

# Associations of multimorbidity and patient-reported experiences of care with conservative management among elderly patients with localized prostate cancer

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## Abstract

**Background:** Many elderly localized prostate cancer patients could benefit from conservative management (CM). This retrospective cohort study examined the associations of patient-reported access to care and multimorbidity on CM use patterns among Medicare Fee-for-Service (FFS) beneficiaries with localized prostate cancer.

**Methods:** We used linked Surveillance, Epidemiology, and End Results cancer Registry, Medicare Claims, and the Medicare Consumer Assessment of Healthcare Providers and Systems (MCAHPS) survey files. We identified FFS Medicare Beneficiaries (age  $\geq 66$ ; continuous enrollment in Parts A & B) with incident localized prostate cancer from 2003 to 2013 and a completed MCAHPS survey measuring patient-reported experiences of care within 24 months after diagnosis ( $n = 496$ ). We used multivariable models to examine MCAHPS measures (getting needed care, timeliness of care, and doctor communication) and multimorbidity on CM use.

**Results:** Localized prostate cancer patients with multimorbidity were less likely to use CM (adjusted odds ratio (AOR)=0.42 (0.27- 0.66),  $P < .001$ ); those with higher scores on timeliness of care (AOR = 1.21 (1.09, 1.35),  $P < .001$ ), higher education attainment (3.21 = AOR (1.50,6.89),  $P = .003$ ), and impaired mental health status (4.32 = AOR (1.86, 10.1)  $P < .001$ ) were more likely to use CM.

**Conclusion(s):** Patient-reported experience with timely care was significantly and positively associated with CM use. Multimorbidity was significantly and inversely associated with CM use. Addressing specific modifiable barriers to timely care along the cancer continuum for elderly localized prostate cancer patients with limited life expectancy could reduce the adverse effects of overtreatment on health outcomes and costs.

## KEYWORDS

active surveillance, conservative management, multimorbidity, patient-centered care, prostate cancer

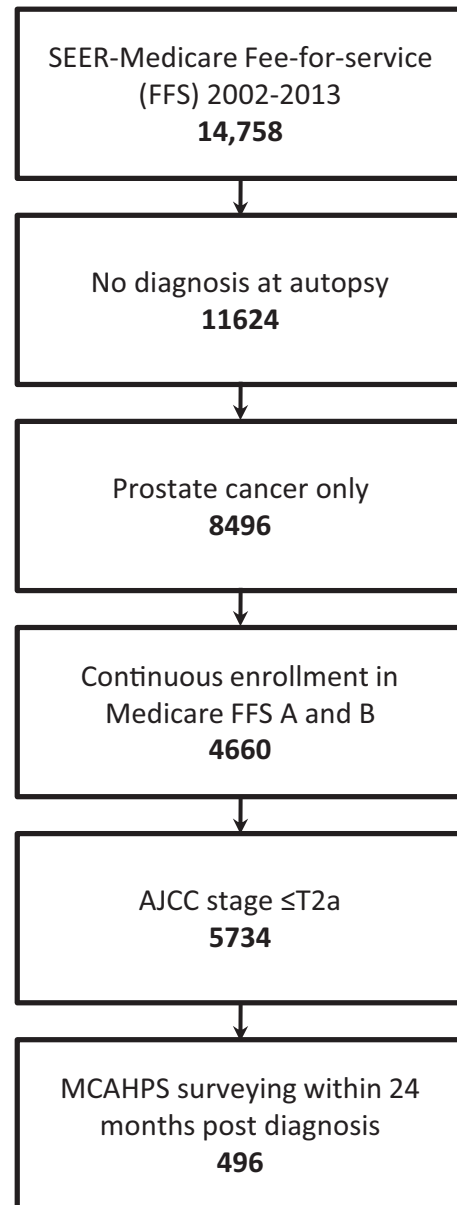
## 1 | INTRODUCTION

Conservative management (CM) has emerged as a preferred disease management approach for many older adults with localized prostate cancer.<sup>1</sup> CM use in patients with low-risk localized prostate cancer or limited life expectancy is supported by high-level evidence.<sup>2</sup> CM includes protocols for low- or intermediate-risk prostate cancer, such as follow-up biopsies and PSA testing, or “watchful waiting” for patients with less than 5 years of life expectancy. Use of CM among patients with low-risk prostate cancer or limited life expectancy improves health-related quality of life (ie, urinary, bowel, and/or erectile dysfunction) and could reduce excessive annual health-care costs of overtreatment by \$1.2 billion.<sup>3,4</sup>

