Cervical Cancer Screening Among Women Without a Cervix

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Context Most US women who have undergone hysterectomy are not at risk of cervical cancer—they underwent the procedure for benign disease and they no longer have a cervix. In 1996, the US Preventive Services Task Force recommended that routine Papanicolaou (Pap) smear screening is unnecessary for these women.

Objective To determine whether Pap smear screening among women who have undergone hysterectomy has decreased following the recommendation.

Design We used data from the Behavioral Risk Factor Surveillance System (1992-2002), an annual, population-based telephone survey of US adults conducted by the Centers for Disease Control and Prevention. Data about timing, type, and indication for hysterectomies were obtained from the Nationwide Inpatient Sample and other sources.

Study Participants In each year of the survey, a representative sample of US women 18 years and older who had undergone hysterectomy (combined n=188390) was studied.

Main Outcome Measure The main outcome was the proportion of women with a history of hysterectomy who reported a current Pap smear (within 3 years). Overall proportions are age adjusted to the 2002 US female population.

Results Twenty-two million US women 18 years and older have undergone hysterectomy, representing 21% of the population. The proportion of these women who reported a current Pap smear did not change during the 10-year study period. In 1992 (before the US Preventive Services Task Force recommendations), 68.5% of women who had undergone hysterectomy reported having had a Pap smear in the past 3 years; in 2002 (6 years after the recommendation), 69.1% had had a Pap smear during the same period (*P* value for the comparison=.22). After accounting for Pap smears that may have preceded a recent hysterectomy and hysterectomies that spared the cervix or were performed for cervical neoplasia, we estimate that almost 10 million women, or half of all women who have undergone hysterectomy, are being screened unnecessarily.

Conclusions Many US women are undergoing Pap smear screening even though they are not at risk of cervical cancer. The US Preventive Services Task Force recommendations either have not been heard or have been ignored.

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PAPANICOLAOU (PAP) SMEAR screening for cervical cancer, introduced in the 1940s, has become a widely accepted cancer screening test. High rates of screening are the rule in all industrialized nations, and the number of cases and deaths from cervical cancer has decreased substantially since the introduction of screening. In the United States, all women have historically been considered eligible for Pap smear screening. This includes the millions of women who have undergone complete hysterectomy—women who are not at risk of cervical cancer.

Women without a cervix who undergo Pap smear testing receive vaginal smears, screening for cancer of the vagina, a rare gynecologic malignancy that accounts for 0.3% of cancers in women—a cancer less common than cancer of the tongue or the small intestine.[1] Previous Pap smear screening guidelines, including consensus guidelines issued in 1988,[2-4] largely failed to distinguish between women who had undergone hysterectomy and those with an intact cervix. In 1996, however, based on accumulated evidence from observational studies,[5,6] the US Preventive Services Task Force recommended that routine Pap smear screening is unnecessary for women who have undergone a complete hysterectomy for benign disease.[7]

Although screening among women who had undergone hysterectomy was reported during the early 1990s,[8] there have been no reports for the years following this recommendation. We sought to determine whether screening has declined following the task force recommendation and to estimate how many women are currently being screened unnecessarily.

METHODS

Data Sources

We used data from the Behavioral Risk Factor Surveillance System (BRFSS), an annual, cross-sectional, population-based, random-digit-dialed telephone survey conducted by the Centers for Disease Control and Prevention. The BRFSS collects data on health care use, risk behaviors, and demographics from a representative sample of civilian, noninstitutionalized adults (18 years or older) in the United States.[9] Our analysis included each year of the survey from 1992 to 2002, except 2001, when no ques-

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tions related to Pap smear screening were asked. Median annual response rate, based on persons estimated to be eligible to participate, ranged from 49% (2000) to 71% (1993).[10-14]

Each state's yearly BRFSS data file is weighted to the respondent's probability of selection and the age-specific, sex-specific, and race-specific population from the most current census data (or intercensal estimates) for each state. These weights adjust for differences in probability of selection and nonresponse and may also partially correct for any bias caused by lack of telephone coverage.[9] Because the poststratification weights reflect the size of the underlying stratum-specific population, we were able to combine data (using Stata statistical software, version 7.0, Stata Corp, College Station, Tex) from each state into summary measures that represent the combined population of the country.

