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PROSPECTIVE STUDY

Screening polypectomy rates below quality benchmarks: A prospective study

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Abstract

AIM: To estimate and compare sex-specific screening polypectomy rates to quality benchmarks of 40% in men and 30% in women.

METHODS: A prospective cohort study was undertaken of patients aged 50-75, scheduled for colonoscopy, and covered by the Québec universal health insurance plan. Endoscopist and patient questionnaires were used to obtain screening and non-screening colonoscopy indications. Patient self-report was used to obtain history of gastrointestinal conditions/symptoms and prior colonoscopy. Sex-specific polypectomy rates (PRs) and 95%CI were calculated using Bayesian hierarchical logistic regression.

RESULTS: In total, 45 endoscopists and 2134 (mean age = 61, 50% female) of their patients participated. According to patients, screening PRs in males and females were 32.4% (95%CI: 23.8-41.8) and 19.4% (95%CI: 13.1-25.4), respectively. According to endoscopists, screening PRs in males and females were 30.2% (95%CI: 27.0-41.9) and 16.6% (95%CI: 16.3-28.6), respectively. Sex-specific PRs did not meet quality benchmarks at all ages except for: males aged 65-69 (patient screening indication), and males aged 70-74 (endoscopist screening indication). For all patients aged 50-54, none of the CI included the quality benchmarks.

CONCLUSION: Most sex-specific screening PRs in Québec were below quality benchmarks; PRs were especially low for all 50-54 year olds.

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Key words: Benchmarking; Colonoscopy; Colorectal cancer; Quality assurance; Screening

Core tip: Colonoscopy quality is essential to effective colorectal cancer screening. Polypectomy rates (PRs) of 40% in men and 30% in women have recently been proposed as screening colonoscopy quality indicators. In this prospective cohort study, we sought to estimate and compare screening PRs in Québec with published screening colonoscopy quality benchmarks. We found that sex-specific screening PRs benchmarks were rarely met. The very low screening PRs in patients aged 50-54 could not be explained by shorter than recommended screening intervals. Further research is needed to understand the discrepancy between quality benchmarks and clinical practice.

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INTRODUCTION

Endoscopic polypectomy is the standard treatment for gastrointestinal polyps[1,2] and reduces the incidence of subsequent colorectal cancer (CRC)[3]. Polypectomy is performed during colonoscopy, a key procedure to both opportunistic and organized CRC screening that facilitates visualization of the entire colon and performance of therapeutic options (*e.g.*, biopsy, polypectomy). Delivery of high quality colonoscopy is essential to effective CRC screening, and quality assurance programs and colonoscopy quality indicators have been developed to ensure that endoscopists operate within accepted standards of care. The adenoma detection rate (ADR) is considered a critical colonoscopy quality indicator owing to its association with interval cancers (missed at colonoscopy) and implication for screening failure[4]. However, ADR calculation is problematic, given the unavailability of data both at the time of colonoscopy and in administrative health databases that commonly results from the difficulty for data linkage between endoscopy and pathology reports. To overcome these difficulties, experts have proposed the polyp detection rate or polypectomy rate (PR)[5-7], the proportion of colonoscopies that result in the removal of one or more polyps, as a surrogate for the ADR. The PR overcomes the drawbacks of and is highly correlated with the ADR[5-7]. Screening ADRs of 25% for men and 15% for women[4] and PRs of 40% for men and 30% for women[5] have been proposed to ensure cost-effective CRC screening, despite the difficulties in discerning screening from non-screening colonoscopies with reasonable accuracy in administrative health databases[8-12].

In the present study, we sought to estimate and compare PRs in Québec with published colonoscopy quality benchmarks. To overcome the challenge of identifying screening colonoscopy in administrative health databases, PR estimates were calculated using patient- and endoscopist-reported colonoscopy indications (screening/non-screening).

