

REVIEW

Quality indicators in colonoscopy. The colonoscopy procedure

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Received: 11/12/2017 · **Accepted:** 13/02/2018

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ABSTRACT

The aim of the project this paper is part of was to propose quality and safety procedures and indicators to facilitate quality improvement in digestive endoscopy units. In this second issue, procedures and indicators are suggested regarding colonoscopy. First, a diagram charting the previous and subsequent steps of colonoscopy was designed. A group of experts in health care quality and/or endoscopy, under the auspices of the Sociedad Española de Patología Digestiva (SEPD), performed a qualitative review of the literature regarding colonoscopy-related quality indicators. Subsequently, using a paired-analysis method, the aforementioned literature was selected and analyzed. A total of 13 specific indicators were found aside of the common markers elsewhere described, ten of which are process-related (one pre-procedure, seven procedure, and two post-procedure markers) while the remaining three are outcome-related. Quality of evidence was assessed for each one of them using the GRADE (Grading of Recommendations Assessment, Development and Evaluation) classification.

Key words: Quality indicators. Colonoscopy. Digestive system.

INTRODUCTION

When attempts are made to define quality within a health care setting, a reflective attitude is fitting on the huge number of potential, legitimate definitions that may be put forward according to the approach under consideration. A way of approaching this concept would be to define it as that property or set of properties inherent in a health care service that allows its being considered as comparable to, or better or worse than, other services of the same kind. Three relevant characteristics stem from this definition. First, the need to understand quality as a relative concept. Second, the fact that this concept involves comparison (comparable, better, worse). Third, the need for a standard, norm, or model to which comparisons may be made (1).

Thus, depending on the approach under consideration, a definition of health care quality may be diverse. Bearing this heterogeneity in mind, Avedis Donabedian systematized quality assessment in health care as a triad made up of structure, process, and outcome. Structural measurements or indicators assess characteristics in the overall health care setting, process indicators assess performance during service provision, and outcome indicators assess the effects of the health care services provided (2).

As was to be expected, and taking into consideration the relevance quality measurement has progressively acquired within health systems, endoscopic procedures have now been included in this systematic evaluation by means of tools such as the indicators posited by Donabedian. However, a major challenge gastroenterologists and endoscopists must confront on a daily basis is the maintenance of high quality standards in colonoscopy despite its increasing demand. It is therefore essential that ongoing quality improvement programs be implemented using evidenced-based, valid, reliable indicators. In accordance with this need, the Sociedad Española de Patología Digestiva (SEPD) has developed a project dealing with digestive endoscopy indicators. In continuation of this enterprise, the present study deals with quality procedures and indicators as recommended for the colonoscopy setting. It is relevant to refer to the initial study that started this project (3) as it reviewed concepts related to general and key quality aspects, including dimensions or values, and the importance of indicator development along the lines put forward by Donabedian as well as from an endoscopic perspective (1-4). Consequently, this study was meant to suggest the

Sánchez-del-Río A, Pérez-Romero S, López-Picazo J, Alberca-de-las-Parras F, Júdez J, León-Molina J; on behalf of the Grupo de Trabajo de "Indicadores de calidad en endoscopia" of the Sociedad Española de Patología Digestiva (SEPD). Quality indicators in colonoscopy. The colonoscopy procedure. *Rev Esp Enferm Dig* 2018;110(5):316-326.

DOI: 10.17235/reed.2018.5408/2017

structure, process, and outcome procedures and indicators necessary to implement and evaluate quality in the colonoscopy setting.

METHODOLOGY

The study was developed along two phases. First, a multidisciplinary task force was formed, based at Hospital Clínico Universitario Virgen de la Arrixaca, Murcia, to review the literature and design a procedure for diagnostic colonoscopy. In a second phase, the team's proposals were reviewed and assessed by a panel of experts selected by the SEPD until a definitive version was established. Subsequently, spec sheets were developed for each indicator in order to assess the procedures involved.

