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GUIDELINES

EAES rapid guideline: surgical management of complicated diverticulitis – with ESCP participation

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Abstract

Background The surgical management of complicated diverticulitis varies across Europe. EAES members prioritized this topic to be addressed by a clinical practice guideline through an online questionnaire.

Objective To develop evidence-informed clinical practice recommendations for key stakeholders involved in the treatment of complicated diverticulitis; to improve operative and perioperative outcomes, patient experience and quality of life through a systematic evidence-to-decision approach by a diverse, multidisciplinary panel.

Methods Informed by a linked individual participant data network meta-analysis of resection and primary anastomosis (PRA) versus Hartmann's resection (HR) versus laparoscopic lavage (LPL), a panel of general and colorectal surgeons, patient partners, trialists, and fellows appraised the certainty of the evidence using GRADE and CINeMA. The panel discussed the evidence using the evidence-to-decision framework during a synchronous consensus meeting. An asynchronous modified Delphi survey was used to establish consensus.

Results The panel suggests that patients with complicated diverticulitis without sepsis receive PRA over HR or LPL when there is availability of a surgeon with skills and experience in colorectal surgery. HR is suggested over PRA or LPL in the subgroups of septic, frail, as well as immunocompromised patients. These recommendations apply to patients with an indication for surgery. Surgeons and patients should first consider conditionally recommended interventions, then conditionally recommended against. Based on the evidence, the key benefit of PRA was a higher likelihood of not having a stoma at 1 year, with similar risks across comparisons. Conditional recommendations call for shared decision-making when considering management options. The full guideline with user-friendly decision aids is available in https://app.magicapp.org/#/guideline/7490.

Conclusion This clinical practice guideline provides evidence-informed recommendations on the management of patients with complicated diverticulitis in accordance with the highest methodological standards through a structured framework informed by an international, multidisciplinary panel of stakeholders.

Keywords Diverticulitis · Colorectal surgery · Minimally invasive surgery · Laparoscopic surgery · Guidelines

Colonic diverticulitis carries an important burden on the general population, with an estimated 23% prevalence of colonic diverticula and a mortality of 3% in patients admitted for diverticular disease [1]. The management of acute complicated diverticulitis is manifold and depends on disease and patient characteristics and available resources [2]. Many factors are considered in the decision-making process including disease stage, extent of inflammation, the number, location, and size of collections in cross-sectional imaging, the presence of sepsis, and patient characteristics and preferences [3]. The multitude of management options reflects the diversity of the disease and patient attributes.

Observational and randomized studies with head-to-head comparisons of competing interventions, such as open and laparoscopic Hartmann's resection (HR), laparoscopic peritoneal lavage (LPL), and primary resection

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and anastomosis (PRA), have aimed to provide insight into the benefits and harms of treatment options [3]. Available summary analyses have two primary limitations. First, outcome assessment at the study level usually cannot account for individual patient characteristics when the number of studies is small, typically fewer than 10 [4]. Furthermore, meta-regression may consider a limited number of factors for subgroup analyses, such as disease stage and the American Society of Anesthesiologists (ASA) class, if such subgroup data are available in a fair number of studies. Second, currently available evidence syntheses summarize outcomes in pairwise comparisons, which does not allow for concurrent appraisal of multiple interventions [5].

Practice guidelines on the management of acute diverticulitis provide recommendations on complicated diverticulitis informed by evidence with such limitations in summary analyses [3, 6–8]. The Guidelines Subcommittee of the European Association for Endoscopic Surgery (EAES) decided to address this gap of clinical practice recommendations informed by best available evidence. The decision was based upon quality appraisal of published guidelines and a survey of EAES members. For an outline of the process, please refer to https://eaes.eu/consensus-guideline-projects/. Thirty-nine percent (confidence interval, 33–45%) of EAES members prioritized a guideline on the management of complicated diverticulitis.

This rapid guideline aims to provide recommendations on the surgical management of patients with acute complicated diverticulitis of the left colon. The objective is to inform gastrointestinal, endoscopic, and general surgeons, gastroenterologists, interventional radiologists, other healthcare professionals, policymakers, and patients and to improve operative and perioperative outcomes, patient experience, and quality of life.