MATERIALS AND METHODS

A prospective cohort study was undertaken by combining data from two prospective cohort studies that used the same study methodologies; the second study was undertaken to increase the sample size of the first study. Recruitment occurred during January-March 2007 and January 2008-March 2009 at one of six hospital endoscopy facilities in Montréal; these included the McGill University Health Centre (Royal Victoria Hospital and Montreal General Hospital), the Sir Mortimer B Davis Jewish General Hospital, St. Mary's Hospital Centre, Hôpital Maisonneuve-Rosemont, Hôpital Fleury and the Centre Hospitalier de l'Université de Montréal. Potential participants included staff endoscopists and their patients who were about to undergo colonoscopy. Eligible endoscopists, *i.e.* those with provincial colonoscopy billing privilege, were enrolled prior to patient recruitment. A research assistant approached patients in the waiting area prior to colonoscopy to ascertain eligibility (aged 50-75, scheduled for colonoscopy, covered by the Québec provincial health insurance board (RAMQ) at the time of study and in the preceding year). The research assistant administered the patient questionnaire to consenting patients to assess history of large bowel conditions and symptoms[13], prior colonoscopy, and the reason for the index colonoscopy. Administrative health data (RAMQ) from the day of the index colonoscopy were used to determine polypectomy status. An endoscopist questionnaire was used to ascertain the colonoscopy indication.

Colonoscopy indications have been defined in detail elsewhere[14] and will be described briefly. Endoscopist screening indication was defined as colonoscopy performed in individuals without symptoms or with a family history of CRC; endoscopist non-screening indication was defined as either surveillance (performed in individuals with history of either colon, polyps, CRC, ulcerative colitis or Crohn's disease), diagnostic (performed for large bowel symptoms), or confirmatory (performed to follow-up on a positive screen). Patient screening indication was defined as colonoscopy performed in individuals without a history of either gastrointestinal (GI) conditions in the past 12 mo or large bowel symptoms in the past 6 mo; patient non-screening indication was defined as having a history of either GI conditions in the past 12 mo or large bowel symptoms in the past 6 mo. This definition of the patient colonoscopy indication is consistent with the "asymptomatic" definition upon which the quality benchmarks are based[4].

Ethics

Ethics approval was obtained from the McGill Faculty of Medicine Institutional Review Board and the research ethics committees at the study sites prior to study inception. Endoscopists and patients provided written informed consent prior to their participation. We followed the STROBE guidelines in the reporting of this observational study[15].

Statistical analysis

Descriptive statistics were used to characterize the study population. Bayesian hierarchical logistic regression modeling with random intercepts to account for endoscopist-level clustering was used to estimate sex-specific PRs according to colonoscopy indication and patient age (50-54/55-59/60-64/65-69/70-75 years). Adjusted PR estimates were calculated from model rate estimates by accounting for the imperfect accuracy of the RAMQ database polypectomy billing code[16]. Previously we estimated that sensitivity and specificity of the RAMQ database polypectomy billing code in comparison to medical chart

Table 1 Sex-specific polypectomy rates according to patient and endoscopist colonoscopy indications (n = 2134)

Colonoscopy indication[1]	Male		Female	
	Screening PRs % (95%CI)	Non-screening PRs % (95%CI)	Screening PRs % (95%CI)	Non-screening PRs % (95%CI)
Patient	32.4 (23.8-41.8)	34.4 (27.0-41.9)	19.4 (13.1-25.4)	22.3 (16.3-28.6)
Endoscopist[a]	30.2 (22.3-38.9)	37.3 (29.7-45.3)	16.6 (11.0-22.7)	26.3 (19.4-33.3)
Endoscopist[b]	31.4 (23.5-39.7)	36.1 (28.2-44.4)	17.6 (11.7-23.7)	25.2 (18.1-32.4)

[1]Screening colonoscopy indications defined as follows: (1) Patient: colonoscopy performed in individuals without a history of either gastrointestinal conditions in the past 12 mo or large bowel symptoms in the past 6 mo; (2) Endoscopist[a]: colonoscopy performed in asymptomatic individuals or those with a family history of colorectal cancer; and (3) Endocopist[b]: colonoscopy performed in asymptomatic individuals or those with a family history of colorectal cancer; or reported as confirmatory colonoscopy (performed to follow-up on a positive screen). PRs: Polypectomy rates.