CM decisions are complex as 60% of older adults (age > 65 years) with localized prostate cancer have preexisting multimorbidity.<sup>5,6</sup> Multimorbidity affects life expectancy<sup>5</sup> and more than 50% of patients with multimorbidity seek care from three or more health-care specialists.<sup>7</sup> Patients with multimorbidity and cancer may be vulnerable to poor quality of cancer care and have prompted greater attention in measuring, monitoring, and incentivizing patient-centered care.<sup>8</sup> Measures of patient-centered care, such as patient-reported experiences with care include domains of physician communication, timely care, and perceptions of getting needed care, are increasingly used as quality measures by health plans, medical groups, and physician practices. Positive patient-reported experience scores are associated with adherence to medical advice, improved clinical outcomes, and lower utilization of unnecessary health-care services<sup>9,10</sup> such as overtreatment of low-risk localized prostate cancer.

Patient-reported experiences may differ by multimorbidity status, which may further complicate or facilitate treatment choices for low-risk prostate cancer.<sup>11</sup> Identifying specific measures of patient-reported experiences that facilitate CM use among patients with incident localized prostate cancer and multimorbidity is needed to promote evidence-based cancer care.<sup>12</sup> For example, in colorectal cancer populations, patient-reported experiences with perceived timely care are associated with evidenced-based follow-up.<sup>13</sup> Understanding the relationship between patient-reported experiences of care on CM use can inform patient-centered care approaches to improve adoption of CM use, thereby reducing the adverse effects of overtreatment among older patients with multimorbidity and localized prostate cancer.

Despite the importance of patient-reported experiences, CM studies primarily focus on disease characteristics, clinical, and sociodemographic factors.<sup>1,14-16</sup> To date, no studies have investigated the impact of patient-reported experiences on CM use among medically complex patients with localized prostate cancer. Therefore, the primary objective of this study is to examine the associations of multimorbidity and patient-reported experiences on CM use among Fee-for-Service



**FIGURE 1** Cohort Selection and Exclusion

(FFS) Medicare beneficiaries with localized prostate cancer using Consumer Assessment of Healthcare Providers and Systems (MCAHPS®) patient surveys and Medicare claims linkages.

## 2 | METHODS

The study cohort included men diagnosed with localized prostate cancer defined as American Joint Committee on Cancer stage T2a or less,<sup>2</sup> aged 66 or older, with continuous enrollment in FFS Medicare Parts A and B throughout the study period (Figure 1).

Date of incident localized prostate cancer diagnosis was used as an index date and 12 months before diagnosis was

used as the baseline period. During the baseline period, we identified multimorbidity using Medicare claims and calculated life expectancy estimates.

We also defined the “CM measurement” period as 12 months after diagnosis. During this period, we identified CM based on validated methods for claims data.<sup>17</sup>

As MCAHPS surveys can be administered at varying points during the postdiagnosis period, we followed individuals for an additional period of 12 months. Thus, our follow-up period consisted of 24 months after incident localized prostate cancer diagnosis.

To account for varying months from diagnosis to survey administration, we included time from diagnosis to survey as one of the independent variables in the models. However, as this variable was not significant and did not affect our main results, we did not include time from diagnosis to survey administration variable in the final model. As a sensitivity analysis, we also estimated CM use during 24 months after diagnosis (Table S2).

## 2.1 | Data sources

The Surveillance, Epidemiology, and End Results (SEER) cancer registry contains tumor and demographic information for patients diagnosed with cancer while residing in a SEER region. We derived Medicare eligibility from the SEER data (Figure 1). We extracted FFS Medicare claims from Medicare Provider Analysis and Review (MEDPAR), Carrier Claims, Outpatient Claims, Home Health Agency, and Durable Medical Equipment files.