Literature search and study selection strategies

Two strategies were used for searching the literature: one was directed to clinical practice guidelines (CPGs); the other, to original and review papers. Colonoscopy-related CPGs were taken from three international sources (Agency for Healthcare Research and Quality [AHRQ], National Institute for Health and Care Excellence [NICE], Scottish Intercollegiate Guidelines Network [SIGN]) and a Spanish one (GuíaSalud), as well as from reviews found in the web sites of endoscopy and gastroenterology societies (American Society for Gastrointestinal Endoscopy [ASGE], American Gastroenterological Association [AGA], European Society of Gastrointestinal Endoscopy [ESGE], Sociedad Española de Endoscopia Digestiva [SEED], SEPD, and Asociación Española de Gastroenterología [AEG]). Original papers were obtained from the Web of Knowledge (WoK), PubMed, and Cochrane databases using the following search strategy: selection of all documents dated from January 1, 2006 to August 10, 2016 including any of the following descriptors: [colonoscop*] plus [informed consent, quality, safety, (security), assessment, assurance, indicators, criteria]. Active filters included: clinical trial, controlled clinical trial, meta-analysis, randomized controlled trial, review, guideline, practice guideline, publication date from 2006/01/01 to 2016/08/10; humans; adults; language: English, Spanish. Complementarily, a review was undertaken of the references included in the original papers, guidelines, and meta-analyses selected and included in the analysis, and those deemed interesting and previously overlooked were retrieved. Once the search protocol was completed, all articles obtained were reviewed and assessed separately by two reviewers. Each reviewer screened the selected studies using any of the following criteria: a) the paper includes recommendations on appropriate preparation, performance, and follow-up; b) the paper includes or suggests quality indicators for structure, process, or outcomes. Studies selected by only one reviewer were checked out by the other in order to decide their inclusion or otherwise. To provide a homogeneous assessment of every study selected, a table was designed to collect the information included on structure, process, and outcome indicators, and whether that information was explicit or otherwise. Furthermore, the table also included the type of study referenced (clinical trial, observational study, meta-analysis, etc.), which was identified as related to colonoscopy.

Colonoscopy procedure design

Taking the selected references and author experience as a point of departure, the activities required for each procedure were collected and sorted. Regarding the procedures shared by all endoscopic examinations, the logical structural, functional, and organizational differences found among clinical digestive endoscopy units limit their development to a minimum. Similarly, descriptions of specific techniques exclusively applied to some situations were excluded, as they were not included in the goals of the present work. The result was diagrammed in flowcharts or parallel path flowcharts. Proposals were reviewed and assessed by a panel of professionals selected by the SEPD until a definitive version was agreed.

Indicator design

In order to obtain valid indicators, quality was measured for the knowledge available regarding procedure-related activities and for the documents selected after the literature search. This was accomplished using the GRADE system. In this system, quality of "evidence" (hereafter used without quotations to mean the best proof-based knowledge available) is initially classified as high or low according to its origin in experimental or observational studies. Then, by considering a number of items that may diminish or increase the baseline score, quality is graded as high, moderate, low, or very low (4,5). To ensure reliability and to facilitate scoring for the indicators selected by clinical units, each indicator is provided with a datasheet including scope of applicability (procedure[s] where it may be applied); denomination; calculation formula; type of indicator according to Donabedian's model (3); temporal relationship with procedure (pre-procedure, procedure, post-procedure); quality dimension it relates to; justification, exclusions and clarifications; and supporting level of evidence.

RESULTS AND DISCUSSION

Search results

The selection process began by suppressing duplication and by excluding studies explicitly dealing with colonoscopy as cancer screening tool, poorly referenced studies, abstract-only publications, papers unavailable or published before 2006, papers dealing with pediatric topics, veterinary medicine or nondigestive endoscopy, and papers in a language other than Spanish or English. In our search and assessment, we made an exception for the definition of interval cancer, which specifically refers to screening colonoscopy, because of its being a direct outcome indicator (albeit not the only one as will be seen later) of colonoscopy quality.