data were 84.7% (95%CI: 78.6-89.4) and 99.0% (95%CI: 97.5-99.6), respectively[17]. We then converted the confidence intervals into close-fitting beta densities that were used in the model as prior distributions for sensitivity and specificity. For all other parameters, non-informative prior distributions were used. Bayesian 95% credible intervals, analogous to frequentist confidence intervals, were reported for all model results and are indicated by CI. Because some experts may consider confirmatory colonoscopy as a screening exam, sensitivity analysis was performed in which endoscopist-reported confirmatory colonoscopies were recategorized to screening. All analyses were conducted using WinBUGS software version 1.4.3 (MRC Biostatistics Unit, Cambridge).

RESULTS

Participants

Of the 2394 eligible patients approached, 2134 (89.1%) (mean age = 60.9 ± 7.1, 49.9% female) consented to participation. Reasons for exclusion were: 236 (9.9%) refused, 5 (0.2%) were sampled in both cohorts, 12 (0.5%) had no available RAMQ data, and 7 (0.3%) were missing the patient colonoscopy indication. The 45 endoscopists included 38 (84.4%) gastroenterologists, 6 (13.3%) surgeons, and 1 (2.2%) internist.

Baseline patient characteristics revealed that 627 (29.4%) had a history of GI conditions, 852 (40.0%) had lower abdominal symptoms in the previous 6 mo, 505 (23.7%) had a family history of CRC, 60 (2.8%) had a positive fecal occult blood test in the past 12 mo, and 991 (46.4%) had had a prior colonoscopy in the last 10 years. According to patients and endoscopists, the proportions of screening colonoscopies were 40.3% (95%CI: 38.2-42.4) and 55.1% (95%CI: 52.9-57.2), respectively. There were no missing data on patient characteristics.

Polypectomy rates

At the index colonoscopy, 548 (25.7%) patients had at least one polypectomy. Sex-specific PR estimates according to patient and endoscopist screening and non-screening colonoscopy indications are shown in Table 1. For all indications, PR estimates were consistently higher in males compared to females. According to patients, screening PR estimates in males and females were 32.4% (95%CI: 23.8-41.8) and 19.4% (95%CI: 13.1-25.4), respectively, and non-screening PR estimates were 34.4% (95%CI: 27.0-41.9) and 22.3% (95%CI: 16.3-28.6), respectively. According to endoscopists, screening PR estimates in males and females were 30.2% (95%CI: 22.3-38.9) and 16.6% (95%CI: 11.0-22.7), respectively, and non-screening PR estimates were 37.3% (95%CI: 29.7-45.3) and 26.3% (95%CI: 19.4-33.3), respectively. The sensitivity analysis that reclassified 41 endoscopist-reported confirmatory colonoscopies to screening colonoscopies showed almost no effect on the PR estimates for males and females (data not shown).

Sex-specific PR estimates according to patient and endoscopist colonoscopy indications and patient age are presented in Table 2. Estimates were higher for males [range: 18.1% (95%CI: 9.5-27.1) to 51.2% (95%CI: 31.0-72.0)] compared to females (range: 11.0% (95%CI: 3.1-20.5) to 28.8% (95%CI: 12.6-46.6)). Quality benchmarks were met in males aged 65-69 (40.4% (95%CI: 20.6-62.1)) according to patient screening indication, and in males aged 70-74 (42.1% (95%CI: 27.5-58.9)) according to endoscopist screening indication. For females, no screening PR estimate reached the quality benchmark level. For all 50-54 year olds, both the PR estimates and their accompanying credible intervals failed to reach the quality benchmark level. To explore the possibility that 50-54 year olds were inappropriately screened, we restricted the analysis to patients who reported no colonoscopy in the prior 10 years. PRs remained very low: 19.4% and 21.1%, according to patient and endoscopist screening indications, respectively (data not shown).

