article or quality improvement report was included in the selection process and in the final assessment. Other types of primary articles (for example, letter to the editor, commentaries) or secondary/review articles were not included. Reference lists of selected reviews, original articles, and textbooks were scanned to find additional articles. A gray literature search for other documents and hand searches of journals, professional organizations' websites, and guideline clearinghouses was carried out. Snowball technique was applied to the search strategy.¹⁷

Data Selection

Two authors [D.G., R.D.] independently screened all identified articles by scanning abstracts or portions of the text

to determine if they met the inclusion criteria. Any disagreements were resolved through discussion and/or reaching consensus with the aid of a third reviewer [T.H-B.] who decided for the final adjudication.

In the first screening stage, only the articles related to quality of care for prostate cancer were included. All other articles that discussed the quality of care for the diseases other than prostate cancer care were excluded. In the final screening stage, only those articles that assessed quality measures/metrics related to prostate cancer care were selected. More precisely, only the articles that assessed one of the proposed quality measures/metrics for research and/or for actual quality improvement with a particular sample of patients were considered for the final sample. This was carried out with a thorough review of the abstracts and/or the full articles. [Figure 1](#) shows the flowchart for the article inclusion/exclusion and selection process.

Data Extraction

Three authors [D.G., R.D., T.H-B.] independently extracted the data from included articles. Key information was gathered systematically using a standardized form to capture descriptions of the data sources and institutions that used or proposed the quality measure. The same team also adjudicated categorization of each measure to one of the three constructs of Donabedian's model of "structure," "process," and "outcome" measures/concepts.³ The 71 proposed prostate cancer quality measurements were ranked based on (1) how many studies assessed the measures in a patient population and (2) the sample sizes in which they were implemented and/or tested. Two authors [D.G., R.D.] independently classified studies as "quality improvement" if it was specified in their purpose that they directly targeted the quality of care enhancement. On the other hand, "research studies" were those that were not clearly associated with direct care quality improvement. Each measure was compared to a list we constructed of National Quality Forum (NQF)-endorsed measures from the NQF online database (accessed December 10, 2016).⁷ Any disagreement by the two authors was resolved through discussion.

Outcomes of Interest

Finally, we created a general table of the 10 most cited and used measures/concepts, and also a "top 5" table. The "top 5" measures were selected via research team consensus. This selection took into account several factors: (1) a set of measures that contained all three constructs of the Donabedian model, (2) measures that provide the most insight into high-quality health care delivery, and (3) measures that were frequently reported in the literature.