A total of 260 studies were included in the paired analysis and assessed full-text, including both randomized and non-randomized clinical trials, as well as high-quality series of cases, reviews and meta-analysis for a total of 107.

Colonoscopy procedure

The procedure has been plotted in a diagram (Fig. 1) with the following correlative steps:

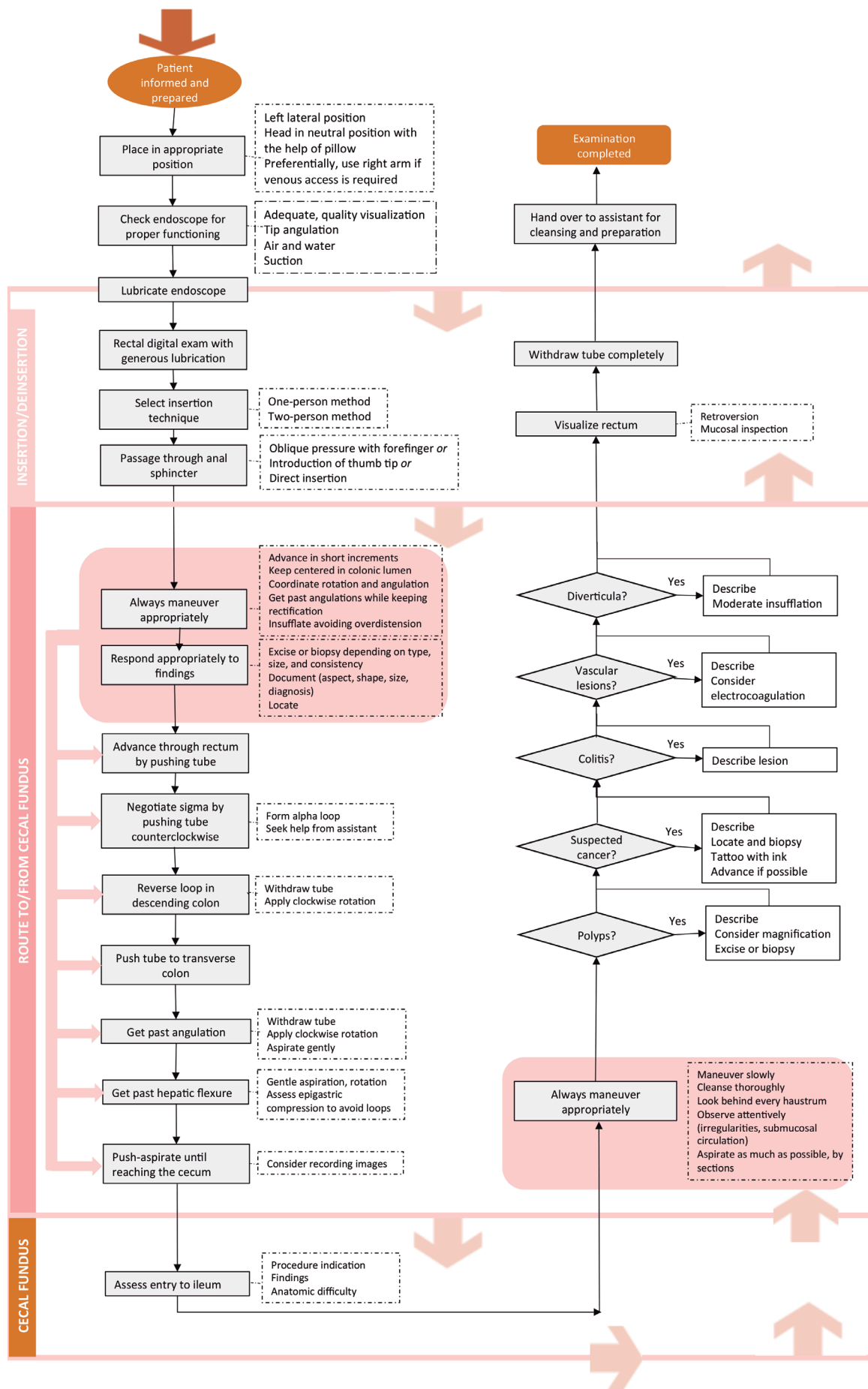


Fig. 1. Colonoscopy process.