Methods

This project was developed by the EAES Guidelines Subcommittee with participation of the European Society of Coloproctology (ESCP). The guideline follows AGREE-S, GRADE, Institute of Medicine, Guidelines International Network (GIN), and Cochrane Rapid Reviews Methods Group development and reporting standards [9–13]. An AGREE-S reporting checklist is provided in Supplementary File 1. GRADE guidance published in a series of articles in the Journal of Clinical Epidemiology was consulted for up-to-date information. The process of guideline development was facilitated using MAGICapp, an online authoring and publication platform.

Steering group

The steering group consisted of two general surgeons who either performed (SAA) or have vast experience in laparoscopic colorectal surgery (HJB). A member of the steering group is a GIN-certified lead guideline developer and chair with vast experience in evidence outreach, synthesis, assessment, and guideline development (SAA; INGUIDE certification number: 2022-L3-V1-00014) [14]. Both steering group members declared no direct nor indirect conflicts [15]. Two trainee guideline methodologists supported the development of this guideline (BH, FMC). An experienced systematic reviewer coordinated the systematic review, data collection and risk of bias assessment, performed by two systematic reviewers, as detailed in the accompanying systematic review [16].

Guideline panel

The guideline panel consisted of 2 general and 4 colorectal surgeons whose colorectal surgery practice consists primarily of minimally invasive surgery, including two members from ESCP and 2 patient partners. One patient partner was a stoma care nurse with a research background, who has also participated in other guideline development projects. Another patient partner has lived experience of complicated diverticulitis. He experienced a first episode of diverticulitis with abscess that was initially treated conservatively. Because of an enlargement of the abscess, he was offered laparoscopic lavage or laparoscopic HR. He opted for the latter and had an uneventful postoperative course. During the process of guideline development, he was in the waiting list for Hartmann's reversal, which he received after the consensus meeting and before the Delphi survey. Both participated as panel members with equal participation and voting rights. The authors of randomized trials addressing the subject of this guideline participated as external advisors with no voting rights in the evidence-to-decision framework as per Guidelines International Network principles [17]. Facilitators of individual patient data collection participated as fellows with no voting rights or active participation in the evidence-to-decision framework.

Panel members watched a short video tutorial outlining the guideline development methodology. The composition of panel members aimed to be representative of different parts of Europe and different age groups. All panel members disclosed no direct nor indirect conflicts related to the topic of this guideline [15]. A member of the GRADE Working Group participated as an external auditor (SS).

The composition of the guideline development group and each member's role are available in the online appendix [15]. An external advisor (WB), a patient partner (JJ), a systematic reviewer (RA), a fellow (VH), and a trainee methodologist (FMC) could not participate in the consensus meeting, neither on-site, nor online. All other members of the guideline development group participated in the consensus meeting on site.

Health question

This guideline addresses the following healthcare question: Should Hartmann's resection (HR), primary resection and anastomosis (PRA), or laparoscopic peritoneal lavage (LPL) be used in the surgical management of acute complicated diverticulitis?

Subgroup questions aimed to address the use of these interventions in immunocompromised patients, frail patients, patients with sepsis, and patients with Hinchey class Ib, II, III, and IV. A subgroup question aimed to address the use of laparoscopy for the interventions HR and PRA.

This guideline refers to adult patients with acute complicated diverticulitis without obstruction, who are deemed fit for open or laparoscopic surgery, as specified in the recommendations. It refers to complicated diverticulitis (phlegmon, abscess, purulent or feculent peritonitis) without obstruction.

Target users

This work is intended to assist gastrointestinal, endoscopic, and general surgeons, gastroenterologists, interventional radiologists, other healthcare professionals, policymakers, and patients in the decision on the management of complicated diverticulitis. Patients may find the patient-specific version more useful, available as Supplementary File 2. This was developed via the paid version of ChatGPT-4.0 on June 16th, 2024 by uploading a copy of a previous guideline and accompanying patient-specific version, and asking ChatGPT to create a patient version of this guideline manuscript.

