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BRIEF ARTICLE

Quality audit of colonoscopy reports amongst patients screened or surveilled for colorectal neoplasia

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Abstract

AIM: To complete a quality audit using recently published criteria from the Quality Assurance Task Group of the National Colorectal Cancer Roundtable.

METHODS: Consecutive colonoscopy reports of patients at average/high risk screening, or with a prior colorectal neoplasia (CRN) by endoscopists who perform 11 000 procedures yearly, using a commercial computerized endoscopic report generator. A separate institutional database providing pathological results. Required documentation included patient demographics, history, procedure indications, technical descriptions, colonoscopy findings, interventions, unplanned events, follow-up plans, and pathology results. Reports abstraction employed a standardized glossary with 10% independent data validation. Sample size calculations determined the number of reports needed.

RESULTS: Two hundreds and fifty patients (63.2 ± 10.5 years, female: 42.8%, average risk: 38.5%, personal/family history of CRN: 43.3%/20.2%) were scoped in June 2009 by 8 gastroenterologists and 3 surgeons (mean practice: 17.1 ± 8.5 years). Procedural indication and informed consent were always documented. 14% provided a previous colonoscopy date (past polyp removal information in 25%, but insufficient in most to determine surveillance intervals appropriateness). Most procedural indicators were recorded (exam date: 98.4%, medications: 99.2%, difficulty level: 98.8%, prep quality: 99.6%). All reports noted extent of visualization (cecum: 94.4%, with landmarks noted in 78.8% - photodocumentation: 67.2%). No procedural times were recorded. One hundred and eleven had polyps (44.4%) with anatomic location noted in 99.1%, size in 65.8%, morphology in 62.2%; removal was by cold biopsy in 25.2% (cold snare: 18%, snare cautery: 31.5%, unrecorded: 20.7%), 84.7% were retrieved. Adenomas were noted in 24.8% (advanced adenomas: 7.6%, cancer: 0.4%) in this population with varying previous colonic investigations.

CONCLUSION: This audit reveals lacking reported items, justifying additional research to optimize quality of reporting.

Key words: Colonic-disorders; Endoscopy-general; Oncology-clinical; Colonoscopy; Endoscopic reporting system

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INTRODUCTION

Colorectal cancer (CRC) is the second leading cause of death from cancer in Canada[1]. Screening of asymptomatic average-risk persons for this type of cancer is strongly recommended[2-6]. Colonoscopy is one of the most accurate screening tests for CRC. It is used for primary CRC screening but also for surveillance of patients with prior colorectal neoplasia (CRN), including cancer, and diagnosing patients with lower gastrointestinal (GI)-track symptoms. The effectiveness and safety of colonoscopy depends, However, on the quality of examination in what is a high-volume procedural setting. A growing body of evidence suggests that the quality of clinical practice varies[7-12].

In 2007, the Quality Assurance Task Group of the National CRC Roundtable developed a reporting and data system for colonoscopy (CO-RADS) to assist endoscopists in establishing standards that permit the monitoring of quality indicators in their practice. The Quality Assurance Task Group created a standardized reporting system that represents a consensus among experts in gastroenterology, diagnostic radiology, primary care and health care delivery[2]. A national US study was recently conducted, using the standardized reporting system, and uncovering lacks in the colonoscopy reports. Yet in Canada, to our knowledge, no such initiative has been published to date[13].

The objective of this study was therefore to assess the level of adherence of a sample of colonoscopy reports from an academic university-based endoscopy unit using the criteria set out by the Quality Assurance Task Group CO-RADS, and to determine reporting of quality indicators with the poorest adherence.

MATERIALS AND METHODS

Patient population

We selected consecutive colonoscopy reports completed from procedures performed in June 2009. We only considered procedures carried out for the screening or surveillance of patients with prior CRN, excluding colonoscopy reports completed for other reported indications.

