



Open Journal of Gastroenterology and Hepatology (ISSN:2637-4986)



Electronic Procedural Reporting for Colonoscopy; Challenges (Discrepancies) in Data Entry and Report Generation

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ABSTRACT

Aims: Computerized reporting systems that generate standardized endoscopy reports are available and facilitate easy retrieval of data for quality assurance review. We aim to compare the accuracy of extracted database fields in our reporting system (endoPRO) for key measures of quality to the final edited endoscopy report for colonoscopy procedures.

Methods: In a retrospective analysis, we compared data retrieved from endoPRO to the final colonoscopy reports at Hamilton Health Sciences (HHS). The data included demographics, indications for procedures, bowel prep quality, findings, extent of exam, and recommendations. Discrepancies, changes or missing information pertaining to key quality indicators for colonoscopies were recorded.

Results : In total, 1843 colonoscopy procedures were done at HHS from January to March 2010, and reports for 592 colonoscopies, randomly selected, were analyzed for this study. Discrepancies were seen in: Indication - 34 cases (5.7%), Assistants present during colonoscopy - 94 cases (15.9%), Quality of bowel preparation - 35 cases (5.9%), Findings & impressions - 38 cases (6.4%) including polyps, inflammation, diverticulosis and haemorrhoids.

Conclusions: Our study demonstrates the variability between data found in patients' final colonoscopy reports and data retrieved from the endoscopy databases. Structured endoscopy reporting and the use of databases facilitate quality assurance but editing of procedure reports after structured data entry compromises accuracy of the data in key quality measures. Inaccurate or incomplete data recording will compromise the enhancements in quality assurance that would accrue otherwise from regular audit processes.

Keywords:

Endoscopy reporting, Quality Assurance, Colonoscopy

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How to cite this article:

Tahseen Rahman, David Armstrong, Khurram J. Khan. Electronic Procedural Reporting for Colonoscopy; Challenges (Discrepancies) in Data Entry and Report Generation.. Open Journal of Gastroenterology and Hepatology, 2019, 2:8

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INTRODUCTION

Colon cancer screening programs rely upon colonoscopies as the gold standard for early detection and removal of polyps in the United States and Canada. Guidelines suggest performing a colonoscopy for colorectal cancer (CRC) screening every ten years in average risk patients, 5 years in high risk family history patients [1], or as follow-up for positive fecal occult blood tests (FOBT), abnormal findings during imaging studies, and as surveillance for other bowel diseases including inflammatory bowel disease (IBD) or hereditary polyposis syndromes [1].

The value of a colonoscopy relies on the quality of the procedure performed. However, studies suggest that such quality varies considerably in clinical practice [2, 3]. As such, the *American Society for Gastrointestinal Endoscopy and the American College of Gastroenterology (ASGE/ACG) taskforce on Quality of Endoscopy* has published guidelines that encourage regular assessment and monitoring for the quality of colonoscopies performed at institutions [2, 4]. This has resulted in multiple studies that report quality measures of colonoscopies performed at their centers and offer comparisons to the acceptable averages found across the nation [5, 6, 7].

To carry out such quality assessments, institutions rely on computerized reporting systems to store and analyze databases from multiple sites. Most endoscopy quality research uses prompted-data entered into specified fields, but these data can be manually changed in the proofing stage of report generation, thus potentially compromising accuracy of databases. At our centre, data are entered and the report finalized using endoPRO (Pentax Medical Company, Montvale NJ) before it is electronically sent to our electronic health record (Meditech, Westwood, MA).

To our knowledge, the accuracy of such endoscopic software for capturing and reporting relevant data is not well known. We aim to

compare our endoscopy database fields (endoPRO) to the final report and determine the effect of editing in capturing data related to colonoscopic procedures.

METHODS

Study Design and Population

The study was approved by the local Research Ethics Board, and conducted at the Hamilton Health Sciences (HHS) sites which include McMaster University Medical Centre, Juravinski Hospital, and Hamilton General Hospital. All are all teaching hospitals affiliated with McMaster University in Hamilton. As tertiary referral sites for the Central West region of Ontario, they provide care to a catchment population of over 2.2 million.

This retrospective study compared the accuracy of endoPRO-retrieved data to final endoscopy reports (i.e. medical chart on Meditech) at these institutions. All colonoscopies performed during regular hours from January to March 2010 were considered for the study.

The gastroenterologists and general surgeons who performed the colonoscopies on their patients were unaware that this study was to be conducted as it was conceived and done retrospectively.

About EndoPRO

endoPRO (Pentax Medical Company, Montvale NJ) is an enterprise software suite that is used for scheduling and comprehensive documentation of endoscopic procedures with storage of the relevant details and images in a central database.

Hamilton Health Sciences has used endoPRO (version 6.8) since October 2005; a customized version was introduced on July 12, 2007 to include mandatory reporting fields (Colonoscopy Interim Reporting Tool – CIRT), required by the Ontario Ministry of Health (MOH), for all colonoscopies performed at institutions participating in the ColonCancerCheck colorectal cancer screening program, managed by Cancer Care Ontario.

