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Global practices and attitudes in acute appendicitis management: the PAMAP-W international survey and Delphi consensus study on the WSES appendicitis grading system

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Abstract

Background Despite the availability of several appendicitis grading systems and ongoing efforts toward standardization, substantial variability persists worldwide in the management of acute appendicitis. Differences are particularly evident in operative approach, stump closure, postoperative antibiotic use and duration, drainage, interval appendectomy after non operative management and follow-up strategies. The PAMAP-W project was designed as a sequential mixed-method study to explore real-world practice patterns and to develop grade-linked expert statements to support clinical and surgical decision-making.

Methods The study consisted of two complementary phases. First, an international cross-sectional web-based survey was conducted among surgeons involved in emergency and acute care surgery to assess practices and attitudes regarding appendicitis severity classification and grade-linked management. The questionnaire explored demographics, surgical approach, appendiceal stump management, intra-abdominal lavage and drainage, postoperative antibiotic therapy, and follow-up strategies according to acute appendicitis severity. Second, a Delphi consensus process involving an international expert panel was carried out to review and refine candidate grade-linked management statements derived from areas of heterogeneity identified in the survey. Consensus thresholds were predefined for each Delphi round.

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Results A total of 467 surgeons from 64 countries completed the survey, providing an international snapshot of contemporary appendicitis management. Laparoscopy was the preferred approach across all grades, although increasing disease severity was associated with greater variability in operative choices and postoperative management. Considerable heterogeneity was observed in stump closure techniques, use of drainage, duration of antibiotic therapy, and follow-up strategies, particularly in complicated appendicitis. Fifty international experts were invited to participate in the Delphi process, 37 and 33 completed rounds 1 and 2, respectively. Most candidate statements achieved consensus after two rounds, resulting in a set of grade-linked expert statements intended to support more consistent interpretation and management of appendicitis severity.

Conclusions Marked international heterogeneity persists in the intraoperative and postoperative management of acute appendicitis, particularly in complicated disease. The PAMAP-W project combines real-world practice mapping with expert consensus refinement to support a pragmatic, grade-linked framework for clinical and surgical decision-making. The WSES Acute Appendicitis grading system is intended to complement, not replace, formal evidence-based recommendations. Further studies are needed to assess its reproducibility, implementation, and impact on clinical outcomes.

Keywords Acute appendicitis, Laparoscopy, Intraoperative grading, Delphi consensus, WSES grading, Global survey

Introduction

Acute appendicitis remains one of the most common surgical emergencies worldwide and requires timely, appropriate management to prevent complications. Despite its frequency and the availability of international guidelines, the management of acute appendicitis continues to vary across institutions and countries, reflecting persistent uncertainty regarding diagnostic pathways, operative strategies, postoperative care, and follow-up [1]. Laparoscopic appendectomy is one of the most commonly performed emergency surgical procedures worldwide, as reflected in large international studies such as CIAOW and POSAW [2, 3]. However, the distinction between uncomplicated and complicated appendicitis remain inconsistent, with considerable inter-observer variability in laparoscopic assessment and intraoperative classification [4]. In addition, the persistence of negative appendectomies highlights the need for more standardized diagnostic and management pathways [5, 6]. Variability is particularly evident in the choice between non-operative and operative treatment, the definition of complicated appendicitis, postoperative antibiotic strategies, use of drainage, interval appendectomy, and follow-up after conservative management.

Grading systems have an important role in surgical practice because they provide a structured language to describe disease severity, guide management, standardize reporting, and support comparison across studies. Over the years, the World Society of Emergency Surgery (WSES) has contributed substantially to the development of disease-specific guidelines and severity classifications aimed at improving consistency in emergency surgical care worldwide [7, 8]. In acute appendicitis, a standardized grading system based on objective clinical and intraoperative findings could help align treatment decisions with disease severity, improve reproducibility, and reduce unwarranted variation in practice.

Intraoperative classification is particularly relevant because operative findings may influence postoperative management, including antibiotic use, drainage, length of hospital stay, follow-up, and the need for additional investigations. Standardization has also become increasingly important in the artificial intelligence era, where reliable classification and structured datasets are essential for developing reproducible predictive models and decision-support tools. The absence of a universally adopted intraoperative grading system therefore limits not only clinical consistency but also the comparability of research findings.

Several grading systems have been developed to address the need for standardized classification of acute appendicitis as summarized in Table 1 [9–12]. These systems have shown the potential to reduce subjectivity, improve reproducibility, and link operative findings to disease severity. However, the 2020 WSES Jerusalem guidelines highlighted persistent variability in the definitions of uncomplicated and complicated appendicitis, uncertainty regarding intraoperative classification, and discordance between macroscopic and histopathological findings [13]. These limitations support the need for further refinement and for a pragmatic framework that can be applied consistently in real-world emergency surgical practice.