Electronic reporting system and institutional database

The Montreal General Hospital site of the McGill University Health Centre (MUHC-MGH) is a tertiary care institution with a 4-room endoscopy unit staffed by 12 medical and surgical endoscopists. Patients can access the services of the unit both through a same-day consultation and procedural critical path of care at the request of a referring physician providing screened information, or on a subsequent date, after the specialist endoscopist has initially assessed the patient in the office. On average, 11 000 procedures are performed at the MUHC-MGH per year, of which 75% were colonoscopies in 2008. Average waiting time between the indication of the colonoscopy and the colonoscopy is currently around 2-3 mo. All patients receive an information sheet on the procedure prior to colonoscopy and consent is obtained by the endoscopist. Patients also receive written instructions after the colonoscopy is performed.

The unit is equipped with a structured, computerized endoscopic report generator allowing for image and video capture (Endoworks, Olympus Corporation, Center Valley, PA, United States). It is used for all cases performed during and outside regular hours by all endoscopists. The data file from the report is electronically transmitted to a central data repository housed at the MUHC-MGH. The information is then securely locked in an MUHC Endoworks database.

The routine colonoscopy report at the MUHC-MGH endoscopy unit includes some compulsory fields, default population of certain fields included in the final report for which the endoscopist needs to approve or choose alternatives, drop down menus for selecting other components of the report, and data acquisition fields for free text entries. Endoscopists were not aware we would be carrying out the audit at the time the reports were entered in Endoworks. Any *post-hoc* amendment of a report can be identified through a review of the electronic log entries.

We also accessed pathology results from an institutional electronic medical file software (OACIS, Telus, Vancouver, Canada) which is not part of Endoworks as the current practice is not to link directly the pathology results as part of the actual colonoscopy report. These latter data provided us with the prevalences of adenomas, advanced adenomas, and cancer detection rate.

Quality indicators

Based upon continuous quality improvement indicators established by the Quality Assurance Task Group of the National CRC Roundtable[2], we developed a specific list of quality indicators (Table 1) that should be explicitly addressed in the colonoscopy reports, and made available to the referring physician. Unplanned interventions for adverse events included only those interventions that were reported at the time of colonoscopy since no specific mechanism or manpower support currently exists at the MUHC-MGH digestive endoscopy unit to allow for the reliable capture of downstream adverse events once the patient has returned home.

Data collection

The current study is a retrospective review of all consecutive eligible reports using a standardized checklist developed using the Quality Assurance Task Group of the National CRC Roundtable publication[2]. We dichotomized screened patients into those for whom the indication for colonoscopy was average or increased-risk (patients with a family or personal history of CRC or polyps). Data were compiled and individually analyzed by a trained research assistant using a specially developed electronic data abstraction form. Using a standardized glossary of study variables, 10% of all entered data was reviewed by an independent observer and validated.

Table 1 Colonoscopy quality indicators

Patient demographics and history
Age
Sex
MRN
Management plans
Informed consent documentation
Previous GI procedures: documented date (yes/no)
Documentation of ASA classification
Indications for procedure
Average risk
Increased risk
Incomplete colonoscopy
Post adenoma resection
Procedure: Technical description
Date and time
Sedation
Level of difficulty of the procedure
Bowel preparation
Type and dosage
Quality
Actual extent of examination
Cecal intubation (yes/no)
Documentation of cecal landmarks
Appendiceal orifice
Ileocecal valve
Total and withdrawal time recorded (yes/no)
Colonoscopic findings
Colonic polyp(s):
Number
Size
Morphology
Morphology anatomic location
Method of removal
Completeness of removal (yes/no)
Retrieved (yes/no)
Sent to pathology (yes/no)
Interventions/unplanned events
Unplanned interventions and complications
Documentation of discharge plans (info to patient, info to referring MD)
Pathology
Documentation of pathology results to the patient and the physician
Adenoma detection (yes/no)
Cancer detection (yes/no)

MRN: Medical record number; ASA: American Society of Anesthesiology; GI: Gastrointestinal.

Statistical analysis

The sample size was based on a preliminary analysis of the first 111 consecutive reports. The widest point estimate for presence (or absence) of documentation of a quality indicator was for that of polyp removal (51.1%; 95% CI: 35.9%-63.3%).We estimated the number of reviewed reports, needed to narrow the range of uncertainty around this point estimate to 10%. Assuming an identical projected point estimate of 51%, we calculated that we would need to audit 250 scope reports to narrow a 95% CI down to 45.5%-55.8%. We therefore completed the audit up to this consecutive number of patients.

