

Surveillance Patterns and Polyp Recurrence following Diagnosis and Excision of Colorectal Polyps in a Medicare Population

Mayur M. Amonkar, Timothy L. Hunt, Zhiyuan Zhou, and Xiaodong Jin

Worldwide Outcomes Research, Pfizer Inc., Peapack, New Jersey

Abstract

Objective: Study objectives were to determine surveillance and polyp recurrence rates among older, increased-risk patients who have been diagnosed and excised of colorectal polyps. The high incidence of colorectal cancers in the Medicare-eligible population, the strong evidence linking reductions in mortality from colorectal cancer by removal of colorectal polyps, and the paucity of postpolypectomy surveillance data in this population all supported the need for this study.

Methods: This retrospective study used Medicare claims data to identify a cohort of 19,895 beneficiaries ages ≥ 65 years diagnosed and excised of colorectal polyps in 1994. Survival analysis was used to compute surveillance and polyp recurrence rates over 5 years. Log-rank test was used for all statistical comparisons.

Results: Median time to first surveillance was 2.6 years. Surveillance rates for 1, 3, and 5 years were 17.6%, 55.8%,

and 74.5%, respectively. Twenty-six percent had no surveillance event. Polyp recurrence rates for 1, 3, and 5 years were 10.9%, 38.2%, and 52.6%, respectively. Males and younger patients were more likely to undergo surveillance and showed higher polyp recurrence rates.

Conclusions: The high likelihood of polyp recurrence underscores the need for continued efforts to promote awareness of and compliance with postpolypectomy surveillance. Efforts to increase surveillance rates among individuals diagnosed with colorectal polyps and making available additional treatment options that may prevent the recurrence of polyps and/or their possible progression to colorectal cancer should help make significant progress in reaching the Healthy People 2010 goal of reducing colorectal cancer deaths by 34% by the year 2010. (Cancer Epidemiol Biomarkers Prev 2005;14(2):417–21)

Introduction

Colorectal cancer, a major cause of morbidity and mortality, is the third most frequently diagnosed cancer and the third most common cause of cancer-specific death for both men and women in the United States (1). In 2002, there were an estimated 148,300 new colorectal cancer cases in the United States (2), with $\sim 71\%$ occurring among the ≥ 65 -year-old, Medicare-eligible population (3). With the aging of the population, the number of colorectal cancer cases is likely to increase in the years ahead.

Available evidence suggests that significant reductions in mortality from colorectal cancer can be achieved by more widespread use of existing screening and surveillance tests to detect and remove the common precursor to colorectal cancer, a premalignant lesion (adenomatous polyp; ref. 4). Screening is the search for polyps and early cancers in asymptomatic individuals, whereas surveillance refers to detection methods used in patients with a previous diagnosis of colorectal polyps or colorectal cancer or in those with chronic inflammatory bowel disease (5). Recent data indicate that only about half of American adults ages >50 years are receiving recommended screening tests for colorectal cancer that might help to reduce mortality and morbidity (6).

Colonoscopy is increasingly being recognized as the most effective colon cancer screening and surveillance strategy and consequently showing greater acceptance as an initial screening test even in average-risk persons (asymptomatic individuals ages >50 years; ref. 7). Effective July 1, 2001,

Medicare does provide coverage for screening colonoscopy for all individuals, not just those at increased risk of colorectal cancer (8). Previous evidence suggests that there is the potential for a 75% to 90% reduction in colorectal cancer mortality with the use of colonoscopy and clearing polypectomy, substantially higher than the 60% to 70% estimated for sigmoidoscopy and 20% to 60% estimated for fecal occult blood test (6, 9–14).

