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Indications, findings, and technical performance of colonoscopies by a single general surgeon in a small rural hospital

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Technical performance

Abstract

CONTEXT: Colorectal cancer is the third leading cause of cancer-related death in the United States. Colonoscopy is a proven effective screening tool for precancerous polyps.

OBJECTIVE: To assess indications, findings, and technical performance of colonoscopies by a single general surgeon in a rural hospital to compare with previously published literature and establish a baseline for possible future studies.

METHODS: A retrospective chart review of patients receiving a colonoscopy from a single general surgeon from January 1, 2007 through June 11, 2009. Multiple patient factors and procedural details were recorded. Cecal intubation and adenoma detection rates were also calculated.

RESULTS: A total of 313 colonoscopy procedures were recorded from 303 patients. Average age of patients was 57 $\pm$ 14; 46.3% were male. The most common reason for colonoscopy was blood loss signs and symptoms (45%, $n = 141$), with 31.9% of these patients having adenomatous polyps. Cecal landmarks were mentioned in all complete colonoscopies. The average cecal intubation rate was 91.3%, gradually improving from 85.3% in 2007 to 96.6% in 2009. Adenoma detection rate for patients $\geq$50 years of age was 30.5% overall, 34.8% for men, and 36.1% for women. Quality of bowel preparation was not mentioned in 75.7% of cases and withdrawal time was not recorded.

CONCLUSIONS: A successful assessment of a general surgeon performing colonoscopies in a small rural hospital setting was performed. Adenoma detection rate and cecal intubation are above the recommended guidelines by the US Multisociety Task Force on Colorectal Cancer. Documentation for withdrawal times, adequate bowel preparation, and photographic documentation of cecal landmarks were lacking. As quality improvement measures are becoming more prevalent in health care it is important to continuously evaluate performance.

Colorectal cancer is the third leading cause of cancer-related deaths in the United States. By the end of 2009, there will be an estimated 146,970 new cases of colon and rectal cancer, resulting in an estimated 49,920 deaths.[1] Screening is useful in preventing colorectal cancer, which is both common and fatal if left untreated. Colonoscopy identifies and treats slow-growing precursor lesions called adenomas, which can prevent the progression to cancer. Therefore, the American College of Gastroenterology recommends screening for average-risk persons over the age of 50 every 10 years.[2] Colonoscopy is the preferred screening strategy, because it has been shown that colonoscopy with polypec-

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Table 1 Characteristics of the 303 patients

Variable	Value
Age (y)	
Mean ± SD	57.0 ± 14.0
<50, *n* (%)	68 (22.4)
50–59, *n* (%)	103 (34.0)
60–69, *n* (%)	77 (25.4)
>69, *n* (%)	55 (18.2)
Male sex, *n* (%)	145 (46.3)
Female sex, *n* (%)	168 (53.7)

tomy prevents colorectal cancer in asymptomatic adults in a cost-effective manner.[3,4]

The procedure of colonoscopy, which can be accompanied with polypectomy, must be performed by a trained individual to optimize the patient's comfort and safety.[5,6] Previous studies have shown that trained surgeons and family physicians can safely and competently perform colonoscopies consistent with published guidelines.[7-14] In the rural setting, endoscopy can account for a large percentage (24%) of a general surgeon's practice because of the small number of subspecialists in the rural setting.[14] The US Multisociety Task Force on Colorectal Cancer released recommendations in 2002 to increase quality in the technical performance and continuous improvement of colonoscopy.[6] A basic audit, as listed by Lieberman et al,[15] can be used to monitor quality and identify specific elements for continuous quality improvement. The audit includes: bowel preparation quality, cecal intubation rate, rate of photo documentation of cecal landmarks, mean colonoscopic withdrawal time in patients without polypectomy or biopsy, adenoma detection rate in first-time screening examination based on patient's sex, adverse or unplanned events occurring within 24 hours of colonoscopy, rates of hospitalization, bleeding, perforation surgery, and rate of documentation of recommendations for follow-up.[15] The purpose of the present study is to assess indications, findings, and technical performances of colonoscopies, by a single general surgeon in a small rural hospital to compare his experience to previously published literature and establish a baseline for possible future studies.