The Practices and Attitudes of Managing Acute Appendicitis Worldwide (PAMAP-W) survey was designed to address these gaps by mapping current global practices in the classification and management of acute appendicitis, focusing on the intraoperative grading system proposed by Gomes et al. [10]. The survey explored how emergency surgeons use disease severity to inform operative and postoperative decisions, including surgical approach,

Table 1 Different intraoperative grading systems of acute appendicitis

Scoring system	Year	Basis	Grades/key parameters	Key features	Validation/ outcomes
Laparoscopic Appendicitis Score (LAPP)	2013	Intraoperative findings	Appendiceal inflammation Presence of fecaliths Periappendiceal fluid Appendiceal perforation	Structured score for diagnosing and grading appendicitis during laparoscopy	Pilot study demonstrated high predictive value; requires further multicenter validation
AAST Grading System	2014	Clinical, imaging, endoscopic, operative, and pathological findings	*Grade I*: Mild *Grade II–IV*: Moderate to severe inflammation *Grade V*: Severe with critical complications	Covers multiple gastrointestinal emergencies, including appendicitis, to assess disease severity and predict outcomes	Strong correlation with surgical outcomes, complications, and length of hospital stay in both adult and pediatric populations
Gomes et al. Grading System endorsed by the World Society of Emergency Surgery (WSES)	2015	Laparoscopic findings	*Grade 0*: Normal appendix *Grade 1*: Inflamed appendix *Grade 2*: Necrosis *Grade 3*: Inflammatory tumor; abscess *Grade 4*: Diffuse peritonitis	Standardized grading system focusing on inflammation and complications to guide treatment and research	Facilitates uniformity in appendicitis research and treatment strategies globally
Sunshine Appendicitis Grading System (SAGS)	2017	Intraoperative findings and postoperative outcomes	Severity-based categories predicting risks of intra-abdominal collections and guiding antibiotic therapy	Simple and actionable classification for appendicitis severity	Demonstrated accuracy in predicting postoperative risks and optimizing antibiotic therapy

appendiceal stump management, lavage and drainage, postoperative antibiotic therapy, interval appendectomy, and follow-up strategies. By capturing real-world variation in practice, PAMAP-W provides the foundation for the proposed 2025 WSES Appendicitis Classification, a grade-linked framework intended to support more consistent decision-making across the clinical pathway, including both patients undergoing upfront surgery and selected complicated cases initially managed non-operatively.

Materials and methods

Study design and overall methodological framework

The PAMAP-W project was conceived as a sequential mixed-method study with two complementary phases. The first phase consisted of an international cross-sectional web-based survey designed to map contemporary practices and attitudes in the intraoperative and postoperative management of acute appendicitis. The second phase consisted of a Delphi consensus process aimed at refining and appraising grade-linked expert statements derived from areas of heterogeneity identified through the survey, as summarized in Supplementary Fig. 1.

The overall aim of the project was to explore how emergency surgeons currently interpret intraoperative appendicitis severity and translate it into management decisions, and then to refine pragmatic expert statements that could support more consistent grade-linked decision-making.

The survey phase was reported in accordance with the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) and the Consensus-Based Checklist for Reporting of Survey Studies (CROSS) [14–16].

Phase 1: International cross-sectional survey

Study objective

The primary objective of the survey phase was to describe current international practices and attitudes among emergency and acute care surgeons regarding the management of acute appendicitis according to disease severity. Particular attention was paid to operative approach, appendiceal stump management, abdominal lavage and drainage, postoperative antibiotic therapy, interval appendectomy, and follow-up strategies.

Target population and eligibility

The target population consisted of surgeons actively involved in the management of acute appendicitis in emergency and acute care settings. Surgeons working in academic, public, private, and mixed healthcare institutions were all eligible to participate. The survey was disseminated internationally through the WSES network with the aim of capturing a broad range of geographic, institutional, and professional backgrounds.

Survey development

The questionnaire was developed by the coordinating study team on the basis of the WSES/Gomes intraoperative grading framework for acute appendicitis [1, 10]. The initial survey instrument was designed to explore how intraoperative disease severity influenced surgeons' decisions across key management domains.

The final questionnaire consisted of 34 structured items, including multiple-choice questions, selected items assessed using a 5-point Likert scale anchored

from 1 ("totally disagree") to 5 ("totally agree") or from 1 ("never") to 5 ("always"), and a limited number of open-ended questions. It was organized into seven domains:

1. respondent demographics and professional background;
2. hospital setting and surgical experience;
3. intraoperative management according to appendicitis grade;
4. postoperative antibiotic strategies;
5. drainage and lavage practices;
6. interval appendectomy and follow-up after non-operative management;
7. attitudes toward intraoperative grading.

Content clarity and face validity were reviewed by experienced emergency surgeons within the coordinating group (FAZ, FC, CAG). The draft questionnaire then underwent pilot testing in a small sample of surgeons to identify ambiguities, refine wording, and improve usability before formal dissemination.

Survey administration

The final questionnaire was implemented using an online platform and distributed by email through WSES communication channels. The survey remained open from December 23, 2023, to December 31, 2024. Before accessing the questionnaire, participants received an invitation explaining the purpose of the study, the voluntary nature of participation, and the anonymous handling of responses. Reminder emails were circulated periodically through WSES channels during the study period in order to enhance participation.

Only completed responses were included in the final descriptive analysis. Data were stored in a password-protected database accessible to the coordinating investigator.

Definitions and grading framework used in the survey

To standardize interpretation across respondents, the survey adopted a modified WSES/Gomes appendicitis grading framework and grouped appendicitis into uncomplicated and complicated forms. The presence or absence of an appendicolith was not used as an independent criterion for grade assignment. When present, an intraluminal appendicolith did not, by itself, define complicated appendicitis. An extraluminal or free appendicolith indicates perforation, and the final grade should be assigned according to the associated abscess and the extent of peritoneal contamination [7, 8, 10, 17].

