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Effective Clinical Practice.
1999;2:228–233.

Trends in the Use of Radical Prostatectomy for Treatment of Prostate Cancer

CONTEXT. The incidence of prostate cancer and rates of radical prostatectomy increased sharply in the Medicare population (men older than 65 years of age) after the introduction of prostate-specific antigen screening in the late 1980s.

PRACTICE PATTERN EXAMINED. Trends in age-specific rates of use of radical prostatectomy in U.S. men between 1989 and 1995.

DATA SOURCE. The National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) program.

RESULTS. Overall, rates of radical prostatectomy more than doubled between 1989 and 1992 (from 78 per 100,000 men to 206 per 100,000 men) but decreased by a third between 1992 and 1995 (to 146 per 100,000 men). The pattern in overall radical prostatectomy rates between 1992 and 1995, however, obscures changes that occurred for men in different age groups. Decreases in radical prostatectomy rates were most dramatic in elderly persons, dropping 51% in men 70 to 74 years of age and 71% in men 75 years of age or older. In contrast, rates in younger men continued to increase between 1992 and 1995, rising 42% in men 45 to 49 years of age and 18% in men 50 to 54 years of age. In each age group, trends in surgery rates mirrored trends in cancer detection rates.

CONCLUSIONS. Surgical treatment of prostate cancer in older men is decreasing; however, surgery rates are increasing in younger men. These divergent trends reflect the pattern of prostate cancer detection in clinical practice.

Prostate-specific antigen (PSA) testing, which came into wide clinical use in 1987, uncovered a large reservoir of asymptomatic men who had prostate cancer that was undetectable by digital rectal examination. The overall incidence of prostate cancer increased 82% between 1986 and 1991.^{1,2} More cases were detected at earlier stages and thus were amenable to surgical resection by radical prostatectomy.³ As a result, use of this procedure increased dramatically. For example, rates of radical prostatectomy in Medicare beneficiaries increased more than fourfold between 1987 and 1992.^{4,5}

In the early 1990s, however, questions about the value of early detection and aggressive treatment of prostate cancer, particularly in elderly men, began to appear in the medical literature.^{6–16} Rates of prostate cancer detection and rates of radical prostatectomy began to decrease concomitantly in the Medicare population.¹⁷ To examine trends in all age groups, we studied men undergoing radical prostatectomy between 1989 and 1995 by using data from the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) program.

Methods

Rates of prostate cancer incidence and radical prostatectomy were obtained from the SEER public-use database.¹⁸ The SEER program is the federal government's primary effort to collect data about and report on cancer incidence, initial treatment, and

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survival (subsequent treatment and recurrence data are not collected). Trained abstractors collect information from hospital records, outpatient clinics, radiation centers, private laboratories, and physicians' offices. The SEER database includes information from population-based cancer registries in various areas of the country, including Connecticut, Iowa, New Mexico, Utah, Hawaii, and the metropolitan areas of Detroit, San Francisco, Seattle–Puget Sound, and Atlanta. These areas include approximately 10% of the U.S. population.

The primary goal of our analysis was to describe trends in rates of radical prostatectomy in different age groups, not to test specific hypotheses. Because of the large sample sizes, population-based rates generated from the SEER database are very precise. For example, the 95% CI for the 1992 rate of radical prostatectomy in men 75 years of age or older (the smallest age group examined in our analysis and therefore the one yielding the least precise rates) was $84 \pm \text{SD } 8$ per 100,000 men. For simplicity, we display age-specific rates standardized to 1989 (i.e., the rate for each age group starts at 1 in 1989). Standardized rates are interpreted as follows: If the standardized rate is 2, rates have doubled; if the standardized rate is 0.5, rates have halved. Absolute rates for men in different age groups by year are given in the **Appendix**.

Our secondary goal was to compare rates of surgery with those of prostate cancer incidence. We used only incidence for treatable disease. Ideally, we would have used the tumor, node, metastasis (TNM) staging system, as defined by the American Joint Committee for Cancer Staging and End Results Reporting. However, because of the structure of SEER reporting before 1995, we were limited to using a more generic staging system. We excluded patients who had metastatic disease at the time of initial diagnosis (approximately 27% of incident prostate cancer cases in 1989 and 17% of incident prostate cancer cases in 1995) because these patients would not have been considered for radical prostatectomy. We combined patients identified as having localized or regional disease and considered them to be treatable.

