The Polyp Manager: a new tool for optimal polyp documentation during colonoscopy. A pilot study.

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submitted 18. July 2015
accepted after revision
8. February 2016

Bibliography
DOI http://dx.doi.org/10.1055/s-0042-103414
Published online: 21.4.2016
Endoscopy International Open 2016; 04: E572–E576

E-ISSN 2196-9736

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Background and study aims: Conventional reporting of polyps is often incomplete. We tested the Polyp Manager (PM), a new software application permitting the endoscopist to document polyps in real time during colonoscopy. We studied completeness of polyp descriptions, user-friendliness and the potential time benefit.

Patients and methods: In two Dutch hospitals colonoscopies were performed with PM (as a touchscreen endoscopist-operated device or nurse-operated desktop application). Completeness of polyp descriptions was compared to a historical group with conventional reporting (CR_H). Prospectively, we compared user-friendliness (VAS-scores) and time benefit of the endoscopist-operated PM to conventional reporting (CR) in one hospital. Duration of colonoscopy and time needed to report polyps and provide a pathology request were measured. Provided that using PM does not prolong colonoscopy, the sum of the latter two was considered as a potential time-benefit if the PM were fully integrated into a digital reporting system.

Results: A total of 144 regular colonoscopies were included in the study. Both groups were comparable with regard to patient characteristics, duration of colonoscopy and number of polyps. Using the PM did reduce incomplete documentation of the following items in CR_H-reports: location (96% vs 82%, $P=0.01$), size (95% vs 89%, $P=0.03$), aspect (71% vs 36%, $P<0.001$) and completeness of removal (61% vs 37%, $P<0.001$). In the prospective study 23 PM-colonoscopies where compared to 28 CR-colonoscopies. VAS-scores were significantly higher in the endoscopist-operated PM group. Time to report was 01:27 ± 01:43 minutes (median + interquartile range) in the entire group (PM as CR), reflecting potential time benefit per colonoscopy.

Conclusions: The PM is a user-friendly tool that seems to improve completeness of polyp reporting. Once integrated with digital reporting systems, it is probably time saving as well.

Introduction

Colonoscopy is an important tool for detection and removal of colonic polyps, thus reducing the risk of development of colorectal cancer [1]. One of the quality indicators for colonoscopy is appropriate documentation of the procedure, especially the documentation of polyps. According to a consensus statement, standardized documentation of colon polyps should include at least the following seven items: location, size, morphology, method of removal, completeness of removal and retrieval, and whether the specimen is provided to the pathologist [2]. The Dutch screening organization (RIVM) has added mucosal aspect ("endoscopic diagnosis," for example "adenomatous") of the polyp as a supplementary item in screening colonoscopy reports and also proposes to send each polyp in a separate container to the pathologist [3]. The number of polyps and their location and size are important items for determining the adequate surveillance interval [4]. Previous studies have shown that documentation of polyps is often incomplete [5–13]. One of the major obstacles for endoscopists recalling all data on polyp characteristics after colonoscopy.

To overcome these problems, the Polyp Manager (PM) is a new software application with a touchscreen interface that allows an endoscopist to document all polyps *during* a colonoscopy (**Fig. 1**). The application uses a structured format prompting the user to report all items mentioned above. Once the PM is integrated into the reporting system, the recorded data will automatically appear in the endoscopy report and pathology request. The PM has not been studied yet.

