

Retrospective Study

Simple colonoscopy reporting system checking the detection rate of colon polyps

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Abstract

AIM: To present a simple colonoscopy reporting system that can be checked easily the detection rate of colon polyps.

METHODS: A simple colonoscopy reporting system Kosin Gastroenterology (KG quality reporting system) was developed. The polyp detection rate (PDR), adenoma detection rate (ADR), serrated polyp detection rate (SDR), and advanced adenoma detection rate (AADR) are easily calculated to use this system.

RESULTS: In our gastroenterology center, the PDR, ADR, SDR, and AADR test results from each gastroenterologist were updated, every month. Between June 2014, when the program was started, and December 2014, the overall PDR and ADR in our center were 62.5% and 41.4%, respectively. And the overall SDR and AADR were 7.5% and 12.1%, respectively.

CONCLUSION: We envision that KG quality reporting system can be applied to develop a comprehensive system to check colon polyp detection rates in other gastroenterology centers.

Key words: Colon polyp; Detection rate; Reporting system

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Core tip: Detecting the rate of colon polyps, such as the adenoma detection rate is an important quality indicator during colonoscopy exams. However, reporting the detection rate in daily practice is not easy because manual reporting requires a lot of time and effort. To our knowledge, reporting systems for detecting the

rate of colon polyps are rare. We developed a simple colonoscopy reporting system that can be checked easily the detection rate of colon polyps. We envision our system can be applied to develop an optimal system for assessing the detection rate of colon polyps in other gastroenterology centers.

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INTRODUCTION

Colorectal cancer is ranked as the third leading cause of cancer-related death in the world^[1-3]. It is well known that most colorectal cancers arise from adenomatous polyps and patients with adenomatous polyps have greater risks of future development of advanced neoplasia^[4-8]. A colonoscopy is a useful tool to detect and remove colorectal polyps. However, a number of polyps could be missed clinically during colonoscopic examination, which can increase the incidence of interval cancer^[9-12]. A large tandem colonoscopy study that assessed variable detection of adenomas, demonstrated miss rates ranged from 17% to 48%^[13]. To reduce the missing rate of colon polyps, several quality indicators including adenoma detection, bowel preparation, cecal intubation, withdrawal time, patient's discomfort, and complications, such as perforation and postpolypectomy bleeding have been suggested, all of which aim to measure colonoscopists' performance and to target quality improvement^[14,15]. Of such indicators, the adenoma detection rate (ADR) is currently considered the most important quality indicator during colonoscopy^[16-18]. According to data from the study by Boroff *et al*^[19], the polyp detection rate (PDR) may be a valid surrogate marker of ADR in the proximal but not the distal colon. In daily practice however, reporting for the PDR and ADR is not easy, because manual reporting requires a lot of time and effort. Recently, van Doorn *et al*^[20] developed a new colonoscopy reporting system that enables automatic quality assessment, and reported that 94% of colonoscopies that are performed overall were reported completely and that ADR was used as the measurement unit in 35.4% of the system reports. However, in practice it is not easy to introduce this system to other gastroenterology centers, because additional costs will be incurred as this system was developed in collaboration with the Olympus Corporation.

To our knowledge, reporting systems for detecting the rate of colon polyps are rare. Our gastroenterology center also had not checked the PDR and ADR until May 2014, because we thought that this process was

complicated. The "KG (Kosin gastroenterology) quality reporting system" was produced because we wanted to identify an easier and more accessible way to check PDR and ADR on routine colonoscopic examination. We tried to develop a simple colonoscopy reporting system which can possibly check the PDR and ADR, as well as the serrated polyp detection rate (SDR) and advanced adenoma detection rate (AADR). In this study, we describe a simple colonoscopy reporting system that was applied in our gastroenterology center to check the PDR, ADR, SDR, and AADR.