Results

Overall, rates of radical prostatectomy increased sharply (160%) between 1989 and 1992 but decreased 29% between 1992 and 1995. The change in overall rates, however, obscures distinct trends for men in different age groups. **Figure 1** shows the extent to which recent trends in radical prostatectomy are, in fact, age-dependent.

The recent decline in overall rates is solely attributable to the decreasing use of radical prostatectomy in men older than 60 years of age. The largest relative

decline in surgery rates (71%) between 1992 and 1995 occurred in men 75 years of age and older. In absolute terms, the largest decline occurred in men 70 to 74 years of age (from 449 per 100,000 men to 220 per 100,000 men).

In younger men, however, rates of radical prostatectomy increased throughout the study period. Surgery rates in men younger than 60 years of age increased dramatically between 1989 and 1992 and continued to rise at a slower rate after 1992. Between 1992 and 1995, surgery rates rose 42% in men 45 to 49 years of age and 17% in men 50 to 54 years of age.

The divergent trends in surgery rates in men of different ages could be caused by changes in the rates of detection or changes in treatment strategy. As shown in **Figure 2**, detection of nonmetastatic prostate cancer increased dramatically between 1989 and 1992. Although detection continued to rise after 1992 for men younger than 60 years of age, rates fell to levels near those of 1989 for men older than 70 years of age. For all age groups, trends in rates of radical prostatectomy were very similar to the reported incidence of prostate cancer (as evidenced by the similar patterns in **Figures 1** and **2**).

In contrast, **Figure 3** shows that patterns of treatment for cases of prostate cancer (once detected) were relatively stable during the study period. As expected, the proportion of men with nonmetastatic prostate cancer who were undergoing surgery varied according to age. Men younger than 60 years of age were most likely to undergo radical prostatectomy; men older than 70 years of age were most likely to receive radiation therapy (external beam or brachytherapy) or other treatments (including hormonal treatment or watchful waiting). For all age groups, a slightly higher proportion of patients with prostate cancer underwent radical prostatectomy in 1992 than in 1995. However, these differences were small when compared with much larger changes in absolute surgical rates.

Discussion

As is reflected by national trends in radical prostatectomy rates, the management of prostate cancer has changed substantially over the past decade. Soon after introduction of PSA screening in the late 1980s and dramatic increases in prostate cancer detection rates, surgery rates rose sharply in men of all age groups. After 1992, however, rates of radical prostatectomy continued to increase (albeit at a lower rate) in men younger than 60 years of age but decreased substantially in older men. In each age group, changes in surgery rates over time seemed to reflect changes in clinical decision making about diagnosis, not treatment; trends in radical prostatectomy rates closely

