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Trends in Surgical Overtreatment of Prostate Cancer

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IMPORTANCE Overtreatment of prostate cancer is a public health concern that undermines prostate cancer screening efforts.

OBJECTIVE To assess trends in pathologic grade on prostatectomy during the past 2 decades as a surrogate for overtreatment.

DESIGN, SETTING, AND PARTICIPANTS This retrospective cohort study examined the grade of prostate cancer on final pathology reports among patients undergoing prostatectomy between January 1, 2010, and September 1, 2024, in 2 parallel cohorts: Surveillance, Epidemiology, and End Results (SEER), a nationwide cancer registry, and Michigan Urological Surgery Improvement Collaborative (MUSIC), a statewide clinical registry. The presence of higher-risk features among patients who underwent grade group 1 prostatectomy during this period was also assessed.

EXPOSURES The primary exposure of interest was year of radical prostatectomy.

MAIN OUTCOMES AND MEASURES The primary outcome was the proportion of all prostatectomies that were pathologic grade group 1 (pGG1) on final pathology reports. The secondary outcome was the proportion of pGG1 prostatectomies with a higher-risk preoperative feature, assessed as a binary variable and including at least 1 of the following: more than 50% of biopsy cores positive, prostate-specific antigen of 10 ng/mL or higher, or grade group 2 on biopsy.

RESULTS A total of 162 558 male patients in SEER (median [IQR] age, 63 [57-67] years) and 23 370 in MUSIC (median [IQR] age, 64 [59-69] years) underwent prostatectomy. The proportion of radical prostatectomies resulting in pGG1 on final pathology reports decreased from 32.4% (5852 of 18 071) to 7.8% (978 of 12 500) between 2010 and 2020 in SEER and from 20.7% (83 of 401) to 2.7% (32 of 1192) between 2012 and 2024 in MUSIC. A more recent prostatectomy was associated with a lower likelihood of a pGG1 prostatectomy while controlling for age and race within SEER (odds ratio [OR] per 5 years, 0.41; 95% CI, 0.40-0.42; $P < .001$) and MUSIC (OR per 5 years, 0.39; 95% CI, 0.36-0.43; $P < .001$). Within a subset analysis of those prostatectomies that were final pGG1, a more recent prostatectomy was associated with the presence of a higher-risk preoperative feature, including more than 50% of biopsy cores positive, prostate-specific antigen of 10 ng/mL or higher, and grade group 2 on prior biopsy within SEER (OR per 5 years, 1.60; 95% CI, 1.54-1.67; $P < .001$) and MUSIC (OR per 5 years, 1.60; 95% CI, 1.34-1.90; $P < .001$)

CONCLUSIONS AND RELEVANCE This cohort study found that since 2010, the frequency of pGG1 prostatectomies markedly decreased, and those few that were performed were more likely to have a higher-risk feature. This reduction in the proportion of prostatectomies that are pGG1 likely reflects improved diagnostic pathways, adherence to active surveillance protocols for low-risk cases, and ongoing efforts at both the state and national levels to minimize unnecessary surgical interventions in patients diagnosed with clinically insignificant prostate cancer.

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Supplemental content

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Prostate cancer is the most common malignant neoplasm among men in the US, with an estimated 299 010 new cases in 2024. Prostate cancer is also the second-leading cause of cancer-related death among men, with 35 250 estimated deaths in the same year.[1] Despite this, the widespread adoption of prostate cancer screening is controversial. Screening for prostate cancer is facilitated by a prolonged asymptomatic period in which localized treatment offers a meaningful chance to cure, a high baseline prevalence in patients of a certain age, and an affordable blood test of reasonable sensitivity (ie, prostate-specific antigen [PSA]). However, there are warranted concerns that the potential morbidity and health care costs of diagnosis and treatment often outweigh the oncologic benefit for many patients. Radiation and prostatectomy both have long-term risks, and many patients with indolent prostate cancer will not be affected by their disease in their lifetime.