Medicare Consumer Assessment of Healthcare Providers & Systems (MCAHPS®) surveys, administered by the CMS, use standardized and validated questionnaires to collect information on patient-reported experiences with healthcare providers.<sup>18</sup> MCAHPS collection methodologies use a weighted probability sampling procedure covering all the 50 US states, DC, and Puerto Rico, which are then linked to SEER patients.<sup>18,19</sup>

Area Health Resource File (AHRF) files were linked via MEDPAR FIPS state and county codes and were used to calculate radiation oncologist and urologist densities.<sup>20</sup> Census files were linked to calculate county-level median income quartiles.

## 2.2 | Dependent Variable

We operationalized CM use as the absence of curative treatment within 12 months after incident localized prostate cancer. Treatment was identified using International Classification of Diagnosis 9th edition (ICD9), ICD9 procedure codes, and Healthcare Common Procedure Coding System (HCPCS) codes from FFS Medicare claims (Table S3).<sup>2,15,17</sup>

## 2.3 | Key independent variables

The *multimorbidity* framework developed by the United States Department of Health and Human Services for guiding programs, practice, and policy guided the selection of chronic conditions as follows: arthritis, asthma, coronary artery disease, congestive heart failure, chronic kidney disease, chronic obstructive pulmonary disease, cardiac arrhythmias, acute myocardial infarction, dementia, diabetes, depression, hepatitis, hyperlipidemia, hypertension, human immunodeficiency virus, osteoporosis, substance abuse, schizophrenia, stroke, anemia, and lower limb fracture.<sup>21</sup> The most common definition of multimorbidity is the concurrent presence of two or more conditions in the same individual.<sup>22</sup> We defined multimorbidity as the presence of three or more conditions in the same individuals as older men diagnosed with prostate cancer at age 65 or higher are at high risk for competing risk mortality. For example, among men with three or more comorbid conditions, aged 61-74 and 75 years or older, 10-year other cause mortality is 40% and 71%, respectively.<sup>23</sup>

*Prostate cancer comorbidity index* (PCCI), a weighted comorbidity index validated prostate cancer patient populations, was used to predict 5- and 10-year life expectancy in prostate cancer patient populations.<sup>24</sup> PCCI was calculated during the baseline period to estimate 5- and 10-year life expectancy. PCCI was categorized into three groups: 0–8 (>10-year life expectancy); 9 to 13 (5- to 10-year life expectancy); and > 13 (<5-year life expectancy). In all models, PCCI total 0-8 was used as the reference group.

Published research in prostate cancer patients often uses Charlson Comorbidity Index (CCI); therefore, we conducted a supplemental analysis using CCI. In these analyses, CCI scores were dichotomized with “0-1” as the reference group.<sup>25</sup>

We included three MCAHPS composite measures—“getting needed care,” “getting care quickly,” and “doctor communication”—which rates the ability to get needed appointments, timeliness of care when care is needed, and how well the physician communicated.<sup>18</sup> Patients report experiences with health-care access in the last 6 months.<sup>18</sup> MCAHPS surveys have been extensively validated for measuring patient-reported access to care and are commonly used for quality improvement as well as value-based purchasing initiatives.<sup>18</sup> MCAHPS are based on a 0-100 scale with 0 representing the lowest and 100 representing the highest score; we examined the effect of 10 unit changes in composite items on the dependent variable.

Management of preexisting multimorbidity and shared prostate cancer treatment decision-making requires the use of limited resources (ie, time to manage chronic conditions and availability of health-care professionals and resources). Therefore, for other independent variables, the competing demands model was used to conceptualize factors known to affect localized prostate cancer treatment selection within

clinician, patient, and practice ecosystem domains.<sup>15,17,26</sup> (Figure 2).

Multivariable models were adjusted with independent variables: diagnosis year group (2003-2009 and 2010-2013), low-risk prostate cancer (operationalized as Gleason Score  $\leq 6$  and PSA test  $\leq 10$  ng/mL or Gleason Score  $\geq 7$  or PSA  $\geq 10$  ng/mL), self-reported general and mental health status, education-level, zip-code income quartiles, and county-level quartiles of urologists and radiation oncologists per 10,000 persons over age 65.

Our analyses include several case-mix adjustment variables such as age, education, general health status, mental health status, income level, and race. Secondary analyses using additional recommended case-mix adjustment variables, such as dual-eligible Medicaid respondents, “proxy” survey completion, and time from cancer diagnosis to survey completion, did not significantly improve model specification.<sup>27</sup>

To assess the potential influence of missing data, we examined missing data patterns using covariate-dependent missingness methods.<sup>28</sup> Mean values were imputed to independent variables of interest. For categorical variables, including general and mental health status, missing data indicators were created and included as a separate category in the regression models.