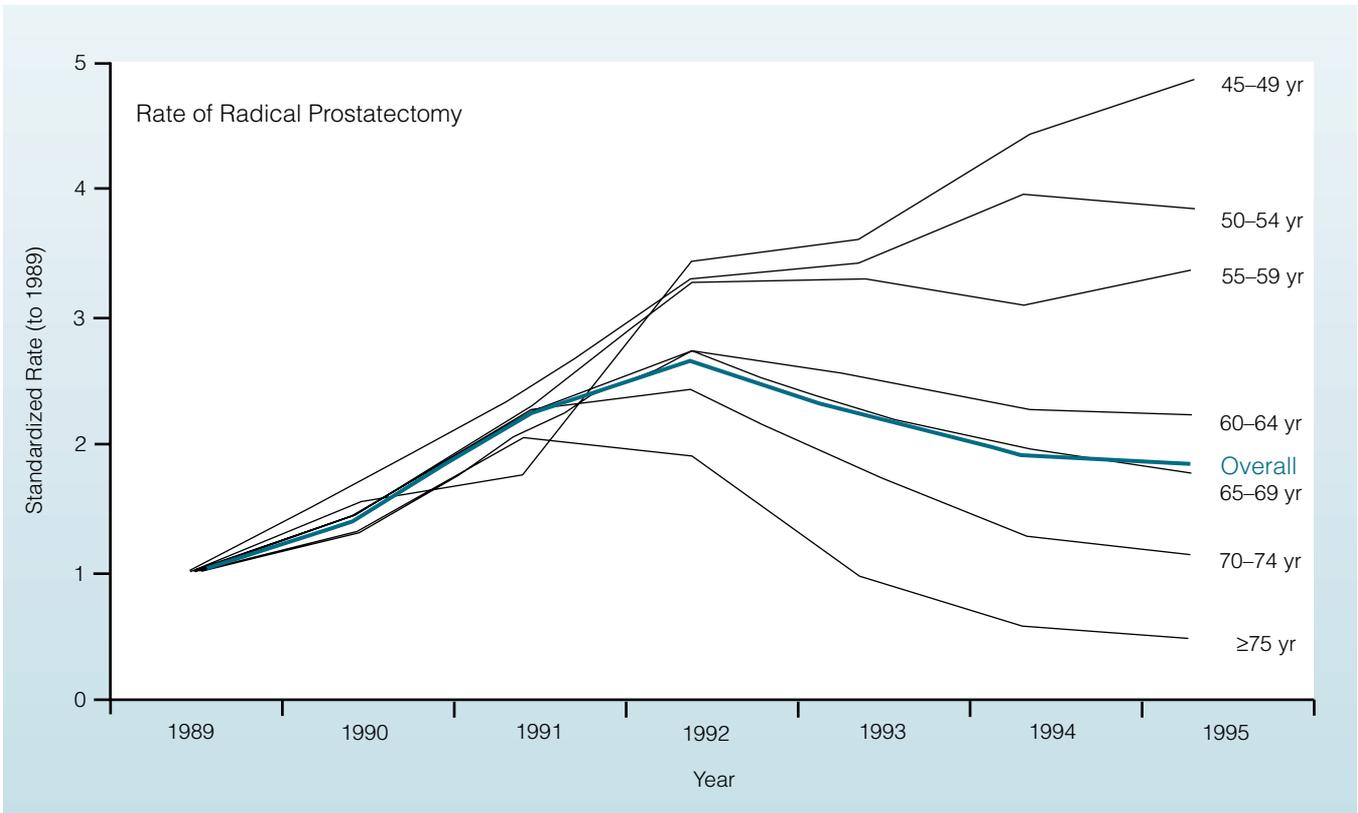


FIGURE 1. Age-stratified annual rates, standardized to 1989 rates.

mirrored those in prostate cancer. However, the proportion of men in different age groups who received a diagnosis of nonmetastatic prostate cancer and had radical prostatectomy did not change substantially over time.

Incidence of prostate cancer in older men may be decreasing for two reasons. First, it has been suggested that widespread use of PSA testing in the late 1980s and early 1990s may have exhausted a preexisting reservoir of preva-