Uncomplicated appendicitis included:

Grade 0: macroscopically normal-looking appendix in the context of suspected appendicitis;
Grade 1: inflamed appendix without necrosis, perforation, abscess, or peritonitis.

Complicated appendicitis included:

Grade 2A: segmental non-perforated necrotizing appendicitis;
Grade 2B: necrosis involving the appendiceal base without perforation or abscess;
Grade 3A: appendiceal phlegmon, defined as an inflammatory mass involving the appendix and surrounding tissues without a drainable fluid collection;
Grade 3B: localized appendiceal abscess < 4 cm, defined as a walled-off periappendiceal fluid collection;
Grade 3C: localized appendiceal abscess > 4 cm;
Grade 4: localized appendiceal peritonitis, defined as free purulent or turbid fluid and inflammatory exudate confined to the right iliac fossa or adjacent pelvic recesses, without generalized contamination;
Grade 5: diffuse appendiceal peritonitis, defined as generalized purulent or fecal peritoneal contamination extending beyond the right lower quadrant.

For the purposes of the survey, the 4-cm threshold was adopted as a pragmatic operational cut-off to distinguish smaller from larger localized appendiceal abscesses. This threshold was extrapolated from the practical management approach commonly used in complicated diverticulitis, where abscess size may influence the choice between antibiotic treatment alone, percutaneous drainage, and surgery. Short-course postoperative antibiotic therapy was defined as a limited regimen tailored to disease severity, adequacy of source control, and clinical response, generally ranging from 24–72 hours in selected low-risk patients and up to 5 days in diffuse peritonitis after adequate source control.

These definitions were presented consistently throughout the survey and were maintained during the Delphi phase to preserve alignment between the descriptive and consensus-based components of the project.

Outcome domains explored in the survey

The survey explored surgeon-reported preferences across the following predefined domains: management of Grade 0 appendicitis; operative strategy across increasing disease severity; laparoscopic versus open approach; appendiceal stump closure technique; use of resection or stapled closure in advanced grades; abdominal lavage and drain placement; postoperative antibiotic duration

by grade; conservative treatment and interval appendectomy in phlegmon or abscess; and colonoscopic or clinical follow-up after non-operative management.

Statistical analysis of survey data

Survey data were analyzed using descriptive statistics only. Categorical variables were summarized as absolute frequencies and percentages. No inferential comparisons or multivariable analyses were planned, as the purpose of the survey phase was descriptive: to map real-world variation in management attitudes and practices rather than to test causal associations.

The response rate was calculated using the number of email addresses available in the WSES mailing list used for survey dissemination. Because the survey was anonymous and disseminated through a society-wide mailing list, a formal non-responder analysis was not feasible.

Phase 2: Delphi consensus process

Objective of the Delphi phase

The aim of the Delphi phase was to refine and appraise a set of grade-linked expert statements addressing management domains that emerged from the survey as heterogeneous, operationally relevant, or insufficiently standardized in real-world practice. The Delphi process was therefore conceived as a consensus complementary to the survey phase. It was not intended to provide outcome-based validation of a classification system, but rather to support a more structured operational interpretation of appendicitis severity grades across the clinical and surgical pathway.

Generation of candidate statements

After completion of the survey analysis, the coordinating group reviewed the descriptive findings and identified the key domains characterized by substantial practice variation or persistent uncertainty. These domains were then translated into candidate expert statements covering the principal intraoperative and postoperative decision-making areas linked to appendicitis severity.

Selection of Delphi panelists

The Delphi panel consisted of 50 international experts in emergency and acute care surgery, selected on the basis of recognized clinical and academic expertise in appendicitis management and prior involvement in the WSES scientific board for the 2025 update guidelines on the management of acute appendicitis.

The coordinating group drafted the statements and administered the Delphi process, whereas the broader expert panel provided the ratings.

Delphi procedure

The Delphi process was conducted in two consecutive rounds between 1 and 20 January 2025. In each round, panelists were asked to rate each candidate statement using a 5-point Likert scale, where 1 indicated strongly disagree, 2 disagree, 3 neutral, 4 agree, and 5 strongly agree.

After round 1, statements that did not reach the predefined consensus threshold were revised for wording and clarity on the basis of panel feedback and then resubmitted for round 2.

Consensus definition

Consensus was defined a priori as the proportion of panelists assigning a score of 4 or 5 to each statement. The predefined threshold for acceptance was ≥ 65% agreement in round 1 and ≥ 70% agreement in round 2. These thresholds were selected in advance to balance methodological rigor with the expected heterogeneity of an international expert panel addressing pragmatic intraoperative decisions in emergency surgery.

Statements reaching the predefined agreement threshold were considered to have achieved expert consensus. Statements that did not meet threshold after revision and second-round voting were not retained as final consensus statements.

Analysis of Delphi data

For each statement, the proportion of respondents selecting agreement scores of 4 or 5 was calculated. Delphi results were summarized descriptively for each round. The number of statements reaching consensus in round 1, the number revised, and the final number reaching consensus after round 2 were reported. Expert participation was recorded separately for each round.

Relationship between the survey and Delphi phases

The survey and Delphi components addressed different but closely related objectives within the same broader project. The survey provided an international descriptive map of current appendicitis management practices, whereas the Delphi phase refined expert statements in those areas where the survey revealed substantial heterogeneity or persistent uncertainty.