Chi-square tests and t tests were used to identify significant group differences in CM use by categorical variables. Multivariable models were fit using separate unadjusted and adjusted logistic regressions to identify independent and interactive associations of multimorbidity and patient care experiences on CM use. All statistical tests were two-sided with a 5% Type I error rate and were completed in STATA (StataCorp, College Station, TX).

### 3 | RESULTS

The study cohort was predominantly non-Hispanic, whites (84.5%). The median age at diagnosis was 72.8 years and did not differ by year of diagnosis (2003-2009:73.6 = M, 5.38; 2010-2013:73.6 = M, SD = 5.14). Average composite scores for doctor communication, getting needed care, and getting

care quickly were 91.0 (SD = 12.2), 88.6 (SD = 15.6), and 70.8 (SD = 21.7), respectively.

Overall 33.5% used CM, defined as no curative treatment within 12 months of incident localized prostate cancer diagnosis. Use of CM was only marginally higher in men with low-risk relative to those with higher-risk disease ( $\leq$  cT2a and PSA  $\geq 10$  ng/mL or Gleason Score  $> 6$ ) (38.7% vs 30.9%, respectively,  $P = .08$ ) (Table 1). High-school graduation, college education, low-risk prostate cancer diagnosis, and mental health status were significantly more frequent among patients using CM (Table 1). CM use by localized prostate cancer patients with higher-risk disease was 30.9%. Higher-risk disease was significantly more common among age groups 75+ (75.9%) vs 66-74 (62.4%) ( $P = .002$ ) and significant differences by patients with multimorbidity 24.6% ( $n = 45$ ) vs those without multimorbidity 38.7% ( $n = 58$ ), ( $X^2 = 7.65$ ,  $P = .006$ ) were observed.

In our study cohort, 57.2% had multimorbidity. Patients 75 years or older were significantly more likely to have multimorbidity than those aged 66-74 years (64.4% vs 53.4%). Blacks had a higher percentage of multimorbidity as compared to whites (76.1% vs 53.9%). Patients with multimorbidity using treatment ( $n = 207$ ) did not differ significantly by patient, clinician, or practice ecosystem factors except for mental health status of excellent/very good (74.6%) and good (77.5%) vs patients using CM ( $P = .031$ ). Patients with multimorbidity and higher-risk disease ( $n = 183$ ) significantly more frequently used treatment if aged 66-74 (82.5%) ( $P = .011$ ). Average composite scores for doctor communication, getting needed care, and getting care quickly did not differ by multimorbidity status. CM use was significantly lower in men with vs without multimorbidity (27.1% vs 72.9%, respectively,  $P < .001$ ).

Average getting care quickly composite scores (ie, timely care) were higher for those with CM use as compared to those without CM use (Table 2). CM use significantly differed by PCCI categories, with lower percentages among groups with less than 10 (27.0%) and 5 (27.0%) vs more than 10 (38.9%) years of life expectancy ( $X^2 = 7.82$ ,  $P = .020$ ) (Table 2).

PCCI life expectancy groups did not statistically differ by CM use. Higher-risk patients reporting fair or poor mental health status (62.1%;  $P = .002$ ) vs excellent mental health status, and college education (33%) or high-school graduates (37.5%) vs no high-school graduation (13.7%), significantly used CM more frequently. Getting care quickly composite scores were significantly higher among higher-risk patients ( $n = 333$ ) using CM (M = 75.8) vs curative treatment (M = 69.8), ( $t = -2.43$ , CI 95% = 69.3, 73.9,  $P = .016$ ).