MATERIALS AND METHODS

KG quality reporting system production

The "KG Quality reporting system" platform used our hospital's computer program system. In previous colonoscopic input program systems that were used in our gastroenterology center, we manually entered some data including the insertion time, withdrawal time, bowel preparation, and cecal intubation. Based on the current literature and knowledge^[15,20], we developed a colonoscopic input program system list that included established quality indicators, such as "reason for colonoscopy, insertion time, withdrawal time, bowel preparation, cecal intubation, patient's discomfort status, and polyp detection (including whether polyp size are larger or smaller than 1 cm)". Two indicators, including "last examination date and anticoagulants", were also added (Figure 1). We used the Aronchick bowel preparation scale as the bowel preparation index, and the Gloucester Comfort Scale^[21] as the patient's discomfort scale index. All indicators could be entered with one click, except for insertion time and withdrawal time which are entered as the number of minutes and seconds. If one or more polyps were located during the colonoscopic examination, the gastroenterologist would check "yes" for the polyp detection indicator (violet colored box on Figure 1). The polyp size which is measure by using open biopsy forceps, could be indicated by selecting whether "Size \geq 1 cm" or not.

We made a patients' list searchable so each gastroenterologist could find the examined patients. In this step, several items including "Polyp", "Adenoma", "Serrated polyp", "HGD (high grade dysplasia)", "Villous comp (component)", and "Advanced adenoma" are presented on a new page (Figure 2). Serrated polyps are defined as hyperplastic polyps (HP) which excluded small lesions (< 10 mm) of HP limited to the rectum and sigmoid, sessile serrated adenoma/polyp (SSA/P), or traditional serrated adenoma (TSA)^[22]. Advanced adenoma is defined as adenoma that was 1 cm or greater, or with HGD, or with villous component (tubulovillous or villous)^[23,24]. The "Polyp" column (green colored box on Figure 2) is automatically presented as "Yes" or "No" which is linked with a click of "Yes" or "No" to the polyp detection indicator shown in Figure 1. For other items including "Adenoma",

Quality Indicators	
1. Reason for CFS	<input type="checkbox"/> Screening <input type="checkbox"/> Surveillance (post-polypectomy) <input type="checkbox"/> Surveillance (post-op d/t cancer) <input type="checkbox"/> Colon cancer w/u <input type="checkbox"/> <input type="checkbox"/> Anemia <input type="checkbox"/> Constipation <input type="checkbox"/> Diarrhea <input type="checkbox"/> Abdominal pain <input type="checkbox"/> Weight loss <input type="checkbox"/> IBD f/u <input type="checkbox"/> <input type="checkbox"/> Stool OB (+) <input type="checkbox"/> Melena <input type="checkbox"/> Hematochezia <input type="checkbox"/> Other <input type="text"/>
2. Last exam date	<input type="checkbox"/> New exam <input type="checkbox"/> ≥ 10 yrs <input type="checkbox"/> 5-10 yrs ago <input type="checkbox"/> 3-5 yrs ago <input type="checkbox"/> 1-3 yrs ago <input type="checkbox"/> ≤ 1 yr <input type="checkbox"/>
3. Anticoagulants	<input type="checkbox"/> None <input type="checkbox"/> Aspirin <input type="checkbox"/> Clopidogrel <input type="checkbox"/> Cilostazole <input type="checkbox"/> Ticlopidine <input type="checkbox"/> <input type="checkbox"/> Dipyridamole <input type="checkbox"/> Dabigatran <input type="checkbox"/> Warfarin <input type="checkbox"/> Heparin <input type="checkbox"/> Other <input type="text"/>
4. Insertion time	<input type="text"/> min <input type="text"/> sec
5. Withdrawal time	<input type="text"/> min <input type="text"/> sec
6. Bowel preparation	<input type="checkbox"/> Excellent <input type="checkbox"/> Good <input type="checkbox"/> Fair <input type="checkbox"/> Poor <input type="checkbox"/> Inadequate <input type="checkbox"/>
7. Cecal intubation	<input type="checkbox"/> Success <input type="checkbox"/> Fail <input type="text"/>
8. Discomfort (Gloucester Comfort Scale)	<input type="checkbox"/> No discomfort (1) <input type="checkbox"/> (2) <input type="checkbox"/> (3) <input type="checkbox"/> (4) <input type="checkbox"/> Extreme discomfort (5) <input type="checkbox"/>
9. Polyp detection	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Size ≥ 1Cm <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/>

Figure 1 Quality indicators in the Kosin Gastroenterology quality reporting system.