Methods

This study was approved by the Institutional Review Board at the participating institution. A retrospective chart review was performed collecting data from all colonoscopies from January 1, 2007 to June 11, 2009 performed by a single general surgeon. Data were also recorded for esophagogastroduodenoscopy (EGD) when this was performed concurrently with colonoscopy. Patient demographic information (age and gender) and referring provider were also recorded. Each patient's previous history of intra-abdominal and pelvic surgery was also included. Patients were primarily outpatient; however these data were not recorded.

Presenting indications were based on the physician's preoperative diagnosis listed on the dictation report. Also recorded from the physician's dictation report was the postoperative diagnosis, concurrent procedures performed while under anesthesia (e.g., colonoscopy, EGD, hemorrhoid ligation), how the biopsies were taken (biopsy forceps with or without cautery or snare), and patient bowel preparation. Cecal intubation was recorded from the physician's dictation report with mention of notable landmarks (ileocecal valve, appendiceal orifice, transilluminated light in the right lower quadrant, and confluence of tenia). Terminal ileum intubation was recorded if mentioned or attempted. Numbers of biopsies received by the pathologist and polyp or mucosal classification were recorded from the pathologist's report. Beginning and ending time were recorded from the nurse's procedure report.

All statistical analysis was performed with SPSS (SPSS, Inc., Chicago, IL). Calculations included frequencies and descriptive calculations. To calculate cecal intubation rates, procedures were followed as outlined by Rex et al,[6] only counting cases with adequate bowel preparation (if bowel preparation was not mentioned, it was deemed adequate in our study as stated by the surgeon endoscopist). We excluded from calculations procedures where the cecum was surgically absent. Adenoma detection rate was calculated for comparison with Millan et al[16] by following their procedure and including asymptomatic patients, patients with a history of rectal bleeding, and patients with a history of polyps or colorectal cancer as presenting indications (N = 190). For this calculation, adenomatous polyps were considered either present or not present. A chi-square with Yates correction analysis was performed to determine statistical difference between the two values.

Results

A total of 313 colonoscopy procedures were recorded on 303 different patients. Characteristics of the patients are shown in Table 1. Average age of the patients was 57 (±14); 46.3% were male.

Cecal intubation rates were calculated by year and shown in Table 2. The year 2009 is only a partial year through June

Table 2 Overall cecal intubation rates and by year

Year of colonoscopy	% Of successful cecal intubation	Successful/total colonoscopies
Overall	91.3%	263/288
Asymptomatic screening	95.4%	62/65
2007	85.3%	29/34
2008	88.3%	121/137
2009*	96.6%	113/117

*Partial year through June 11, 2009.

Table 3 Frequencies and findings from colonoscopy of various presenting indications

Indications	Frequency (%)‡	Adenoma %	Park et al[17] adenoma%	Hyperplastic %
Blood-loss indications	141 (45.0)	31.9	38.5*	16.3
Abdominal pain	75 (24.0)	28.0	22.0	9.3
Asymptomatic screening without risk factors	69 (22.0)	20.3	32.4	21.7
Alterations in bowel function	58 (18.5)	24.1	22.7†	20.7
Family history of colon cancer or polyps	42 (13.4)	31.0	30.0	31.0
Personal history of polyps or colon cancer	39 (12.5)	48.7	34.1	20.5
Weight loss	15 (4.8)	26.7	—	20.0
History of recent diverticulitis	7 (2.2)	57.1	—	28.6
History of inflammatory bowel disease	7 (2.2)	28.6	18.1	100.0
Abnormal x-ray findings	5 (1.6)	40.0	—	20.0

*Park et al[17] recorded melena/hematochezia and iron-deficiency anemia. Here we consider them blood-loss indications.
†Park et al[17] recorded bowel habit change. Here we consider them alterations in bowel function.
‡Frequencies total >100% because some patients had more than one indication.

11, 2009, with a cecal intubation percentage of 96.6% of a total of 117 colonoscopy procedures. The average cecal intubation was 91.3% overall, steadily improving from 85.3% in 2007 to 96.6% in 2009.