1. Place patient in appropriate position:
 - Left lateral position, although a supine position is also feasible.
 - Head in neutral position with pillow support.
 - If venous access is required, preferably use the right arm.
2. Check functioning of endoscope:
 - Adequate quality visualization.
 - Tip angulation.
 - Air and water.
 - Suction.
3. Lubricate endoscope:
4. Insert endoscope:
 - Rectal digital examination with generous lubrication.
 - Select insertion technique (may be hybrid or mixed, by sections):
 - One-person method. The endoscopist is autonomous for insertion. Assistance is only needed for abdominal compression, position changes or support.
 - Two-person method. An assistant handles the tube; the endoscopist operates the controls.
 - Pass anal sphincter. Three options:
 - Oblique pressure with forefinger until sphincter relaxation.
 - Introduce thumb tip and replace with tube.
 - Direct insertion.
5. Advance to cecal fundus:
 - Maneuver properly through the colon:
 - Advance tube in short steps to avoid loop formation.
 - Always keep endoscope centered within the colonic lumen.
 - Coordinate appropriately rotation (torque) and angulation movements using both hands.
 - Negotiate angles with mild pushes followed by short withdrawals with clockwise rotation on the tube to maintain rectification.
 - Improve visibility by insufflating while avoiding overdistension.
 - Position changes may help passage through difficult colonic areas.
 - Respond adequately to findings:
 - Excise or biopsy lesions according to type, size, and consistency.
 - Reference lesions, including aspect, shape, size, and presumptive diagnosis.
 - Locate lesions using distance from anus/cecum or anatomic hallmarks when feasible (transverse colon, cecum, hepatic and splenic flexures, anastomosis, scars, etc.).
 - Pass through rectum by pushing the endoscope.
 - Pass through sigmoid colon by pushing the tube counterclockwise, usually forming an alpha loop, with help from an assistant.
 - Release alpha loop in descending colon by withdrawing colonoscope and applying clockwise torque.
 - Advance by pushing tube to transverse colon.
 - Go through mid-transverse colon angulation by withdrawing endoscope with clockwise torque while aspirating gently.
 - Use aspiration and mild torque to go beyond hepatic flexure. Epigastric compression may be needed to prevent loops in transverse colon.
 - Push and aspirate along ascending colon down to cecal fundus.
 - Consider imaging.
6. Assess entry into ileum:
 - Weigh according to test indication, findings, and anatomic difficulty.
7. Withdraw tube:
 - Maneuver slowly.
 - Clean thoroughly, remove residual mucus.
 - Look behind every haustrum.
 - Observe attentively to identify haustral irregularities and submucosal circulation changes.
 - Respond adequately to findings:
 - Polyps:
 - Describe morphology (Paris classification), size, and location.
 - Consider magnification to improve diagnosis.
 - Excise or biopsy.
 - Suspect cancer lesions:
 - Locate and biopsy.
 - Tattoo with India ink (except lower rectum and cecum).
 - Advance to cecum if lesion passable.
 - Colitis:
 - Collect biopsy simple.
 - Describe extent, patchy or continuous involvement.
 - Try and visualize ileum.
 - Vascular lesions (angiodyplasia, etc.)
 - Describe.
 - Consider electrocoagulation.
 - Diverticula:
 - Describe.
 - Avoid insufflation, particularly if inflammatory component present.
 - Aspirate as much air as possible by segments.
8. Visualize rectum:
 - Rest tube on wall and turn to obtain retroversion in rectal ampoule.
 - Inspect mucosa.
9. End examination:
 - Withdraw tube completely.
 - Pass endoscope over to ancillary personnel for cleansing and new preparation.

Indicators

Table 1 offers an overall view of colonoscopy-specific indicators (boldface) and general indicators common to all endoscopic procedures.

