

# Colorectal polypectomy and endoscopic mucosal resection: European Society of Gastrointestinal Endoscopy Cascade Guideline



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Colorectal cancer (CRC) is a major contributor to morbidity and cancer death globally with an increasing incidence also in low- and middle-income countries [1, 2]. However, CRC is preventable if precursor lesions are detected and treated [3, 4].

Throughout the world, national screening programs have been established that are aimed at the endoscopic detection and removal of polyps, as well as the diagnosis of cancers at an early stage [5, 6]. In addition to screening, diagnostic colonoscopy is

► **Table 1** Pre-defined resource levels

I: Basic	These are core resources or fundamental services absolutely necessary for an endoscopy care system to function. It includes capability to perform diagnostic procedures (gastroscopy and colonoscopy), basic therapeutic procedures (resection of small polyps), and provide fundamental monitoring (assessment of vital signs, blood haematology and biochemistry analysis). By definition, a health care system lacking Basic level resources would be unable to provide endoscopic services to its patient population.
II: Limited	These are second-tier resources or services that produce major improvements in outcome, such as increased survival, that are attainable with limited financial means and modest infrastructure. Limited level resources include minor endoscopic procedures to improve major clinical outcomes such as polypectomy, clipping, sclerotherapy or adrenaline injection, band ligation, and also offer more advanced treatment with plasma expanders and basic surgical interventions.
III: Enhanced	These are third-tier resources or services that are optional but important. Enhanced-level resources may produce minor further improvements in outcome but increase the number and quality of therapeutic options. Enhanced level resources include most procedures that improve clinical outcome such as endoscopic retrograde cholangiopancreatography, electrosurgical techniques, and polypectomy/mucosectomy, and also offer anesthesia support where required.
IV: Maximal	These are high-level resources or services that may be used in some resource-rich countries or be recommended in guidelines that assume unlimited resources. Maximal-level resources typically depend on the existence and functionality of all lower-level resources and additionally may offer advanced technology-based interventions such as endoscopic submucosal dissection and endoscopic ultrasound.

crucial for investigation of symptoms. However, in resource-limited settings, screening programs might be absent, and the availability of colonoscopy might be limited by costs, travel distance, and lack of trained endoscopists. Furthermore, to achieve the full benefit of colonoscopy, detected lesions should be optimally removed to prevent recurrence and subsequent development of CRC, while avoiding adverse events (AEs) such as bleeding and perforation. This can be ensured with suitable training and mentoring programs and accompanied by guidelines developed with a generally high level of evidence [7–10]. Nevertheless, some recommendations within these guidelines include utilization of accessories that are costly and additionally require appropriate training to use safely. Hence, in a resource-limited setting, adherence to current guidelines for colonoscopy and polypectomy may be challenging.

In 2018, the European Society of Gastrointestinal Endoscopy (ESGE) and the World Endoscopy Organization (WEO) established an international working group with the aim of creating a set of guidelines amenable also in resource-sensitive communities [11]. Consequently, a cascade methodology was introduced developing adapted recommendations for different levels of available resources. The cascade methodology has already been applied to guidelines for non-variceal upper gastrointestinal bleeding, esophageal stenting, endoscopic treatment of variceal upper gastrointestinal bleeding, as well as a guideline in conjunction with the World Gastroenterology Organization for resuming endoscopy after the COVID pandemic [12–15]. Based on the ESGE guideline by Ferlitsch et al, the aim of this cascade guideline is to propose recommendations for colorectal polypectomy and endoscopic mucosal resection (EMR) in resource-limited settings [7].

## Methods

The cascade methodology has previously been described in detail in the ESGE position paper [11]. Briefly, five colleagues from Ethiopia, Ghana, and Nigeria reviewed the recommendations from the ESGE guidelines and commented on resource-limita-

tions in relation to each statement. Guided by this review, five members (AE, PB, CS, LA, GA) of the International Affairs Working Group (IAWG) independently categorized the statements as either resource-sensitive or not. The statements that more than 50% of the IAWG members agreed were resource-sensitive were then revised according to the cascade methodology into recommendations for four predefined resource levels (► **Table 1**) after extensive discussion and consultation between IAWG and the external panel of African colleagues. The modified statements were then subject to a Delphi process with local doctors invited by a dedicated mailing list representative of gastroenterology specialists in different areas of Africa, as well as members of the GI-Echo WhatsApp group. Finally, the statements were subject to a Delphi survey in which African doctors were invited to participate [16]. If an agreement of 75% or higher was reached, the recommendations were accepted. If not, the recommendations were modified according to the comments by the survey participants.