Multimorbidity was significantly and inversely related to CM use in unadjusted logistic regression analyses (odds ratios (OR) = 0.55; 95% CI = 0.35, 0.75). Adjustment for other factors, including timeliness of care, further strengthened this association (adjusted OR (AOR) = 0.42,

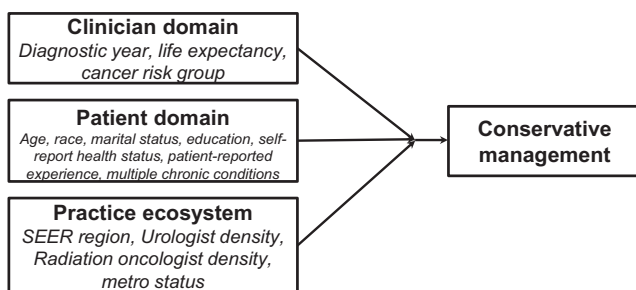


FIGURE 2 Competing Demands Framework

**TABLE 1** Patient Characteristics by Conservative Management among Fee-for-Service Medicare Beneficiaries with Incident Localized Prostate Cancer using Linked SEER Cancer Registry with MCAHPS, 2002-2013 (n = 496)

	CM		No CM		X <sup>2</sup>	P-value
	N	%	N	%		
ALL	166	33.5	330	66.5		
Age in Years					1.32	.250
66-74	102	31.7	220	68.3		
75+	64	36.8	110	63.2		
Race					0.07	.964
White	140	33.4	279	66.6		
Black	15	32.6	31	67.4		
Other	11	35.5	20	64.5		
Marital Status					0.2	.905
Married	115	32.9	235	67.1		
Unmarried	22	34.9	41	65.1		
Unknown	29	34.9	54	65.1		
Income quartiles					0.54	.909
First	38	33.3	76	66.7		
Second	39	33.6	77	66.4		
Third	38	31.1	84	68.9		
Four	51	35.4	93	64.6		
Education					8.11	<b>.017</b>
College or more	100	36.6	173	63.4		
High-School Grad.	42	35.9	75	64.1		
No High-School Grad.	13	18.8	56	81.2		
General health status					3.32	0.19
Excellent/Very Good	59	35.5	107	64.5		
Good	54	28.6	135	71.4		
Fair/Poor	47	37.6	78	62.4		
Mental health status					11.3	<b>.004</b>
Excellent/Very Good	104	31.6	225	68.4		
Good	34	30.1	79	69.9		
Fair/Poor	22	57.9	16	42.1		
Urologist density					4.99	.173
0 to 1.41	41	33.1	83	66.9		
1.41 to 2.49	33	26.6	91	73.4		
2.5 to 3.46	51	39.8	77	60.2		
3.47 to 10.2	41	34.2	79	65.8		
Radiation oncologist density					5.43	.143
0 to 0.44	37	29.8	87	70.2		
0.45 to 1.07	41	33.1	83	66.9		
1.07 to 1.49	52	41.6	73	58.4		
1.51 to 5.35	36	29.3	87	70.7		
SEER region					5.09	.166
Northeast	33	35.5	60	64.5		
South	35	30.4	80	69.6		

(Continues)

TABLE 1 (Continued)

	CM		No CM		X <sup>2</sup>	P-value
	N	%	N	%		
North-central	13	22.4	45	77.6		
West	85	37	145	63.0		
Metro Status					0.71	.401
Metro	138	34.3	264	65.7		
Nonmetro	28	29.8	66	70.2		
Diagnosis Year					0.44	.509
2002–2007	96	32.3	201	67.7		
2008–2013	70	35.2	129	64.8		
Low-risk prostate cancer					2.93	.087
Yes	63	38.7	100	61.3		
No	103	30.9	230	69.1		

Note: Bold values denote statistical significance at the  $P$ -value < .05 level.

Based on 496 older (age  $\geq$  66 years) Fee-for-Service Medicare beneficiaries, with continuous enrollment in Medicare Part A & Part B, diagnosed with incident localized prostate cancer between 2003 and 2013.

Abbreviations: CM, Conservative management; MCAHPS, Medicare Claims and the Medicare Consumer Assessment of Healthcare Providers and System surveys; SEER, Surveillance, Epidemiology, and End Results cancer Registry.