Search button

Go to Excel button

Close button

Search Completed

Duration of Exam

20141001

20141031

Exam Doctor

Doctor 1

Save

	Name	ID	age /sex	Exam date	Polyp	Adenoma	Serrated polyp	HGD	Villous comp	Advanced adenoma
1			F/61	20141001	Yes	Yes	No	No	No	
2			M/53	20141001	Yes	Yes	Yes	No	No	
3			M/71	20141002	No					
4			M/55	20141002	No					
5			F/57	20141002	No					
6			F/77	20141006	Yes	No	No	No	No	
7			M/59	20141006	Yes	Yes	No	No	No	
8			M/59	20141006	No					
9			F/55	20141006	No					
10			M/62	20141008	Yes	Yes	No	No	No	Yes
11			F/40	20141010	Yes					
12			F/41	20141010	Yes	Yes	No	No	No	
13			M/48	20141010	No					
14			M/22	20141010	Yes	No	No	No	No	
15			M/44	20141013	No					
16			M/66	20141013	Yes	Yes	No	No	No	
17			M/46	20141013	Yes	Yes	No	No	No	
18			M/67	20141013	Yes	Yes	No	No	No	
19			M/54	20141015	Yes	Yes	No	No	No	Yes
20			M/64	20141015	Yes	Yes	No	Yes	No	Yes
21			F/54	20141016	Yes	No	No	No	No	
22			M/61	20141017	Yes	No	No	No	No	
23			M/65	20141017	Yes	No	No	No	No	
24			M/67	20141017	No					

Figure 2 Search results for the patient lists by each examining gastroenterologist and the input-system for pathologic data in the Kosin Gastroenterology quality reporting system.

Table 1 Overall detection rate of colon polyps between June 2014 and December 2014 in our gastroenterology center

Month	6	7	8	9	10	11	12	Overall (male vs female)
PDR	64.6%	62.4%	64.3%	61.0%	59.6%	63.7%	64.2%	62.5% (66.0% vs 55.8%)
ADR	40.4%	36.1%	44.3%	38.2%	40.7%	41.0%	47.2%	41.4% (45.5% vs 36.3%)
SDR	13.5%	8.2%	11.2%	8.0%	5.8%	6.6%	8.7%	7.5% (7.7% vs 7.4%)
AADR	6.8%	13.5%	16.0%	11.2%	13.3%	11.2%	12.8%	12.1% (13.6% vs 9.7%)

PDR: Polyp detection rate; ADR: Adenoma detection rate; SDR: Serrated polyp detection rate; AADR: Advanced adenoma detection rate.

"Serrated polyp", "HGD", "Villous comp", and "Advanced adenoma", we tried to link automatically with the pathological data, however, in practice, this approach was not easy. We modified this approach and adjusted the program so that data such as "Adenoma", "Serrated polyp", "HGD", and "Villous comp" could be entered manually. Each gastroenterologist was asked to input this specific data. For example, if the histology of a resected polyp was adenoma, the examining gastroenterologist was asked to enter "Yes" in the "Adenoma" space. Similarly, if the histology of a resected polyp was serrated polyp, the examining gastroenterologist entered "Yes" in the 'Serrated polyp' space. In cases of adenoma with HGD or villous components, the gastroenterologist input "Yes" in the "HGD" or "Villous comp" spaces, respectively. If any one of the three components including "HGD", "Villous comp" (shown in Figure 2), and "Size \geq 1 cm (shown in Figure 1)" were entered as "Yes", this information was automatically presented as "Yes" in the "Advanced adenoma" space. For cases with multiple resected polyps, additional work is needed to identify whether the resected polyp was an adenoma larger than 1 cm in size. Although this process could be tedious, entering one month of data only requires about 15 min. Additionally, this process can help to identify gastroenterologist's own pathological data for resected polyps. These inputted data can be saved by selecting the "Save" button, and can be transferred to the Excel program (Microsoft Corporation, Washington, United States) (Figure 2).

PDR, ADR, SDR, and AADR calculations

Calculating PDR, ADR, SDR, and AADR is easily accomplished using the Microsoft Excel program. This process was performed by the investigator. PDR is calculated as the number of colonoscopies in which one or more polyps were detected, divided by the total number of colonoscopies performed by the colonoscopist. ADR is calculated as the number of colonoscopies in which one or more adenomas were detected, divided by the total number of colonoscopies performed by the colonoscopist. SDR is calculated as the number of colonoscopies in which one or more serrated polyps were identified, divided

by the total number of colonoscopies performed by the colonoscopist. AADR is calculated as the number of colonoscopies in which one or more advanced adenomas were detected, divided by the total number of colonoscopies performed by the colonoscopist.