## Results

### Statement selection

In the selection process, 36 of the 57 statements from the original guideline were selected. For each of the 36 statements, three cascade recommendations were suggested according to basic, limited, and enhanced resource settings. The maximal setting was equal to the statements in the original guideline and was not included in the process.

### The Delphi process

The 108 adapted cascade statements were subsequently included in a Delphi process. Thirty-nine participants contributed to the Delphi process. Geographically, the areas most represented were Northern Africa (38.4%) and Eastern Africa (33.3%), while no participants from Southern Africa participated (► **Table 2**). The participants were asked to indicate the socioeconomic status of their institution (► **Table 2**), which was mainly assessed as low (42.6%) or middle (41.0%). Of the 36 adapted

► **Table 2** Characteristics of Delphi process participants.

	Participants N = 39
Geographical area	
▪ Northern Africa (%)	15 (38.5)
▪ Central Africa (%)	1 (2.6)
▪ Eastern Africa (%)	13 (33.3)
▪ Western Africa (%)	10 (25.6)
▪ Southern Africa (%)	0
Socioeconomic status of institution/hospital	
▪ High (%)	6 (15.4)
▪ Mid (%)	16 (41.0)
▪ Low (%)	17 (43.6)

statements, 32 reached agreements in the Delphi process while four statements that reached between 68% and 71% agreement were subject to minor modifications according to comments from the Delphi participants. The four revised statements were related to endoscopic mucosal resection (EMR), tattooing, and use of CO<sub>2</sub>, which required adjustment of the resource level for the specific cascade statements.

### Cascade adaptation

Adequate training of personnel in each technique is imperative and independent of the resources available to carry out the procedures. The selected resource-sensitive statements and the accepted cascade modifications are presented in ► **Table 3**. The modifications are focused mainly on three areas.

1. Indications
2. Polypectomy techniques
3. EMR

### Indications

For the majority of the previous cascade guidelines, the focus was on emergency situations, such as endoscopic treatment of variceal upper gastrointestinal bleeding [14]. Colorectal polypectomy and EMR, however, are mostly carried out in an elective setting. At a basic resource level, referral to a tertiary care center might be preferable if there is a lack of trained personal or limited access to accessories needed to perform a safe and adequate procedure. The risk of advanced histological features is extremely low for diminutive polyps (<5 mm) [17]. Therefore, diminutive polyps could be removed and discarded, or even not removed, in a setting with a basic resource level. It is not recommended to attempt treatment of more advanced lesions without access to injection therapy or mechanical hemostasis with clips.

### Polypectomy techniques

In many centers, CO<sub>2</sub> is not available; however, air insufflation might be an acceptable alternative. In general, cold snare polypectomy is widely available and recommend for polyps up to 10 mm in size. With larger polyps for which submucosal injection is recommended, normal saline might be used. However, with polyps larger than 20 mm for which more extensive resection is required and the risk of AEs is higher, in settings with basic and limited resource levels, referral is recommended to centers that have clips and injectors available.

### EMR

Access to EMR is limited at all three resource levels, which is reflected in a recommendation to carry out surgical resections in cases in which referral to an advanced endoscopy center is impossible and in cases in which there is a high suspicion of submucosal invasion. In cases with a need for tattooing either before surgery or for a follow-up colonoscopy after endoscopic removal of a lesion, sterile carbon particle or Indian Ink is strongly recommended. If these are not available, we recommend carefully describing the location of the lesion.

### Conclusions

In conclusion, the need for safe and adequate polypectomy and EMR for colorectal lesions is increasing even in resource-limited settings. This cascade guideline proposes a set of recommendations for colorectal polypectomy and EMR applicable in resource-sensitive regions and offers recommendations for minimal requirements at each resource level in order to carry out procedures safely.

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► **Table 3** Selected resource-sensitive statements and accepted cascade modifications.