The mandatory fields were 1. MOH Indications (5 choices), 2. Cecum viewed (Y/N), 3. Preparation adequate (Y/N), 4. Bowel perforation (Y/N).

Procedural information is entered into endoPRO by the endoscopist, or for teaching lists, by the resident after a procedure. Endoscopists and residents are provided with a standard orientation when they start at Hamilton Health Sciences and residents would be given feedback as needed during their training.

Data entry is accomplished using the endoPRO interface which offers multiple options that may be selected by users in the form of checkboxes, or, in many cases, entered in unstructured free text mode. Options are categorized under multiple headings, ranging from indications for the procedure and quality of bowel preparation, to impressions and findings during the colonoscopy and post-procedural recommendations.

The procedural data are synthesized to produce a computer generated report in the form of a letter. The user can then further modify this report manually but the modifications are not captured in the database. The final report is signed off by the attending endoscopist. The edited report can be printed, and a copy is uploaded directly into the central hospital health record system (Meditech, Westwood MA). The endoPRO database can be queried conveniently using pre-programmed or custom programmed search tools to generate data tables suitable for analysis used routinely for internal studies of endoscopy quality.

Fields Being Assessed for Reporting Accuracy

ASGE/ACG taskforce for the Quality of Endoscopy has published several criteria that may be used to assess quality of colonoscopies [2, 4]. Recent published studies have also used these guidelines to assess quality of colonoscopies at their institutions. As such, our

study assessed the accuracy of EndoPRO at capturing data for these specific criteria. The criteria assessed in our study for accuracy in reporting include [2, 4]:

- 1) Indication for colonoscopy
- 2) Presence of an assistant
- 3) Quality of preparation
- 4) Surveillance intervals
- 5) Extent of colonoscopy (i.e. cecal intubation) and verification technique
- 6) Documentation for complications

Data Collection and Analysis

Data regarding colonoscopies were collected using a search strategy directly from the endoPRO database with support from the endoPRO vendor. Extracted fields included patient demographics, date of procedure, presence of an assistant, indications and extent of colonoscopy, quality of the preparation and any findings and recommendations. The final colonoscopy report was reviewed from electronic health record (Meditech).

In this qualitative assessment, the endoscopy reports were reviewed (STR & KJK) and compared to endoPRO-retrieved data. Agreement on how comparisons were made were discussed by the 2 reviewers and several examples were done together. The endoPRO retrieved data with the logged endoscopy reports were manually compared, and any discrepancies, changes or missing information pertaining to key quality indicators for colonoscopies were recorded.

RESULTS

In all, a total of 1843 colonoscopy procedures were reported at the HHS sites from January to March 2010. Of these, 592 colonoscopies (about one-third) were randomly selected to get a reasonable sample and analyzed further in this study. A total of 26 endoscopists performed the colonoscopies, 17 were gastroenterologists. On average, each endoscopist performed 22.8 colonoscopies [SD 17.3]. The patients had a mean age of 59.5 years [SD 15.1] and 51.5%

were female. The completion rate to the cecum/terminal ileum was 92.4%. [See Table 1].

Accuracy of Reporting

Data retrieved from endoPRO database were compared manually to the endoscopy reports retrieved from Meditech (see Table 1). Discrepancies in indications for undergoing colonoscopies were found in 5.7% of cases. In Ontario, the Ministry of Health (MOH) has mandatory fields for the government to keep

track of procedure census; these fields were integrated into the endoPRO reporting tool at the time of introduction. Twenty-four cases had an indication recorded in the “Ministry of Health Indication” section of the endoscopy report, but this information was not captured by endoPRO during data extraction. The remaining 10 cases captured some but not all of the indications listed in the endoscopy report. This is most likely due to editing after the electronic report had been generated by endoPRO.

TABLE 1: Characteristics of endoscopists & patients included in the study

Characteristics	Value
Total colonoscopies performed	1843
No. selected for analysis (random)	592
Average age	59.5 [15.1]
Female sex	51.50%
No. of endoscopists	26
No. colonoscopies per endoscopists	22.8 [17.3]
No. of colonoscopies per site	197.3
Speciality, No. (%)	
Gastroenterologist	17 (58.6%)
Other	9 (34.6%)

Table 2 – Discrepancy in Reporting

Discrepancy in Reporting:	Number of Cases	Percentage
Indications for colonoscopy	34	5.7%
Presence of assistants	94	15.9%
Extent of colonoscopy and verification technique	Nil	Nil
Quality of bowel preparation	35	5.9%
Findings & impressions	33	5.6%
Total Colonoscopies	592	

Table 3 – Omissions in the Impression

Nature of Omissions	Number of Cases	Percentage
Polyp		
No mention of polyps, although it was present	5	0.85%
Number of polyps reported	2	0.34%
Description of polyp (i.e. location, size)	6	1.0%
Description of melena/BRB stool visualized	2	0.34%
Diverticulosis	4	0.68%
Comment on mucosa (i.e ulcerated, erythema)	11	1.9%
Hemorrhoids	2	0.34%
Strictures	1	0.17%

With respect to residents assisting for the procedures, our findings indicate that 15.9% of reports had discrepancies when it came to declaring if an assistant was present during the procedure. There were 87 cases (14.7%) for which an assistant was present according to endoscopy reports, but endoPRO did not capture this data. Of the remaining 7 cases (1.2%), endoPRO recorded the procedure as having an assistant but the endoscopy report noted that an assistant was not present. [Table 2].