Ethics

Participation in both the survey and the Delphi process was voluntary. Responses were anonymized, and no patient-level data or personal identifiers were collected. The study was conducted within the scientific activities of the WSES. Confidentiality and anonymity were maintained throughout data collection and analysis.

Results

Phase 1. International survey findings

Respondent characteristics

A total of 467 emergency and acute care surgeons responded to the PAMAP-W survey. Seventy-eight percent were males. The mean age of participants was 41.7 years, with a median age of 40 years. The response rate was 31.1%. This rate was calculated based on the number of email addresses (1500) provided in the list supplied by the General Secretary of the WSES.

The PAMAP-W study collected responses from 467 surgeons across 64 countries in Europe, Asia, the Americas, Africa, and Oceania. The largest number of responses came from Italy (151/467, 32.3%), followed by the United Kingdom (55/467, 11.8%), Greece (51/467, 10.9%), Spain (27/467, 5.8%), Türkiye (17/467, 3.6%), and Malaysia (13/467, 2.8%) as shown in Table 2. Regarding professional position, 132 respondents (28.3%) were senior consultant surgeons, 116 (24.8%) were surgical residents, 88 (18.8%) were young consultant surgeons, 77 (16.5%) were attending surgeons, and 54 (11.6%) were department chiefs. The mean reported duration of work experience was 12.7 years (SD 9.9; range 0–43 years). Respondents practiced across a range of healthcare settings, including public hospitals, academic or university hospitals, private hospitals, and trauma centers, as shown in Fig. 1.

Overall patterns of appendicitis management across grades

Uncomplicated appendicitis (Grade 0–1) The majority of respondents (304/467; 65%) favor *performing appendectomy even when the appendix appears normal* (grade 0) during laparoscopy. Preservation of the appendix and treatment of other potential diseases is the second most common approach (95/467; 20.3%). A smaller proportion supports preservation with short-course antibiotic treatment (37/467; 7.9%) or without antibiotics, coupled with outpatient follow-up (31/467; 6.66%).

For stump closure in normal-looking appendices, the *Endoloop* is the preferred method (359/467; 76.9%), with alternatives such as metallic Endoclip, polymeric clip, and Endostapler less commonly used. Other methods account for only 1.9% (9/467) of responses.

In cases of simple inflamed appendicitis (grade1), *laparoscopic (multiport) appendectomy* is overwhelmingly preferred (373/467; 79.9%). Non-operative treatment with antibiotics is chosen by 15.8% (74/467), while laparotomy/McBurney incision (11/467; 2.4%) and SILS (9/467; 1.9%) are rarely selected. *Endoloop* is also the favored method for stump management in these cases (347/467; 74.3%), followed by polymeric non-resorbable clips (52/467; 11.1%), Endostapler suture (35/467; 7.5%), and surgical metallic Endoclip (25/467; 5.4%).

Table 2 Countries represented in the PAMAP study

Country	n	%
Italy	151	32.3
United Kingdom	55	11.8
Greece	51	10.9
Spain	27	5.8
Türkiye	17	3.6
Malaysia	13	2.8
India	11	2.4
Bulgaria	9	1.9
Russian Federation	8	1.7
United States	8	1.7
Brazil	7	1.5
France	7	1.5
Ukraine	7	1.5
Mexico	6	1.3
Australia	5	1.1
Romania	5	1.1
Colombia	4	0.9
Egypt	4	0.9
Germany	4	0.9
Portugal	4	0.9
Belarus	3	0.6
Serbia	3	0.6
Argentina	2	0.4
Croatia	2	0.4
Finland	2	0.4
Georgia	2	0.4
Iran	2	0.4
Ireland	2	0.4
Israel	2	0.4
Morocco	2	0.4
Netherlands	2	0.4
Nigeria	2	0.4
Poland	2	0.4
Saudi Arabia	2	0.4
South Africa	2	0.4
South Korea	2	0.4
Tunisia	2	0.4
Vietnam	2	0.4
Albania	1	0.2
Austria	1	0.2
Azerbaijan	1	0.2
Brunei Darussalam	1	0.2
Cuba	1	0.2
Cyprus	1	0.2
Czech Republic	1	0.2
Guinea-Bissau	1	0.2
Japan	1	0.2
Jordan	1	0.2
Luxembourg	1	0.2
Mauritius	1	0.2
Nepal	1	0.2
Pakistan	1	0.2
Paraguay	1	0.2

Table 2 (continued)

Qatar	1	0.2
Republic of Moldova	1	0.2
Senegal	1	0.2
Singapore	1	0.2
Slovakia	1	0.2
Sweden	1	0.2
Switzerland	1	0.2
Thailand	1	0.2
United Arab Emirates	1	0.2
Uruguay	1	0.2
Yemen	1	0.2
Total	**467**	**100.0**

Regarding antibiotics for simple inflamed appendicitis, a single preoperative dose is the most common practice (188/467;40.3%), followed by short 3 days course therapy (141/467; 30.2%) and 24-h administration (108/467; 23.1%). *Only 6.4% (30/467) of respondents opt not to administer antibiotics.*

Necrotic non-perforated appendicitis (Grade 2A-B) For segmental necrotizing appendicitis (Grade 2A), 92.5% (437/467) of respondents prefer urgent laparoscopic appendectomy (multiport). Open approaches such as McBurney's incision (17/467; 3.6%) and SILS (14/467; 3%) are less common, and non-operative treatment is rarely selected (4/467; 0.90%).