In 2012, the US Preventive Services Task Force recommended against PSA screening, citing overtreatment of indolent disease and its associated morbidity as a major limitation to the safety of widespread screening.[2] This recommendation was revised in 2018, and the US Preventive Services Task Force now advises that PSA screening should only be pursued after an individualized discussion with the patient, emphasizing the risk of overtreatment.[3] During this period, urologists, radiation oncologists, and medical oncologists have made concerted efforts to reduce overdiagnosis and overtreatment in localized prostate cancer, with all major guidelines (ie, National Comprehensive Cancer Network, European Association of Urology, and American Urological Association/American Society for Radiation Oncology) expanding and strengthening their recommendations in favor of active surveillance for low-risk prostate cancer.[4-6] Given this rapidly evolving landscape, we sought to evaluate trends in the surgical overtreatment of prostate cancer during the past 2 decades.

Key Points

Question Has there been an improvement in the rate of surgical overtreatment of prostate cancer during the past 2 decades?

Findings This cohort study of 185 928 male patients in 2 parallel registries—Surveillance, Epidemiology, and End Results and Michigan Urological Surgery Improvement Collaborative—found a greater than 5-fold decrease in the proportion of patients undergoing prostatectomies with pathologic grade group 1 between 2010 and 2024. On a subset analysis of those prostatectomies that were pathologic grade group 1, an increase in the proportion that had a higher-risk preoperative feature (>50% of biopsy cores positive, prostate-specific antigen ≥10 ng/mL, or grade group 2 on biopsy) during that time was observed.

Meaning These findings suggest that management of low-risk prostate cancer has improved during the past 2 decades, with a substantial decrease in the frequency of pathologic grade group 1 prostatectomies.

Methods

We evaluated the proportion of patients undergoing radical prostatectomies with pathologic grade group 1 (pGG1) on final surgical specimen as a surrogate for clinically insignificant disease between January 1, 2010, and December 31, 2020, within the Surveillance, Epidemiology, and End Results (SEER) Research Plus Data, 17 Registries and between January 1, 2012, and September 1, 2024, within the Michigan Urological Surgery Improvement Collaborative (MUSIC) registry. All analysis was performed strictly in parallel, and data were not combined. MUSIC is a statewide quality improvement collaborative consisting of more than 260 urologists providing care at 46 diverse urology practices in Michigan, funded by Blue Cross Blue Shield of Michigan. SEER served as a national sample, whereas MUSIC served as a more granular statewide sample with a focus on validated urologic outcomes, including early adoption of active surveillance.[7-9] Approval to participate in MUSIC was obtained by each practice's or institution's institutional review board. Deidentified data were abstracted, and patient consent was waived by the University of Michigan Institutional Review Board. This study was deemed exempt by the University of Michigan Institutional Review Board. The study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline for cohort studies.

Statistical Analysis

Within both SEER and MUSIC, pGG1 was modeled as a binary variable against time while controlling for age and self-reported race. Within MUSIC, we included a mixed-effects logistic model with nested random effects for practice and surgeon. A similar approach was used in a subset analysis to further assess the proportion of pGG1 prostatectomies with preoperative higher-risk features: PSA of 10 ng/mL or higher (to convert to micrograms per liter, multiply by 1), more than 50% of biopsy cores positive, or clinical grade group 2 on biopsy. The presence of any of these risk features was modeled as a binary variable against time, controlling for age and race. Age and race were chosen as known drivers of prostate cancer outcomes and management. In all models, age was taken at the time of the prostate cancer diagnosis. Patients with missing data for any of the variables included in the analysis were excluded.

To provide added detail regarding the biopsy grade of patients undergoing prostatectomy in both cohorts, we also reported both the final pathologic grade and the biopsy grade of patients undergoing prostatectomy at each year. Additionally, to report practice-level variation in rates of pGG1 prostatectomies within MUSIC, we reported the proportion of prostatectomies that were pGG1 in 2012 to 2015, 2016 to 2020, and 2021 to 2024 within each practice included in the MUSIC analysis.

We used R statistical software, version 4.4.2 (R Project for Statistical Computing) for our data analyses. A 2-sided $P < .05$ was considered statistically significant.

Results

Demographics and characteristics of the 162 558 male patients in the SEER cohort (median [IQR] age, 63 [57-67] years; 13.0% Black, 80.2% White, and 5.9% other race, including

Alaska Native, American Indian, Asian, and Pacific Islander) and the 23 370 male patients (median [IQR] age, 64 [59-69] years; 12.3% Black, 75.1% White, and 2.6% other race, including Alaska Native, American Indian, Asian, and Pacific Islander) in the MUSIC cohort are summarized in **Table 1**. The PSA values were broadly similar between the 2 cohorts. A greater percentage pGG1 prostatectomies were observed in SEER compared with MUSIC (18.7% vs 9.2%).