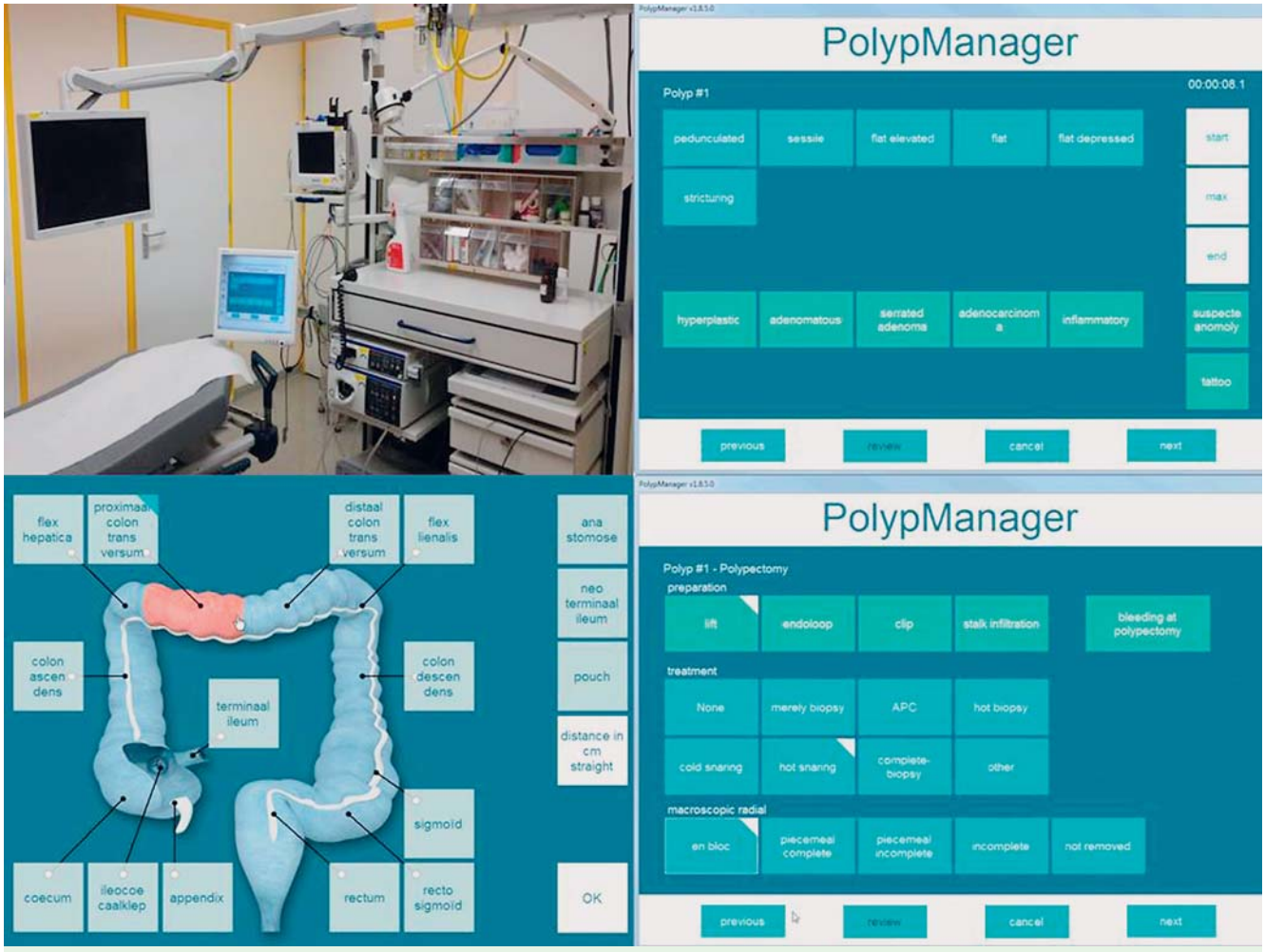

Fig. 1 The Polyp Manager. From upper left to lower right: PM on the endoscopist-operated medical tablet; first screen; screen for the location of the polyp; screen for the polypectomy.

In this two-center pilot study we validated the PM by comparing the completeness of polyp descriptions documented with reports using the software and using conventionally reported colonoscopies (CR_H) in patient groups of similar sizes. In one hospital we also prospectively investigated the user-friendliness and potential time benefit the PM.