The focus of this article is on the increased-risk patients who have been diagnosed with colorectal adenomatous polyps (9). According to the American Cancer Society guidelines, patients should undergo total colon examination following colonoscopic removal of all adenomatous polyps (15). The intervals at which the exam is repeated are dependent on the size, multiplicity, and appearance of the adenoma(s). As per the guidelines, individuals with a single, small (<1 cm) adenoma are recommended to receive a colonoscopy 3 to 6 years after the initial polypectomy, whereas those with a large (≥ 1 cm) adenoma, multiple adenomas, or adenomas with high-grade dysplasia or villous change should receive a colonoscopy within 3 years after initial polypectomy. In patients who do not wish to undergo colonoscopy or in situations in which colonoscopy is not available or feasible, double-contrast barium enema or flexible sigmoidoscopy followed by double-contrast barium enema are acceptable alternatives.

The high incidence of colorectal cancers in the ≥ 65 -year-old, Medicare-eligible population, the strong evidence linking reductions in mortality from colorectal cancer by removal of colorectal polyps, and the paucity of data regarding postpolypectomy colorectal surveillance patterns in this population all supported the need for this study. Thus, the objectives of our study are to determine surveillance patterns and polyp recurrence rates among older, increased-risk patients who have been diagnosed and excised of colorectal polyps.

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Requests for reprints: Timothy L. Hunt, Worldwide Outcomes Research, Pfizer, Inc., 100 Route 206 North, Peapack, NJ 07977. Phone: 908-901-8638; Fax: 908-901-1882. E-mail: timothy.l.hunt@pfizer.com

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Materials and Methods

Data Source. This retrospective study used a 5% Standard Analytical File sample of the Medicare claims data from 1994 to 1999. Medicare, the nation's largest health insurance program, which covers ~40 million Americans, is administered by the Centers for Medicare & Medicaid Services (formerly the Health Care Financing Administration; ref. 16). It is a health insurance program for people ages ≥ 65 years, some disabled people ages < 65 years, and people with end-stage renal disease.

Besides a master enrollment file for all persons eligible for Medicare, Standard Analytical File Medicare data include all claims for inpatient hospitalization, outpatient hospital services, skilled nursing facility, home health, hospice, and physician services. All billed claims contain fields for diagnoses and procedures as coded by the *International Classification of Diseases, Ninth Revision, Clinical Modification* (17) and *Current Procedural Terminology, Fourth Edition* codes (18), respectively, as well as fields for dates of service. All patient identifiers are encrypted and a unique ID is used to track patients longitudinally.

Study Cohort. The study cohort consisted of 19,895 Medicare beneficiaries ages ≥ 65 years, who received a diagnosis for a colorectal polyp (*International Classification of Diseases, Ninth Revision* codes 211.3, 211.4, and 569.0) and underwent an index procedure, a colonoscopy and a polypectomy (*Current Procedural Terminology, Fourth Edition* codes 45383, 45384, and 45385), between January 1, 1994 and December 31, 1994. Thus, this study may have included individuals with prevalent or incident polyps. Because this was a longitudinal analysis, all subjects in the cohort had to have continuous coverage until the end of the study period or until the point of being censored. If a second colonoscopy with polypectomy was reported within 3 months of the baseline procedure, the baseline procedure was considered as the index procedure because it is reasonable to assume that the second event may have resulted from a delay in claim submission caused by a time lag normally expected between the date of service and the date of entry of the claim. In addition, if subjects received a diagnosis code for a malignant colorectal neoplasm within 3 months of diagnosis of a colorectal polyp and the baseline procedure, the malignant diagnosis superceded the polyp diagnosis, and such patients were excluded from the study cohort.

Outcome Measures. The outcomes measures used for this study included surveillance rates, time to surveillance, and polyp recurrence rates. To determine surveillance rates, a surveillance event was first defined. A surveillance event included a follow-up with any of the following four types of procedures: colonoscopy with polypectomy (45383, 45384, and 45385), colonoscopy only (45355, 45378, 45379, 45380, and 45382), barium enema (74270 and 74280), or sigmoidoscopy (45300, 45305, 45308, 45309, 45310, 45315, 45320, 45330, 45331, 45333, 45336, 45338, and 45339). Time to surveillance was defined as the time from the index or baseline procedure (polypectomy) done in 1994 to the first surveillance event. To estimate polyp recurrence rates, a surveillance event that involved a colonoscopy combined with a polypectomy was used as a proxy measure because such a procedure would need to be done to remove any polyp growth that occurred following the baseline polypectomy.