In our primary analysis, the proportion of prostatectomies that were pGG1 decreased from 32.4% (5852 of 18 071) to 7.8% (978 of 12 500) between 2010 and 2020 in SEER and from 20.7% (83 or 401) to 2.7% (32 of 1192) between 2012 and 2024 in MUSIC (**Figure 1**; eTables 1 and 2 in Supplement 1). In our multivariable model, adjusting for age and race, this decrease was statistically significant in both SEER (odds ratio [OR] per 5 years, 0.41; 95% CI, 0.40-0.42) and MUSIC (OR per 5 years, 0.39; 95% CI, 0.36-0.43) (**Table 2**). Age was associated with decreased likelihood of a pGG1 prostatectomy in both SEER (OR per 5 years, 0.81; 95% CI, 0.81-0.82) and MUSIC (OR per 5 years, 0.77; 95% CI, 0.74-0.80) Black race was also associated with a decreased likelihood of a pGG1 prostatectomy in SEER (OR, 0.86; 95% CI, 0.83-0.90) and MUSIC (OR, 0.70; 95% CI, 0.60-0.83).

Our subset analysis of patients who underwent a pGG1 prostatectomy included 30 358 patients within SEER and 2160 patients within MUSIC. In this cohort, the proportion with more than 50% of cores positive on preoperative biopsy increased from 10.5% (260 of 2478) to 14.6% (89 of 611) in SEER and from 3.8% (3 of 79) to 18.8% (6 of 32) in MUSIC (**Figure 2**). The proportion with preoperative PSA values of 10 ng/mL or greater increased from 9.2% (472 of 5158) to 12.8% (102 of 794) in SEER and from 6.0% (5 of 83) to 12.5% (4 of 32) in MUSIC. Finally, the proportion of pGG1 prostatectomies with clinical grade group 2 or greater on biopsy (therefore representing downgrading on final pathology report) varied widely between 2012 and 2024 in MUSIC (28.2% [70 of 248] to 50.0% [37 of 74]) but increased from 16.9% (898 of 5312) to 28.3% (231 of 816) between 2010 and 2020 in SEER. A more recent pGG1 prostatectomy was significantly associated with the presence of any of these features, modeled as a binary variable, adjusting for age and race, in both SEER (OR per 5 years, 1.60; 95% CI, 1.54-1.67; $P < .001$) and MUSIC (OR per 5 years, 1.60; 95% CI, 1.34-1.90; $P < .001$) (**Table 3**).

Additionally, preoperative biopsy results of patients undergoing prostatectomy in SEER and MUSIC are provided in eTables 3 and 4 in Supplement 1. The biopsy grade group of patients undergoing prostatectomy closely paralleled the final pathologic grade group across the years examined with less grade group 1 in recent years. For instance, within SEER in 2010, 47.5% of prostatectomies (7927 of 16 705) were in patients biopsied as grade group 1, whereas in 2020 only 14.1% of prostatectomies (1666 of 11 849) were in patients biopsied as grade group 1. Within MUSIC, this number decreased from 24.7% (99 of 401) to 8.3% (99 of 1190) from 2012 to 2024.

Practice-level variation in rates of pGG1 prostatectomy within MUSIC are shown in the eFigure in Supplement 1. In almost every one of the 31 practices assessed, a numerically lower proportion of prostatectomies were pGG1 in 2021 to 2024 compared with 2012 to 2015, regardless of their initial proportion in 2012 to 2015. From 2012 to 2015, the proportion of prostatectomies that were pGG1 varied widely among practices, mostly falling between 10.0% and 30.0%, whereas from 2021 to 2024 the proportion was less than 10.0% in almost all practices.