Among quality dimensions, efficiency is commonly overlooked by colonoscopy quality guidelines. Here, efficiency has been considered as a cross-sectional dimension reflecting the way our proposed indicators are evaluated. For instance, “all polyps excised” was included as uncommon indicator to emphasize the need to satisfy patient requirements in one single procedure. Efficiency also influenced the definition of indicators regarding adenoma excision, as based exclusively on the index colonoscopy (excluding repeat colonoscopies to complete a prior procedure).

Table 1. Common and specific (boldface) quality markers in colonoscopy

A. Structure	
01.	Valid informed consent
02.	Antithrombotic medication management plan
03.	Experienced endoscopist
04.	Discharge plan
05.	Discharge report quality
06.	Endoscopy equipment disinfection procedure
07.	Endoscopy unit structural and functional characteristics
B. Process - pre-procedure	
01.	Appropriate indication
02.	Signing of informed consent form
03.	Clinical assessment
04.	Sedation planning
05.	Antithrombotic medication management
06.	Adequate follow-up of patients with adenomas, serrated polyps
C. Process - procedure	
01.	Tracings/imaging
02.	Sedated patient monitoring
03.	Recording of immediate adverse events
04.	Adequate cleansing
05.	Complete colonoscopy
06.	All polyps under 20 mm excised
07.	All polyps under 20 mm excised in one fragment
08.	Withdrawal time
09.	Biopsy sample collection in patients with chronic diarrhea
10.	Appropriate biopsy or chromoendoscopy technique for dysplasia screening in chronic inflammatory bowel disease
D. Process - post-procedure	
01.	Patient recovery
02.	Information on discharge
03.	Recording of late adverse events
04.	Recording colon cleansing quality
05.	Recording withdrawal time
E. Result	
01.	Incidence of adverse events
02.	Patient satisfaction
03.	Percentage of colonoscopies with adenoma
04.	Mean number of adenomas per colonoscopy
05.	Incidence of interval cancer

B.06. Appropriate interval between colonoscopies

Definition and formula
Percentage of cases with appropriate interval between colonoscopies: – Numerator: 100 x cases with appropriate interval – Denominator: total of cases assessed
Type, temporal relationship, quality dimension
Process - Pre-procedure - Efficiency
Evidence
High

Several clinical practice guidelines have been published regarding follow-up for these patients (7-9). Such guidelines are primarily based on population studies and clinical trials with different types of follow-up, and take into account the risk for recurrent lesions after an index colonoscopy. This study recommends that every digestive endoscopy unit adheres to one of these guidelines to establish their own practice, and assess the proposed indicator.

Excision of adenomas or serrated polyps during colonoscopy is a risk factor for the subsequent development of new adenomas and colorectal cancer. The indication of colonoscopy for the follow-up of previously excised adenomas or serrated polyps is currently a very usual one. Overindication is here common, which represents an unnecessary workload. Furthermore, inadequate or lax follow-up represents a risk factor for the development of new lesions or even colorectal cancer. Adequate follow-up will prevent colorectal cancer development, but not completely. Follow-up after excision of a colon adenoma will depend upon three factors: index colonoscopy quality, characteristics and number of excised lesions, and excision technique or difficulty (10,11).

C.04. Colon preparation

Definition and formula
Percentage of cases where colon cleansing is considered to be adequate: – Numerator: 100 x cases with adequate preparation – Denominator: total of cases assessed
Type, temporal relationship, quality dimension
Process - Pre-procedure - Effectiveness
Evidence
Moderate

Achieving adequate colonic cleansing or preparation is one of the most common quality issues in colonoscopy (12). Good or, at least, moderately good colonic cleansing facilitates identification of colon adenomas, as was confirmed by several clinical trials and meta-analyses (13,14). Thus, it indirectly prevents colorectal cancer development, as will be seen below. Clinical practice guidelines, based on systematic reviews and meta-analyses, recommend using split

doses or the entire cleansing dose just a few hours before the procedure (15-18). Colon preparation must be individualized according to personal risks (19). The recommended standard for adequate cleansing ranges from 85% to 90%, the latter figure being recommended for screening colonoscopy (20,21). This paper suggests as recommendation using the Boston scale (22,23). A score of two or three for each segment is recommended when using this scale (13).