Study Population: Women With Hysterectomy

During the 10 years analyzed, 188 390 women reported having undergone hysterectomy. Of these, we excluded 720 who did not respond to the question, "Have you ever had a Pap smear?" (item nonresponse rate, 0.4%), leaving 187 670 women in our study population. Those women who reported having had a Pap smear were asked about the timing of the most recent test. For each year, we report the proportion of women with a history of hysterectomy who had received a current Pap smear. Current is defined by the standard of most US professional organizations: a Pap smear performed within the past 3 years.[15,16] For women who reported having had a Pap smear but did not respond to the question about the timing of the most recent test, we assumed that they did not have a current Pap smear (item nonresponse rate, 2%-3%).

Analysis

Temporal Trends, 1992-2002. We analyzed responses based on age and report the proportion screened using 3 age categories: 18 to 44 years, 45 to 64 years, and 65 years and older. To produce an overall proportion, we used the direct method to age adjust (using 9 age categories) to the 2002 US population of women with hysterectomies, using BRFSS 2002 estimates. We compared the proportion of women with a history of hysterectomy who reported a current Pap smear in 1992 and in 2002 (and in 1996 compared with 2002) using the 2-sample test of proportions. All reported P values are based on 2-sided tests; $P<.05$ is considered statistically significant.

Estimating the Volume of Unnecessary Screening, 2002. To estimate the number of women being screened unnecessarily, we used BRFSS to determine the total number of women in 2002 who both had a history of hysterectomy and had been screened in the previous 3 years. From this total, we subtracted the estimated number in whom screening for cervical cancer may be warranted—women whose most recent Pap smear could conceivably have preceded their hysterectomy, those who still had a cervix, and those whose hysterectomy was performed for cervical neoplasia. We made 2 simplifying assumptions in this calculation: (1) that the 3 groups were mutually exclusive and (2) that all the women in these groups had had a Pap smear in the past 3 years. Both assumptions tend to overestimate the number in whom current Pap smear may have been warranted and, conversely, underestimate the number being screened unnecessarily.

Because BRFSS does not collect information about the timing, type, or indication for a woman's hysterectomy, we used the Nationwide Inpatient Sample (NIS),[17] a database containing all hospital discharge abstracts from a representative sample of nonfederal acute care hospitals in the United States, to estimate the number of women in each of the 3 groups. To determine the number of women whose current Pap smear could have preceded their hysterectomy (in other words, any woman whose hysterectomy occurred in the past 3 years), we summed the number of US women in each of the 3 previously specified age groups who underwent hysterectomy during the 3 years before the survey (1999-2001), using data from the NIS.[18] The resulting figure (1.8 million women) was corroborated by estimates derived from the National Hospital Discharge Survey[19] and the 2000 National Health Interview Survey.[20] To determine the number of women who still have a cervix after hysterectomy, we used data on subtotal hysterectomy incidence (from the NIS, 1997-2001[18]) and prevalence[21] to derive an upper bound estimate of the proportion of women with hysterectomy who still have a cervix (5% or, in 2002, 1.1 million women). Finally, to determine the number of women in whom hysterectomy was performed for cervical neoplasia, we used previously published estimates from the National Hospital Discharge Survey (1988-1997)[8] and data from the NIS (2000)[22] to establish an upper bound estimate of the proportion of women whose hysterectomies were performed for this indication (10% or, in 2002, 2.2 million women).

Finally, we calculated age-specific estimates of the prevalence of unnecessary screening, stratifying women into 1 of the 3 previously specified age groups: 18 to 44 years, 45 to 64 years, and 65 years and older.