Table 1. Cohort Characteristics

Characteristic	No. (%) of participants[a]	
	SEER (n = 162 558)	MUSIC (n = 23 370)
Age, median (IQR), y	63 (57-67)	64 (59-69)
Race[b]		
Black	21 087 (13.0)	2883 (12.3)
White	130 317 (80.2)	17 556 (75.1)
Other[c]	9494 (5.9)	616 (2.6)
Highest preoperative PSA, median (IQR), ng/mL	6.3 (4.8-9.3)	6.7 (5.0-9.8)
Highest preoperative PSA, ng/mL		
<10	114 899 (70.7)	17 386 (74.4)
10-20	23 691 (14.6)	4178 (17.9)
>20	8757 (5.4)	1411 (6.0)
Pathologic grade group		
1	30 358 (18.7)	2160 (9.2)
2	75 457 (46.4)	12 391 (53.0)
3	33 424 (20.6)	5685 (24.3)
4	9296 (5.7)	1125 (4.8)
5	14 023 (8.6)	2009 (8.6)
Pathologic stage		
T2	109 087 (67.1)	14 430 (61.7)
≥T3	51 890 (31.9)	8928 (38.2)
Pathologic N stage		
N0	103 038 (63.4)	17 677 (75.6)
N1	7886 (4.8)	958 (4.1)
Nx	51 634 (31.8)	4735 (20.3)

Abbreviations: MUSIC, Michigan Urological Surgery Improvement Collaborative; PSA, prostate-specific antigen; SEER, Surveillance, Epidemiology, and End Results.

SI conversion factor: To convert PSA to micrograms per liter, multiply by 1.

[a] Unless otherwise indicated.

[b] Race was self-reported within each registry.

[c] Races in the other group include Alaska Native, American Indian, Asian, and Pacific Islander.

Discussion

Our analyses show that the proportion of prostatectomies that are pGG1 has decreased more than 5-fold since 2010, and the pGG1 prostatectomies that are now performed are more likely to have higher-risk preoperative features. Although further improvement in surgical overtreatment of prostate cancer is necessary, these results reflect a dramatic shift in how low-risk prostate cancer has been managed in the US during the past 2 decades.

Figure 1. Trends in Grade Group (GG) Among 162 558 Surveillance, Epidemiology, and End Results (SEER) Prostatectomies and 23 370 Michigan Urological Surgery Improvement Collaborative (MUSIC) Prostatectomies

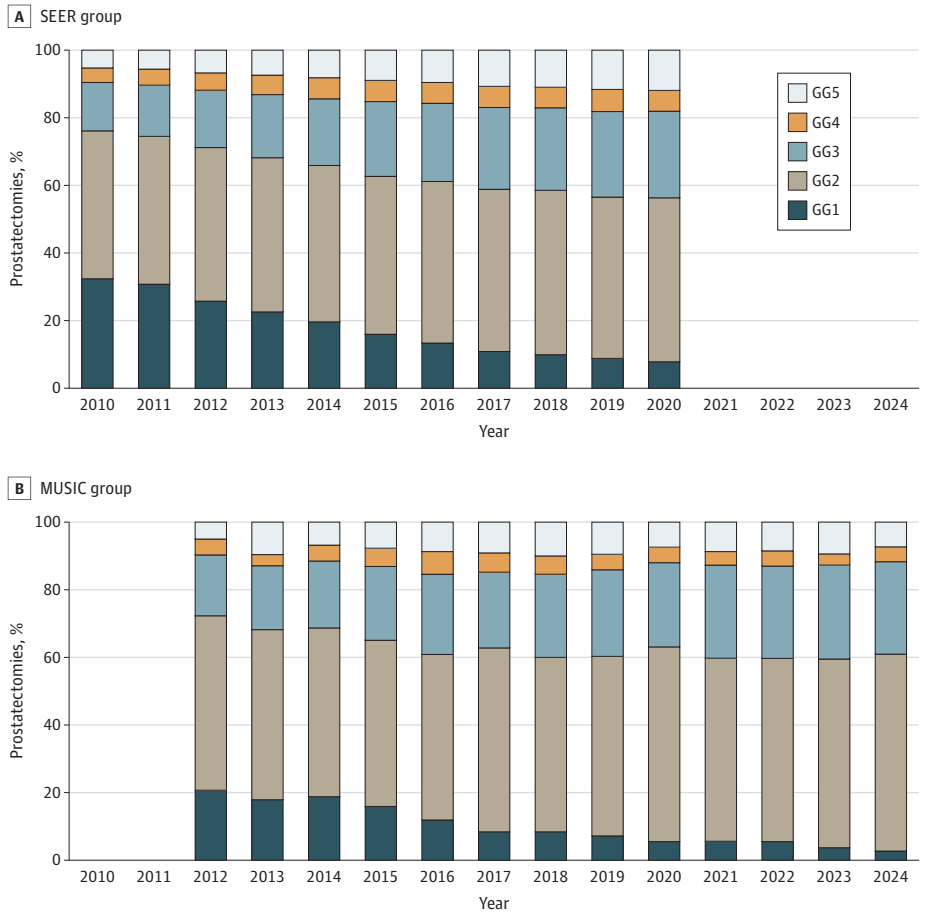


Table 2. Multivariable Analysis Modeling of the Likelihood of Pathologic Grade Group 1 on Prostatectomy Within SEER and MUSIC