Patients and methods

Patients

In two hospitals (Slingeland Hospital, Doetinchem and Ikazia Hospital, Rotterdam, referred to as Hospital 1 and Hospital 2, respectively), patients scheduled for a regular colonoscopy (no population screening program for bowel cancer) between October and December 2014 were included if at least one polyp was found (independently of removal). A colonoscopy was excluded if no polyp was found during intubation and/or withdrawal. Patients with prior colon surgery or incomplete colonoscopy were also excluded. An equally sized retrospective population (CR_H) with the same inclusion and exclusion criteria was selected in both hospitals beginning on September 30, 2014 and moving backwards in time.

Study centers and conventional reporting

The two hospitals differed in the way they drew up the conventional reports. In hospital 2 relevant polyp characteristics were documented manually during the endoscopy by a nurse on a structured form that includes the same set of polyp characteristics as the PM. This form than served as input for the final report made afterwards by the endoscopist using the Endobase© reporting system (Olympus, Zoeterwoude, The Netherlands). In hospital 1 data were not structurally collected during the endoscopy. The final report was made afterward by the endoscopist based on recalled relevant data and using the Clinical Assistant© reporting system (RVC, Baarn, The Netherlands). In Hospital 1 data were collected by two senior gastroenterologists whereas in Hospital 2 data were collected by four senior gastroenterologists, two residents, and one nurse-endoscopist (**Fig. 2**).

The Polyp Manager

The PM (**Fig. 1**) is a software application for Windows (Microsoft Corporation, Redmond, WA, United States), designed to be used on a touchscreen tablet (although it can be installed on a desktop computer). The PM consists of five consecutive screens, each containing tags to describe the polyp. The user is prompted to enter information on polyp morphology and aspect, location and diameter; the method of polypectomy; and the container in which the specimen is stored. On detection of a polyp, the endos-

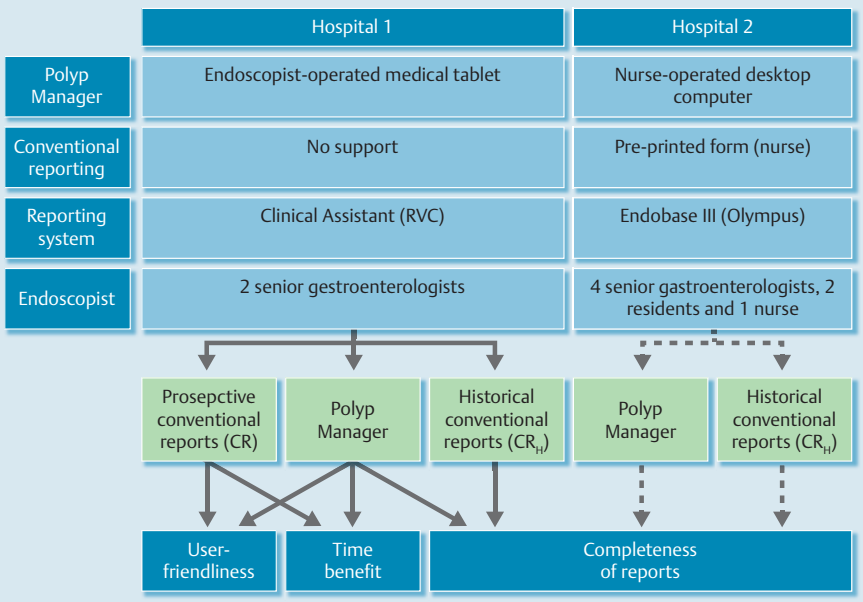

Fig. 2 Study methodology. Table with characteristics of the study centers. Upper boxes: Groups and method of reporting. Lower filled boxes: outcomes. Solid arrow: Hospital 1. Dotted arrow: Hospital 2.

copist is guided through the five screens. After completion of the description, the PM automatically returns to the first screen. Multiple polyps are numbered consecutively. There are mandatory tags to provide the minimal required data following the international standard mentioned above [2]. PM also includes many optional tags such as Kudo classification, use of clips, lifting, and tattooing. In the case of a potentially malignant lesion, a separate screen opens with tumor-specific tags such as distance to the anus, circumference, length, and tattooing. The PM also prompts for the maximum intubation site and automatically calculates the total duration of the colonoscopy and withdrawal time.