Each patient in the study cohort was followed from the date of the index procedure (i.e., colonoscopy and polypectomy) until the first surveillance event or until censored. Patients were censored if (a) they died without a follow-up event before the end of the 5-year follow-up (i.e., by December 31, 1999); (b) they switched to a managed care program without any surveillance before the end of the 5-year follow-up; or (c) until December 31, 1998, the last date for which data were available.

Statistical Analysis. For all outcome measures in the study, study subjects were followed up to identify whether one or more of the procedure(s) of interest was done. Survival curves, indicating time from index procedure to a surveillance event, were constructed using the Kaplan-Meier method. Survival curves were also used to estimate polyp recurrence rates only for subjects where the surveillance event was a colonoscopy combined with a polypectomy. Survival curves were used to produce unbiased estimates of surveillance events in the presence of censoring (patient loss to follow-up). For ease of illustration, values were plotted as the cumulative proportion having a surveillance event (i.e., 1 - cumulative proportion without surveillance). Survival curves were also developed for the outcome measures on the basis of age and gender. The log-rank test was used to make all statistical comparisons.

Results

A total of 19,895 patients with colorectal polyps, who underwent a colonoscopy and polypectomy between January 1, 1994 and December 31, 1994, were identified and served as the study cohort (Table 1). The mean age of the patients was 74.2 years; the majority were ages 65 to 74 years and 51% were male. The principal reasons for censoring were end of follow-up (65.8%), death (23.6%), and switch to managed care (10.6%). A total of 44,792 surveillance events were observed for the cohort of 19,895 subjects over the 5-year period, with colonoscopy combined with polypectomy being the most common procedure (66.5%) followed by colonoscopy alone (21.8%), sigmoidoscopy (8.1%), and barium enema (3.6%).

The Kaplan-Meier survival estimates for surveillance following the index colonoscopy and polypectomy are shown in Fig. 1. The first surveillance event could have been any of the four procedures: colonoscopy with polypectomy, colonoscopy only, sigmoidoscopy, or barium enema. The median time to the surveillance event (i.e., time it took for 50% of the cohort to have undergone a surveillance event) was 954 days (2.6 years). Almost 18% of the cohort underwent a surveillance event in 12 months (365 days), 55.8% within 3 years, and 74.5% within 5 years. Twenty-six percent of the subjects had none of the assessed surveillance events at any time while in the cohort.

Surveillance estimates were also obtained on the basis of age and gender. These results are presented in a tabular format for ease of interpretation (Table 2). In terms of gender, males have a shorter median time to surveillance (900 days) compared with females (1,006 days) and also a greater probability of receiving a surveillance event for each year of follow-up after the first. The distribution of time to first surveillance by age also indicates an overall age-dependent trend with longer median times to surveillance and lower probability of a surveillance event (most notably at years 4 and 5) among the higher age groups. For example, 50% of subjects ages 65 to 69 years received a follow-up test in 915 days compared with 1,272 days for subjects ages

Table 1. Baseline characteristics of study cohort (n = 19,895)

Characteristics	n (%)
Gender	
Male	10,132 (50.9)
Female	9,763 (49.1)
Age (y)	
65-69	5,285 (26.6)
70-74	6,037 (30.3)
75-79	4,564 (22.9)
80-84	2,704 (13.6)
85+	1,305 (6.6)

NOTE: Study cohort comprised Medicare beneficiaries ages ≥ 65 years who received a diagnosis for a colorectal polyp and underwent a colonoscopy and polypectomy between January 1, 1994 and December 31, 1994.