	SEER (n = 162 558)		MUSIC (n = 21 039)	
Variable	OR (95% CI)	*P* value	OR (95% CI)	*P* value
Year (+5 y)	0.41 (0.40-0.42)	<.001	0.39 (0.36-0.43)	<.001
Age (+5 y)	0.81 (0.81-0.82)	<.001	0.77 (0.74-0.80)	<.001
Race				
White	1 [Reference]	NA	1 [Reference]	NA
Black	0.86 (0.83-0.90)	<.001	0.70 (0.60-0.83)	<.001
Other[a]	0.74 (0.70-0.79)	<.001	0.70 (0.51-0.97)	.03

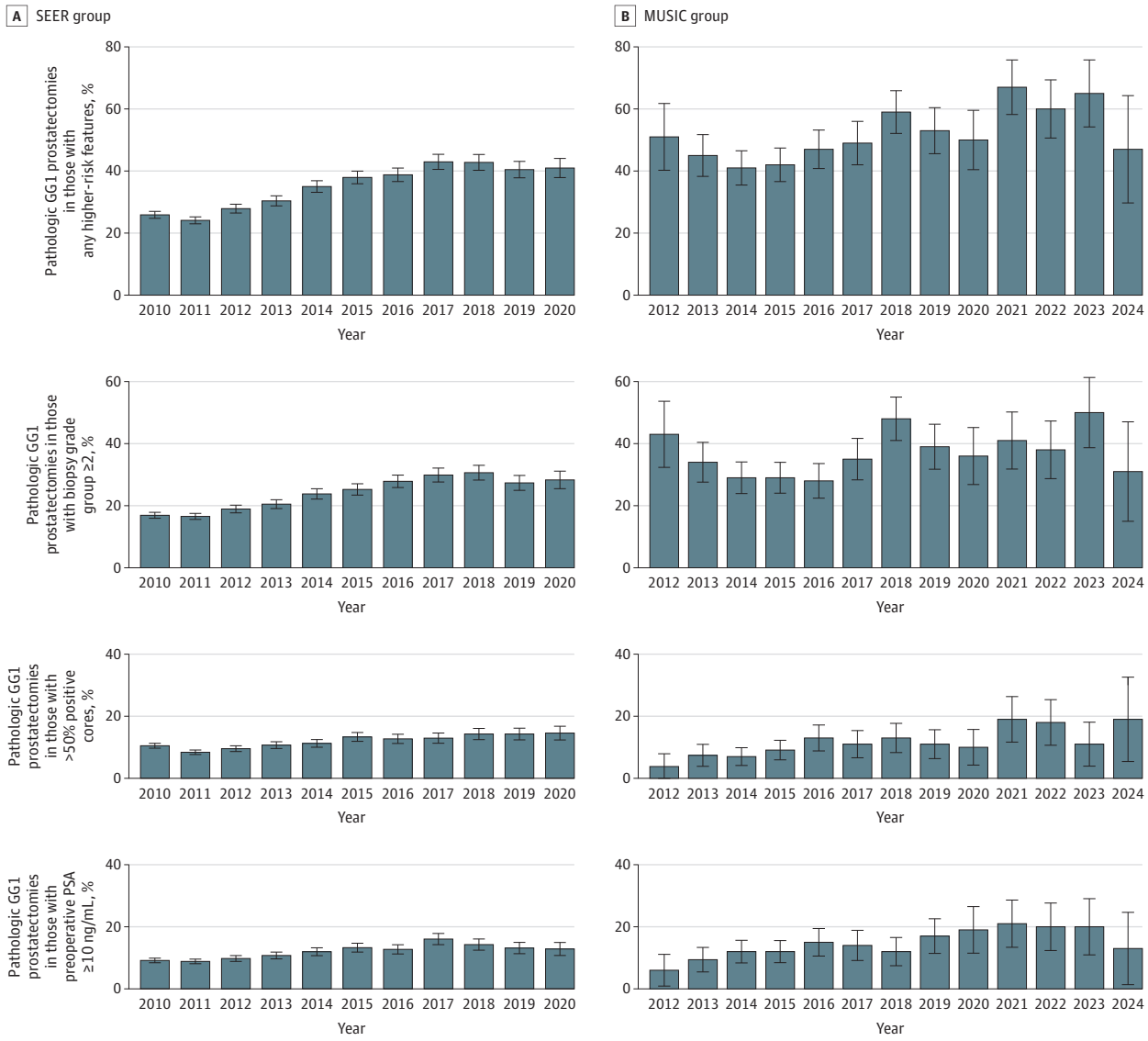
Abbreviations: MUSIC, Michigan Urological Surgery Improvement Collaborative; NA, not applicable; OR, odds ratio; SEER, Surveillance, Epidemiology, and End Results.