DISCUSSION

The present observational study estimated and compared sex-specific PRs to quality benchmarks according to patient age and colonoscopy indication (screening/non-screening), in which screening was defined as colonoscopies performed in asymptomatic individuals. Our findings showed that for individuals undergoing outpatient colonoscopy, sex-specific PR estimates were lower than quality benchmarks, with two exceptions: males aged 65-69 according to patient screening indication and males aged 70-74 according to endoscopist screening indication. Our findings corroborate those of others that showed higher PRs in men compared to women[18-20] and increasing PRs with advancing age in screening[20-22] and non-screening[23]

Table 2 Sex-specific polypectomy rates according to patient and endoscopist colonoscopy indications by patient age (n = 2134)

Age category (yr)	n	Patient indication[1]				Endoscopist indication[2]			
		Screening PRs % (95%CI)		Non-screening PRs % (95%CI)		Screening PRs % (95%CI)		Non-screening PRs % (95%CI)	
		Male	Female	Male	Female	Male	Female	Male	Female
50-54	500	23.0 (10.5-37.9)	11.0 (3.1-20.5)	18.1 (9.5-27.1)	19.6 (11.9- 28.2)	20.5 (9.5, 33.2)	16.6 (7.6-26.3)	19.2 (8.1-31.6)	13.1 (4.3-23.8)
55-59	489	32.3 (18.3-47.0)	27.2 (17.2- 38.2)	32.3 (18.1-47.0)	21.6 (12.4- 32.1)	33.0 (20.0- 46.2)	22.6 (12.8-32.2)	32.3 (18.7-46.6)	25.6 (14.7- 39.8)
60-64	456	28.5 (12.7-46.8)	15.6 (7.2-26.9)	37.9 (25.7-50.8)	21.8 (12.8- 32.1)	31.8 (16.8- 48.8)	14.3 (7.0-22.6)	36.9 (22.3-51.8)	28.0 (14.9- 42.0)
65-69	373	40.4 (20.6-62.1)	16.5 (6.1-28.4)	39.9 (23.9-55.6)	24.0 (10.5- 39.6)	30.4 (14.4- 46.6)	14.5 (4.5-25.8)	51.2 (31.0-72.0)	28.6 (13.0- 46.3)
70-74	316	34.6 (18.3- 52.9)	28.8 (12.6- 46.6)	39.3 (21.9- 55.9)	24.1 (11.1- 37.6)	42.1 (27.5- 58.9)	17.2 (5.3-32.0)	40.7 (25.3- 55.3)	28.8 (11.6- 46.3)

[1]Patient screening indication: colonoscopy performed in individuals without a history of either gastrointestinal conditions in the past 12 mo or large bowel symptoms in the past 6 mo; [2]Endoscopist screening indication: colonoscopy performed in asymptomatic individuals or those with a family history of colorectal cancer. PRs: Polypectomy rates.

colonoscopies. Sensitivity analysis had almost no effect on the PR estimates.

Of note, very low PR estimates were observed for individuals aged 50-54, as none of the credible intervals included the quality PR benchmarks. These findings suggest either inferior polyp detection resulting from poor quality colonoscopy or differences in biology resulting from increased risks for CRC and polyps with advancing age[24]. Inappropriate use of screening colonoscopy did not appear to contribute to low PRs. In the future, if benchmarks apply to colonoscopy naïve individuals, then prior colonoscopy dates should be obtained from reliable sources.

Low overall and sex-specific PRs have been observed by others. In one cohort study of screening and non-screening colonoscopies, only 20% of approximately 1.8 million colonoscopies included a polypectomy[18]. In one population-based study in Alberta, 23.7% of men and 15.4% of women undergoing a first colonoscopy had polypectomy[19], and large variation in endoscopist PR rates was observed. In contrast, we calculated PRs according to patient characteristics rather than by endoscopist, to elucidate whether at certain ages, quality benchmarks were met. Whereas we previously showed a statistically significant association between patient age and PRs after adjusting for sex, family history of CRC, colonoscopy indication, prior colonoscopy and endoscopist specialty[25], findings from the present study advance our understanding by showing how having a younger clientele could result in endoscopist failure to meet quality standards.