In this pilot study, the PM was not yet integrated into the digital reporting system ("standalone"). The endoscopist still had to create a conventional endoscopy report after the colonoscopy, using the obtained PM report as a reminder. This enabled us to measure the time needed for adequate reporting of the removed polyps and thus estimate the potential time benefit of integrating the PM into a digital reporting system.

Methods

The PM was provided as an endoscopist-operated medical tablet in one center (Hospital 1) and as a nurse-operated desktop application in the other center. In Hospital 1 the endoscopist operated the PM on the tablet by himself whereas in Hospital 2 a nurse operated the PM on the desktop computer, during colonoscopy.

Completeness of the polyp description generated with the PM was compared with a historical control group (CR_H) to prevent the effect that endoscopists might make more complete reports in the control group once they got used to using the PM in the intervention group (Hawthorne effect). Completeness of the polyp description was evaluated per polyp by counting each of the eight polyp descriptors (location, size, morphology, aspect, method of removal, completeness of removal and retrieval, and whether the specimen is sent to pathologist in a separate container) [3], by one researcher blinded to the way the polyp was reported (PM or CR_H). Documentation of less than 80% of the polyp descriptor information was considered as underreporting. The completeness of a colonoscopy report was defined as the sum of all scores (range 0 to 8 per polyp) divided by the total number of polyps described per report.

In the prospective part of this study, only performed in Hospital 1, user-friendliness and time benefit of reporting with the endoscopist-operated PM was compared to conventional reporting (CR). Randomization was performed by using the endoscopy room: Only one of the two endoscopy suites was equipped with the medical tablet. Patients examined in the other suite were assigned to the CR group.

For user-friendliness, after each colonoscopy, the endoscopists were asked to rate their overall satisfaction with reporting on polyps, on a 100-mm visual analogue scale (VAS). Establishing the real-time benefit was not possible with the standalone version of the PM. To estimate the potential time benefit of using the PM for reporting polyps, the time needed for describing all polyps in the final endoscopy report and for filling out the pathology request was recorded, in both the PM and the CR groups. That was considered as the maximum time benefit that could be obtained by using the PM, assuming that the total duration of colonoscopy did not increase. When colonoscopy is performed using the PM, the polyp description is complete when the colonoscopy is finished, whereas with conventional reporting, the polyp has to be described after the procedure. The total duration of colonoscopy in both the PM and the CR groups was also recorded.

Analysis

Statistical analyses were performed by using the Statistical Package for Social Sciences version 21 (SPSS Statistics, IBM, Chicago, Ill). We analyzed the frequency distributions of continuous variables by skewness, kurtosis, histograms, and the Kolmorogov-Smirnov test. Non-parametric data are presented as median ± interquartile range (IQR). We used the Mann-Whitney U test (exact, two-tailed) to compare continuous variables. Categorical variables are presented as proportions with 95% confidence intervals and compared using a χ^2test. Variables were regarded as significantly different if a 2-sided P value was < 0.05.

Table 1 Patient characteristics.