	Original statements	Suggested modifications
	<b>1. Definition, classification, removal, and retrieval of polyps</b>	
3	ESGE recommends that all polyps be resected except for diminutive ( $\leq 5$ mm) rectal and rectosigmoid polyps that are predicted with high confidence to be hyperplastic. (High-quality evidence; strong recommendation.)	Level I/II/III: No adjustment.
4	ESGE recommends retrieval of all resected polyps for histopathological examination. In expert centers, where optical diagnosis may be made with a high degree of confidence, a “resect and discard” strategy may be considered for diminutive polyps. (Moderate-quality evidence; strong recommendation.)	Level I: Resect and discard if histopathology is unavailable. Level II: No adjustment. Level III: No adjustment.
	<b>2. Resection of polyps &lt; 20 mm in size</b>	
	2.1 Resection of diminutive polyps ( $\leq 5$ mm)	
5	ESGE recommends cold snare polypectomy (CSP) as the preferred technique for removal of diminutive polyps (size $\leq 5$ mm). This technique has high rates of complete resection, adequate tissue sampling for histology, and low complication rates. (High-quality evidence; strong recommendation.)	Level I: Omit resection or resect and discard. Level II: No adjustment. Level III: No adjustment.
	2.2 Resection of small polyps (6–9 mm)	
8	ESGE recommends snare polypectomy for sessile polyps 6–9 mm in size. ESGE recommends against the use of biopsy forceps for resection of such polyps because of high rates of incomplete resection. (High-quality evidence; strong recommendation.)	Level I: Referral to a less resource-limited center. Level II: No adjustment. Level III: No adjustment.
9	ESGE suggests CSP for sessile polyps 6–9 mm in size because of its superior safety profile, although evidence comparing efficacy with HSP is lacking. (Moderate-quality evidence; weak recommendation.)	Level I: Referral to a less resource-limited center. Level II: No adjustment. Level III: No adjustment.
	2.3 Polypectomy of sessile polyps (10–19 mm)	
10	ESGE suggests hot snare polypectomy (HSP) (with or without submucosal injection) for removal of sessile polyps 10–19 mm in size. In most cases deep thermal injury is a potential risk and thus submucosal injection prior to HSP should be considered. (Low-quality evidence; strong recommendation.)	Level I: Referral to a less resource-limited center, or if that is impossible, surgical resection. Level II: Submucosal injection of normal saline prior to polypectomy. Level III: No adjustment.
	2.4 Polypectomy of pedunculated lesions	
12	ESGE recommends HSP for pedunculated polyps. To prevent bleeding, in pedunculated colorectal polyps with head $\geq 20$ mm or a stalk $\geq 10$ mm in diameter, ESGE recommends pretreatment of the stalk with injection of dilute adrenaline and/or mechanical hemostasis. (Moderate-quality evidence; strong recommendation.)	Level I/II: Referral to a less resource-limited center, or if that is impossible, surgical resection. Endoscopic treatment without access to injection therapy or mechanical hemostasis is only recommend in emergency cases (bleeding). Level III: No adjustment.
	2.5 Which polyps should be removed by an expert endoscopist in a referral or tertiary center?	
13	Large ( $\geq 20$ mm) sessile and laterally spreading or complex polyps, should be removed by an appropriately trained and experienced endoscopist, in an appropriately resourced endoscopy center. (Moderate-quality evidence; strong recommendation.)	Level I: Referral to a less resource-limited center, or if that is impossible, surgical resection. Endoscopic treatment without access to injection therapy or mechanical hemostasis is only recommend in emergency cases (bleeding). Level II: Endoscopic treatment without access to injection therapy or mechanical hemostasis is only recommend in emergency cases (bleeding). Level III: No adjustment.
	2.6 Polyps requiring other (non-snare) techniques, e. g. endoscopic submucosal dissection (ESD) or surgery	
14	The majority of colonic and rectal lesions can be effectively removed in a curative way by standard polypectomy and/or by EMR. (Moderate-quality evidence; strong recommendation.)	Level I/II/III: No adjustment.