Definitions

This document uses the original Hinchey classification [18]:

- Hinchey I: localized abscess (para-colic)
- Hinchey II: pelvic abscess
- Hinchey III: purulent peritonitis
- Hinchey IV: feculent peritonitis

Primarily under consideration of the surgeon and patient perspective, this guideline uses a pragmatic intention-to-treat concept. Disease classification according to Hinchey is based upon intraoperative findings.

Protocol

A protocol was developed a priori by the steering group [15]. The protocol draft was made publicly available through the EAES website and EAES members were invited through email to comment on the content. The guideline question and outcomes of interest were refined in collaboration with the panel members and the external advisors. Amendments to the protocol with justifications are provided below.

Outcome selection and determination of utility values

The steering group drafted a list of potential outcomes. Panel members independently assessed the list of draft potential outcomes and could also propose additional outcomes for review. Panel members rated the importance of the full draft list of outcomes on a scale of 1 (limited importance) to 9 (critically important) using the GRADE scale to prioritize outcomes to be evaluated for key questions in our guideline [19]. We identified outcomes scored as "important" (score 4–6) and "critical" (score 7–9) for inclusion using the median score for each outcome, as no substantial variation was obtained among panel evaluations. The selection of additional outcomes was guided by placing emphasis on patient-important outcomes while adhering to Cochrane guidance in focusing on the most relevant outcomes for patients, clinicians, and policymakers [13].

Panel members also provided their judgements on the utility of each outcome. Utility represents an individual's health experience associated with a given outcome, with 0 being the worst possible health state/death, and 1 the best possible health state.

We presented questions in the following format: "What do you consider is the utility value of major postoperative complications (Clavien–Dindo $\geq$ 3b; e.g., reoperation, abdominal abscess requiring drainage)? Utility represents the strength for an individual's preference for a given outcome. Zero reflects states of health equivalent to death/worst imaginable health, and 1 reflects perfect health/best imaginable health." We selected the median utility value for each outcome unless there was significant variation in responses, in which case consensus was achieved in the in-person consensus meeting among panel members and external advisors.

Utility values were converted to absolute risk difference thresholds according to the equation Absolute Risk

Difference = [coefficient/(1—Utility)] * 1000. We used research-informed anchors as coefficients indicating trivial-to-small effect threshold (0.0135), small-to-moderate effect threshold (0.0321), and moderate-to-large effect threshold (0.0625). We obtained absolute risk thresholds for trivial/small, small/moderate, and moderate/large effects. Additionally, utility values were converted to coefficients according to the equation: Coefficient = Absolute Risk Difference * (1—Utility). We aggregated these values (positive and negative). The judgements on the effect sizes of each outcome informed discussions on the evidence-to-decision framework by comparing absolute risk differences to empirically derived absolute risk thresholds, and the net benefit or harm/burden using the aggregate coefficient compared to coefficient thresholds [20]. The outcomes were considered within a fully contextualized evidence-to-decision process [21].

We considered the importance of outcomes as follows:

- In-hospital or 30-day mortality: 8 – critical
- Major postoperative complications (30 days or in-hospital, Clavien–Dindo ≥ 3b; includes complications of any follow-up procedures): 7 – critical
- Having a stoma at 1 year: 6 – important
- Quality of life at 2 years: 6 – important
- Mortality at 1 year: 8 – critical
- Re-intervention at 2 years: 7 – important

In the consensus meeting, the guideline panel and the external advisors considered other interventions as important (which may not be captured by the outcome 'reintervention at 2 years'). After deliberations and online anonymous voting, the outcome 'reintervention at 2 years' encompassed Hartmann's reversal, any kind of stoma reversal, planned colonic resection after lavage, percutaneous drainage of intra-abdominal collection, any colonic resection for recurrent diverticulitis, repair of abdominal wall hernia, and adhesiolysis. The survey is listed in the online appendix [15]. This was for purposes of capturing all important outcomes in comparative effect estimates, rather than conceptual relevance of the term 'reinterventions' with the interventions encompassed therein.

The outcomes quality of life at 2 years, mortality at 1 year, and reintervention at 2 years were prioritized by panel members and external advisors. A detailed list of ratings, proposed, included, and excluded outcomes, with justification, is provided in the appendix [15].