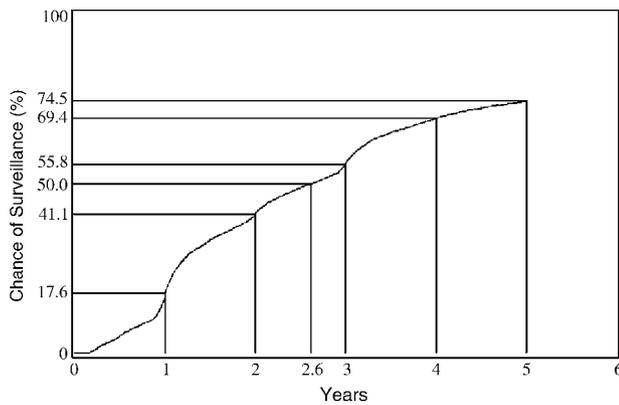


Figure 1. Probability of first surveillance event for study cohort diagnosed and cleared of polyps at baseline (estimated using Kaplan-Meier method). First surveillance event could include follow-up with any of the following four types of procedures: colonoscopy with polypectomy, colonoscopy only, barium enema, or sigmoidoscopy.

≥85 years. Additionally, by the end of the fifth year, ~78% of subjects ages 65 to 69 years had received a surveillance test compared with 58% of subjects ages ≥85 years.

A follow-up colonoscopy combined with a polypectomy would likely be done during the study period if patients in the cohort were diagnosed yet again with a polyp. Thus, the use of a colonoscopy with a polypectomy can serve as a proxy measure for polyp recurrence or growth because a polypectomy would need to be done to remove any recurring or new polyps. Like the time to first surveillance event, a survival curve was also plotted for the first surveillance colonoscopy with polypectomy done for the study cohort (Fig. 2). The percentage of subjects receiving a colonoscopy with a polypectomy increased from 10.9% by the end of the first year to 38.2% by the end of 3 years and to 52.6% by the end of 5 years.

Surveillance estimates for the first colonoscopy with polypectomy for the study cohort were also obtained on the basis of age and gender. Again, these results are presented in a tabular format for ease of interpretation (Table 3). In terms of gender, males have a shorter median time to surveillance with a polypectomy, possibly reflecting a faster rate of polyp recurrence (1,290 days or 3.5 years) compared with females (>5 years) and also a greater probability of receiving a surveillance polypectomy or demonstrating polyp recurrence for each year of follow-up. The distribution of time to polyp recurrence by age also indicates an age-dependent trend with longer median times to surveillance among the higher age groups and lower probability of a surveillance polypectomy or possible slower rate of polyp recurrence. For example, 50% of subjects ages 65 to

69 years received a follow-up colonoscopy combined with polypectomy in 1,250 days compared with >1,825 days for subjects ages ≥85 years. Additionally, by the end of the fifth year, ~59% of subjects ages 65 to 69 years had shown polyp recurrence compared with 31.4% of subjects ages ≥85 years.

Discussion

This study is the first to estimate colorectal cancer surveillance rates in a large cohort of 19,895 Medicare beneficiaries diagnosed and excised of polyps at baseline. We found that although various follow-up surveillance procedures (colonoscopy, sigmoidoscopy, and barium enema) were used frequently there was considerable variation in rates of testing based on type of test done, age, and gender, with ~26% of patients not undergoing any procedures assessed in this study in the 5-year follow-up period. It is important to note that the study cohort may have included prevalent and incident cases of polyps, the data for which were not obtained in this study. Thus, the distribution of patients with prevalent or incident polyps may have affected the surveillance and polyp recurrence rates reported. For example, surveillance rates for patients with a previous history of polyps may be higher if they perceive a greater risk of developing colorectal cancer.

The finding that colonoscopy combined with polypectomy or colonoscopy alone were the most common procedures is probably a reflection of the increasing interest in the use of this procedure for surveillance despite its limitations of invasiveness, risk of complication, and cost. Along with its common use for surveillance, colonoscopy is also increasingly being recognized as the most effective colorectal cancer screening strategy and consequently showing greater acceptance as an initial screening test, even in average-risk persons (7).