Prior colonoscopy experience may eventually produce counter-intuitive PRs. Although we did not find very low PRs in the 70-74 age category, CRC screening was not widespread at the time of our study; in fact, only 50% of Canadians were up-to-date with CRC screening[26]. However, with the participation of individuals in successive screening rounds and the detection and removal of polyps and adenomas, incidence of CRC and precancerous polyps may be reduced in older people. This idea is supported by findings from two population-based studies, conducted between the early 1990s and late 2000s, that showed increased CRC incidence in persons aged 51-70 and decreased incidence in those over 71[27,28]. The continued use of PR benchmarks to evaluate endoscopist colonoscopy performance may need to adapt to changes that result from increased CRC screening over time. Implementing a comprehensive program of education and standardized testing might reduce the need for benchmark revision. Currently in Canada refresher courses are offered to endoscopists on how to improve colonoscopy performance[29] that could be followed by standardized evaluation of colonoscopy quality with the requirement of meeting predetermined criteria to perform colonoscopy.

Study strengths include: (1) increased generalizability owing to the multicenter design and recruitment of most staff endoscopists at the study sites; and (2) low risk for information bias due to the assessment of patient colonoscopy indication prior to colonoscopy performance, and the objective assessment of polypectomy status based on administrative health data. Study limitations include: (1) wide credible intervals for the PR estimates due to small patient sample size; (2) possible reporting bias as the endoscopist may have filled out the indication questionnaire after the colonoscopy when the polypectomy status was known; and (3) possible confounding due to lack of bowel preparation quality data, as inadequately cleansed patients have lowered diagnostic yield for polyps[30,31]. We did not use self-reported colonoscopy in the prior 10 years to define the non-screening indication; although patients self-report prior colonoscopy with fair agreement when compared to medical records (kappas ranging from 74% to 87%)[32-34], accuracy of the timing of the colonoscopy has not been evaluated.

In conclusion, most sex-specific screening PRs in Québec were below quality benchmarks; PRs were especially low for all 50-54 year olds. As this was a descriptive study, future larger studies that include data on bowel preparation quality and pathology, and administrative data on colonoscopy in the prior 10 years are needed to help elucidate the reasons for discrepancies between quality benchmarks and clinical practice.

COMMENTS

Background

Endoscopic polypectomy is the standard treatment for gastrointestinal polyps

and reduces the incidence of subsequent colorectal cancer The polyp detection rate or polypectomy rate has been proposed as a quality colonoscopy benchmark. Screening polypectomy rates of 40% for men and 30% for women are proposed. The polypectomy rate overcomes the disadvantages of the adenoma detection rate, including the unavailability of data at the time of colonoscopy and in administrative health databases, and the difficulty for data linkage with pathology reports.

Research frontiers

Screening colonoscopy quality indicators have been proposed to ensure cost-effective colorectal cancer screening.

Innovations and breakthroughs

The results of this study corroborated those of others that showed higher polypectomy rates in men compared to women that also increased with advancing age in both screening and non-screening colonoscopies. The especially low rates in the 50-54 year old age group needs to be explored.

Applications

As these are the first polypectomy rate data from Quebec, our findings will increase awareness among endoscopists of the low polyp detection rates. Future larger studies that include information on bowel preparation quality and pathology, and administrative data on colonoscopy in the prior 10 years will to help elucidate the reasons for the discrepancies between polypectomy benchmarks and clinical practice.

Terminology

The polyp detection rate or polypectomy rate is defined as the proportion of colonoscopies that result in the removal of one or more polyps.

Peer review

The authors investigated polypectomy rates in screening and non-screening colonoscopies in Quebec using provincial health administrative data. This paper seems to be important and promising.

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