[a] Races in the other group include Alaska Native, American Indian, Asian, and Pacific Islander.

These results are also consistent with other studies reporting the increased use of active surveillance for low-risk prostate cancer since 2010, which now represents the predominant approach for managing grade group 1 prostate cancer and is increasingly accepted for certain grade group 2 prostate cancers.[10-12] This increased adoption of active surveillance has been facilitated by guideline changes, prospectively monitored active surveillance protocols, and broad quality improvement initiatives throughout the country.[4,8,13,14]

Our current understanding of surgical overtreatment is informed by who benefits from prostatectomy. The few randomized clinical trials comparing surgery and observation were all published during the era investigated by our study (2010-2024) and greatly increased the acceptance of active surveillance for low-risk prostate cancer during that period. The PIVOT (Prostate Cancer Intervention vs Observation Trial), PROTECT (Prostate Testing for Cancer and Treatment), and SPCG-4 (Scandinavian Prostate Cancer Group Study 4) trials included most patients with grade group 1 prostate cancer on biopsy (72%, 77%, and 61%, respectively), meaning current guidelines would now recommend surveillance for many of the patients in these studies.[15-17] Within these studies, the modest survival benefit of prostatectomy appears to be driven by those patients with grade group 2 or higher because can-

Figure 2. Higher-Risk Features Among Grade Group 1 (GG1) Prostatectomies



High-risk features included biopsy grade group of 2 or higher, more than 50% biopsy cores positive, and preoperative prostate-specific antigen value of 10 ng/mL (to convert to µg/L, multiply by 1.0) or greater in the Surveillance, Epidemiology, and End Results (SEER) and Michigan Urological Surgery Improvement Collaborative (MUSIC) study groups. Error bars represent 95% CIs of the mean proportion.

cer death and even progression were extremely rare in those patients with grade group 1 cancer. These studies support the current understanding that pGG1 cancer at prostatectomy represents clinically indolent disease and likely overtreatment.

Still, surgical treatment of pGG1 represents a limited definition of overtreatment. We focused only on pGG1 and not PSA or biopsy core characteristics in our primary analysis given concerns of missing data and coding inaccuracy for these more nuanced variables within cancer registries. Additionally, our analysis reflects only the biology of the cancer and not the competing comorbidities of the patient. Reducing treatment of localized prostate cancer in patients with limited life expectancy, regardless of cancer aggressiveness, is an essential aspect of improving overtreatment and one unmeasured in this current analysis.[18] Nevertheless, at each step (screening, workup, and treatment), management of localized prostate cancer should be informed by the individual patient and appropriately deferred in patients with limited life expectancy.

A substantial number of patients with pGG1 prostatectomies in this study were downgraded from their initial biopsy. This finding is consistent with the literature, which suggests that approximately 8% of biopsy grade group 2 are downgraded to grade group 1 on prostatectomy and highlights the limitations of biopsy grade alone to guide selection for active surveillance.[19] This finding also supports the increasing acceptance of certain grade group 2 prostate cancers for active surveillance and the need for continued quality improvement in grade group 2 prostate cancer management.