	PM	CR_H	CR
No. of colonoscopies (n)	78	78	x
Hospital 1	23	23	28
Hospital 2	55	55	x
Age in years*	62.5 ± 12.6 (28 – 86)	63.6 ± 12.0 (36 – 88)	x
Hospital 1	64.5 ± 13.1 (34 – 82)	65.2 ± 12.4 (40 – 88)	63.9 ± 9.0 (49 – 80)
Hospital 2	61.7 ± 12.4 (28 – 86)	62.9 ± 11.6 (36 – 85)	x
Sex (% men)	46.2	55.1	x
Hospital 1	39.1	65.2	60.7
Hospital 2	49.1	50.9	x
No. of polyps per colonoscopy*	2.7 ± 2.4 (1 – 11)	2.6 ± 2.0 (1 – 12)	x
Hospital 1	2.6 ± 2.5 (1 – 10)	2.5 ± 1.4 (1 – 5)	2.7 ± 1.7 (1 – 6)
Hospital 2	2.8 ± 2.3 (1 – 11)	2.6 ± 2.2 (1 – 12)	x

* mean ± standard deviation (minimum -maximum); CR, conventional reporting in prospective study; CR_H, historical conventional reporting; PM, Polyp Manager

Table 2 Documentation of polyp descriptors in percentages*.

Polyp descriptors	PM	CR_H	*P*
Location	95.8 (92 – 98)	89.2 (84 – 93)	0.014
Morphology	86.4 (81 – 90)	80.8 (75 – 86)	0.145
Size	94.8 (91 – 97)	88.7 (84 – 92)	0.030
Aspect	71.4 (65 – 77)	35.5 (29 – 42)	<0.001
Method of removal	93.0 (89 – 96)	92.6 (88 – 96)	1.000
Completeness of removal	60.6 (54 – 67)	37.4 (31 – 44)	<0.001
Retrieval	99.1 (97 – 100)	96.6 (93 – 98)	0.098
Sent to pathology in separate container	54.5 (48 – 61)	45.8 (39 – 53)	0.095

CR_H, historical conventional reporting; PM, Polyp Manager
P value < 0.05 regarded as significant
* 95 %-CI between the brackets

Results

Completeness of polyp description

A total of 78 PM reports were completed and an equally sized retrospective group (CR_H) was selected. The PM described 213 polyps and 203 polyps were described conventionally. Patient characteristics were comparable between hospitals and groups (**Table 1**) and the CR_H group. The Polyp descriptions were more complete with PM than with CR_H. The reports in the PM group scored 7.0 ± 2.0 (median ± IQR) compared to 6.0 ± 2.0 in the CR_H group. Hospital 2 made significantly more complete reports than did hospital 1 ($P < 0.005$) regardless of using PM, probably due to the different reporting system (Endobase vs Clinical Assistant).
With CR_H, underreporting was especially noted in regard to morphology, aspect, completeness of removal of the polyp, and whether the polyp was provided to the pathologist in a separate container (**Table 2**). Reports made using PM scored significantly better on location, size, aspect, and completeness of removal.

Prospective part: user-friendliness and potential time benefit

In Hospital 1, 23 PM reports and 28 CR reports were completed for colonoscopies with comparable patient characteristics (**Table 1**). The user-friendliness of PM was rated 85 ± 22 mm (median + IQR) on a visual analogue scale versus 68 ± 49 mm for CR_H ($P < 0.001$). VAS scores showed a wide distribution. **Fig. 3** illustrates the higher VAS scores with use of the PM versus CR_H.
To find out if using PM led to a potential time benefit we first needed to confirm that using PM did not prolong colonoscopy procedure time. The duration (median ± IQR (minimum – maximum) in minutes: seconds) of the colonoscopies in the PM population was 19:00 ± 14:34 (08:10 – 01:00:00) versus 23:08 ± 18:28 (09:07 – 01:00:00) in the CR_H population ($P = 0.602$). Time to report polyps and provide a pathology request was 01:27 ± 01:43 (00:20 – 08:15) overall, reflecting the potential time benefit per colonoscopy.