We considered the following utility values:

- In-hospital or 30-day mortality: 0 (corresponding to decision thresholds of 14/32/63 per 1,000 for small/moderate/large effect)
- Major postoperative complications: 0.6 (corresponding to decision thresholds of 34/80/156 per 1,000 for small/moderate/large effect)
- Having a stoma at 1 year: 0.6 (corresponding to decision thresholds of 34/80/156 per 1,000 for small/moderate/large effect)
- Quality of life at 2 years: not applicable
- Mortality at 1 year: 0 (corresponding to decision thresholds of 14/32/63 per 1,000 for small/moderate/large effect)
- Reintervention at 2 years: 0.6 (corresponding to decision thresholds of 34/80/156 per 1,000 for small/moderate/large effect)

A detailed list of utility values voted for by panel members and external advisors is provided in the appendix [15].

Systematic review

The methodology applied in the development of the systematic review and individual participant data network meta-analysis is reported in the accompanying publication.

GRADE summary of findings

We assessed the certainty of evidence from the network meta-analysis using the GRADE approach [22]. The methodology team assessed the certainty of the evidence for five domains: risk of bias, publication bias, indirectness, inconsistency, imprecision, and publication bias.

We used the CINeMA platform to summarize the risk of bias contributed by each study to the network for each outcome, and the overall risk of within study bias was determined by the highest proportion of risk of bias contributed to the network [23].

We assessed indirectness based on differences in characteristics in populations, settings, and interventions between the source studies and those referred to in this guideline. We rated down the certainty of evidence by one or two levels if substantial unexplained incoherence was found. The methodology team used minimal important differences for each outcome, calculated by transforming a priori set utility values by the guideline panel, to make judgments regarding imprecision. We used these assessments to separately assign a certainty rating of high, moderate, low, or very low for each pairwise comparison for a given outcome, illustrated with the use of GRADE evidence profiles using MAGICapp.

Evidence-to-decision framework

The steering group provided the panel with GRADE evidence summaries and supporting material one week prior to a synchronous consensus meeting, held in-person. The meeting began with a detailed presentation of the guideline development methodology. The panel then discussed concerns surrounding the evidence summaries as well as the evidence-to-decision framework and resolved disagreements by consensus [17].

We used the evidence-to-decision framework to develop recommendations by considering the following factors [24]:

- Benefits and harms of the intervention
- Certainty of the evidence
- Values and preferences of patients and healthcare providers
- Resources required
- Acceptability of the intervention
- Feasibility of implementing the intervention
- Equity

External advisors participated in discussions but were not permitted to make judgements about the evidence-to-decision domains. Following the consensus meeting, panel members participated in an online voting on the direction and strength of the recommendations and had the opportunity to suggest modifications to existing recommendations according to the GRADE methodology [25]. We considered consensus as agreement among > 80% of panel members, if after exhaustive deliberations no unanimous consensus was achieved.

Amendments to the protocol

We included six instead of seven general/colorectal surgeons in the panel, because we invited three additional non-panel members: two fellows and an external advisor. This was done primarily for logistical reasons, because experiential evidence suggests that smaller groups are more effective, and the extended panel (guideline panel and external advisors) should comprise 10–12 members per the INGUIDE Guideline Methodologist Certification Course. The panel and external advisors provided their collective judgment on the importance and determined utility values of additional prioritized outcomes (beyond the structured online prioritization process) after deliberations during the on-site consensus meeting. The outcome 'reintervention at 2 years' encompassed Hartmann's reversal, any kind of stoma reversal, planned colonic resection after lavage, percutaneous drainage of intra-abdominal collection, any colonic resection for recurrent diverticulitis, repair of abdominal wall hernia, and adhesiolysis, based on the panel's and external advisors' suggestion, to capture patient-relevant outcomes.

Comparison-adjusted funnel plots and Egger's test for assessing funnel asymmetry were not conducted due to the limited number of studies (less than 10). Additionally, subgroup analyses for frailty, Hinchey class Ib, and II were not performed. Frailty data were unavailable in the individual participant data, while Hinchey class Ib and II were only observed in a small number of patients.