RESULTS

In our gastroenterology center there are three experts and eleven training fellows; a monthly average of 60 colonoscopic examinations are performed per gastroenterologist. By using our system, we calculated the PDR, ADR, SDR, and AADR of each gastroenterologist in our clinic. Based on these data, we analyzed the flow of data of each gastroenterologist, and estimated the overall PDR, ADR, SDR, and AADR of all gastroenterologists in our clinic. At the beginning of every month, the results of the last month, which consisted of tables and figures were updated and sent to all gastroenterologists in our clinic by e-mail. Between June 2014, when the program was started, and December 2014, the overall PDR of gastroenterologists in our clinic was 62.5% (66.0% in male patients, and 55.8% in female patients). The overall ADR was 41.4% (45.5% in male patients, and 36.3% in female patients), the overall SDR was 7.5% (7.7% in male patients, and 7.4% in female patients), and the overall AADR was 12.1% (13.6% in male patients, and 9.7% in female patients). These data are summarized in Table 1. The flow of each gastroenterologist's monthly data was plotted with a broken line graph. Figure 3A and Figure 3B show examples for the flow of monthly data of two fellows.

DISCUSSION

We worked to develop an easy system to check the PDR, ADR, SDR, and AADR during routine colonoscopic examinations. The first step was to search the list of patients that were examined by each gastroenterologist. We allowed the examined patients' list to be searchable by each gastroenterologist in our clinic, and we also made it possible to automatically link between the "Polyp" indicator (violet colored box

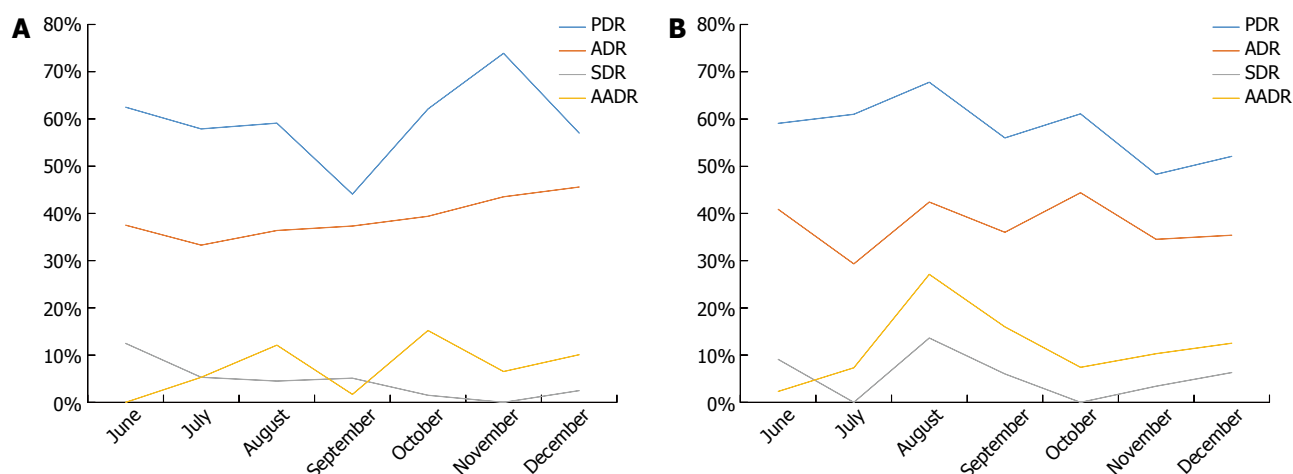


Figure 3 Monthly polyp detection rate data flow for fellow 1 (A) and fellow 2 (B). PDR: Polyp detection rate; ADR: Adenoma detection rate; SDR: Serrated polyp detection rate; AADR: Advanced adenoma detection rate.

on Figure 1) and the results of the “Polyp” column (green colored box on Figure 2). The second step was to input the “Adenoma”, “Serrated polyp”, “HGD”, and “Villous comp” data. This process was performed by each examining gastroenterologist. And then, PDR, ADR, SDR, and AADR were easily calculated as described in the “Methods” section.