Descriptive variables are presented as means and standard deviations for continuous variables and proportions with 95% confidence intervals for categorical variables. All analyses were performed by using SAS software version 9.1 (SAS Institute Inc, Cary, NC, United States).

Table 2 Patient population and endoscopists description *n* (%)

	Patients (n = 250) endoscopists (n = 11)
Mean age (yr)	63.2 ± 10.5
Sex	
Women	107 (42.8)
Men	143 (57.2)
Procedure indications	
Average risk	85 (38.5)
Past personal history	90 (43.3)
Past family history	42 (20.2)
HNPCC	1 (1.4)
FAP	1 (1.4)
Specialty of endoscopists	
Surgical	3 (27.3)
GI	8 (72.7)
Average years of endoscopists practice (yr)	17.1 ± 8.5

HNPCC: Hereditary nonpolyposis colorectal cancer syndrome; FAP: Familial adenomatous polyposis; GI: Gastrointestinal.

RESULTS

From June 1st to June 30th 2009, 250 reports on 250 consecutive patients were audited for the frequency of reporting of patient demographics and history, procedure indications, technical descriptions, colonoscopy findings, interventions, unplanned events, follow-up plan, and we reviewed the corresponding histological information. These 250 colonoscopy reports were reported by 11 different physicians including 2 colorectal surgeons, 1 general surgeon, and 8 gastroenterologists. Not all endoscopists were included since they do not all perform screening colonoscopies. The average number of years of practice of the 11 endoscopists was 17.1 ± 8.5 years.

Patient demographics and endoscopists' description

The overall patient population and endoscopists' description of the reports are presented in Table 2. The mean age of the patient population was 63.2 ± 10.5 years with 42.8% of the patients being women. The procedure indication pertaining to the risk of the patient was indicated in every report. Overall, 38.5% of examinations were performed on average risk individuals, 43.3% of patients had a past personal history of prior CRN, while 20.2% of patients had first-degree relatives with CRC or a CR adenoma. Only one patient had a hereditary nonpolyposis CRC syndrome, while another had familial adenomatous polyposis.

Pre-procedure indicators

The American Society of Anesthesiology (ASA) classification field was not completed in any of the reports. The documentation of informed consent was noted in all reports. Overall, 9.6% of patients had had previous colonoscopies, but the date of the prior examination was only noted in 14% of reports with details about previous polyp resection in 25%. In most cases, the colonoscopy report lacked sufficient information to determine wheth-

Table 3 Pre-procedure indicators *n* (%)

Quality indicator sought in the report	(*n* = 250)
Consent documentation	250 (100.0)
Management plan for anticoagulation[1]	1 (0.5; 95% CI: 0.0-1.5)
Previous GI colonoscopy date[1]	24 (14.0; 95% CI: 8.7-19.2)
ASA classification	0 (0)
Previous polyp resection	20 (12.7; 95% CI: 7.4-17.9)
Details available	5 (25.0; 95% CI: 4.2-45.8)
1-2 tubular adenoma < 1 cm	2 (33.3; 95% CI: 0.0-87.5)
3-10 tubular adenoma > 1 cm	1 (16.7; 95% CI: 0.0-59.9)
10 adenomas	1 (16.7; 95% CI: 0.0-59.9)
Sessile adenoma > 2 cm	1 (16.7; 95% CI: 0.0-59.9)

[1]Usually documented elsewhere, but not in the endoscopy report. ASA: American Society of Anesthesiology; GI: Gastrointestinal.

er the surveillance interval respected published guidelines (Table 3).

Procedural indicators

The date of the examination was recorded in 98.4% of reports. Administered medications and dosage were indicated in 99.2%, while the level of difficulty of the procedure was reported in 98.8%. The quality of the bowel preparation was not recorded in 0.1% of the reports. When reported, the quality was described as good in 85.1%, fair in 10.8% and poor in 4%. All reports included information about cecal intubation. The cecum was reached in 94.4% of examinations, while cecal landmarks (appendiceal orifice and/or ileocecal valve) were noted in 78.8% when the cecum had been reached. Photo-documentation was present in 67.2% of reports. Retroflexion in the rectum was performed in 70.8% of procedures. Total procedural and withdrawal times were never recorded. Intra-procedural complications were reported in 0.4% (Table 4).