Comments from EAES members

A comment referred to the use of laparoscopic surgery, which is addressed in the protocol. Another comment highlighted that in a proportion of patients, laparoscopic lavage might not be the definitive treatment due to high risk of recurrent diverticulitis and that the comparison with other interventions might not be appropriate. The panel considered that, for a significant proportion of patients who had laparoscopic lavage, resection will be proposed and performed. Analyses of mortality and perioperative morbidity in this guideline considered both the primary and any additional procedures required for recurrent diverticulitis. Further, we added the outcome 'reinterventions' per the EAES members' and panel members' suggestion. Another EAES member suggested including an interventional radiologist in the panel. The guideline development group considered this as a pragmatic limitation. To address this, panel members and external advisors invited an interventional radiologist and a gastroenterologist and they provided their comments to the content. Another member asked for specification of the follow-up of each outcome; however, this could not be specified at the protocol stage, because it should be a consensus decision among panel members and external advisors. Two members asked for addressing elderly patients; however, we consider that the concept of frailty might capture contemporary healthcare questions. Nevertheless, such information was not available in the source studies.

Results

We found 14 reports of seven randomized trials [26–39]. All studies were conducted in Europe and in European populations.

We collected full individual participant data from the LADIES trial (DIVA and LOLA; n = 196), the DIVERTI trial (n = 102), the Swiss trial (n = 62), the Italian trial (n = 90), and the SCANDIV trial (n = 145). We could not collect data from the DILALA trial (n = 83; due to no availability of the data). Collected data accounted for 88%% (595 out of 678) of the total.

Subgroup analyses

We found no sufficient data on frailty, and the group decided that it may not be appropriate to use age as surrogate variable. Relevant recommendations considered indirect evidence from the network and empirical evidence from the panel members and external advisors. Similarly, no sufficient evidence was available for immunocompromised patients, patients with sepsis, and patients operated on with laparoscopic surgery.

Delphi survey

The panel reached a consensus after 2 rounds of Delphi. The consensus was unanimous for all recommendations, except recommendation number 3, which was approved with 86% (6 out of 7 panel members) agreement. The evidence tables are available in Supplementary File 3. The summary of evidence-to-decision considerations is summarized in Table 1. Evidence-Informed Recommendations are illustrated in Box 1.

Box 1: Recommendations for the Surgical Management of Diverticulitis

1. In patients with complicated diverticulitis without sepsis, we suggest sigmoid resection with primary anastomosis, with or without diverting ileostomy, over Hartmann's resection or laparoscopic peritoneal lavage, if there is availability of a surgeon with skills and experience in colorectal surgery. Conditional recommendation, low certainty of evidence:

This recommendation refers to minimally invasive and open surgery, depending on the surgeon's experience and skills.

The definition of sepsis in the above recommendation refers to the Sepsis-3 criteria [40].

2. In patients with complicated diverticulitis without sepsis, we suggest Hartmann's resection over sigmoid resection with primary anastomosis or laparoscopic peritoneal lavage, if there is no availability of a surgeon with skills and experience in colorectal surgery. Conditional recommendation, low certainty of evidence:

This recommendation refers to minimally invasive and open surgery, depending on the surgeon's experience and skills.

The definition of sepsis in the above recommendation refers to the Sepsis-3 criteria [40].

3. In patients with complicated diverticulitis with sepsis, we suggest Hartmann's resection over sigmoid resection with primary anastomosis or laparoscopic peritoneal lavage. Conditional recommendation, very low certainty of indirect evidence:

This recommendation refers to minimally invasive and open surgery, depending on the surgeon's experience and skills.

The definition of sepsis in the above recommendation refers to the Sepsis-3 criteria [40].

4. In frail patients with complicated diverticulitis, we suggest Hartmann's resection over sigmoid resection with primary anastomosis or laparoscopic peritoneal lavage. Conditional recommendation, very low certainty of indirect evidence:

This recommendation refers to minimally invasive and open surgery, depending on the surgeon's experience and skills.

5. In immunocompromised patients with complicated diverticulitis, we suggest Hartmann's resection over sigmoid resection with primary anastomosis or laparoscopic peritoneal lavage. Conditional recommendation, very low certainty of indirect evidence.

This recommendation refers to minimally invasive and open surgery, depending on the surgeon's experience and skills.