Several quality indicators for colonoscopy are used in the KG quality reporting system (Figure 1). Of these indicators, ADR is the quality indicator with the strongest association to post-colonoscopy colorectal cancer or missed colorectal cancer. Among healthy asymptomatic patients that undergo screening colonoscopy, adenomas should be detected in $\geq 25\%$ of men and $\geq 15\%$ women more than 50 years old^[15]. In our gastroenterology center, the overall ADR was 41.4% (45.5% in male patients, and 36.3% in female patients) between June and December 2014. Serrated polyps are classified as HP which excluded small lesions (< 10 mm) of HP limited to the rectum and sigmoid, SSA/P, or TSA^[22]. Both SSA/P and TSA are pre-cancerous lesions, and SSA/P located in the proximal colon is considered as a cause of interval cancer^[25]. A recent article by these investigators showed that the SDR correlated with the ADR in their routine colonoscopic examinations^[26]. In our gastroenterology center, the overall SDR was 7.5% (7.7% in male patients, and 7.4% in female patients) between June and December 2014. According to the current literature and knowledge, about one-third of all polyps larger than 10 mm in size have advanced histology, but diminutive polyps (≤ 5 mm in size) rarely have advanced pathology^[27,28]. A polyp larger than 10 mm in size is categorized as advanced adenoma, which also includes adenoma with high-grade dysplasia (HGD), or with villous components (tubulovillous or villous)^[23,24]. Recently, Greenspan *et al.*^[29] reported that the overall AADR was 7.97% for 14 colonoscopists who performed a total of 1944 colonoscopies. Additionally, Lee *et al.*^[30] showed that

the overall AADR was 4.46% for 18 colonoscopists who performed a total of 561 colonoscopies. In our gastroenterology center, the overall AADR was 12.1% (13.6% in male patients, and 9.7% in female patients) between June and December 2014.

There are some limitations to the system we developed. First, the detection rate of colon polyps is not categorized by the reason for colonoscopy. Our data included patients with prior polypectomy as well as screening colonoscopy, so the detection rate of colon polyps in our gastroenterology center could be overestimated. In the next step, we will develop this system to categorize the detection rate of colon polyps by the reason for colonoscopy. Second, the input of pathologic data is performed manually in our system. Currently, each examining gastroenterologist enters the pathologic data of resected polyps, which it can cause manual data entry errors. The next step is to develop an automatic linkage between our system and pathologic data.

In addition to the practical application of our system which checks the detection rate of colon polyps, other possible associations between various quality indicators and the detection rate of colon polyps can be evaluated. The data acquired from our program can be used as a basis for performing colonoscopy research. Furthermore, identifying gastroenterologists' own data for polyp detection rates can facilitate colonoscopic examination quality improvements. In the next step, we will develop our system to possible the statistical analysis for each quality indicator. Although the KG quality reporting system is still being developed, we hope that this system can be applied to develop an optimal system for assessing the detection rate of colon polyps in other gastroenterology centers.

COMMENTS

Background

Detecting the rate of colon polyps, such as the adenoma detection rate (ADR)

is an important quality indicator during colonoscopy exams. However, reporting the detection rate in daily practice is not easy because manual reporting is time consuming and requires effort. To our knowledge, reporting systems for detecting the rate of colon polyps are rare.

Research frontiers

This study presents a simple colonoscopy reporting system (KG quality reporting system) that can be checked easily the detection rate of colon polyps.

Innovations and breakthroughs

The KG quality reporting system is focused on the detection rate of colon polyps, such as polyp detection rate, ADR, serrated polyp detection rate, and advanced adenoma detection rate.

Applications

This system can be applied to develop an optimal system for assessing the detection rate of colon polyps in other gastroenterology centers.

Terminology

Serrated polyps are defined as hyperplastic polyps which excluded small lesions (< 10 mm) of hyperplastic polyps limited to the rectum and sigmoid, sessile serrated adenoma/polyp, or traditional serrated adenoma. Advanced adenoma is defined as adenoma that was 1 cm or greater, or with high grade dysplasia, or with villous component (tubulovillous or villous).

Peer-review

This paper deals with a simple colonoscopy reporting system that can facilitate the automatic analysis of colonoscopy quality indicators. This system may be useful for performing colonoscopy research and improving the quality of colonoscopy.

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