For necrotizing appendicitis involving the base (Grade 2B), urgent laparoscopic appendectomy (multiport) was chosen by 88.9% (415/467) of respondents. Open approaches, including McBurney's incision (27/467; 5.8%), midline incision (11/467; 2.4%), and SILS (11/467; 2.4%), were less frequent. *Non-operative treatment (0.4% 2/467) and other approaches (1/467; 0.2%) are rarely used.*

Laparoscopic endostapler with cecal segment resection (Napoleon's hat) is the preferred method for stump management in Grade 2B (286/467; 61.2%), followed by endosuture (80/467; 17.1%) and Endoloop (58/467; 12.4%). Polymeric non-resorbable clips (16/467; 3.4%) and surgical metallic Endoclips (7/467; 1.5%) are rarely employed.

Antibiotic administration for necrotizing appendicitis varies, with most respondents favouring a long-course therapy of 5–7 days (226/467;48.4%). Short-course therapy of three days is chosen by 37.9 (177/467) %, while fewer respondents prefer 24-h administration (46/467; 9.9%) or single-shot prophylaxis (18/467; 3.9%).

Phlegmon and appendicular abscess (Grade 3A-B-C) In cases of appendiceal phlegmon, in patients without organ dysfunction or fecalith (Grade 3A), the majority (265/467; 56.7%) of respondents prefer urgent laparoscopic appendectomy (multiport). Medical treatment followed by interval/delayed laparoscopic appendectomy was chosen by 22.1% (103/467), while purely medical treatment with antibiotics was 10.5% (49/467). Open approaches, including McBurney's incision (19/467; 4.1%) and midline incision (12/467; 2.6%), were less common.

Stump management for Grade 3A appendicitis was divided between Endoloop (176/467; 37.7%) and Endostapler suture with cecal segment resection (177/467; 37.9%). Laparoscopic suture (45/467; 9.6%) and polymeric non-resorbable clips (30/467; 6.4%) were less frequently selected. Surgical metallic Endoclips were rarely used (14/467; 3%), while individualized or rarely used techniques were 2.5%.

For appendiceal abscesses < 4 cm (Grade 3B), laparoscopic multiport surgery was preferred by 57.4% (268/467) of respondents. Antibiotics with percutaneous drainage (75/467; 16.1%) and antibiotics with observation (72/467; 15.4%) were also notable options, while open approaches such as McBurney incision (28/467; 6%) and midline laparotomy (24/467; 5.1%) were less common.

For abscesses > 4 cm without fecalith (Grade 3C), urgent laparoscopic appendectomy was the most common approach (199/467; 42.6%), followed by antibiotics with percutaneous drainage (116/467; 24.8%) and antibiotics with interim appendectomy (112/467; 24%). Urgent laparotomic appendectomy (32/467; 6.9%) and antibiotics with observation (8/467; 1.7%) were less frequently selected.

The majority of respondents (78.8%; 368/467) favored the laparoscopic multiport approach for appendiceal abscess > 4 cm. Open midline laparotomy (12.6%; 59/467), McBurney incision (32/467; 6.9%), and SILS (8/467; 1.7%) were less frequently chosen. The primary reason for conversion to open surgery in severe appendicitis was difficult dissection or appendix base identification (290/467; 62.1%). Diffuse peritonitis and adhesions accounted for 20.3% (95/467), while iatrogenic injury (40/467; 8.6%), retrocecal appendicitis (12/467; 2.6%), and bleeding (9/467; 1.9%) were less frequent.

Colonoscopy practices in non-operative management (Grades 3A, B, C) When choosing non-operative management for acute appendicitis graded as 3A, B, or C, 42.2% of respondents (197/467) routinely perform colonoscopy in all adult patients aged≥40 years, according to the WSES 2020 appendicitis management guidelines [1]. Selective colonoscopy based on individual patient risk factors is practiced by 23.1% (108/467) of respondents. Meanwhile, 21.2% (99/467) do not routinely perform colonoscopy, and 7.9% (37/467) never perform it in these cases. A smaller group (5.6%; 26/467) reported rarely conducting colonoscopy under these circumstances.