C.05. Complete colonoscopy

Definition and formula
Proportion of fully completed colonoscopies to the cecum:
– Numerator: number of colonoscopies with adequately documented cecal imaging (fully completed)
– Denominator: total number of colonoscopies performed
Type, temporal relationship, quality dimension
Process - Effectiveness
Evidence
Low

A technical goal for any colonoscopy is complete colonic examination. Incomplete examinations are associated with increased risk for interval cancer (24). In clinical practice, meeting this indicator was perhaps highly variable until recently (25-28,12). Colonoscopy is considered as complete when the tip of the endoscope reaches beyond the ileocecal valve, which allows to assess the cecum's medial aspect (a common site for interval cancer) and the area around the appendicular orifice. The report must state that cecal structures (ileocecal valve, appendicular orifice) were identified, and an image including the appendicular orifice and characteristic cecal fold should also be attached (20,21,29-31).

C.06. Excision of all polyps smaller than 20 mm

Definition and formula
Proportion of colonoscopies where all polyps smaller than 20 mm are excised:
– Numerator: 100 x number of index colonoscopies where all polyps smaller than 20 mm were excised
– Denominator: number of index colonoscopies assessed
Type, temporal relationship, quality dimension
Structure - Efficiency
Evidence
Very low

Colonoscopy, as any other medical procedure, must be cost-effective, if possible on the first attempt. A technical goal is excision of all polyps within the reach of any average endoscopist (12,25). While scales are available to assess the difficulty of polyp excision, they remain inadequately validated (11). Although evidence is sparse, an indicator based on polyp size (20 mm) is considered to reflect the overall

technical quality of polyp excision by an endoscopist. Some patients may have complex or multiple polyps. An endoscopist may choose to initially excise the more challenging ones and then leave the easier polyps for a second colonoscopy procedure; or he/she may excise all polyps in some specific segment (30). As with other indicators that will be seen below, this indicator should only be assessed for index procedures. An index colonoscopy is the first colonoscopic procedure performed in a given patient (whether for symptoms, screening, follow-up, etc.).

C.07. All polyps smaller than 20 mm excised in one fragment

Definition and formula
Proportion of polyps smaller than 20 mm excised in one fragment:
– Numerator: 100 x number of polyps smaller than 20 mm excised in one fragment
– Denominator: total number of polyps smaller than 20 mm assessed
Type, temporal relationship, quality dimension
Process - Effectiveness
Evidence
Very low

Among indicators to assess the technical ability of an endoscopist as regards polyp excision, the following may be considered: the percentage of polyps excised in one fragment and the fragment rate per mucosectomy above 2 cm. For most endoscopists, it is technically possible to excise most polyps smaller than 20 mm in one fragment (32). However, some polyps smaller than 20 mm may be challenging to access, and excision in two or more fragments may be then advisable.

C.08. Withdrawal time

Definition and formula
Average time for endoscope withdrawal after reaching the cecum:
– Numerator: sum total of withdrawal times
– Denominator: total number of cases assessed
Type, temporal relationship, quality dimension
Process - Procedure - Effectiveness
Evidence
Low

Withdrawal time is considered as an indirect quality indicator related to adenoma and interval cancer identification rates (33,34). It is therefore an indicator to consider especially for physicians with low adenoma detection rates. This indicator is assessed based on colonoscopies where no polyps are found. Standard average time ranges from six to eight minutes for one endoscopist (35,36). Impor-

tantly, colon length is variable, and withdrawal time might be shorter in an adequately cleansed shorter colon. Not all studies find this indicator valuable (37,38).