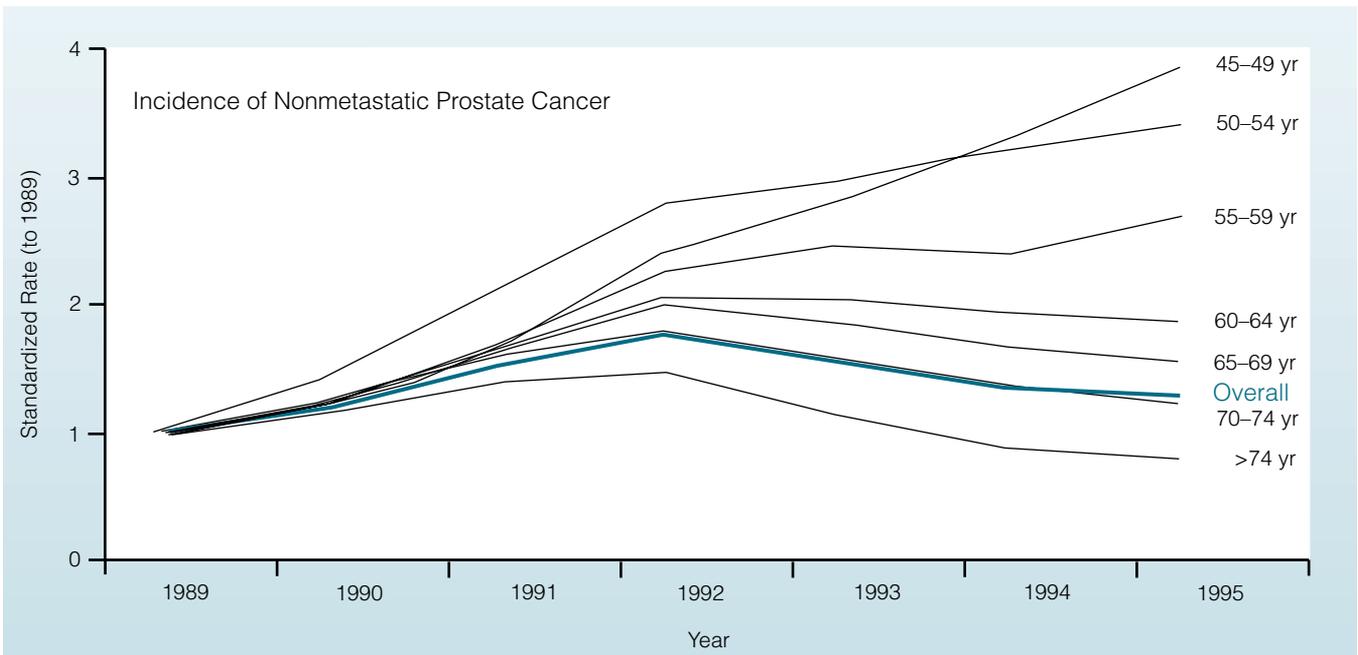


FIGURE 2. Age-stratified annual incidence, standardized to 1989 rates.

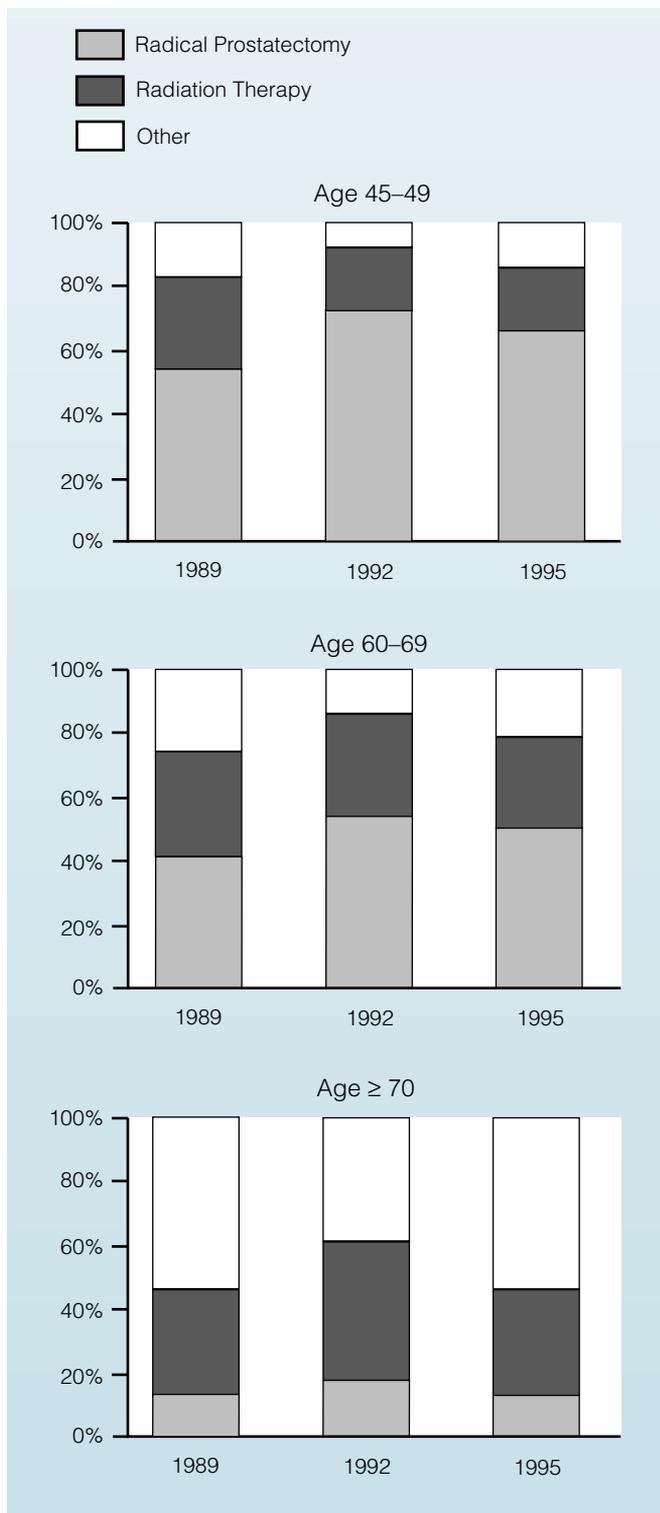


FIGURE 3. Trends in the proportion of men with nonmetastatic prostate cancer who were treated with radical prostatectomy, external-beam radiation, and other therapies in three age groups.