The presenting indications for the colonoscopies are shown in Table 3. The most common reason for colonoscopy is blood loss signs and symptoms ($n = 141$), which included occult blood/guaiac-positive stool, anemia, rectal bleeding, or history of gastrointestinal bleed. Following in frequency were abdominal pain and asymptomatic screening without risk factors ($n = 75$ and 69, respectively). Also included in Table 3 are the adenoma detection rates for each presenting indication as well as data from Park et al[17] for comparison purposes. Frequencies can total >100% because some patients had more than one presenting indication.

The findings of the colonoscopy are shown in Table 4. Adenomatous polyps were found in 30.7% of patients and adenocarcinoma was found in 2.2% of patients. Colitis (edema, erythema, erosions, ulcerations, hemorrhage) was seen visually by the colonoscopist in 14.1% of patients, but only confirmed by the pathologist in 3.8% of patients.

Table 5 shows characteristics of the seven patients with invasive adenocarcinoma. Five were male, all sharing rectal bleeding as at least one of their symptoms. Only two patients had adenocarcinoma proximal to the rectum.

Table 4 Colonoscopy findings

Findings	Frequency (%)*
Adenomatous polyps	96 (30.7)
Other polyps	68 (21.7)
Hyperplastic	57 (18.2)
Normal colonoscopy	87 (27.8)
Colitis (determined visually)	44 (14.1)
Colitis (confirmed histologically)	12 (3.8)
Diverticulosis	104 (33.2)
Adenocarcinoma	7 (2.2)

*Frequencies total >100% because some patients had more than one finding.

Comparisons of our adenoma detection rates with that of Millan et al[16] are shown in Table 6. Adenoma detection rate was 30.5% overall with an average procedure time of 25.0 ± 10.8. Chi-square analysis with Yates correction demonstrated a chi-square value of 9.68, $p = 0.002$.

There were no major complications (perforation or bleeding) reported as a result of any case in this series.

Discussion

Colonoscopy has been shown to be performed successfully and safely as a screening strategy in asymptomatic, average-risk men.[18] It has become the criterion standard for the detection and removal of adenomas to prevent colorectal cancer.[16] Therefore, many studies have been published documenting quality improvements, standardized reporting, and quality indicators of colonoscopy.[6,15,19] Following these guidelines we reviewed colonoscopy procedures from a single general surgeon in a small rural hospital to create a comparison to literature and establish a baseline for future study.

As reported by Lieberman et al,[15] it is important to record patient age and sex, for these are both important risk factors for adenomas and colorectal cancer. Compared with other studies the demographics of our patients contain a larger female population. The reasons for this are unknown, though the larger number of females is possibly due to a higher personal concern for health among women than men. Comparing our results with Millan et al[16] in Table 6, our overall adenoma detection rate is greater and significantly different ($p = 0.002$). For females >50 years of age with asymptomatic screening, rectal bleeding, or previous history of colon cancer, our adenoma detection rate is almost two-fold greater. Because the reported adenoma detection rate targets for men and women >50 years of age are ≥25% in men and ≥15% in females, our results are validated for quality based on adenoma detection rate.

Continuous quality improvement targets for cecal intubation rates in all cases with adequate bowel preparation are

Table 5 Characteristics of patients with adenocarcinoma

Patient	Age (y)	Sex	Presenting indication	Location of adenocarcinoma
1	59	Female	Occult blood/guaiac positive stool; anemia; diarrhea	Rectum
2	44	Male	Rectal bleeding	20–45 cm of the colon
3	64	Male	Rectal bleeding	15 cm
4	70	Male	Rectal bleeding; anemia	15 cm
5	43	Male	Rectal bleeding; palpable rectal mass	Anorectal junction
6	69	Male	Rectal bleeding; abdominal pain	15–18 cm
7	98	Female	GI bleed; abnormal x-ray findings	Splenic flexure 70 cm

≥90% and ≥95% for screening cases.[19] As shown in Table 2, our cecal intubation rates were above the target goals. The rates improved by year, which could be accounted for by the addition of a certified registered nurse anesthetist to provide anesthesia in place of the surgeon-endoscopist, and by the accumulated experience of the endoscopy team. Similar studies by Newman et al[11] and Erle Kirby[10] also demonstrate improving cecal intubation rates by year. Therefore, it may be necessary that a training program requires 250 or more procedures before certifying a general surgeon or family physician in colonoscopy.