C.09. Biopsy sample collection in patients with chronic diarrhea

Definition and formula
Percentage of cases with chronic diarrhea where biopsy is performed on healthy mucosa:
– Numerator: 100 x number of cases of chronic diarrhea and healthy mucosal biopsy
– Denominator: number of cases of chronic diarrhea and healthy mucosa
Type, temporal relationship, quality dimension
Process - Procedure - Effectiveness
Evidence
Low

In patients with intermittent or chronic watery diarrhea, the prevalence of microscopic colitis has been estimated around 9.5-13.7% (39,40). Diagnosing these conditions may improve quality of life through the use of specific therapy with drugs such as oral budesonide (41). Thus far, the only way to diagnose microscopic colitis (whether collagenous or lymphocytic) is systematic biopsy collection during colonoscopy. Several schemes are recommended, including biopsy sample collection all through the colon, which involves at least four samples from the proximal colon up to the splenic flexure (42,43).

C.10. Number and distribution of biopsies in patients with inflammatory bowel disease (IBD)

Definition and formula
Percentage of cases of IBD with adequate biopsy collection for the follow-up of dysplasia:
– Numerator: 100 x cases of IBD undergoing adequate biopsies
– Denominator: total number of IBD-related colonoscopies
Type, temporal relationship, quality dimension
Process - Procedure - Effectiveness
Evidence
Low

Patients with IBD and colon involvement are at higher risk of colorectal cancer (44). This risk increases with colonic involvement extension and time since disease onset. In these patients, cancer is preceded by dysplasia. Follow-up programs for these patients including multiple biopsies may improve life expectancy. Recently, several clinical trials found an increased effectiveness in dysplasia detection using high-resolution endoscopy and chromoendoscopy (45), but results may be conflicting in clinical practice (46,47). In this study, a program using chromoendoscopy

and targeted biopsies, or a classic regimen of four-quadrant biopsy samples every 10 cm, is recommended for patients with chronic IBD on follow-up for the screening of dysplasia and colorectal cancer.

D.04. Colon preparation report

Definition and formula
Proportion of reports recording colon cleanliness extent:
– Numerator: number of reports recording colon cleanliness extent
– Denominator: total number of colonoscopies assessed
Type, temporal relationship, quality dimension
Process - Safety
Evidence
Low

In order to establish an appropriate follow-up interval, or merely to know whether a colonoscopy was high-quality, this information should be available in the procedure's report. Colonic cleansing quality should be recorded using a validated scale and by segments (22,23,36,48). However, there is often significant variability, and this and other relevant aspects of colonoscopy occasionally remain outside the scope of reports (39).

D.05. Withdrawal time report

Definition and formula
Percentage of colonoscopies where withdrawal time is reported:
– Numerator: 100 x colonoscopies where withdrawal time is measured
– Denominator: total number of cases assessed
Type, temporal relationship, quality dimension
Process - Procedure - Effectiveness
Evidence
Low

We suggest that this indicator be included to provide information on procedure quality in the colonoscopy report. However, as already mentioned, what matters is the average withdrawal time per endoscopist performing colonoscopies. However, including this indicator may lead endoscopists to maintain higher average withdrawal times (36).

E.01. Incidence of adverse effects

In order to facilitate improved endoscopist performance, digestive endoscopy units have increasingly measured adverse events (AEs). While severe AEs are usually perceived as uncommon or rare, a considerable number of unexpected hospital admission may result from colonoscopy procedures, as well as considerable health care costs, and mortality in a healthy population. Lower diges-

tive endoscopy, including colonoscopy, has been increasingly used as CRC screening instrument both in Europe and the US during the past few years, supported by growing evidence of its effectiveness to reduce CRC rates and CRC-related mortality. Therefore, awareness of colonoscopy-related adverse events in routine practice is key for the decision-making process of policy makers (49,50).