No specific recommendations apply for specific Hinchey classes, because subgroup data did not allow for plausible subgroup analyses.

Recommendation statements on specific patient subgroups (e.g., patients with sepsis) and laparoscopic surgery are based upon indirect evidence and discussion among the panel within the evidence-to-decision framework.

An alternative option in the presence of sepsis is the two-stage approach, which refers to damage-control surgery with resection of the affected bowel, lavage and abdominal vacuum therapy, stabilization of the patient and planned re-laparotomy, and potential establishment of bowel continuity [41]. *This option was not considered in the present guideline.*

A strong recommendation means that all or almost all properly informed stakeholders (patients, surgeons, allied healthcare professionals) would opt for the recommended course of action and only in exceptional cases, the recommendation may not be followed.

A conditional recommendation means that the majority of stakeholders (patients, surgeons, allied healthcare professionals), if properly informed, would opt for the recommended course of action. However, uncertainty in the evidence and/or variability in patient preferences and

Table 1 Summary of evidence-to-decision considerations. More details and a visual summary are available in https://app.magicapp.org/#/guideline/7490

Benefits and harms	**Research evidence** The panel noted consistent benefits for PRA across comparisons to HR and LPL. A lower risk of stoma was observed with PRA compared to HR at 1 year, while a lower risk of mortality was demonstrated with PRA compared to LPL. No significant harms were observed with PRA relative to the other two comparators **Additional considerations** Key evidence on quality of life was not available. Summary effects for individual outcomes and summary judgments on net benefit/harm do not account for the certainty of the evidence, which is addressed in the next domain No sufficient data were available to support conclusions based upon subgroup analyses. Judgments on net benefits/harms for patients with sepsis, frailty, and immunocompromised status were based upon indirect summary evidence from the study populations, as well as the experiential evidence of the panel With reference to PRA, the panel suggested that net benefits and harms depend on the surgeon's experience and skills in colorectal surgery For patients with sepsis, frailty, and immunocompromised status, the panel considered net benefit in favor of Hartmann's procedure For minimally invasive or open surgery, the panel suggested that net benefits and harms depend on the surgeon's experience and skills in colorectal surgery **Summary** The panel suggested that there is a net benefit for PRA among patients with complicated diverticulitis in reducing mortality and yielding a lower risk of having a stoma at 1 year. The harms with PRA are considered small when performed in the hands of a surgeon with experience and skills in colorectal surgery, compared to those observed with the alternatives of HR and LPL	Substantial net benefits of the recommended alternative
Certainty of the evidence	**Research evidence** The certainty of the evidence was considered to be low to very low across comparisons due to limited evidence on critical outcomes. The consistency of findings in sensitivity analyses increases our confidence in the effect estimates of primary analyses. The panel considered the global certainty of the network of evidence to be low to moderate **Summary** The overall certainty of the evidence was considered to be low to moderate	Low to moderate

Table 1 (continued)

Preferences and values	**Research evidence** A scoping search of the literature (search string ("diverticulitis" OR "diverticular disease") AND ("patient preference"[mh] OR preference[ti] OR preferences[ti])) search performed on April 10, 2024 did not identify relevant evidence on patient's values and preferences **Additional considerations** The panel noted that there would be no variability in patient values and preferences for perioperative mortality. However, there would likely be substantial variation in values and preferences for major complications, due to the wide spectrum of potential major complications Furthermore, summary data were presented that suggest that patients assign high utility ratings to having a stoma after receiving one, whether for malignant or benign reasons.[1] However, patients with diverticulitis often present emergently and may have inferior outcomes due to the placement of a stoma without the involvement of a stoma nurse. Many of the panel members also still felt that patients would vary in their preferences prior to receiving a stoma, and thus the panel anticipated substantial variability across the outcomes studied here **Summary** The panel concluded that substantial variability is expected across the outcomes studied here due to the diversity in potential major complications, as well as the emergent nature of stoma placement	Substantial variability is expected or uncertain
Resources	**Research evidence** Three recent articles were found providing guidance on the use of resources among comparisons Overall mean costs per patient have been shown to be lower among patients receiving PRA compared to HR by a mean difference of €–8126 (–14.660 to –1592), with an incremental cost-effectiveness of €–39.094 (95% bias-corrected and accelerated confidence interval –1213 to –116).[2] Among patients receiving LPL compared to HR, the difference in mean cost per patient was found to be lower by €–8.983 (95% confidence interval –16.232 to –1735) at 12 months and by €–19.794 (95% confidence interval –34.657 to –4.931) through a patient's lifetime.[3] No cost data was found comparing PRA to LPL. Total costs were found to be lower with LPL compared to sigmoid resection (encompassing HR & PRA) with a mean difference of € – 3.512, 95% bias-corrected and accelerated confidence interval – 16.020 to 8.149. Stoma reversal increased costs in the sigmoid resection group, while surgical reintervention increased costs in the LPL group.[4] **Summary** The panel surmised that no important differences in resource utilization would be observed with PRA and that there is some evidence that it may result in lower costs compared to the alternatives of HR & LPL	No important issues with the recommended alternative
Equity	**Research evidence** No evidence on equity was identified **Additional considerations** The panel suggested that there is likely minimal variation in the effectiveness and access to care of the alternatives on population subgroups **Summary** The panel did not identify issues with equity among the alternatives	No important issues with the recommended alternative