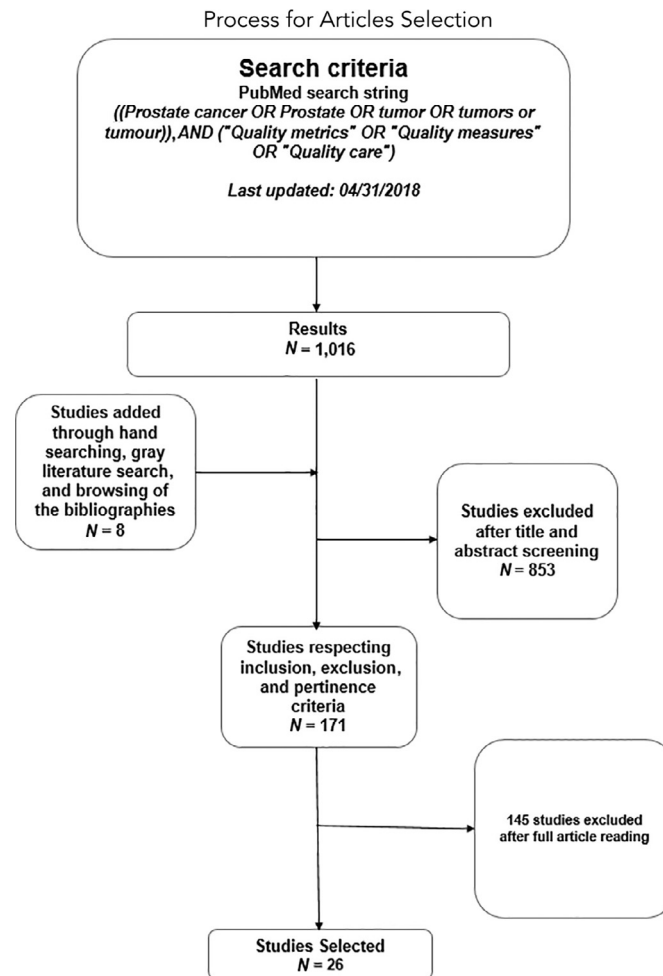


Figure 1: This flow diagram provides the phases of article identification and selection. From the 1,016 articles that were initially found through the search, 26 studies were identified after a two-step selection screening and were deemed eligible for inclusion. Prepared in accordance with Moher D, et al. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *J Clin Epidemiol.* 2009;62:1006–1012.

RESULTS

Search Results

The initial search yielded 1,016 articles. Hand searching and a gray literature search added 8 pertinent articles. The first selection was carried out through titles and abstract screening, and 171 articles were eligible for reading in extenso. After this second step, 26 articles^{18–43} were eligible for data extraction.

Study and Quality Measures Characteristics

[Appendix 1](#) (available in online article) summarizes the descriptive characteristics of the prostate cancer care quality measures assessed. A total of 71 proposed quality measures were identified from these articles and/or from websites of the proposing institutions/initiatives. Process measures accounted for 84.5% of all the measures proposed. Only 6 outcome measures and 5 structure measures were proposed, each contributing less than 10% of the total measures assessed. Of the 71 quality measures identified, only 7

(avoidance of overuse measure—bone scan for staging low-risk patients, treatment summary communication; radical prostatectomy pathology reporting, androgen deprivation therapy (ADT)/adjuvant hormonal therapy for high-risk prostate cancer patients, following up with the patient at least twice during the first year after treatment, constipation assessed at time of narcotic prescription or following visit, and patient emotional well-being assessed by the second office visit) were endorsed by NQF.

RAND was the leading source for proposed prostate cancer quality measures with 23 (32.4% of all measures assessed). Other proposing institutions/initiatives were the Quality Ontology Practice Initiative under the American Society of Clinical Oncology, the American Urological Association Quality Registry, the College of American Pathologists, the Physician Consortium for Performance Improvement, the American Medical Association, and the Physician Quality Reporting Initiative.

Three of the 5 structure measures were used in the literature. One (proportion of patients treated by a high-volume

Measures	Used By	Data Source	Type of Institution That Performed the Study
The proportion of patients treated by a high-volume (upper tertile) provider (surgeon or radiation oncologist)	Shroeck FR, et al. (2014) ³³	Survey	Academic, nonprofit, for-profit
	Herrel LA, et al. (2017) ²³	Administrative	Academic, nonprofit, for-profit
	Schroeck FR, et al. (2015) ³²	EHRs	Academic, nonprofit, for-profit
	Schroeck FR, et al. (2014 April) ³⁴	EHRs	Academic, nonprofit, for-profit
	Schroeck FR, et al. (2014 Nov) ³⁵	EHRs	Academic, nonprofit, for-profit
	Miller DC, et al. (2007) ²⁸	EHRs	Teaching, nonprofit
Availability of radiation oncology facilities and psychological counseling for patients	Miller DC, et al. (2007) ²⁸	EHRs	Teaching, nonprofit
Board certification of urologists and radiation oncologists	Bekelman JE, et al. (2007) ¹⁸	EHRs and Administrative	Teaching, for-profit, nonprofit
	Miller DC, et al. (2007) ²⁸	EHRs	Teaching, nonprofit

* References can be found at the end of this article.
EHR, electronic health record.

provider) appeared in six studies, another (board certification of urologists and radiation oncologists) was used in two studies, and the third (availability of radiation oncology facilities and psychological counseling), appeared in only one study (Table 1a). Of the 38 process measures that were used in the literature, 15 (39.5%) appeared in only one study each (Table 1b). All 6 outcome measures identified in the literature were used exclusively in scientific studies; however, only 2 of those appeared in more than one study—patient’s assessment of urinary, sexual, and bowel functioning after treatment, and patient’s satisfaction with treatment choice, continence, and potency were each used in three studies as quality measures (Table 1c).