Table 3. Subset Analysis Evaluating Only Patients With Final Pathologic Grade Group 1 on Prostatectomy and Modeling of the Likelihood of Having at Least 1 of 3 Defined Higher-Risk Features[a]

	SEER (n = 30 358)		MUSIC (n = 1930)	
Variable	OR (95% CI)	*P* value	OR (95% CI)	*P* value
Year (+5 y)	1.60 (1.54-1.67)	<.001	1.60 (1.34-1.90)	<.001
Age (+5 y)	1.14 (1.12-1.16)	<.001	1.10 (1.03-1.18)	.004
Race				.02
White	1 [Reference]	NA	1 [Reference]	NA
Black	1.39 (1.29-1.50)	<.001	1.59 (1.15-2.19)	.005
Other[b]	1.19 (1.06-1.35)	.004	1.21 (0.63-2.33)	.57

Abbreviations: MUSIC, Michigan Urological Surgery Improvement Collaborative; NA, not applicable; OR, odds ratio; SEER, Surveillance, Epidemiology, and End Results.

[a] Higher-risk features were prostate-specific antigen value of 10 ng/mL (to convert to µg/L, multiply by 1.0) or higher, more than 50% of positive biopsy cores, or clinical grade group of 2 or higher on initial biopsy.

[b] Other races included Alaska Native, American Indian, Asian, and Pacific Islander.

Although not the main aim of our study, we did note substantial practice-level variation in the rate of pGG1 prostatectomy that seemed to decrease over time; more consistency was observed across practices in the low proportion of pGG1 in 2021 to 2024 compared with the higher proportion in 2012 to 2015 (eFigure in Supplement 1). This finding may reflect different rates of acceptance of active surveillance across practices, with some early adopters and some latecomers, and underscores the need for practice-level engagement in prostate cancer quality improvement initiatives.[8]

Limitations

This study is limited by its retrospective nature and the potential coding inaccuracies inherent to registry data, particularly for laboratory data such as PSA. Although large registries, SEER and MUSIC may also not reflect clinical practice in all regions and populations in the United States. Despite being retrospective, our study is strengthened by the parallel analysis of 2 large cancer registries with overlapping periods—one national and one statewide. The Detroit/Michigan registry is not included in SEER 17, so our observations within SEER and MUSIC are strictly among separate populations. Similar findings were observed in both cohorts. For instance, for the years shared between MUSIC and SEER, 2012 to 2020, the absolute percentage difference in pGG1 between cohorts was always less than 5%. In addition, the graphical trends of a decrease in pGG1 in Figure 1 and an increase in higher-risk features in Figure 2A-B were approximately parallel in both cohorts. Finally, the OR for pGG1 and year of prostatectomy was 0.41 in SEER and 0.39 in MUSIC, and the OR for higher-risk feature and year of pGG1 prostatectomy was 1.60 in SEER and 1.60 in MUSIC. The similarity of these findings in 2 independent cohorts supports their validity and our conclusion that the incidence of pGG1 prostatectomies has markedly decreased.

Conclusions

Prostate cancer remains a major public health concern. Although often indolent because of its very high prevalence, prostate cancer remains the second-most lethal cancer among patients in the US. Progress in prostate cancer management involves early identification of patients with lethal cancer who need treatment but also reduction in treatment of the many patients who do not need it. To this second end, we observe a greater than 5-fold reduction in the proportion of prostatectomies that were pGG1 between 2010 and 2024. Although pGG1 is a narrow definition of overtreatment, our results reflect a profound change in how low-risk prostate cancer is managed in the US. Surgical overtreatment has decreased markedly since 2010.

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Concept and design: Monda, Sarle, Srivastava, Labardee, Ginsburg, Morgan, Borza.
Acquisition, analysis, or interpretation of data: Monda, Demus, Jaime-Casas, Meah, Labardee, Ghani, Ginsburg, Borza.
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REFERENCES

1. American Cancer Society. Key statistics for prostate cancer: prostate cancer facts. Accessed January 3, 2025. https://www.cancer.org/cancer/types/prostate-cancer/about/key-statistics.html

2. Moyer VA; U.S. Preventive Services Task Force. Screening for prostate cancer: U.S. Preventive Services Task Force recommendation statement. *Ann Intern Med*. 2012;157(2):120-134. doi:10.7326/0003-4819-157-2-201207170-00459

3. Grossman DC, Curry SJ, Owens DK, et al; US Preventive Services Task Force. Screening for prostate cancer: US Preventive Services Task Force recommendation statement. *JAMA*. 2018;319(18):1901-1913. doi:10.1001/jama.2018.3710

4. Schaeffer EM, Srinivas S, Adra N, et al. NCCN Guidelines® Insights: prostate cancer, version 3.2024. *J Natl Compr Canc Netw*. 2024;22(3):140-150. doi:10.6004/jnccn.2024.0019