For quality of bowel preparation, there were 35 cases (5.9%) where the quality of prep listed under the “MOH Quality of Prep” section of the endoscopy report did not match with the endoPRO retrieved data.

Our study found 33 cases (5.6%) for which endoPRO did not capture information pertaining to findings and impressions that were documented in the final endoscopy report. Table 3 lists the nature of these omissions.

With respect the extent of colonoscopy, endoPRO captured the data accurately in all cases, when compared to patients chart.

DISCUSSION

Colonoscopy allows for early detection of colorectal cancer and a decrease in the rates of CRC and mortality. The effectiveness of screening programs depends on the quality of procedures conducted and this should be routinely evaluated [4]. The most common and practical quality assurance method is to audit the colonoscopy reports.

According to the literature, several methods have been used to carry out quality analysis of endoscopies. Conventionally, studies such as those done by Denis 2004, Bair 2009 and Dejonge 2012 relied on manual review [5, 8, 9]. This included strategies such as reviewing individual electronic or paper patient records or establishing paper questionnaires for the purposes of collecting pertinent data to assess quality of an endoscopy.

Other studies utilized administrative databases where billing codes can provide surrogate information in regards to the quality of the procedure performed [10, 11]. For example, billing code for extent of procedure, number of polypectomies performed, or findings of

complications or missed colon cancer can be retrieved. The reliability of administrative databases has been called into question by a paper that found 15% discordance between billing code submissions and manual review of endoscopy reports [11].

Another alternative way is to use data from screening programs such as those done in the Kiminski 2010 study [12]. More recently, studies have relied on customized healthcare databases that cater to the needs of large institutions [5]. One would hypothesize that these databases are more accurate for quality assurance as they were designed for the primary purpose of quality reporting.

Nonetheless, using the quality measures in the literature, we found that there are limits to the accuracy of formal endoscopic databases when pertinent data are compared with the data recorded in the final electronic endoscopy reports. These limitations can be attributed in large part, to editing done by the user during proofing. In our current system (endoPRO), users are likely overlooking the prompts given to select options under each field, choosing instead to enter free text after the software has generated a report.

Computerized reporting systems face a number of challenges with respect to accurate data entry. In the current system, the implementation of mandatory reporting fields to provide data for the Ontario Ministry of Health ensured that the fields were completed but could not ensure that the data were accurate. The provision of check boxes and drop down menus facilitates accurate data entry using standard terminology. However, a fully comprehensive list of diagnoses is cumbersome, difficult to navigate and, often, inadequate to describe subtle diagnostic features; these difficulties can be addressed, in part, by providing the endoscopist with the ability to enter ancillary, free text description of any lesions. Unfortunately, this leads some endoscopists to enter large parts of the report in free-text, thereby hampering accurate database queries.

In addition, the Doc-U-Scribe module permits the endoscopist to edit the printed report generated from the data entry module such that there may be additional discrepancies between the data recorded in the structure database and those included in the final report.

To increase the utility of computerized reporting systems, protocols on data entry should be implemented. More user friendly software to facilitate complete and accurate data entry, mandatory fields for key measures, and standardised terminology would be helpful additions. Prompting users about discrepancies in their reporting options could also improve the utility of the software. Lastly, staff might benefit from intermittent training about using these software. For example, in our study 11 of the 33 cases with discrepancies in findings and impressions of colonoscopies, had "Normal colonoscopy" listed as part of the retrieved data. These users most likely selected the "Normal colonoscopy" option and added comments related to findings after the computer had generated the report, thus causing inaccurate data reporting. CRC screening has brought quality and, hence, reporting into focus but this applies to all endoscopic procedures. However, the implementation of formal CRC screening programs means that payers want to have accurate data on usage and outcomes. Many provinces rely on administrative databases but these do not provide timely feedback (12-18 months to complete data collection, analyze and report data). Quality improvement needs accurate, timely, local data to provide feedback.

Computerized reporting systems have facilitated quality assurance for colonoscopy programs at many institutions but effective quality assurance requires accurate data recording. As our study found, the reporting accuracy from endoscopy reporting systems is not perfect. With a 5% margin of error, some measures such as polyp detection and cecal intubation may overlap key benchmarks. To improve the utility of such software, a

combination of staff training and modifications to the software interface should be explored as possible solutions to optimize accurate data entry.

Acknowledgements:

The authors would like to thank the Pentax endoPRO support team.

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