Table 2 lists the 10 most frequently used quality measures found in the literature, the majority of which were process measures. Androgen deprivation therapy (ADT)/adjuvant hormonal therapy for high-risk patients ranked first, with 15 studies citing it as a quality measure. Research was the primary intent of most of these 15 studies, with only 1 focused on assessing quality improvement (Figure 2).

Two quality measures (clinical T stage documented and avoidance of overuse measure—bone scan for staging low-risk patients) ranked second, as they were each cited by 10 studies. For these two measures, quality improvement was addressed in only 5 of 20 (25.0%) studies (Figure 2). Appearing in 9 studies each were Gleason score reported to patient, PSA level documented, and counseling regarding treatment options. The final five measures on the list are follow up with the patient at least twice during the first year after primary treatment (7 studies), comorbidity assessment and the proportion of patients treated by a high-volume provider (6 studies each), and radical prostatectomy pathology reporting (4 studies).

Overall, the intent of the articles (research vs. quality improvement) was skewed heavily in favor of research, with only 22 of 63 (34.9%) articles focusing on quality improvement. For these measures, the ratio of quality improvement to research studies ranged from 2:7 down to 1:1 (Figure 2). The majority of the measures reported in the literature were focused on quality improvement.

Final Results

Generally speaking, research was the mostly prevalent purpose of each of the 10 most frequently utilized quality measures (Figure 2). The study of quality improvement is directly related to enhancing the quality of care in itself. For example, Flynn et al. (2010) surveyed primary care physicians practicing in two northeastern US states. Assessment of family history as a quality measure was based on the extent of family history taken and ascertaining age at cancer diagnosis for affected family members.²¹ Research studies, on the other hand, may not be directly associated with quality improvement. For example, Bekelman et al. (2007) conducted a study to evaluate the variations in adherence to quality measures of external beam radiotherapy (EBRT) for localized prostate cancer care. They assessed adherence to five EBRT quality measures, including the assessment of completion of two follow-up visits with a radiation oncologist in the year following therapy using Surveillance, Epidemiology, and End Results (SEER) data.¹⁸

DISCUSSION

A systematic review of the literature identified 71 proposed prostate cancer quality measures. The most frequently reported quality measures were associated with care processes (process quality measures), and among the least