Table 1 (continued)

Acceptability	**Research evidence** No evidence on acceptability was identified **Additional considerations** The panel agreed that both LPL and PRA were likely acceptable alternatives to HR. Current practice and cultural resistance to change likely do not pose barriers in this setting **Summary** The panel concluded that no variation in acceptability is anticipated	No important issues with the recommended alternative
Feasibility	**Research evidence** No evidence on feasibility was identified **Additional considerations** The panel suggested that there is likely minimal variation in the ability to perform the alternatives, though acknowledge that this may differ between institutions **Summary** No issues with feasibility were identified	No important issues with the recommended alternative

HR Hartmann's resection, *LPL* Laparoscopic peritoneal lavage, *PRA* Primary resection & anastomosis

surgeon's experience, expertise, and skills may call for joint decision-making.

Discussion

Implications for policy makers

Our international, multidisciplinary panel recommends PRA over HR or LPL among patients with complicated diverticulitis without sepsis. Policymakers must provide the infrastructure and incentive to facilitate this intervention. This may include justified financial billing codes in countries where this is applicable, as well as funding to cover surgeons and surgical trainees attending training courses or embarking on visiting fellowships in minimally invasive surgery and/or colorectal surgery. Healthcare institutions may consider offering around-the-clock colorectal service in regions with high prevalence of diverticulitis.

Implications for healthcare professionals

Surgeons and surgical trainees must be alert to the relative benefits of PRA over HR or LPL in the treatment of patients with complicated diverticulitis without sepsis. These clinicians are encouraged to secure additional training in the absence of the skills necessary to perform this intervention or ensure that patient access to PRA is available through other means at their respective institutions. Surgeons and anesthetists must work collaboratively to decide on the use of HR versus PRA when identifying patients with sepsis or among immunocompromised patients.

Implications for patients

Collaborative, patient-centered decision-making is encouraged across all settings, as the importance placed on the quality of life with or without a stoma versus the risks and benefits of these interventions in the context of their values may differ among patients. Absolute risks of having a stoma at 1 year after index surgery and other decision aids are available on MAGICapp [https://app.magicapp.org/#/guideline/7490]. Surgeons may use these decision aids when discussing the comparative risks of different interventions with patients to help convey the frequency at which these risks occur. Specifically, for any given comparison of interventions, the decision aids display the numbers needed to treat in diaphragmatic format for a given outcome. These are available in Supplementary Files 4, 5, and 6.

Moreover, patients may access the patient version of this guideline in Supplementary File 2. Patients may look toward the summary of the key points of the guideline to help them prepare with upcoming appointments with their gastrointestinal surgeon. The section "questions to ask your surgeon" is meant to probe and trigger patients to think more deeply about their health, values, and goals prior to discussing

surgical management of their complicated diverticulitis with their surgeon.