Colonoscopic findings

Polyps were found in 111 procedures (44.4%). Amongst all patients with polyps, polyp size was recorded in 65.8%, and morphology in 62.2%. The mean polyp size was 17.6 ± 33.1 mm. The anatomic location of the polyp(s) was documented in 99.1%. The method of polyp removal was not mentioned in 20.7% of the reports. When specified, 25.2% of the polyps were removed by cold biopsy, 18% by cold snare, and 31.5% using hot snare cautery. Eighty-four point seven percent of all polyps were retrieved and 76.5% were sent to pathology (Table 4).

Of all retrieved polyps (44.4% of all patients), 70% were adenomas (24.8% of all patients), 21% (7.6% of all patients) were advanced adenomas, and 1% (0.4% of all patients) were cancerous.

Post-procedural indication

Ninety-nine point six percent of all endoscopy reports included documentation of discharge plans. Although documented elsewhere, none of the reports included post-discharge precautions to patients nor the documentation of pathology.

Table 4 Procedural indicators and colonoscopic findings *n* (%)

Procedural indicators	
Quality indicator sought in the report	*n* = 250
Date of exam	246 (98.4, 95% CI: 96.8-100.0)
Medications with dosage	248 (99.2, 95% CI: 98.1-100.0)
Level of difficulty	247 (98.8, 95% CI: 97.4-100.0)
Bowel preparation quality	
Poor	10 (4.0, 95% CI: 1.6-6.5)
Fair	27 (10.8, 95% CI: 7.0-14.7)
Good	212 (85.1, 95% CI: 80.7-89.6)
Actual extent of examination	
Cecum	236 (94.4, 95% CI: 91.7-97.3)
Ascending colon	6 (2.4, 95% CI: 0.5-4.3)
Transverse colon	2 (0.8, 95% CI: 0.0-1.9)
Descending colon	2 (0.8, 95% CI: 0.0-1.9)
Recto sigmoid	4 (1.6, 95% CI: 0.0-3.2)
Cecal intubation	236 (94.4, 95% CI: 91.5-97.3)
Photodocumentation	186 (74.4, 95% CI: 69.0-79.8)
Documentation of cecal landmarks	
Appendiceal orifice	168 (67.2, 95% CI: 61.2-73.2)
Ileocecal valve	103 (41.2, 95% CI: 35.1-73.1)
Retroflexion in rectum	177 (70.8, 95% CI: 65.1-76.5)
Withdrawal time	0 (0)
Total time	0 (0)
Intra-procedural complications	1 (0.4, 95% CI: 0.0-1.2)
Colonoscopic findings: polyps	
Polyp findings	111 (44.4, 95% CI: 38.2-50.6)
Mean polyp number	2.2 ± 2.5
Polyp size documented	73 (65.8, 95% CI: 56.8-74.7)
Mean polyp size (mm)	17.6 ± 33.1
Morphology	
Documented	69 (62.2, 95% CI: 53.0-71.3)
Pedunculated	17 (23.9, 95% CI: 13.8-34.1)
Sessile	56 (80.0, 95% CI: 70.4-89.6)
Anatomic location documented	110 (99.1, 95% CI: 97.3-100.0)
Method of removal	
Cold biopsy	28 (25.2, 95% CI: 17.0-33.4)
Cold snare	20 (18.0, 95% CI: 10.8-25.3)
Snare cautery	35 (31.5, 95% CI: 22.8-40.3)
Not mentioned	23 (20.7, 95% CI: 13.1-28.4)
Retrieved	72 (84.7, 95% CI: 76.9-92.5)
Sent to pathology	85 (76.5, 95% CI: 67.3-85.7)

DISCUSSION

The effectiveness of colonoscopy in reducing cancer prevalence cannot be improved if procedural reports do not include critical quality indicators to track performance in colonoscopy. In other words, the potential benefits of colonoscopy depend on the quality of the examination[14], and thereby its reporting. The final version of the Standardized Colonoscopy Report includes important elements that can be measured in diverse clinical practice settings. Patient demographics and history, assessment of patient risk and comorbidities, procedure indications, procedure technical description, colonoscopy findings, assessment, interventions and unplanned events, follow-up plan, and pathology are the main variables proposed by the Standardized Colonoscopy Report established by the Quality Assurance Task Group of the National CRC Roundtable, requiring recording[2].