► **Table 3** (Continuation)

	Original statements	Suggested modifications
15	En bloc resection techniques such as en bloc EMR, ESD, or surgery should be the techniques of choice in cases of suspected superficial invasive carcinoma. (Moderate-quality evidence; strong recommendation.)	Level I: Referral to a less resource-limited center, or if that is impossible, surgical resection. Endoscopic treatment without access to injection therapy or mechanical hemostasis is only recommend in emergency cases (bleeding.) Level II: Referral to a less resource-limited center, or if that is impossible, surgical resection. Endoscopic treatment without access to injection therapy or mechanical hemostasis is only recommend in emergency cases (bleeding). Level III: En bloc EMR or surgery.
16	ESD can be considered for removal of colonic and rectal lesions with high suspicion of superficial submucosal invasion and which otherwise cannot be removed en bloc by standard polypectomy or EMR. (Moderate-quality evidence; strong recommendation.)	Level I: Surgical resection. Level II: Surgical resection. Level III: Surgical resection.
18	ESGE recommends that endoscopic cure for lesions resected by EMR should be confirmed at surveillance colonoscopy by advanced endoscopic imaging and systematic biopsy. (Low-quality evidence; strong recommendation.)	Level I: Biopsy. Level II: Biopsy. Level III: No adjustment.
19	ESGE recommends that suspected residual or recurrent adenoma identified at surveillance colonoscopy is snare-resected within the same procedure. Where snare resection is not possible, ablation should be performed. (Moderate-quality evidence; strong recommendation.)	Level I: Referral to a less resource dependent center, or if that is impossible, consider surgical resection. Level II: Snare resection or referral to a less resource-limited center, or if that is impossible, consider surgical resection. Level III: No adjustment.
20	ESGE recommends the use of advanced endoscopic imaging to identify the potential presence of superficial submucosal invasion. (Moderate-quality evidence; strong recommendation.)	Level I: White light imaging. Level II: Standard chromoendoscopy. Level III: No adjustment.
21	ESGE suggests that when advanced imaging is not available, standard chromoendoscopy may be beneficial. (Moderate-quality evidence; strong recommendation.)	Level I: White light imaging. Level II: No adjustment. Level III: No adjustment.
22	ESGE recommends that polyps with advanced endoscopic imaging characteristics of deep submucosal invasion should not be considered for endoscopic treatment and should be referred for surgery. (Moderate-quality evidence; strong recommendation.)	Level I/II/III: No adjustment.
23	ESGE recommends that polyps without characteristics of deep submucosal invasion should not be referred for surgery without consultation with an expert endoscopy center for evaluation for polypectomy/EMR. (Low-quality evidence, strong recommendation.)	Level I: Referral to a less resource limited center, or if that is impossible, surgical resection. Level II: Referral to a less resource -limited center, or if that is impossible, surgical resection. Level III: No adjustment.
2.7 Colonic tattooing: which lesions should be tattooed, and what is the best technique and location for tattoo placement?		
24	ESGE recommends that lesions that may need to be located at future endoscopic or surgical procedures should be tattooed during colonoscopy. (Low-quality evidence, strong recommendation.)	Level I: Use India ink and careful description of the location of the lesion. Level II: Use India ink and careful description of the location of the lesion Level III: No adjustment.
25	ESGE recommends sterile carbon particle suspension as the preferred tattoo agent. (Low-quality evidence, strong recommendation.)	Level I: and careful description of the location of the lesion Level II: No adjustment. Level III: No adjustment.
<b>3. Endoscopic mucosal resection (EMR) for sessile laterally spreading lesions ≥ 20 mm in size</b>		
30	ESGE suggests the use of submucosal injectates for EMR that are more viscous than normal saline and whose safety has been proven, including succinylated gelatin, hydroxyethyl starch, or glycerol, since their use is associated with superior technical outcomes and reduced procedural time. (High-quality evidence; weak recommendation.)	Level I: Referral to a less resource- limited center, or if that is impossible, surgical resection. Level II: Use normal saline. Level III: No adjustment.
31	ESGE recommends that a biologically inert blue dye such as indigo carmine should be incorporated into the submucosal injection solution to facilitate identification of fluid cushion extent, lesion margins, and deep mural injury. (Moderate-quality evidence; strong recommendation.)	Level I/II/III: No adjustment.