We reported 1-, 3-, and 5-year surveillance rates for our study to be 17.6%, 55.8%, and 74.5%, respectively. According to American Cancer Society guidelines, individuals diagnosed with adenomatous polyps are at moderate risk for colorectal cancer and therefore are recommended to undergo follow-up surveillance, the interval for which depends on the type of polyp and the physician's assessment (15). Because polyp characteristics are unavailable from our current data, one is unable to assess compliance with guidelines per se. However, if we assume, for example, that the entire study cohort had a large (≥1 cm) adenoma, multiple adenomas, or adenomas with high-grade dysplasia or villous change at baseline and hence should have received a colonoscopy (or another test) within 3 years after initial polypectomy, failure of compliance with guidelines occurred in almost half (44%) of the cohort. Conversely, if the entire cohort is assumed to have had a single, small (<1 cm) adenoma and thus should have received a colonoscopy (or another test) within 3 to 6 years after initial

Table 2. Probability of first surveillance event for the study cohort diagnosed and cleared of polyps at baseline based on gender and age (estimated using the Kaplan-Meier method)

	Median* (d)	1 y, % (95% CI)	2 y, % (95% CI)	3 y, % (95% CI)	4 y, % (95% CI)	5 y, % (95% CI)	χ^2 (log-rank test)
Gender							
Male	900	18.1 (17.4-18.9)	42.6 (41.6-43.6)	57.3 (56.3-58.4)	71.0 (70.0-72.0)	76.5 (75.5-77.4)	31.4 [†]
Female	1,006	17.0 (16.3-17.8)	39.9 (38.9-40.9)	45.8 (53.1-55.2)	67.8 (66.7-68.9)	72.5 (71.5-73.5)	
Age (y)							
65-69	915	17.2 (16.2-18.2)	41.6 (40.2-43.0)	57.0 (55.6-58.4)	72.4 (71.1-73.7)	78.2 (76.9-78.4)	123.0 [†]
70-74	931	17.8 (16.8-18.8)	41.8 (40.5-43.1)	57.1 (55.8-58.4)	72.2 (71.0-73.4)	77.2 (76.0-78.3)	
75-79	907	18.3 (17.1-19.4)	42.7 (41.2-44.2)	56.5 (54.9-58.5)	69.0 (67.5-70.5)	73.9 (72.4-75.3)	
80-84	1,025	17.0 (15.6-18.5)	38.5 (37.6-41.4)	53.4 (51.3-55.4)	62.7 (60.6-64.8)	67.0 (64.9-69.1)	
≥85	1,272	17.5 (15.4-19.7)	34.7 (31.9-37.5)	45.1 (42.1-48.5)	54.3 (51.0-57.5)	57.8 (54.5-61.1)	

NOTE: First surveillance event could include follow-up with colonoscopy with polypectomy, colonoscopy only, barium enema, or sigmoidoscopy.

*Time taken for 50% of the subgroup (male, female, etc.) to have undergone surveillance test.

[†] $P < 0.0001$.

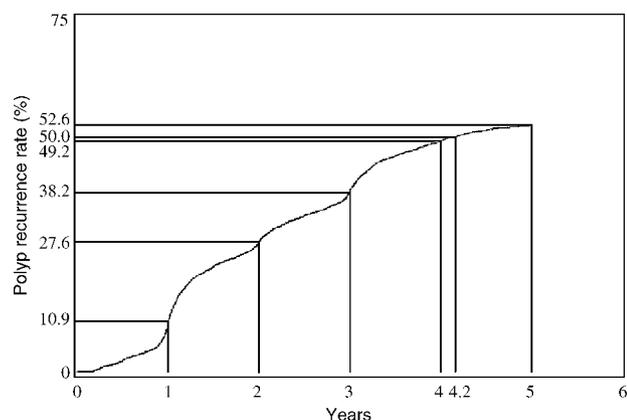


Figure 2. Probability of polyp recurrence in study cohort diagnosed and cleared of polyps at baseline (estimated using Kaplan-Meier method). First surveillance with a colonoscopy combined with polypectomy was used as a proxy measure for polyp recurrence.

polypectomy, then failure of compliance with guidelines occurred in a quarter of the cohort. Lack of data prevents us from estimating surveillance rates at the end of 6 years.