The current study revealed that even with a computerized endoscopic report generator, some key quality fields were lacking, some often. Several of these fields are

Table 5 Comparison between national United States study and the current audit

	%	Current audit (%)
Patient characteristics		
Women	49	42.8, 95% CI: 36.6-49.0
Men	51	57.2, 95% CI: 51.0-63.4
Average risk	29.6	38.5, 95% CI: 32.0-44.9
Past family history	13.4	20.2, 95% CI: 14.7-25.7
Past personal history	19	43.3, 95% CI: 36.5-50.1
Presence of recorded variables		
ASA classification	89.9	0
Bowel preparation quality	86.1	99.6, 95% CI: 98.8-100.0
Previous GI colonoscopy date	33.9	14.0, 95% CI: 8.7-19.2
Cecal landmarks	85.9	67.2, 95% CI: 61.3-73.1
Polyp size	90	65.8, 95% CI: 56.8-74.7
Polyp morphology	85.3	62.2, 95% CI: 53.0-71.3
Polyp retrieval	95.5	84.7, 95% CI: 76.9-92.5
Endoscopic outcomes		
Cecal intubation	96.3	94.4, 95% CI: 91.5-97.3
Polyp findings	36.3	44.4, 95% CI: 38.2-50.6

ASA: American Society of Anesthesiology; GI: Gastrointestinal.

important in determining the quality of the examination including photo documentation of cecal landmarks present in only (67.2%; 95% CI: 61.3%-73.1%). Of course, the absence of these data does not allow us, to infer about a poor examination quality, but makes its tracking difficult, and even impossible for certain aspects. Assuming all past procedures were indicated, the current reports should include documentation of the prior colonoscopy examinations and their findings. In most cases, we found this documentation lacking (86%; 95% CI: 81.5%-90.5%), and, therefore, it was often not possible to determine the appropriateness of the screening interval. Additional important missing information in the report included historical data which, according to current local practice, may be present in a separate consultation report. Nonetheless, the Quality Assurance Task Group of the National CRC Roundtable has mandated that, to facilitate adequate benchmarking, this information should be found in the endoscopic report.

The omission of key polyp descriptors like polyp size absent in (34.2%; 95% CI: 25.3%-43.2%), the number of polyps found, and the morphology lacking in (37.8%; 95% CI: 28.7%-47.0%) of reports can impact subsequent decisions on surveillance colonoscopy intervals[15], although a more accurate determination of polyp size is available from the histological reports, when available. This information should eventually find its was back to the endoscopy report for benchmarking purposes of endoscopists and for good clinical practice to ensure a copy is sent to the referring physician[16]. Here too, these data may have been documented in a separate follow-up form. However once again, Lieberman *et al*[2] have suggested that these data be present in the actual (follow-up) endoscopy report. Indeed, any subsequent quality initiative would otherwise be limited with various pieces of information being present in different places-i.e.,: not all documented in the electronic report. Furthermore, if the documentation of whether the polyp was sent to pathology or not was omitted in many (23.5%; 95% CI: 14.3%-32.7%) of examinations, and affects the immediate patient care, that could lead to risks of undiagnosed cancers if this information is not efficiently retrieved and integrated in overall management. We also had no way of validating whether post-procedural complications were noted without reviewing a patient's file (and even then, such information may be lacking) These data should also find their way back to the endoscopy report. Perhaps data cross links or integrated data management will help future enhancement of reporting quality across pre, intra- and post-procedural domains of quality reporting.

Procedure durations (withdrawal and total times) were never recorded. Although, somewhat of a controversial subject, there is evidence that there exists a significant correlation between withdrawal time and adenoma detection rates[15,17]. It is thus recommended as a quality indicator and has been found useful in previous audits[7].

We noted other lacks in reporting of selected variables which are recommended but do not directly impact examination quality including the ASA classification which was absent in all reports in this audit. Although, this indicator does not reflect examination quality, it can be an important surrogate of co-morbidity[18], and better defines the screened population, aiding the explanation of possible subsequent morbidity and the interpretation of medications dosing and the interpretation of reported patient satisfaction.