TABLE 2 Multimorbidity and Patient Experiences by Conservative Management among Fee-for-Service Medicare Beneficiaries with Incident Localized Prostate Cancer using Linked SEER Cancer Registry with MCAHPS, 2002-2013

	CM		No CM		X <sup>2</sup>	P-value
	N	%	N	%		
	<b>166</b>	<b>33.5</b>	<b>330</b>	<b>66.5</b>		
Multimorbidity					12.1	<.001
Yes	77	27.1	207	72.9		
No	89	42.0	123	58.0		
PCCI					7.82	.020
< 5 years life expectancy	20	27.0	54	73.0		
5-10 years life expectancy	41	27.0	111	73.0		
>10 years life expectancy	105	38.9	165	61.1		
	<b>Mean</b>	<b>SE</b>	<b>Mean</b>	<b>SE</b>	<b>t-Value</b>	<b>P-value</b>
Getting Needed Care	87.1	1.33	89.3	0.81	1.48	NS
Getting Care Quickly	75.0	1.48	68.7	1.25	−3.06	.002
Doctor/Patient Communication	89.8	1.05	91.6	0.63	1.61	NS

Note: Based on 496 older (age  $\geq$  66 years) Fee-for-Service Medicare beneficiaries, with continuous enrollment in Medicare Part A & Part B, diagnosed with incident localized prostate cancer between 2003 and 2013.

Abbreviations: CM, Conservative management; MCAHPS, Medicare Consumer Assessment of Healthcare Providers and System surveys; N.S., Not Significant; PCCI, Prostate Cancer Comorbidity Index; SEER, Surveillance, Epidemiology, and End Results cancer Registry.

CI 0.27- 0.66) (Table 3); additional models adjusting for other patient experience domains or CCI were not significant. Getting care quickly showed a significant, positive association with CM use in both the unadjusted analyses (OR = 1.15; 95% CI = 1.05, 1.27) and the fully adjusted models (AOR = 1.21; 95% CI = 1.09, 1.34). In models including PCCI life expectancy categories, less than 10- and

5-year life expectancy were inversely associated with CM use (Table S1).

CM use was also significantly and positively associated with fair/poor mental health status, low-risk prostate cancer diagnosis, college education or more, and high-school graduation in all adjusted models (Table 3; Tables S1 and S2). We found no evidence for a modifying effect of patient-experience

**TABLE 3** Multivariable Analysis of Timeliness of Care, Multimorbidity, and Factors Associated with Conservative Management Use vs Treatment among Fee-for-Service Medicare Beneficiaries with Incident Localized Prostate Cancer using Linked SEER Cancer Registry with MCAHPS, 2002-2013 (n = 496)

	UOR [95% CI]		P-value	AOR [95% CI]		P-value
Patient Experience: Getting Care Quickly						
Multimorbidity						
Yes	0.51	[0.35-0.75]	.001	0.42	[0.27-0.66]	<.001
No (Ref.)						
Getting Care Quickly	1.15	[1.05-1.27]	.003	1.21	[1.09-1.35]	<.001
Low-risk prostate cancer						
Yes	1.41	[0.95-2.08]	.088	1.76	[1.14-2.72]	.01
No (Ref.)						
Mental Health						
Fair/Poor	2.97	[1.50-5.90]	.002	4.32	[1.86-10.1]	<.001
Ex/VG/Good (Ref)						
Education						
College or more	2.49	[1.30-4.78]	.006	3.21	[1.50-6.89]	.003
High-school graduate	2.41	[1.18-4.92]	0.015	3.53	[1.59-7.83]	.002
No college (Ref.)						
Patient Experience: Getting Need Care						
Multimorbidity						
Yes	0.51	[0.35-0.75]	.001	0.45	[0.30-0.70]	<.001
No (Ref.)						
Getting Needed Care	—	—	NS	—	—	NS
Patient Experience: Doctor Communication						
Multimorbidity						
Yes	0.51	[0.35-0.75]	0.001	0.45	[0.29-0.68]	<.001
No (Ref.)						
Doctor Communication	—	—	NS	—	—	NS

Note: Based on 496 older (age  $\geq 66$  years) Fee-for-Service Medicare beneficiaries, with continuous enrollment in Medicare Part A & Part B, diagnosed with incident localized prostate cancer between 2003 and 2013. Adjusted for age, race, marital status, income, education, health status, urologist density, radiation oncologist density, SEER region, geography, diagnostic year, and low-risk prostate cancer.

Abbreviations: AOR, Adjusted Odds Ratio; CI, Confidence interval; CM, Conservative management; MCAHPS, Medicare Consumer Assessment of Healthcare Providers and System surveys; NS, Not significant; Ref., Reference group; SEER, Surveillance, Epidemiology, and End Results cancer Registry; UOR, Unadjusted Odds Ratio; Statistically significant results displayed.

variables, multimorbidity, PCCI, or other independent variables on the observed associations.