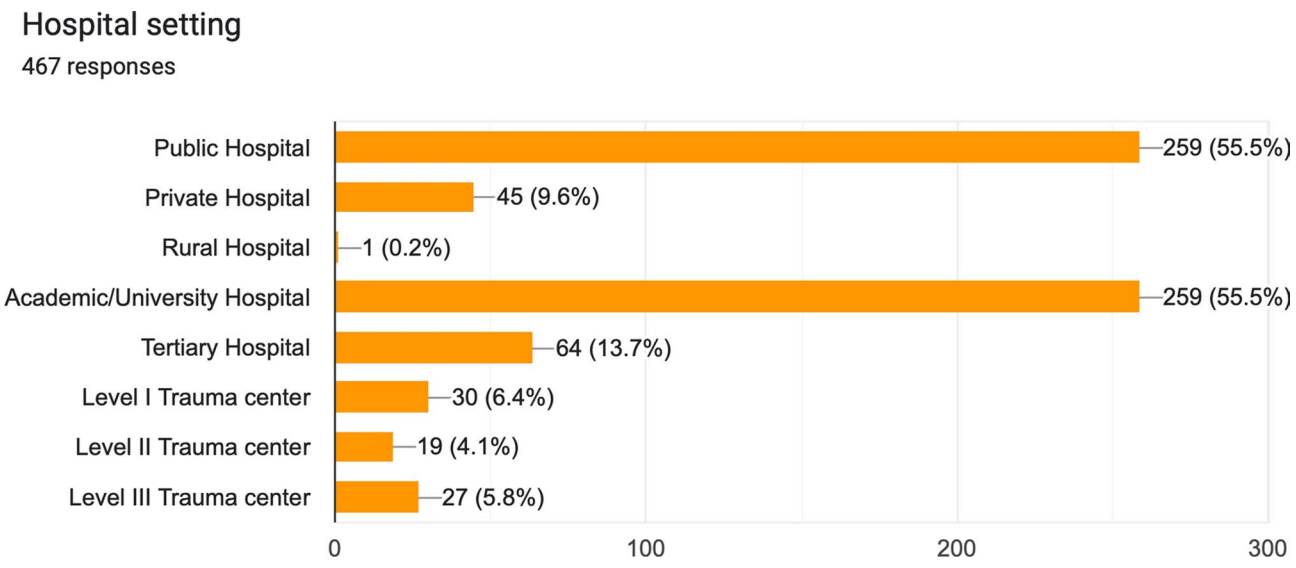

Fig. 1 PAMAP-W hospital settings

Timing of interval appendectomy Regarding the timing of interval appendectomy after medical treatment for complicated appendicitis, 34.3% of respondents reported performing the procedure at 6–12 weeks. Routine interval appendectomy was not performed by 21.6% (101/467), while 17.3% (81/467) of respondents prefer a timing of 3–6 weeks, and 14.8% (69/467) opt for > 12 weeks. Only 4.1% (19/467) perform interval appendectomy within 1–3 weeks. Additionally, 7.9% (37/467) of respondents manage all cases of recurrence with immediate surgical intervention.

Colonoscopy before interval appendectomy Before interval appendectomy, 34.5% (161/467) of respondents selectively require a colonoscopy for their patients, often according on age, while 27.2% (127/467) routinely conduct colonoscopy in all adult patients. Among the remaining respondents, 13.5% (63/467) do not perform routine interval appendectomy, and 13.5% (63/467) do not routinely request colonoscopy. Less frequent responses included rarely (3.6%; 17/467) or never (3.4%; 16/467) performing colonoscopy before interval appendectomy. A small proportion (4.3%; 20/467) manage all cases of recurrence of appendicitis surgically without conducting a colonoscopy.

Localised peritonitis (Grade 4) In the management of localised peritonitis following laparoscopic appendectomy for severe inflammatory appendicitis, practices among respondents showed significant variability. A majority (29.3%; 118/403) of respondents indicated they always wash the abdominal cavity in such cases. The second most common response was "sometimes," chosen by 19.1% (77/403) of participants (Fig. 2). Additionally, 34.5% (161/467) reported “always” draining the cavity, while 27.2% (127/467) selected "sometimes." A small minority (4.5–21/467) of respondents stated they never drain the abdominal cavity under these circumstances. Regarding postoperative antibiotic administration for appendiceal abscesses, nearly half of respondents (49.5–231/467) use a course of 5–7 days, while 23.3% (109/467) use a course of 7–10 days. Twenty-one (21) % of respondents (99/467) prefer a shorter duration of 3–5 days, with only 3.6% (17/467) selecting 0–3 days. Longer durations exceeding 10 days were chosen by just 2.4% (11/467).

Diffuse peritonitis (Grade 5) Urgent laparoscopic appendectomy (multiport) is the standard approach for appendiceal peritonitis, for 73.9% (345/467) of respondents. Urgent laparotomic appendectomy (midline incision) is chosen by 19.5% (91/467), while SILS (17/467; 3.6%) and McBurney incision (14/467; 3%) are rarely performed. The main contraindication to the laparoscopic approach was the hemodynamic instability of the patient as shown in Fig. 3.

As shown in the Fig. 4, 71.7% (289/403) of respondents used to wash the peritoneal cavity in presence of a diffuse peritonitis.

Normal saline is the preferred solution for peritoneal washing in diffuse peritonitis (90.6%). Other solutions, including saline with povidone iodine (27/403; 6.7%) and saline with antibiotics (6/403; 1.5%), were less common. Most respondents (58.3%; 235/403) always drain the abdominal cavity in cases of diffuse peritonitis. Fewer opt for drainage most of the time (15.6%; 63/403) or usually (12.4%; 50/403). A minority report draining only sometimes (8.9%; 36/403) or never (4.7%; 19/403). Antibiotic administration for diffuse appendiceal peritonitis