RESULTS

Overall, 21% of US women have undergone hysterectomy (as of 2002), a proportion that remained relatively constant during the 10-year study period (range, 21%-23%). In 1992, the age-adjusted proportion of women with a history of hysterectomy who reported having a Pap smear within the preceding 3 years was 68.5% (FIGURE). In 1996, the year of the US Preventive Services Task Force guidelines, 69.4% had been screened within the same period, and in 2002, the most recent year for which data are available, 69.1% reported a current Pap smear. There was no significant difference between 1992 and 2002 ($P=.22$) or between 1996 and 2002 ($P=.47$) in the proportion of women with a history of hysterectomy who reported having a current Pap smear. The Figure also shows that

in each of the 3 age groups specified (18-44 years, 45-64 years, and ≥65 years), Pap smear screening rates remained stable throughout the period from 1992 to 2002.

In 2002, an estimated 22 million US women 18 years and older reported ever having undergone hysterectomy, of whom 69.1%, or approximately 15 million, had a current Pap smear. Approximately 1.8 million of these women had undergone hysterectomy in the previous 3 years (1999-2001), and thus their Pap smear may have preceded the surgery. Of the remaining 13.2 million, screening may have been indicated for up to 1.1 million who still had a cervix and as many as 2.2 million whose hysterectomy was performed for cervical neoplasia. Thus, we estimate that approximately 10 million American women, or 45.6% of those who had undergone hysterectomy, were unnecessarily undergoing Pap smear screening in 2002. The TABLE shows that the prevalence of unnecessary screening among women who had undergone hysterectomy was 19.3% for women aged 18 to 44 years, 54.9% for those aged 45 to 64 years, and 40% for women 65 years and older.

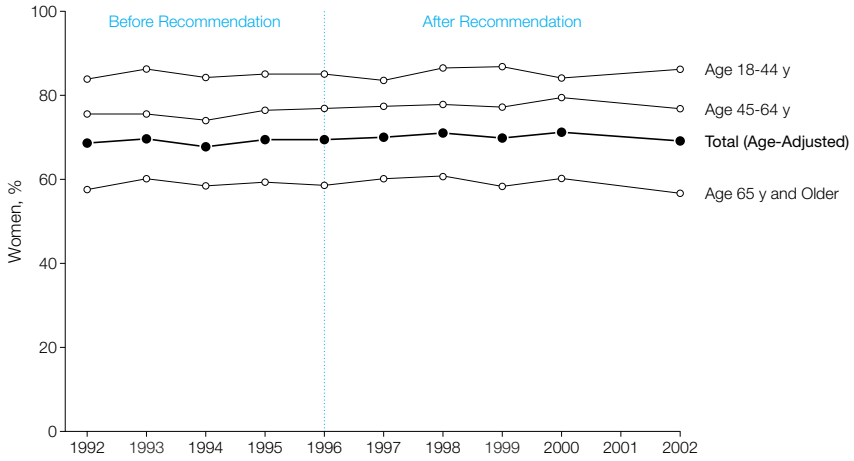
COMMENT

We found that more than two thirds of US women who have undergone hysterectomy report having had a Pap smear within the past 3 years. Despite a 1996 recommendation from the US Preventive Services Task Force that routine Pap smear screening is unnecessary for women who have undergone hysterectomy for benign disease, we found that the proportion screened did not decrease at all in the subsequent 6-year period. Lastly, we estimate that even accounting for the small fraction of women in whom a Pap smear may be warranted despite hysterectomy, approximately 10 million women who do not have a cervix are being screened unnecessarily for cervical cancer.

Our study has several limitations. First, the BRFSS survey was conducted by telephone, and conclusions apply only to the approximately 95% of the US population residing in households with a telephone. Second, because women tend to overreport Pap smear screening,[23-25] self-reported data overestimate the proportion actually being screened. However, even if as many as half of the women who reported a current Pap smear had not had one, millions of women are still being screened unnecessarily. Furthermore, this limitation does not apply to our temporal analysis, because we have no reason to believe that the accuracy of Pap smear self-reports has changed over time. Our estimate of the amount of unnecessary screening is, in fact, close to that of a medical records study[21] in which 58% of women who had previously undergone total hysterectomy for benign disease were found to have been subsequently screened.