5. Eastham JA, Auffenberg GB, Barocas DA, et al. Clinically localized prostate cancer: AUA/ASTRO Guideline, part i: introduction, risk assessment, staging, and risk-based management. *J Urol*. 2022;208(1):10-18. doi:10.1097/JU.0000000000002757

6. Cornford P, van den Bergh RCN, Briers E, et al. EAU-EANM-ESTRO-ESUR-ISUP-SIOG Guidelines on Prostate Cancer-2024 update, part I: screening, diagnosis, and local treatment with curative intent. *Eur Urol*. 2024;86(2):148-163. doi:10.1016/j.eururo.2024.03.027

7. Auffenberg GB, Lane BR, Linsell S, Cher ML, Miller DC. Practice- vs physician-level variation in use of active surveillance for men with low-risk prostate cancer: implications for collaborative quality improvement. *JAMA Surg*. 2017;152(10):978-980. doi:10.1001/jamasurg.2017.1586

8. Vince RA Jr, Sun Y, Mahal B, et al. The impact of a statewide active surveillance initiative: a roadmap for increasing active surveillance utilization nationwide. *Eur Urol*. 2023;83(4):307-310. doi:10.1016/j.eururo.2022.05.028

9. Ginsburg KB, Cher ML, Montie JE. Defining quality metrics for active surveillance: the Michigan Urological Surgery Improvement Collaborative experience. *J Urol*. 2020;204(6):1119-1121. doi:10.1097/JU.0000000000001308

10. Cooperberg MR, Meeks W, Fang R, Gaylis FD, Catalona WJ, Makarov DV. Time trends and variation in the use of active surveillance for management of low-risk prostate cancer in the US. *JAMA Netw Open*. 2023;6(3):e231439. doi:10.1001/jamanetworkopen.2023.1439

11. Ajjawi I, Loeb S, Cooperberg MR, et al. Active surveillance or watchful waiting for intermediate-risk prostate cancer, 2010-2020. *JAMA*. 2024;332(23):2033-2036. doi:10.1001/jama.2024.20580

12. Paudel R, Madan R, Qi J, et al. The use and short-term outcomes of active surveillance in men with National Comprehensive Cancer Network favorable intermediate-risk prostate cancer: the initial Michigan Urological Surgery Improvement Collaborative experience. *J Urol*. 2023;209(1):170-179. doi:10.1097/JU.0000000000003012

13. Newcomb LF, Schenk JM, Zheng Y, et al. Long-term outcomes in patients using protocol-directed active surveillance for prostate cancer. *JAMA*. 2024;331(24):2084-2093. doi:10.1001/jama.2024.6695

14. Cher ML, Dhir A, Auffenberg GB, et al; Michigan Urological Surgery Improvement Collaborative. Appropriateness criteria for active surveillance of prostate cancer. *J Urol*. 2017;197(1):67-74. doi:10.1016/j.juro.2016.07.005

15. Hamdy FC, Donovan JL, Lane JA, et al; ProtecT Study Group. Fifteen-year outcomes after monitoring, surgery, or radiotherapy for prostate cancer. *N Engl J Med*. 2023;388(17):1547-1558. doi:10.1056/NEJMoa2214122

16. Wilt TJ, Vo TN, Langsetmo L, et al. Radical prostatectomy or observation for clinically localized prostate cancer: extended follow-up of the Prostate Cancer Intervention Versus Observation Trial (PIVOT). *Eur Urol*. 2020;77(6):713-724. doi:10.1016/j.eururo.2020.02.009

17. Holmberg L, Garmo H, Andersson SO, et al. Radical prostatectomy or watchful waiting in early prostate cancer. *N Engl J Med*. 2024;391(14):1362-1364. doi:10.1056/NEJMc2406108

18. Daskivich TJ, Luu M, Heard J, Thomas IC, Leppert JT. Overtreatment of prostate cancer among men with limited longevity in the active surveillance era. *JAMA Intern Med*. 2025;185(1):28-36. doi:10.1001/jamainternmed.2024.5994

19. Su ZT, Patel HD, Epstein JI, Pavlovich CP, Allaf ME. Downgrading of grade group 2 intermediate-risk prostate cancer from biopsy to radical prostatectomy: comparison of outcomes and predictors to identify potential candidates for active surveillance. *Cancer*. 2020;126(8):1632-1639. doi:10.1002/cncr.32709