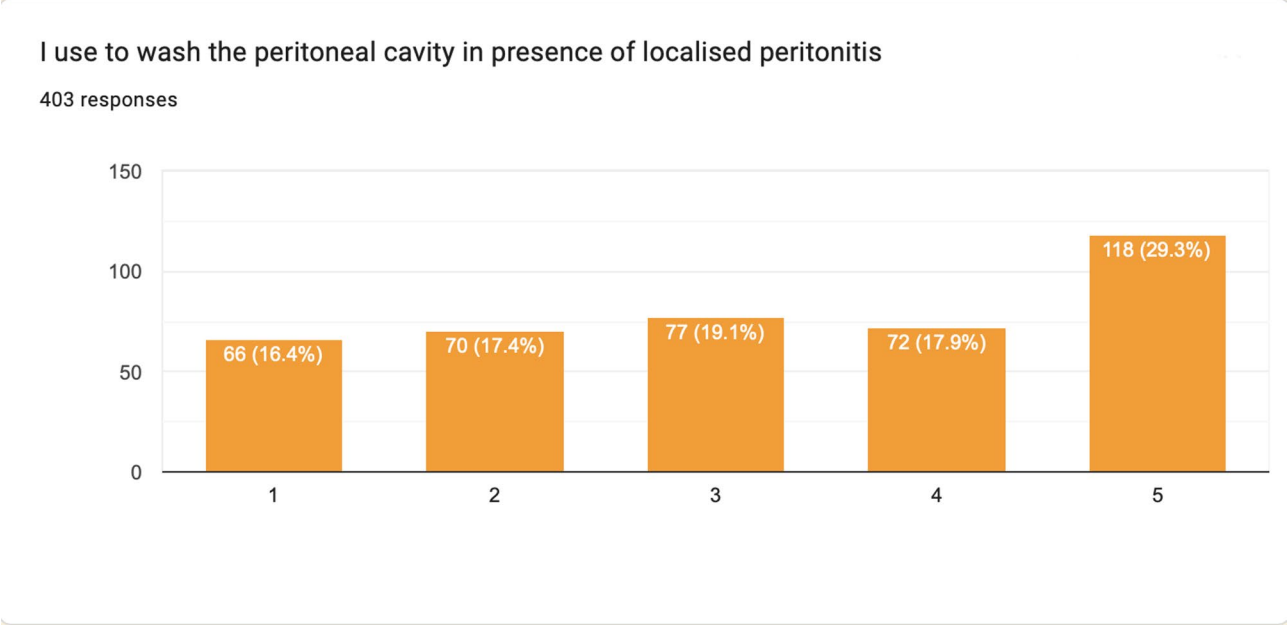

Fig. 2 The "habit" of washing the abdominal cavity in localised appendicitis

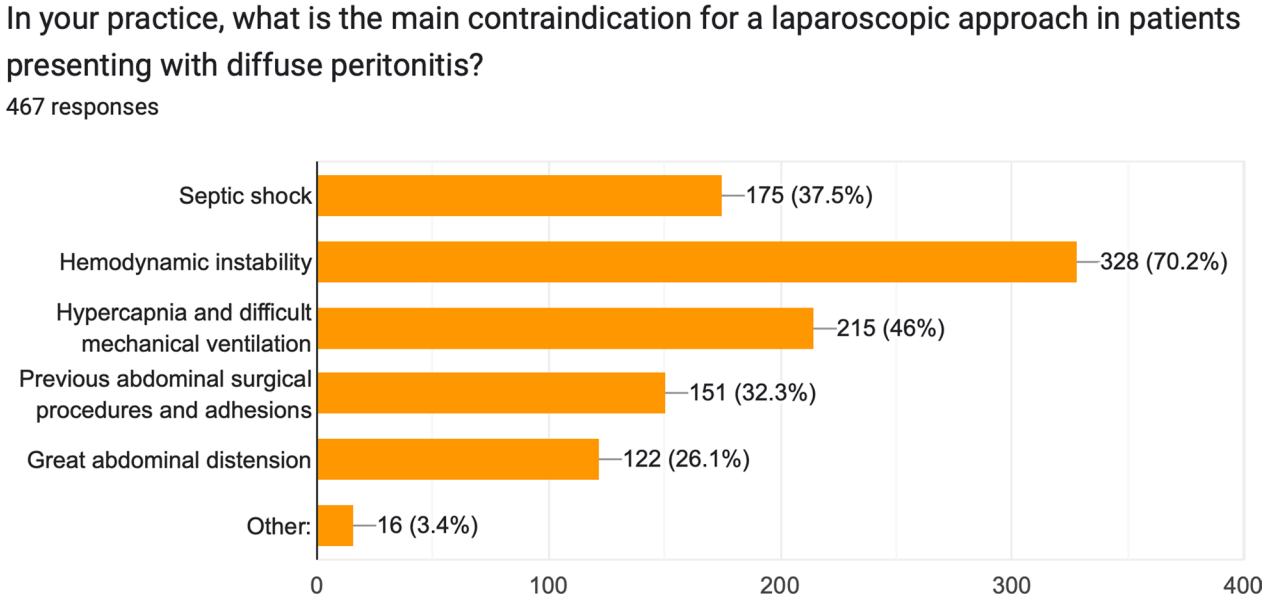

Fig. 3 Main contraindications to the laparoscopic approach

typically spans 7–10 days (41.8%; 195/467) or 5–7 days (38%; 178/467). Shorter durations (3–5 days) are chosen by 10.5% (49/467), while > 10 days is selected by 8.8% (41/467).

Antibiotic use For simple inflamed appendicitis (Grade 1), almost all surgeons (437/467; 93.6%) reported administering peri-operative antibiotics, most commonly as a single-shot prophylaxis (188/467; 40.3%) or for 24 h (108/467; 23.1%). A further 141/467 (30.2%) extended coverage to 3 days, whereas only 30/467 (6.4%) stated that they never prescribe antibiotics for this grade.

In necrotising, non-perforated appendicitis (Grades 2A–2B), 403/467 (86.3%) respondents prescribed antibiotics for at least 3 days. A long course of 5–7 days remained the most common choice (226/467; 48.4%), while 177/467 (37.9%) favored 3-day short-course therapy; only 64 (13.7%) limited treatment to ≤ 24 h.