Lastly, although our information about the timing, type, and indication for women's hysterectomies are derived from the best available national data,[8,18-20] some may be concerned about

Figure. Percentage of Women With a History of Hysterectomy Who Reported Receiving a Papanicolaou Smear in the Past 3 Years Before and After the US Preventive Services Task Force Recommendation*



The US Preventive Services Task Force recommendation states, "Women who have undergone a hysterectomy in which the cervix was removed do not require Pap testing, unless the hysterectomy was performed because of cervical cancer or its precursors."[7]

*For all years, SE for total sample was less than 1%, for each subgroup, less than 3%.

Table. US Women Who Have Undergone Hysterectomy According to Screening Status and Indication for Screening, 2002

Age Group, y	No. With Hysterectomy	Currently Being Screened, No.	May Warrant Screening, No.			Currently Being Screened Unnecessarily, No. (%)
			Recent Hysterectomy*	Intact Cervix	Cervical Neoplasia	
18-44	1 770 000	1 522 000	915 000	88 000	177 000	342 000 (19.3)
45-64	10 581 000	8 125 000	733 000	529 000	1 058 000	5 805 000 (54.9)
≥65	9 244 000	5 275 000	194 000	462 000	924 000	3 695 000 (40.0)
All ages†	21 736 000	15 025 000	1 843 000	1 087 000	2 173 000	9 922 000 (45.6)

*Women who had undergone hysterectomy in the 3 years before the survey whose most recent Papanicolaou smear may have preceded the hysterectomy.
†Age-specific figures do not total due to a small number of women with missing age (item nonresponse rate, <1%).

the technique we used to estimate the number of women screened unnecessarily. Each of our assumptions, however, tends to overestimate the number of women in whom screening may be warranted. First, we assumed that for all women who had both a hysterectomy and a Pap smear in the past 3 years, the Pap smear was warranted because it preceded the hysterectomy. Second, because the number of subtotal hysterectomies has recently been increasing in the United States,[18] as elsewhere,[26] our use of the most recent estimate (4.9% of all hysterectomies in 2001 were subtotal) led us to overstate the population prevalence of women who still have a cervix after hysterectomy. Finally, in our calculations we assumed that every woman in each of the 3 groups in whom screening may be warranted had had a Pap smear in the past 3 years and that the 3 groups were mutually exclusive. All of these assumptions led us to underestimate the number of women being screened unnecessarily.

There are a number of possible explanations for our findings. It is possible that women who have had a total hysterectomy are not aware that they are no longer at risk for cervical cancer. Or they may simply be so enthusiastic about cancer screening[27] that they continue to have Pap smears regardless of the usefulness of the test. It is also possible that physicians are largely responsible for continuing cervical cancer screening after hysterectomy. They may be unaware that screening for vaginal cancer is unwarranted. They may also be reluctant to suggest stopping screening either because they are concerned that patients may question their judgment or motivation or may be wary of the considerable investment of time that might be required to avoid this possibility. Finally, it is possible that systemic factors, specifically, Pap smear performance measures, are responsible. Although these measures may not be intended to apply to women who have undergone hysterectomy, it can be difficult to identify who these women are using administrative data. The net effect may be that all women are encouraged to receive Pap smears in order to meet specified benchmarks for cervical cancer screening. Addressing the problem of unnecessary screening in women who have undergone hysterectomy will require identifying which of these factors is primarily responsible and acting accordingly.

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Study concept and design: Sirovich.
Acquisition of data: Sirovich.
Analysis and interpretation of data: Sirovich, Welch.
Drafting of the manuscript: Sirovich.
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