E.03. Description and excision of adenomas during colonoscopy

Definition and formula
Percentage of colonoscopies where found adenomas are described and excised:
– Numerator: 100 x cases with adenoma description and excision, when applicable
– Denominator: total number of cases assessed
Type, temporal relationship, quality dimension
Result - Effectiveness
Evidence
Low

E.04 - Mean number of adenomas excised per colonoscopy procedure

Definition and formula
Mean number of fully excised adenomas per colonoscopy:
– Numerator: total number of fully excised, retrieved adenomas
– Denominator: number of colonoscopies assessed
Type, temporal relationship, quality dimension
Result - Effectiveness
Evidence
High

These two indicators complement each other. While terms such as adenoma detection index or adenoma detection rate have been used, such denominations are confusing and we had better refer to these markers as percentage of colonoscopies with at least one adenoma excised and number of adenomas excised per colonoscopy. We aim at using natural common language that may be understood by all those involved in the colonoscopy: general public, managers, and any other person involved regardless of education. Traditionally, percentage of colonoscopies with at least one adenoma has been used as key indicator; this has been the most commonly studied indicator and the one best correlated with the prevention of colorectal and interval cancer, both in screening and non-screening colonoscopies (34,49,50). We included the indicator "mean number of excised adenomas per colonoscopy" as an additional marker of endoscopist technical quality (51,52). Currently, no appropriate standards are available for the general population. In waiting for newer data to emerge, we suggest a standard of 20% as percentage of colonoscopies with at least one adenoma excised among all index colonoscopies, regardless of age or indication.

Other potential indicators would include: percentage of colonoscopies with advanced adenoma, mean number of advanced adenomas per colonoscopy, number of adenomas in patients with adenomas or number of adenomas minus the index lesion; while they allow differentiations in quality between endoscopists, their required number of patients is very high (53).

E.05. Incidence of interval cancer after colonoscopy

Definition and formula
Interval cancer is the cancer that emerges between two consecutive scheduled procedures within a screening program, with a time interval ranging from six to 36 months after the index colonoscopy:
– Numerator: number of patients who developed colorectal cancer during or between follow-up colonoscopies
– Denominator: number of colonoscopies performed within a follow-up program for adenomas/serrated polyps over a specific period of time
Type, temporal relationship, quality dimension
Result - Effectiveness
Evidence
Low

This may well be the best outcome indicator for colonoscopy, particularly so in colorectal cancer screening programs (5,7). Though analyzing indicators for colonoscopy in general really is outside our scope, this is theoretically the marker with the strongest impact since a key goal for any colonoscopy is the long-term prevention of colorectal cancer development. Appropriate mucosal inspection, accompanied by excision of identified lesions, prevents colorectal cancer from developing. However, a significant number of undetected lesions is known to exist. Furthermore, some lesions, even flat or smaller lesions, may be highly aggressive, which results in a variable prevalence of post-colonoscopy colorectal cancer at three to five years after the procedure that oscillates between 0% and 9% (37-39). Prolonged withdrawal time, improved colon cleansing, adequate follow-up intervals for patients with adenoma, and higher adenoma excision rates will prevent colorectal cancer (39,40,48,50-52). This indicator has potential barriers, including patient loss to follow-up, prolonged interval between consecutive colonoscopies, and low incidence of post-colonoscopy cancer. The calculation approach for each endoscopy unit remains poorly established, but should ideally include all colonoscopies performed, even those with normal results. However, this research recommends that it be considered in the follow-up program of patients with colonic adenomas or serrated polyps in order to facilitate its monitoring (41-46).

CONCLUSIONS

This paper considered the use of a number of indicators to be included in colonoscopy quality improvement programs,

together with the general indicators considered by the prior paper. The total number of indicators to assess one endoscopy may rise up to 30. Even with a data processing system, managing all these indicators in the setting of ongoing quality monitoring may represent a workload difficult to comply with. Therefore, it is important that assessment be based on key indicators. Various scientific societies agree on the significance of routinely measuring indicators relevant to endoscopy unit performance, thus allowing ongoing improvement cycles according to their results. However, if an endoscopy unit performs above standard during ongoing monitoring for a specific indicator, and keeps this up long-term, our monitoring activity will be unnecessary as it will identify no opportunities for improvement. Hence, flexibility is advisable, and indicator monitoring should be adapted to needs of improvement in each unit. For other quality-related activities, such as implementing an improvement cycle or redesigning health care activities, quality assessment should take the highest number possible of indicators into consideration.

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