Table 1b. Prostate Cancer Process Measures Used in the Literature

Measures	Studies (N)	Data Source	Type of Institution That Performed the Study
Androgen deprivation therapy (ADT)/adjuvant hormonal therapy for high-risk prostate cancer patients	15	Survey, EHRs, Administrative	Academic, nonprofit, for-profit, federal
Clinical T stage documented	10	Survey, EHRs, Administrative	Academic, nonprofit, for-profit
Avoidance of overuse measure—bone scan for staging low-risk patients	10	Survey, EHRs, Administrative	Academic, for-profit, federal
PSA level documented	9	EHRs, Survey, Administrative	Academic, nonprofit, for-profit
Gleason score reported to patient	9	Survey, EHRs, Administrative	Academic, for-profit, federal
Treatment options counseling (multidisciplinary)	9	Survey, EHRs, Administrative	Academic, for-profit, nonprofit
Following up with the patient at least twice during the first year after treatment	7	Survey, EHRs, Administrative	Academic, for-profit, nonprofit
Comorbidity assessment	6	Survey, EHRs, Administrative	Academic, for-profit
Radical prostatectomy pathology reporting	4	Survey, EHRs, Administrative	Academic, for-profit, nonprofit
Assessing the stage of the disease before the treatment/pretreatment clinical staging with DRE, total PSA, Gleason grade	3	Survey, EHRs, Administrative	Academic, for-profit, federal (VA)
Assessment of the family history of prostate cancer	3	Survey, EHRs	Teaching, nonprofit
Bone scan done in high-risk patients	3	EHRs, Administrative	Academic, nonprofit, for-profit
Avoidance of overuse measure—CT scan for staging low-risk patients	3	Survey, EHRs, Administrative	Academic, nonprofit, for profit
Central axis doses of at least 75 Gy for radiotherapy	3	EHRs, Administrative	Federal, teaching, nonprofit
DRE	2	EHRs	Academic, nonprofit, for-profit
CT scan done in high-risk patients	2	EHRs, Administrative	Academic, nonprofit, for-profit
A clear description of the risk of treatment complications	2	Survey, EHRs, Administrative	Academic, nonprofit, for profit
Patient's assessment of urinary, sexual, and bowel functioning before treatment	2	EHRs	Academic, nonprofit, for-profit
Conformal radiation utilized for patients receiving XRT	2	EHRs	Academic, nonprofit, for-profit
Immobilizing the patient during treatment while protecting rectal mucosa	2	EHRs and Administrative	Academic, for-profit, nonprofit
Docetaxel-based chemotherapy for castration-resistant, metastatic prostate cancer	2	EHRs, Administrative	Federal (VA)
Use of high-energy photon (> 10 MV) photons	2	EHRs, Administrative	Academic, for-profit, nonprofit
Plan of care for moderate/severe pain documented	2	Survey	Nonprofit
At least 10 core-needle samples taken at time of prostate biopsy	1	EHRs	Federal (VA hospitals)
Using computerized tomography to plan treatment for radiation therapy	1	EHRs	Teaching, nonprofit
Received radiation therapy (RT) within 30 days of death	1	EHRs	Academic
Surgery performed under epidural anesthesia after retropubic prostatectomy	1	Survey	Academic
Received chemotherapy in the last 14 days of life	1	Administrative	Academic, for-profit, nonprofit
3-D CRT or IMRT for prostate cancer patients treated with EBRT	1	EHRs, Administrative	Federal (VA hospitals)
Prescription of narcotic pain medication for advanced cancer patients in pain	1	EHRs and Administrative	Federal (VA hospitals)
Communicating with the patient's primary care physician to ensure continuing care	1	EHRs	Teaching, nonprofit
Pain assessed by second office visit	1	Survey	Nonprofit
Constipation assessed at the time of narcotic prescription or following visit	1	Survey	Nonprofit
Patient emotional well-being assessed by the second office visit	1	Survey	Nonprofit

(continued on next page)

Measures	Studies (N)	Data Source	Type of Institution That Performed the Study
PSA monitoring after treatment	1	EHRs and Administrative	Federal
DRE monitoring in active surveillance	1	EHRs and Administrative	Federal
Repeat biopsy in 18 months in active surveillance	1	EHRs and Administrative	Federal
Use of active surveillance, watchful waiting for low-risk prostate cancer	1	Administrative	Academic, for-profit, nonprofit

EHR, electronic health record; PSA, prostate-specific antigen; DRE, digital rectal examination; VA, US Department of Veterans Affairs; CT, computed tomography; XRT, radiation therapy; 3D-CRT, three-dimensional conformal radiation therapy; IMRT, intensity modulated radiation therapy; EBRT, external beam radiation therapy.