Rex et al[19] recommend endoscopic reports of visualized landmarks and photography when available. Visualized landmarks were recorded in 100% of cases, but photography of the landmarks was not routinely done. The surgeon endoscopist of this research is exploring digital photographic options, which would cut the costs of printing for the photographic documentation of cecal landmarks.

Colonoscopy indications were recorded for every patient as recommended by Rex et al.[19] It is important to note that patients were not exclusively in one category or another, because they could have multiple indications such as anemia and rectal bleeding. It is beyond the scope of this study to confirm the appropriate use of colonoscopy as recommended by the American Society for Gastrointestinal Endoscopy.[20] A comparison of our adenoma detection percentage (adenoma %) based on indications with Park et al[17] (Table 3) yields similar results. We compared similar symptom classifications; however, we did not differentiate between adenoma and advanced adenoma. Therefore, we summed adenoma percentage and advanced adenoma percentage values from Park et al for adequate comparison. The high percentage of patients with personal history of polyps or colon cancer that were found to have an adenoma further supports the current recommendations that post-adenoma resection follow-up should be at a shorter interval than for average-risk persons.[6]

Table 6 Comparison of adenoma detection rates (ADR) and procedure time from Millan et al[16] with our data

Variable	Present study	Millan et al[16]
ADR overall	30.5%	21%
ADR men >50 y	34.8%	28.6%
ADR women >50 y	36.1%	19.1%
Procedure time* (min)	25.0 ± 10.8	18.2 ± 9.6

*Complete examinations only.

In Table 4, the discrepancy between colitis determined visually and colitis confirmed histologically warrants a discussion. The visually recorded colitis may not be pathologically based, i.e., the erythema, edema, and so on being caused by pressure from the colonoscope or induced by bowel preparation. More research is suggested in this area to determine the reliability of endoscopist visual findings vs. histological findings.

Adenocarcinoma was found in 7 (2.2%) of patients, which is lower than the 7.4% reported by Park et al.[17] This may be caused by the cultural and regional differences or the screening strategy adopted in the United States. It is important to note, however, that in our study two patients with adenocarcinoma were under the age of 50, which is below the recommended colonoscopy screening age. Even more interesting is that neither of these two patients had a family history of colon cancer or other risk factors indicating a colonoscopy, other than their presenting symptoms.

There is no standard system for reporting results of bowel preparation, but it is recommended that bowel preparation quality should be recorded in 100% of cases.[6] In our study, bowel preparation was not mentioned in 75.7% of cases. The surgeon endoscopist, in the present study, did not mention bowel preparation in the report when it was adequate for the procedure. Although this may be a safe assumption, it should not be relied on in all cases. As a result of this study, bowel preparation is now being recorded in all cases at our institution.

Another quality improvement target recommended by Rex et al[6] is the mean examination time during the withdrawal phase, with the goal being at least 6 to 10 minutes. In this study, examination time was recorded from the beginning until the end of the procedure, as documented by the nurses' notes. No distinction was made to indicate completion time for EGD or other concomitant procedure when multiple procedures were performed under one anesthetic. Neither was withdrawal time for colonoscopy specifically noted. This limits comparison for research purposes and for evaluation of quality. Changes in this area of recording are already being put into practice, with the nurses now recording insertion time and withdrawal time for future research.

There are multiple limitations to our study including a small number of patients, only one endoscopist, and the retrospective study design. Another limitation of our study is that it did not record the postpolypectomy surveillance recommendations, which is also a quality measure.[21] However, as a procedural assessment, our study succeeds in providing evidence that in the rural setting, a quality performance evaluation can be adequately performed. With the possibility of health care payment reform moving to a pay-for-performance model, and reimbursements being tied to specific performance measures,[21] the need for more studies that demonstrate this process is increasing.

Conclusion

A basic audit of quality performance was successfully performed of a general surgeon performing colonoscopies in a small, rural hospital setting. These findings demonstrate that colonoscopy can be performed to the quality standards recommended by the US Multisociety Task Force on Colorectal Cancer.[6] The cecal intubation and adenoma detection rates are above the target goals. Documentation regarding withdrawal times, quality of bowel preparation, and photographic documentation of cecal intubation were lacking and, as a result of this study, changes are being made at the respective institution. As health care payment reimbursements move toward a pay-for-performance model, more studies that illustrate a quality performance assessment are needed.

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