Discussion

In this pilot study we showed that a software tool like the Polyp Manager, which enables endoscopists to document polyps during a colonoscopy instead of afterward, improves the completeness of reports. Furthermore, this tool was highly appreciated by endoscopists. Once integrated into a digital reporting system, using the PM could provide a considerable time benefit.
This study confirms earlier reports that documentation of polyps is often incomplete [6, 8,11]. Polyp location, for example, was not documented in 10.8 % of the conventional reports although this descriptor is one of the four items that determine follow-up recommendation according to Dutch surveillance guidelines [4]. Also, polyp size was not described in 11.3 % of the conventional reports, with the result that a surveillance interval could not adequately determined.
Previous authors have suggested that complete documentation of polyps depends on several factors. Improvement has been achieved with the introduction of automated (digital) endoscopy reporting systems [11], avoidance of free text fields [9] and more dedicated templates [6]. However, as has been proposed by Singh et al., complete documentation can only be achieved by using standardized reporting templates with mandatory data entry fields [13]. In fact, the PM is an example of such a template because it is impossible to proceed without responding to mandatory items. As a result, documentation of polyp characteristics improves significantly. Once the PM is integrated into a reporting system, the reports will approximate 100 % completeness.
We also studied the user-friendliness of PM, which is obviously an important prerequisite [14]. Compared with recalling polyp

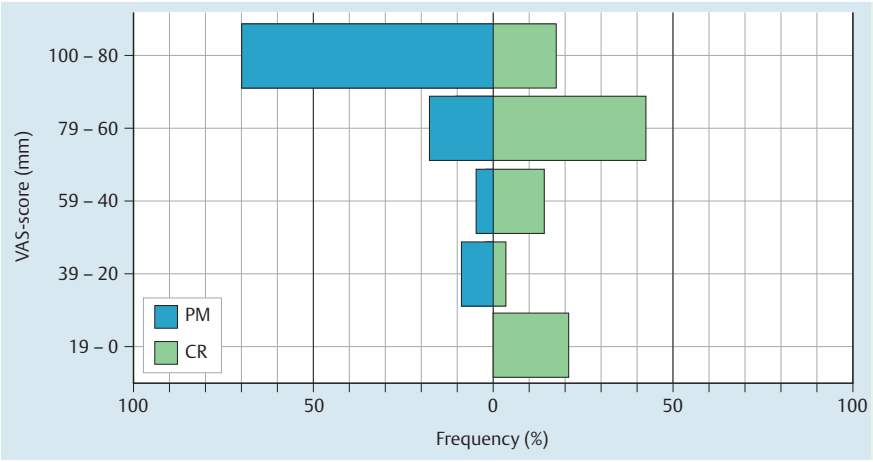

Fig. 3 User-friendliness of PM compared with CR in Hospital 1. Represented as percentages per VAS category.

characteristics from memory after colonoscopy, using the endoscopist-operated PM scored significantly better on user-friendliness. The PM has been designed as a lean and quick algorithm with several mandatory items. If the PM becomes available as an integrated part of a digital reporting system, the information needs to be entered only once, both for the colonoscopy report and for the information form for the pathologist, saving time and minimizing the possibility of making mistakes because data do not have to be recalled and/or re-entered afterward. After the PM is integrated, it is likely that endoscopists will view the program as even more user-friendly than the standalone version.

Besides these positive attributes, we have no indication that documenting polyps during the procedure prolonged colonoscopy. This study suggests that use of the PM can lead to an average time benefit of 1.5 minutes per colonoscopy (or 5 % if 30 minutes are allotted per procedure), because there is no need to describe all removed polyps and create a pathology request afterward. The time benefit will obviously be greater when many polyps need to be described, which is sometimes the case with screening colonoscopies.

This study was hampered by several methodologic limitations that need to be addressed. The primary limitation lies in the fact that the PM was not yet an integrated part of a digital reporting system. Using a standalone version, we had to estimate the potential time benefit of PM by recording the time used to describe the polyps in the final report and generate a pathology request. The time needed for data entry during colonoscopy was not measured. No significant increase was seen in total procedure time, but given the large variation in procedure duration, an effect may have escaped detection (Type 2 error). Furthermore, the clinical setting in the two hospitals differed which may have influenced the completeness of polyp description. Therefore, the data collected in this study, although very promising, need to be confirmed. A follow-up study conducted with an integrated version of the PM and involving patients with multiple polyps such as in a population screening program for bowel cancer would be preferable.