## 4 | DISCUSSION

In this study, we assessed the independent associations of multimorbidity and patient-reported experiences with care on CM use among older men with localized prostate cancer. Despite proven benefits of CM, one in three (33.5%) of all men with localized prostate cancer, and only two in five (41%) men over the age of 75 years, used CM. Our estimates of CM use among patients with localized

prostate cancer are lower than those reported in recent investigations using SEER-Medicare data (42.1% in 2015)<sup>1</sup> but higher than reported in an investigation of Michigan Medicare beneficiaries (22.3% in 2014).<sup>17</sup> We speculate that these differences could be due to variation in study population characteristics (ours included prostate cancer patients from many regions of the US) and geographic practice patterns.<sup>29-31</sup>

Multimorbidity and life expectancy are critical components of patient counseling after a localized prostate cancer diagnosis as many older men do not live long enough to benefit from treatment. Patients with low or favorable intermediate-risk disease or higher-risk disease with limited

life expectancy could avoid significant urinary, erectile, and rectal treatment morbidities without increasing the risk of prostate cancer-specific mortality with CM.<sup>2,32</sup> However, in our study, men with multimorbidity were significantly less likely to use CM compared to those without multimorbidity after controlling for age, low-risk prostate cancer, and other sociodemographic variables. We speculate that men with multimorbidity and low-risk cancer may not opt for treatment because they may have a preference for immediate cure (ie, “take care of it”)<sup>33</sup> and may not want to add one more condition that requires long-term management. Furthermore, men with multimorbidity may fear nontreatment regret,<sup>34</sup> emotional distress,<sup>35</sup> and anxiety.<sup>36</sup> Strong multidisciplinary management strategies, including significant psychological support from primary care physicians and specialists (ie, urologist and/or medical and radiation oncologists), are needed to mitigate decisional conflict<sup>37</sup> and therefore facilitate CM use.<sup>14</sup>

In adjusted models, including validated life expectancy measures for prostate cancer survivors, patients meeting evidence-based criteria<sup>2</sup> for CM were 58% less likely to use CM based on life expectancy alone (ie, less than 5 years). Previous studies using CCI report both positive and negative relationships between comorbidity burden and CM use in Medicare FFS populations.<sup>38-40</sup> In a supplemental analysis in this study, CCI was not significantly associated with CM use. Taken together, these findings suggest that clinical and population differences in comorbidity definitions are likely to account for mixed findings in several previous investigations.<sup>41</sup> By defining multimorbidity using a list of conditions prioritized by policy makers in the US,<sup>21</sup> our study made a unique contribution to this field. However, as pointed out by a systematic review that current life expectancy prediction tools lack both practical and theoretical utility,<sup>42</sup> comorbidity measures that can be easily operationalized in a clinical setting are needed. Recently, age-adjusted indexes, such as the PCCI used in our study, were developed to provide life expectancy estimates in patients with prostate cancer.<sup>24</sup> Certain types (cardiovascular disease) and combinations (cardiometabolic and respiratory)<sup>43</sup> of chronic conditions are associated with treatment regardless of patient, clinician, and health-care ecosystem factors. Additional research is needed to understand the relationship between more precise estimates of life expectancy and multimorbidity on CM use in FFS Medicare populations.

In our study, patient-reported experiences, specifically timeliness of care, were positively associated with CM use. Patients with higher timeliness of care scores were significantly more likely to use CM after adjusting for demographic, clinical, socioeconomic, and health-care system factors. Timely access to care for localized prostate cancer patients

is not limited to initial diagnosis of prostate cancer, but the opportunity and ease by which a patient is able to utilize needed services along the continuum of care throughout survivorship.<sup>44</sup> Choices for elderly localized prostate cancer patients involve selecting curative and noncurative treatments with trade-offs in efficacy, potential adverse quality of life effects, and competing risk mortality. MCAHPS timeliness of care domains, such as perceived barriers to appointment scheduling, are fundamental to shared decision-making among multiple health-care providers that significantly influence localized prostate cancer treatment choice.<sup>45-47</sup> We speculate that patients with higher timely care ratings may choose CM because they may have a favorable perception of health-care system capacity to provide services once a need is detected.