lent cases of early-stage prostate cancer.¹⁹ Therefore, more recent rates reflect a steadier state of incident cases. Alternately, physicians may not be screening as vigorously for prostate cancer with PSA tests, digital rectal examina-

tions, and prostate biopsies because of increased uncertainty about the value of early detection in older men. In the absence of data from randomized clinical trials, outcome researchers have questioned the benefits that are likely to be achieved by radical prostatectomy in older men with early-stage prostate cancer.^{6, 7, 20} For example, on the basis of decision analysis, Flemming and colleagues⁷ estimated that radical prostatectomy increased quality-adjusted life-years by no more than 0.3 in men older than 70 years of age and that surgery may be harmful under many conditions. Enthusiasm for radical prostatectomy in older men has also been tempered by increased recognition of early and late complications.²¹⁻²⁴ Although more favorable results have been reported from selected referral centers,²⁵⁻²⁹ a widely cited population-based study of 757 Medicare patients reported an approximately 40% risk for incontinence and a 90% rate of impotence after radical prostatectomy.²¹ In addition, clinical authorities recommend caution in offering radical prostatectomy to older men.^{30, 31} Many physicians, however, continue to screen for prostate cancer well into the eighth decade of life.³²⁻³⁸

In contrast to trends toward more conservative management of prostate cancer in elderly persons, both cancer incidence and surgery rates continue to increase in men younger than 60 years of age. In the early 1990s, the American Urological Association and the American Cancer Society instituted policy and public education initiatives encouraging PSA screening for all men after 50 years of age.^{39, 40} Subsequently, screening has been widely promoted in the lay media. Enthusiasm for screening younger men may reflect the perception that radical prostatectomy has the most benefit in this group. Because of longer life expectancies, younger men may be more likely to develop symptoms or die of slowly progressing prostate cancer. In addition, younger men are, on average, more likely to have higher-grade, less-differentiated prostate cancer, which is known to be associated with a poorer prognosis when left untreated.^{41, 42} Finally, younger men may have fewer complications with radical prostatectomy.²⁴

Our study has several limitations. First, the SEER cancer registries do not contain information about the use of PSA or other diagnostic tests. Therefore, we cannot directly assess our hypothesis that changes in incidence of prostate cancer over time are attributable to changes in diagnostic intensity. Second, although the SEER program is widely considered the gold standard for examining cancer epidemiology in the United States, SEER rates may not perfectly reflect national patterns. The incidence of prostate cancer and rates of radical prostatectomy vary widely (up to 10-fold) across geographic regions.⁴ It is possible that SEER does not contain a perfect balance of high-rate and low-rate areas.

Although we have shown that rates of radical prostatectomy are changing over time and differ by age group, our findings do not address the fundamental question, "Which rate is right?" A better understanding of the clinical risks and benefits of radical prostatectomy in different age groups awaits the results of randomized clinical trials, which are under way in the United States and Europe. In the meantime, it is important that patients understand the current uncertainties about optimal diagnosis of and treatment strategies for prostate cancer and that they participate in the decision-making process.

Take-Home Points

- After the introduction of PSA screening in the late 1980s, rates of prostate cancer detection and radical prostatectomy increased dramatically.
- After 1992, radical prostatectomy rates decreased in older men but continued to increase in younger men (i.e., those < 60 years of age).
- The divergent trends in radical prostatectomy closely mirrored age-specific trends in prostate cancer incidence.
- Changes in surgery rates over time seem to reflect changes in how aggressively clinicians pursue the diagnosis of prostate cancer, not the way in which they treat cases after detection.

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Acknowledgments

The authors thank Drs. Michael J. Barry and John H. Wasson and other members of the Prostate Patient Outcomes Research Team for their insights and helpful comments on earlier versions of the manuscript.

Grant Support

Supported in part by a grant from the American Urological Association and the American Federation for Urological Disease.

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APPENDIX

Rates from the Surveillance, Epidemiology, and End Results (SEER) Database of Radical Prostatectomy by Age Group, 1989 to 1995

AGE, yr	RATE (PER 100,000 MEN)						
	1989	1990	1991	1992	1993	1994	1995
45-49	3	5	6	12	12	15	17
50-54	18	30	43	59	61	71	69
55-59	51	67	114	165	167	157	171
60-64	124	163	257	334	314	283	279
65-69	189	272	419	510	430	375	343
70-74	186	257	413	449	339	245	220
≥ 75	44	63	89	84	44	27	24
45-59	22	31	49	72	73	75	79
60-69	156	216	336	420	370	328	310
≥ 70	98	136	212	222	156	110	99
Overall	78	109	170	206	175	152	146