Conclusion

The PM is a new tool that permits endoscopists to describe polyps during a colonoscopy. In this pilot study we showed that the application is user-friendly, significantly improves the completeness of polyp descriptions, and can potentially be time saving when it is integrated into an endoscopy reporting system. We hope that the benefit of PM will inspire commercial companies involved in reporting of endoscopies to create a fully integrated version of PM and to commercially exploit the software.

Competing interests: None

References

1 *Lin OS, Kozarek RA, Cha JM*. Impact of sigmoidoscopy and colonoscopy on colorectal cancer incidence and mortality: an evidence-based review of published prospective and retrospective studies. Intest Res 2014; 12: 268 – 274
2 *Lieberman D, Nadel M, Smith RA* et al. Standardized colonoscopy reporting and data system: report of the Quality Assurance Task Group of the National Colorectal Cancer Roundtable. Gastrointest Endosc 2007; 65: 757 – 766
3 RIVM. Technical dataset colonoscopy. Available at Rijksinstituut voor Volksgezondheid en Milieu (Dutch); 2014: http://www.bevolkingsonderzoekdarmkanker.nl/downloads (Accessed June 20, 2015)
4 *Dekker E, van Leerdam ME, Hazewinkel Y* et al. Guideline: Colonoscopy surveillance. Available at Nederlandse Vereniging van Maag-, Darm- en Leverartsen in samenwerking met Nederlandse Vereniging van Pathologie (Dutch); 2013: www.mdl.nl/richtlijnen2 (Accessed June 20, 2015)
5 *Beaulieu D, Barkun A, Martel M*. Quality audit of colonoscopy reports amongst patients screened or surveilled for colorectal neoplasia. World J Gastroenterol 2012; 18: 3551 – 3557
6 *Beaulieu D, Martel M, Barkun AN*. A prospective intervention study of colonoscopy reporting among patients screened or surveilled for colorectal neoplasia. Can J Gastroenterol 2012; 26: 718 – 722
7 *Coe SG, Panjala C, Heckman MG* et al. Quality in colonoscopy reporting: an assessment of compliance and performance improvement. Digest Liver Dis 2012; 44: 660 – 664
8 *de Jonge V, Sint Nicolaas J, Cahen DL* et al. Quality evaluation of colonoscopy reporting and colonoscopy performance in daily clinical practice. Gastrointest Endosc 2012; 75: 98 – 106
9 *Li J, Nadel MR, Poppell CF* et al. Quality assessment of colonoscopy reporting: results from a statewide cancer screening program. Diagn Ther Endosc 2010
10 *Lieberman DA, Faigel DO, Logan JR* et al. Assessment of the quality of colonoscopy reports: results from a multicenter consortium. Gastrointest Endosc 2009; 69: 645 – 653
11 *Palmer LB, Abbott DH, Hamilton N* et al. Quality of colonoscopy reporting in community practice. Gastrointest Endosc 2010; 72: 321 – 327, 327 e321
12 *Robertson DJ, Lawrence LB, Shaheen NJ* et al. Quality of colonoscopy reporting: a process of care study. Am J Gastroenterol 2002; 97: 2651 – 2656
13 *Singh H, Kaita L, Taylor G* et al. Practice and documentation of performance of colonoscopy in a central Canadian health region. Can J Gastroenterol Hepatol 2014; 28: 185 – 190
14 *Gouveia-Oliveira A, Salgado NC, Azevedo AP* et al. A unified approach to the design of clinical reporting systems. Methods Inf Med 1994; 33: 479 – 487