Measures	Used By	Data	Type of Institution That Performed the Study
Hospitalization or medical or surgical treatment for a variety of serious complications	Worwag E, et al. (1998) ⁴²	Survey	Academic hospital, nonprofit
Avoided multiple hospital admissions in the last 30 days of life	Herrel LA, et al. (2017) ²³	Administrative	Academic, for-profit, nonprofit
Hospice admissions for cancer in the final days of life	O'Connor NR, et al. (2014) ²⁹	EHRs	Nonprofit (hospice)
T stage stratified surgical margin status	Webster TM, et al. (2012) ⁴⁰	EHRs, Administrative	Nonprofit (community)
Patient's assessment of urinary, sexual, and bowel functioning after treatment	Hernandez-Boussard T, et al. (2016) ²²	EHRs	Academic hospital
	Shroeck FR, et al. (2015) ³²	EHRs	Academic, for-profit, nonprofit
	Wei JT, et al. (2002) ⁴¹	Survey, Administrative	Teaching hospital
Patients' satisfaction with treatment choice, continence, and potency	Kamal AH, et al. (2013) ²⁵	Survey	Nonprofit (community based)
	Worwag E, et al. (1998) ⁴²	Survey	Academic hospital, nonprofit
	Wright JD, et al. (2015) ⁴³	Survey	Academic, for-profit, nonprofit

* References can be found at the end of this article.
EHR, electronic health record.

Rank	Measures/Concepts	No. of Studies
1	Androgen deprivation (ADT)/adjuvant hormonal therapy for high-risk prostate cancer patients	15
2	Clinical T stage documented	10
2	Avoidance of overuse measure—bone scan for staging low-risk patients	10
3	PSA level documented	9
3	Gleason score reported to patient	9
3	Treatment options counseling (multidisciplinary)	9
4	Following up with the patient at least twice during the first year after treatment	7
5	Comorbidity assessment	6
5	The proportion of patients treated by a high-volume (upper tertile) provider (surgeon or radiation oncologist)	6
6	Radical prostatectomy pathology reporting	4

Distribution Between Research and Quality Improvement Articles for the 10 Most Utilized Quality Measures