Implications for researchers

The following evidence gaps have been identified:

- Comparative evidence on the risks, benefits, and cost-effectiveness in frail patients receiving PRA, HR, and LPL for complicated diverticulitis—multicenter-matched cohort studies.
- Comparative evidence on the risks, benefits, and cost-effectiveness in immunocompromised patients receiving PRA, HR, and LPL for complicated diverticulitis—multicenter-matched cohort studies.
- Patient values and preferences in the quality of life with a stoma in the setting of acute as well as elective surgical repair of complicated diverticulitis—patient surveys and focus groups.

Barriers and facilitators

Resistance to change may be mitigated by embracing a culture of evidence-informed practice, starting with a top-down approach from leaders in surgical divisions across institutions. Availability of surgeons with sufficient skills and expertise in colorectal surgery to perform PRA can be improved by the increased availability and financial accessibility of training courses and visiting fellowships in both minimally invasive surgery and the technique of PRA for surgeons and surgical trainees, facilitated by financial support by policy makers. Patient-centered decision aids such as the one included in this guideline may help enable patients to engage in decisions about their treatment.

Monitoring

Use of the guideline will be monitored through engagement with EAES members through an online questionnaire within three years of publication. Additionally, use of the guideline will be monitored through the online traffic recorded by the journal of publication. Feedback from target users in the form of email communication, publications, and engagement on social media will be documented to inform future iterations of this guideline. We advise to monitor the implementation of this intervention at all respective institutions and to establish clinical outcomes among surgeons at all institutions for the purpose of quality improvement.

Validity period

Given that seven trials have been conducted in this field in the last few decades, we do not anticipate that new trials will substantially impact the evidence available for the comparison of PRA to HR and LPL over the next 7 years. This document is valid until December 2031.

Update

This guideline is planned to be updated within 2031, unless substantial new evidence will be published earlier.

Conclusion

Evidence-informed recommendations by an international, multidisciplinary panel of key stakeholders developed by EAES in collaboration with ESCP will guide treatment decisions among patients with complicated diverticulitis across Europe.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s00464-024-11445-y.

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Declarations

Disclaimers This clinical practice guideline has been developed under the auspice of the European Association for Endoscopic Surgery (EAES). It is intended to be used primarily by health professionals (e.g., surgeons, anesthetists, physicians) and to assist in making informed clinical decisions on diagnostic measures and therapeutic management. It is also intended to inform individual practice of allied health professionals (e.g., surgical nurses, dieticians, physical rehabilitation therapists, psychologists); to inform strategic planning and resource management by health care authorities (e.g., regional and national authorities, health care institutions, hospital administration authorities); and to inform patients wishing to obtain an overview of the condition of interest and its management. The use of recommendations contained herein must be informed by supporting evidence accompanying each recommendation and by research evidence that might not have been published by the time of writing the present document. Users must thus base their actions informed by newly published evidence at any given point in time. The information in the guideline should not be relied upon as being complete or accurate, nor should it be considered as inclusive of all proper treatments or methods of care or as a statement of the standard of care. With the rapid development of scientific knowledge, new evidence may emerge between the time the guideline is developed and when it is published or read. The guideline is not continually updated and may not reflect the most recent evidence. The guideline addresses only the topics specifically identified therein and is not applicable to other interventions, diseases, or stages of diseases. This guideline does not mandate any particular course

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Disclosures Stavros A. Antoniou, Bright Huo, Monica Ortenzi, Roi Anteby, Yegor Tryliskyy, Francesco Maria Carrano, Georgios Seitidis, Dimitris Mavridis, Vincent T. Hoek, Alberto Serventi, Willem A. Bemelman, Gian Andrea Binda, Rafael Duran, Triantafyllos Doulias, Nauzer Forbes, Nader K. Francis, Fabian Grass, Jesper Jensen, Marianne Krogsgaard, Lisa H. Massey, Luca Morelli, Christian E. Oberkofler, Dorin E. Popa, Johannes Kurt Schultz, Shahnaz Sultan, Jean-Jacques Tuech, and Hendrik Jaap Bonjer declare no direct conflicts of interest related to this work. Indirect conflicts of external advisors were documented and managed as per Guidelines International Network Standards. Detailed conflict of interest statements of all contributors can be found in the online appendix [15]. A patient version of this guideline is available in Supplementary File 2.

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