Study results regarding surveillance rates and time to surveillance can be compared with two previous studies. The landmark National Polyp Study (4) achieved compliance rates for follow-up colonoscopy after 3 years of 80% in the clinical trial setting. That compares favorably with the 74% surveillance rates observed after 5 years in our study, clearly outside a clinical trial with entirely voluntary compliance. A recent review (19) of patient medical records showed an 85% compliance rate for 211 postpolypectomy patients, but the authors note that the true surveillance rate is likely lower because the 107 patients lost to follow-up had characteristics more common with noncompliance. Whereas the foregoing study reviewed records at one site, our study is the first to use such a large, population-based sample (i.e., 19,895 Medicare-eligible patients). What is remarkable is that three such different studies—one clinical trial based, another a review of medical records, and our study of Medicare claims data—all found surveillance rates between 74% and 85% with our elderly population-based estimates anchoring the lower end of that range.

Overall, surveillance rates on the basis of age and gender suggest that males and younger Medicare beneficiaries have a greater probability of receiving follow-up procedures. A national population-based study among Medicare beneficiaries showed higher cancer incidence rates for men compared with women (20). In addition, mortality rates for colorectal cancer are higher among males compared with females (1).

This could possibly imply that males, being at greater risk for colorectal cancer, may also be more motivated to seek follow-up care or comply with physician recommendations.

Despite increasing incidence and mortality for colorectal cancer observed with increasing age (1, 20), we found surveillance rates to be inversely proportional to increasing age. One possibility is that the invasive nature of the procedures involved along with the perceived risk of complications in the presence of comorbid conditions could account for the higher refusal rates among the oldest groups. It is also likely that physicians suggest less aggressive treatments for patients in the oldest age groups. However, no definite explanations can be provided for this finding and it needs further investigation.

This study reports frequent use of a colonoscopy with a polypectomy as a surveillance test, suggesting recurrence of polyps. Thus, the polyp recurrence rates for this study ranged from 10.9% within 1 year to 52.6% over the entire 5-year period. Thus, we can conclude that polyp recurrence was observed in ~1 of 10 subjects within the first year and increased to ~5 of 10 such subjects within 5 years. It is likely that these recurrence rates are underestimated given the fact that colonoscopy is not 100% sensitive in detecting all polyps. In addition, for the first year, a few of the polypectomies may have been done to complete resection of a large sessile polyp and thus may not indicate polyp recurrence.

Numerous previous studies have estimated recurrence rates for colorectal polyps with greatly varying results. The landmark National Polyp Study (21) reported a 27% polyp recurrence rate when examined with colonoscopy at 1 year and 32% when examined at 3 years, whereas a randomized trial conducted in Denmark (22) found that polyps recurred in 20% of patients after 2 years, 35% after 4 years, and 50% after 8 years. A study in a Veterans Affairs population (23) reported a 37% rate for recurrent adenomas within a 1- to 5-year time interval, whereas an observational study in a managed care population (24) estimated that 50% of the patients will have a recurrence within 7.6 years. Although the study populations and designs for these studies were much different from the current study, our estimates (38.2% in 3 years) are consistent and within the ranges of these previous estimates. As noted previously, colonoscopy is not 100% sensitive in detecting all polyps. The miss rate as reported previously has shown wide variation, with ranges from 10% to ~25% (25-28), depending on study design and type of polyp. It is possible that some patients in our study who underwent the baseline polypectomy procedure were not completely excised of polyps and therefore underwent a follow-up polypectomy. Thus, it is also possible that our reported polyp recurrence rates are overestimated.