► **Table 3** (Continuation)

	Original statements	Suggested modifications
35	ESGE suggests that where complete snare excision EMR has been achieved, the role of adjuvant thermal ablation of the EMR resection margins to prevent recurrence requires further study. (Low-quality evidence; weak recommendation.)	Level I/II/III: No adjustment.
36	ESGE recommends that when a lesion appears suitable for EMR, but does not lift with submucosal injection, referral should be made to an expert endoscopist in a tertiary center. (Moderate-quality evidence, strong recommendation.)	Level I/II/III: No adjustment
37	ESGE recommends that all EMR specimens be retrieved for histological evaluation. (Moderate-quality evidence; strong recommendation.)	Level I/II: no adjustment, where histological evaluation is available and affordable for patients; Level III: no adjustment
<b>4. Equipment considerations for polypectomy and EMR</b>		
4.1 Type of current		
38	ESGE suggests the use of a microprocessor-controlled electrocautery generator for polypectomy. (Low-quality evidence; weak recommendation.)	Level I/II/III: No adjustment
41	ESGE suggests the use of carbon dioxide (CO <sub>2</sub> ) insufflation during colonoscopy and polypectomy. (Low-quality evidence, strong recommendation.)	Level I/II: Use air for insufflation if CO <sub>2</sub> is not available; Level III: no adjustment
4.2 Carbon dioxide (CO <sub>2</sub> ) insufflation		
42	ESGE recommends the use of CO <sub>2</sub> insufflation for EMR. (Moderate-quality evidence; strong recommendation.)	Level I/II/III: Use air for insufflation if CO <sub>2</sub> is not available.
4.4 Fluid pump		
43	ESGE suggests the use of a fluid jet pump to enable efficient irrigation of the colonic mucosa and polypectomy sites and management of bleeding. (Low-quality evidence; weak recommendation.)	Level I: Manual water irrigation; Level II/III: No adjustment.
<b>5. Polypectomy-associated adverse events: definitions and management</b>		
5.1 Bleeding		
44	For intraprocedural bleeding, ESGE recommends endoscopic coagulation (snare-tip soft coagulation or coagulating forceps) or mechanical therapy, with or without the combined use of dilute adrenaline injection. (Low-quality evidence; strong recommendation.)	Level I: Adrenalin injection. Level II/III: No adjustment.
46	ESGE suggests that there may be a role for mechanical prophylaxis (e. g. clip closure of the mucosal defect) in certain high-risk cases after polypectomy or EMR. This decision must be individualized based on the patient's risk factors. (Low-quality evidence; weak recommendation.)	Level I: Referral to level II/III centers or to surgery. Level II: Attempt high-risk EMR only when all accessories and expertise are available. Otherwise refer to a less resource-limited centre or for surgery. Level III: No adjustment.
47	Patients admitted to hospital with delayed bleeding who are hemodynamically stable, without ongoing bleeding, may be initially managed conservatively. If intervention is required, ESGE recommends colonoscopy as the first-line investigation. (Moderate-quality evidence, strong recommendation.)	Level I/II/III: No adjustment
48	When the polypectomy site is identified during colonoscopy for post-polypectomy bleeding, and active bleeding or other high-risk stigmata are identified, ESGE recommends forceps coagulation or mechanical therapy, with or without the combined use of dilute adrenaline injection. (Moderate-quality evidence; strong recommendation.)	Level I: Adrenalin injection. Level II/III: No adjustment.
5.2 Prevention of perforation		
49	ESGE recommends careful inspection of the post-resection mucosal defect to identify features of or risk factors for impending perforation. Where these risk factors are identified, clip closure should be performed. (Moderate-quality evidence; strong recommendation.)	Level I: Clip closure if available. Level II/III: No adjustment.
5.3 Audit of adverse events		
50	ESGE recommends audit of adverse events. (Moderate-quality evidence; strong recommendation.)	Level I/II/III: No adjustment.

► **Table 3** (Continuation)

	Original statements	Suggested modifications
	<b>6. How is the histology specimen best managed and reported upon? Processing, analysis, and reporting (minimum reporting standards)</b>	
51	ESGE recommends that polypectomy specimens be placed in separate containers, one for each lesion. Local factors may play a role in whether this is feasible. Fixation should be by buffered 10% formalin. The pathologist should measure the size of each specimen in millimeters. (Moderate-quality evidence; strong recommendation.)	Level I/II/III: No adjustment.
	<b>7. Diagnosis of lesions in the adenoma-carcinoma sequence</b>	
	7.2 Histological findings that require further action	
57	The opinion of a second histopathologist may be warranted when reviewing high-risk features. (Low-quality evidence; weak recommendation.)	Level I/II/III: No adjustment.

## Competing interests

The authors declare that they have no conflict of interest.

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