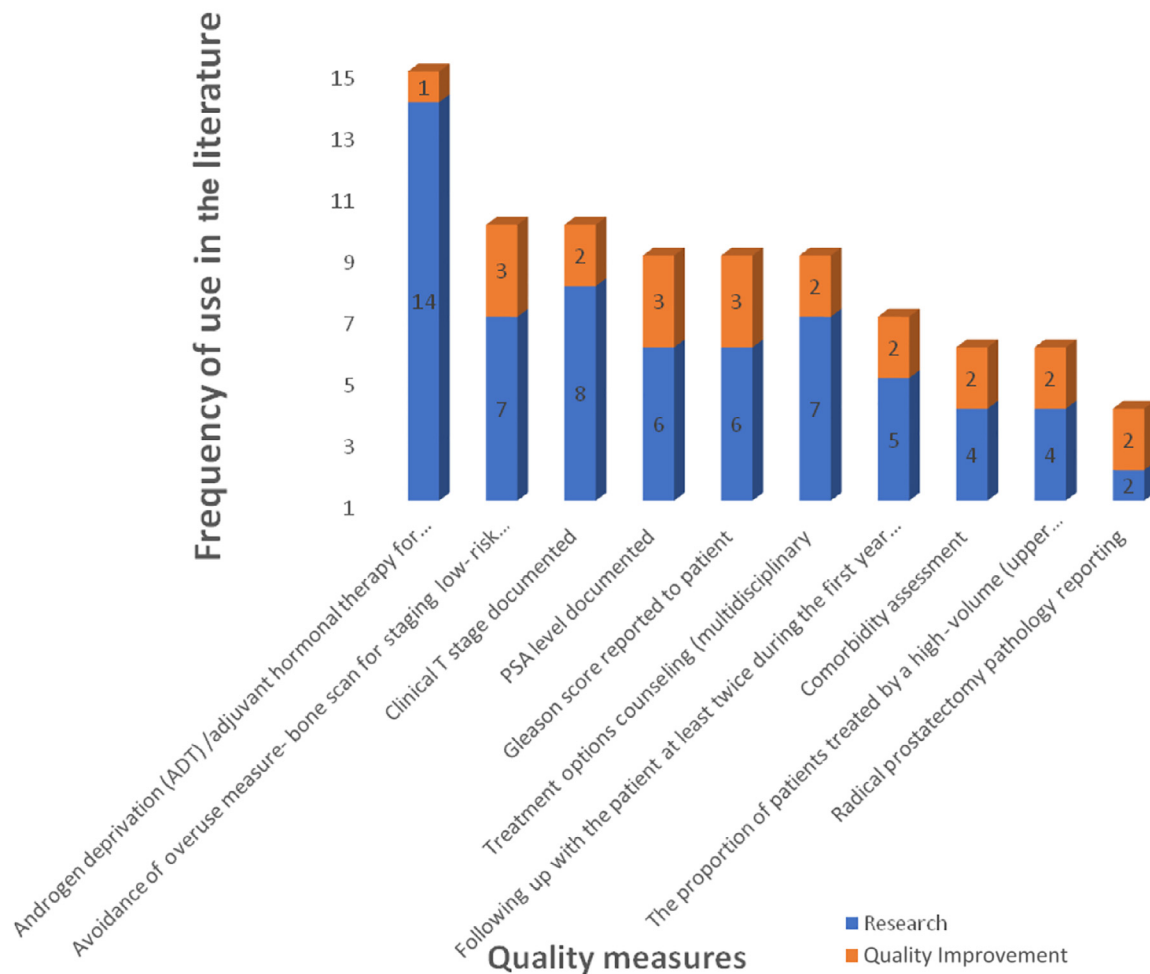


Figure 2: This bar chart shows the prevalences of articles addressed to quality improvement or scientific research purposes in the top 10 measures assessed. From the graph it emerges that articles written for research purposes account for the absolute majority of articles.

studied measures were those related to important patient outcomes, such as assessment of sexual function and urinary incontinence. Among all of the quality metrics identified, only 3 were reported in 10 or more studies, and all of these were process measures. Given the movement to value-based care and quality measure-associated payment modifiers, identification of a manageable, comprehensive set of measures that are important to both the clinician and patient could help guide both quality improvement efforts and resource allocation.

Overall, less than 10% of the total proposed prostate cancer quality measures were endorsed by NQF. For the endorsement of a quality measure, NQF requires an extensive literature review and gathers input from stakeholders across the health care system. In general, only those quality measures endorsed get preference for potential use in federal public reporting and performance-based payment programs.⁴⁴ Given the paucity of endorsed measures for

prostate cancer, the prostate care community has limited metric choices for federal payment modifiers, and therefore selection may result in measures that may not truly reflect the quality of care they provide to their patients. Furthermore, the limited degree of reporting on meaningful quality measures means that patients have little data to help them select a provider for their prostate cancer care, as most quality initiatives (for example, Hospital Compare) highlight only endorsed measures, which are largely process focused. Measures focusing on patient outcomes, in particular those related to urinary and sexual function, need to be identified, as these measures are of high importance for both providers and patients. These outcome measures could have the greatest impact in improving care if targeted for value-based payment services.

Among the 10 most commonly used quality measures identified in the literature, 9 were process quality measures that focused on whether pretreatment/treatment

Measures	Type
The proportion of patients treated by a high-volume provider	Structure
Androgen deprivation therapy (ADT)/Adjuvant hormonal therapy for high-risk patients	Process
Clinical T stage documented	Process
Patient's assessment of urinary, sexual, and bowel functioning after treatment	Outcome
Patients' satisfaction with treatment choice, continence, and potency	Outcome

assessment was performed and/or documented by the care team (for example, digital rectal exam documentation or pretreatment sexual function assessed). These process-centered measures are not unique to prostate cancer care. Other investigators have shown that most of the measures used in government programs (for example, Medicare and Medicaid) have focused on process measures, many of which were not clinically meaningful.^{45,46} It is likely that the abundance of process measures is partly due to their being generally easier to measure and implement. However, other measures, such as prostate cancer–specific patient-centered outcomes, are likely to be of higher value for patients, providers, and payers.