Another controversial variable was retroflexion in the rectum (performed in 70.8% of examinations); it provides additional data that can be added to complete an accurate colonoscopy report, and its recording may be useful either in demonstrating its need in identifying pathology; it remains a controversial quality indicator[2,13].

A number of the variables were recorded in the great majority of the reports such as the date of the exam (98.4%; 95% CI: 96.8%-100.0%), used medications with dosage (99.2%; 95% CI: 98.1%-100.0%), the level of difficulty of the procedure (98.8%; 95% CI: 97.4%-100.0%) and the bowel preparation quality. The compulsory nature of some fields, pre-formatted text, and drop-down menus in the electronic reporting system no doubt participated in this high level of reporting, and should serve to guide improvement in areas of in which the recording of variables was lacking. Indeed, these fields likely need to be developed for other variables which are less frequently reported yet needed.

We compared the findings of the current study with the one conducted by Lieberman *et al*[13]. The study using a national CORI database[13] included 73 US gastroenterology practice sites, and 43 8521 reports. Some differences in patient characteristics existed (Table 5). Quality outcomes from the procedure were similar or superior in the Canadian study polyp detection rate (44.4% *vs* 36.3%; 95% CI: 38.2%-50.6%), while the documentation of patient or procedural variables was poorer in many instances [such as for ASA classification, withdrawal times, previous colonoscopy date, photo-documentation of

cecal landmarks, and polyp description, (Table 5)]. They also used the proportion of patients with polyp(s) > 9 mm or with suspected malignant tumour as a surrogate end point for advanced neoplasia.

Although not our primary aim, this quality initiative also allowed us to benchmark the quality of the colonoscopies performed in this successive sample, and compare them to established consensus thresholds. In total, 111 polyps were found (44.4%). The adenoma detection rate was of (24.8%; 95% CI: 19.4%-30.2%) which suggests that even in this population with a varying colonoscopy screening history, adenoma pick-up rates were excellent, since respective recommended thresholds are > 25% in men older than 50% and > 15% in women according to current recommendations by the United States Multi-Society Task Force on CRC[7,15] and a recent meta-analysis[19]. Furthermore, the recommended benchmark for cecal intubation rate is 95% which is comparable to the cecal intubation rate achieved in this study (94.4%; 95% CI: 91.5%-97.3%)[7,15,20,21]. These recommendations are part of a series of recent studies published in the world literature aimed at improving the quality of colonoscopy[22-24] in an attempt to optimize patient outcomes in CRC screening[25].

In summary, the overall quality of the reports was good (considering the location of reported information pre- and post-procedures), although not optimal. Indeed, the MUHC-MGH group appears to perform within the threshold set by the Quality Assurance Task Group of the National CRC Roundtable[2] for most indicators, although improvement is required for some documentation (for e.g., ASA score, and withdrawal time). It is now imperative to continue to improve the appropriate use of the reporting system and revise the user-interface of the software accordingly to optimize the quality of colonoscopies and CRC screening care. Moreover, further improvements are needed in linking databases for optimal consolidation of information on past procedures, post-procedural complications, and pathology results such that they all appear in a single report that can be provided to referring physicians and patients.

COMMENTS

Background

Colonoscopic quality is critical in colorectal cancer screening. Formal quality assessments of colonoscopy reporting are few. The authors completed a quality review according to criteria of the Quality Assurance Task Group of the National Colorectal Cancer (CRC) Roundtable.

Research frontiers

Prospective studies assessing the completeness of colonoscopic reporting for CRC screening are few in the literature.

Innovations and breakthroughs

The authors audited reports of 250 patients (63.2 ± 10.5 years, 42.8% female) scoped in June 2009 by 8 gastrointestinal and 3 surgeons (mean practice years = 15.3). While some quality indicators were routinely reported, others were systematically lacking.

Applications

Modification of the lectronic reporting software for colonoscopy reporting is required to optimize quality indicator reporting.

Peer review

This is a good descriptive study in which authors complete a quality audit using recently published criteria from the Quality Assurance Task Group of the National CRC Roundtable. The results are interesting and suggest two hundreds and fifty patients were scoped in June 2009 by 8 gastroenterologists and 3 surgeons.

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