Our study findings have important policy implications. Currently, no value-based mechanisms exist to support the use of CM in Medicare FFS populations. Existing literature also suggest that CM use in FFS system varies among physician practices by 5.1%-71.2%.<sup>31</sup> Emerging oncology care models by CMS may need to incorporate risk-adjusted CM use as a quality indicator along the cancer care continuum<sup>48</sup> to promote CM use among men with localized prostate cancer. Recently, the NCCN Quality and Outcomes committee identified significant gaps in evaluating high-quality cancer care with patient experience measures and evidence-based practice.<sup>49</sup> More research is needed to identify specific barriers to timely care and how validated patient-reported experience measures can be used to support evidence-based management of localized prostate cancer patients in oncology care models.

We also observed that elements of social determinants, such as education, were associated with CM use. Although educational attainment may not be modifiable among older adults, initiatives such as “health in all policies” by World Health Organization and the Centers for Disease and Prevention Control “integrate and articulated health considerations” into community health policy.<sup>50</sup> These experts concluded that social, economic, and physical environments have a significant impact on the health of an individual and these effects should be considered in the development of all public policies and programs.

#### 4.1 | Strengths and limitations

The SEER-CAHPS data linkage is a robust and unique resource that provides an ideal opportunity to study patient-centered care delivery of contemporary treatment patterns among patients with localized prostate cancer and multimorbidity. We build on previous findings by including validated estimations of life expectancy and definitions of



multimorbidity to access the impact of comorbid conditions on patterns of contemporary treatment options for older localized prostate cancer patients.

Our study results must be interpreted with important limitations. MCAHPS surveys request patient-reported experiences with care “in the last 6 months”.<sup>18</sup> Due to relatively small sample size, we included surveys completed within 6 months after localized prostate cancer diagnosis which may overlap with the baseline period. However, our results were robust to multivariable adjustments for time between cancer diagnosis and survey completion. Due to MCAHPS survey administration processes and collection, we cannot directly attribute MCAHPS composite ratings to physician specialty or the prostate cancer diagnosis; instead, our results are generalizable to the entire patient experience after diagnosis which may include multiple care providers for multiple conditions. The study sample comprised of predominantly non-Hispanic white, urban adults, potentially limiting generalizability to ethnic minorities, rural, or other populations. Our study was restricted to Medicare FFS enrollees 65 years or older and may not be generalizable to younger adults or individuals on private insurance. Lastly, due to sample size limitations, we were unable to analyze the relationship of individual chronic conditions with CM use.

## 5 | CONCLUSIONS

Our results highlight the effect of patient-reported experiences, multimorbidity, and life expectancy on CM use among older men with localized prostate cancer. While factors such as multimorbidity and life expectancy are critical clinical components that may affect the choice of CM vs over treatment, our study highlights the role of nonclinical factors, specifically patient-reported experiences with care on treatment of localized prostate cancer. Our findings support a “population health-based” oncology care model in which both clinical and nonclinical factors, such as patient-reported experiences, are integrated to promote CM use and avoid overtreatment among older men with localized prostate cancer.

## 6 | PROTECTION OF HUMAN SUBJECTS

This study was conducted after approval by the institutional review board at West Virginia University and in accordance with an assurance filed with and approved by the US Department of Health and Human Services.

## CONFLICT OF INTEREST

The authors report no conflict of interests.

## AUTHOR CONTRIBUTIONS

Ryan Fiano: conceptualization, data curation, formal analysis, methodology, writing - original draft, and writing - review and editing. Gregory S. Merrick: writing - review and editing. Kim E Innes: writing - review and editing. Malcolm Mattes: writing - review and editing. Traci Lemasters: writing - review and editing. Chan Shen: writing - review and editing. Usha Sambamoorthi: writing - review and editing, data curation, formal analysis, and methodology.

## DATA AVAILABILITY STATEMENT

The NCI's Surveillance, Epidemiology, and End Results (SEER) cancer registry data and the Centers for Medicare & Medicaid Services' (CMS) Medicare Consumer Assessment of Healthcare Providers and Systems (CAHPS®) survey linkage were utilized in the present study (<https://healthcare.delivery.cancer.gov/seer-cahps/>).

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## SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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