It is notable that most studies utilizing these process quality measures were research focused, with only a limited number reporting application of process measures for quality improvement. Although concepts and implementation of quality improvement measures are relatively recent, there appears to be a gap between academic research and actual clinical practice in improving performance on these quality measures, at least in terms of what is available in the medical literature. Accurate measurement is critical to effecting changes, but attempts to integrate research and clinical practice for quality improvement could be implemented in the near term to test whether they will improve patient care across settings, rather than in a limited number of academic hospitals.

We found that only a small fraction of proposed measures were patient outcome based, and that they are rarely reported in the literature, either for research or quality improvement. Recently, Jha and Pronovost also emphasized the need for a shift in quality measures to focus on meaningful outcomes, eliminating unnecessary process quality measures from government programs (for example, pay for performance).⁴⁵ In addition, failure to develop and use outcome measures that matter to the patient and clinician makes it difficult for government programs to engage stakeholders in quality improvement. As noted recently from NQF, it is crucial to get feedback from patients and their families in implementing any measure.⁴⁷

Our study not only identifies a set of the 10 most commonly reported quality indicators but also has suggested 5 core indicators that together cover the three classifications of quality measures theorized by Donabedian, have clinical face validity of quality improvement, and are well repre-

sented in the literature (Table 3). The first of these measures reflects structure—the proportion of patients treated by a high-volume provider. Volume is often considered a proxy for health outcomes, and recent literature highlights its importance in oncology, including better health outcomes and survival for prostate cancer in both European⁴⁸ and US practice settings.^{49,50} The second and third most frequently used measures were process focused: the use of androgen deprivation therapy (ADT)/adjuvant hormonal therapy for high-risk patients, and documentation of clinical T stage. ADT agents have demonstrated benefits achieved for effective palliation⁵¹ as well as survival,⁵² while the assessment and documentation of the clinical T stage is fundamental to treatment selection.⁵³ The fourth and fifth measures represent outcomes of care and include assessment and documentation of urinary, sexual, and intestinal functions of the patient after treatment; and the patient's satisfaction with the choice of treatment and with his function in regard to continence and sexual potency. Urinary incontinence and erectile dysfunction have been highlighted as the most common side effects of radical prostatectomy (the most common intervention for prostate cancer)^{54,55} as well as radiation therapy. In radiation therapy, bowel dysfunction is another important outcome measure. Together, urinary, sexual, and bowel function measures most influence postintervention quality of life.^{56,57} Collection of these outcomes also can be very useful in measurement efforts that “give voice” to the patient.⁵⁸ Implementing one or more of the 5 suggested core measures would allow direct comparison across studies and practice settings. By agreeing on and focusing on these 5 measures, studies can be better compared for outcomes for both process and outcome measures that are meaningful to patients and health care providers.

This study has several limitations. The search terms and methods may not have captured all studies that report prostate cancer quality measures. Also, studies focused on quality measurements for clinical care vs. research are not always easily distinguishable. Future studies that include systematic reviews and meta-analyses can improve the robustness of the findings and should also investigate the association of popular quality measures with clinically meaningful outcome measures and patient satisfaction. Finally, we found that a breadth of studies touched on quality measures only indirectly and were excluded from our review. Therefore, the number of studies assessed was relatively low and

confounded by the fact that study designs and types varied greatly. However, we have synthesized the available information on prostate cancer quality assessment as a foundation for developing a core set of quality measures that could be used in both research and quality improvement efforts.

CONCLUSION

A systematic review identified a substantial number of proposed prostate quality measures in the literature; however, less than 10% of these were NQF endorsed. The diversity of nonaccredited quality measures limits the prostate cancer care community's ability to have appropriate value-based payment modifiers and prioritize quality improvement efforts. The absence of outcome credentialed measures for prostate cancer care shows a disconnect between the measures that are reported in the literature and the true quality measures that matter for both providers and patients. From this review, five core indicators were identified that are commonly used in the literature and most likely to be clinically impactful. These measures can serve as the basis for further studies in prostate cancer care and process.

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SUPPLEMENTARY MATERIALS

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