This study has certain limitations, which need to be identified so that results can be interpreted with caution. First,

Table 3. Probability of polyp recurrence as indicated by surveillance polypectomy in study cohort diagnosed and cleared of polyps at baseline based on gender and age (estimated using the Kaplan-Meier method)

	Median* (d)	1 y, % (95% CI)	2 y, % (95% CI)	3 y, % (95% CI)	4 y, % (95% CI)	5 y, % (95% CI)	χ^2 (log-rank test)
Gender							
Male	1,290	11.7 (10.9-12.5)	29.8 (28.7-31.0)	41.2 (39.8-42.5)	53.0 (54.5-51.6)	57.3 (55.8-58.7)	71.98 [†]
Female	>1,825	10.1 (9.3-10.9)	25.3 (24.1-26.4)	35.1 (33.7-36.4)	45.1 (43.6-46.5)	47.7 (46.2-49.1)	
Age (y)							
65-69	1,250	11.2 (10.1-12.4)	29.7 (28.0-31.4)	41.5 (39.7-43.4)	54.2 (52.3-56.2)	58.7 (56.7-60.7)	158.82 [†]
70-74	1,275	11.3 (10.3-12.4)	29.2 (27.7-30.7)	41.4 (39.7-43.2)	53.6 (51.8-55.5)	57.1 (55.3-59.0)	
75-79	1,693	10.8 (9.6-12.0)	28.1 (26.3-30.0)	38.1 (36.1-40.1)	47.8 (45.7-50.0)	50.5 (48.3-52.7)	
80-84	>1,825	9.8 (8.4-11.3)	23.4 (21.2-25.5)	32.3 (29.8-34.8)	39.5 (36.8-42.2)	41.8 (39.0-44.5)	
≥85	>1,825	10.7 (8.6-12.8)	19.4 (16.6-22.2)	25.3 (22.1-28.5)	29.8 (25.2-33.4)	31.4 (27.7-35.1)	

NOTE: First surveillance with a colonoscopy combined with polypectomy was used as proxy measure for polyp recurrence.

*Time taken for 50% of the subgroup (male, female, etc.) to have shown polyp recurrence as indicated by a surveillance polypectomy.

[†] $P < 0.0001$.

this study is based on data that are primarily collected for administrative purposes. Thus, errors due to billing and coding cannot be ruled out. However, previous studies conducted using Medicare claims data have shown good reliability in terms of accuracy and completeness of data for several conditions, including cancer (29-33). Second, we cannot determine from the claims data whether the follow-up test was a result of development of certain symptoms or physical findings, indications unrelated to colorectal polyps or cancer, or part of compliance with the physician's recommendation to receive a follow-up test. Third, there is a lack of clinical data on polyp characteristics (size, number, grade, etc.) in our study cohort; hence, study results cannot be generalized to a population with any specific polyp characteristic(s). Although patients with the baseline polypectomy were considered at increased risk, the polyps removed may have been hyperplastic and hence recommended less aggressive surveillance. Fourth, although fecal occult blood test is not recommended as a surveillance test following polypectomy, we were unable to assess whether individuals used fecal occult blood test as a surveillance test and thus did not receive one of the recommended tests. Finally, the study was limited to Medicare beneficiaries; therefore, the generalizability of the findings to younger populations cannot be assessed. However, colon cancer is largely a disease of the elderly, with 71% of incident colorectal cancers occurring in the Medicare-eligible population (3).

In conclusion, this study found that in the population ages ≥ 65 years that is screened and found to have polyps, about three fourths complete surveillance by the end of 5 years. The high risk of polyp recurrence in this elderly population, about one in every two persons, highlights the importance and need for such surveillance. These estimates should be interpreted with caution due to the study's many limitations, but it should also be noted that this is the first study of surveillance based on such a large sample of the elderly population, and both the estimated surveillance and the polyp recurrence rates are consistent with the other available studies. The challenge is to find ways to increase colorectal cancer surveillance rates among individuals diagnosed with colorectal polyps and making available additional treatment options that may prevent the recurrence of polyps and/or their possible progression to colorectal cancer. Such public health initiatives should help make significant progress in reaching the Healthy People 2010 goal (34) of reducing colorectal cancer deaths by 34% by the year 2010.

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