After surgery for appendiceal abscess (Grades 3A–3C), prolonged treatment predominated: 231/467 (49.5%) continued antibiotics for 5–7 days, and 109/467 (23.3%)

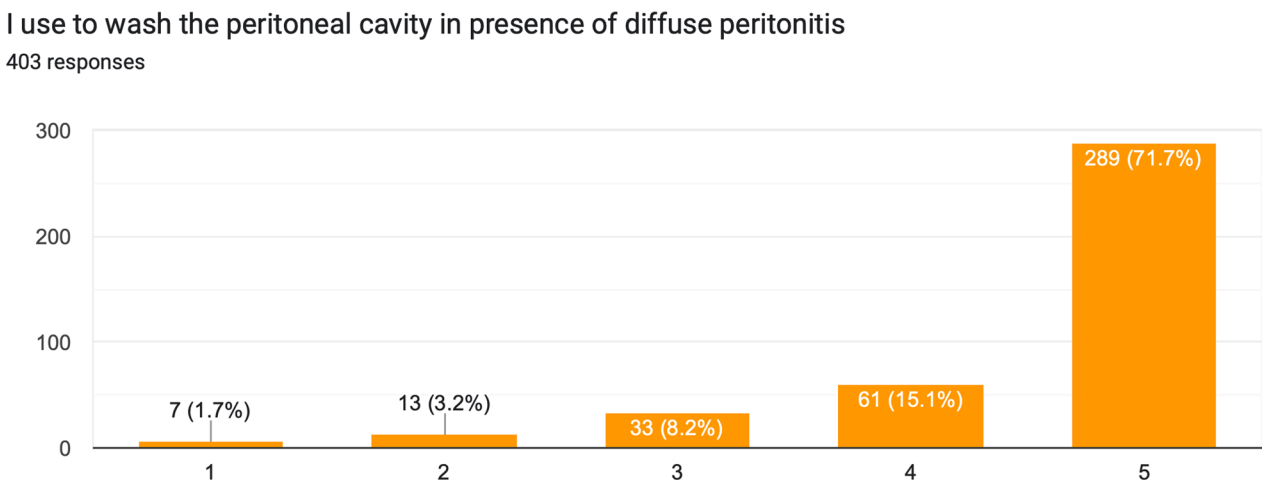

Fig. 4 The "habit" of washing the abdominal cavity in diffuse peritonitis

Table 3 Antibiotic use according to the WSES acute appendicitis grading

WSES grade	Question	Most frequent responses (n [%])
Grade 1—Simple inflamed	"Do you administer antibiotics for patients with simple inflamed appendicitis?"	**Single-shot prophylaxis 188/467 (40.3%)**; for 24 hrs 108/467 (23.1%); 3 days antibiotic therapy 141/467 (30.2%); No 30/467 (6.4%)
Grade 2A–2B—Necrotising, non-perforated	"How do you administer antibiotics in necrotising appendicitis?"	**antibiotic treatment-long course (5–7 days)226/467 (48.4%)**; antibiotic treatment-short course (3 days) 177/467 (37.9%); antibiotic treatment during 24 hrs 46/467 (9.9%); Single shot antibiotic prophylaxis 18/467 (3.8%)
Grade 3A–3C—Appendiceal abscess after surgery	"For how many days do you administer antibiotics in patients presenting with appendiceal abscesses after surgery?"	**5–7 days 231/467 (49.5%)**; 7–10 days 109/467 (23.3%); 3–5 days 99/467 (21.2%); 0–3 days 17/467 (3.6%); > 10 days 11/467 (2.4%)
Grade 4–5—Appendiceal (localised and diffuse) peritonitis	"For how many days do you administer antibiotics in patients presenting with diffuse appendiceal peritonitis after emergency surgery?"	**7–10 days 195/467 (41.8%)**; 5–7 days 178/467 (38.1%); 3–5 days 49/467 (10.5%); > 10 days 41/467 (8.8%); 1–3 days 4 (0.9%)

Bold indicates the most significant outcomes about the use of antibiotics for acute appendicitis

for 7–10 days. One-fifth (99/467; 21.2%) applied 3–5-day courses, and only 6% used shorter or extended (> 10 days) regimens.

In diffuse appendiceal peritonitis (Grades 4–5), the trend toward longer therapy was even more evident. Most respondents (373/467; 79.9%) administered antibiotics for ≥ 5 days, with 195/467 (41.8%) prescribing 7–10 days and 178/467 (38.1%) 5–7 days. Short-course regimens (3–5 days) were reported by only 49/467 (10.5%) surgeons, and very short courses (≤ 3 days) by 4/467 (0.9%).

Main data are summarised in Table 3 and Fig. 5.

Statements were considered accepted if ≥ 65% of respondents rated 4 or 5 on the Likert scale.

Perspectives Forty-four percent (205/467) of respondents totally agree that the updated WSES appendicitis classification could aid in managing acute appendicitis. Partial agreement (31.9%; 149/467) and neutral responses (12.2%; 57/467) are less frequent, while (totally and partially) disagreement (11.13%; 52/467) is uncommon.

Phase 2. Delphi consensus findings

Following analysis of the PAMAP-W survey, 34 candidate statements were generated from management domains showing substantial variability or uncertainty in real-world practice. These candidate statements were designed to support expert appraisal of grade-linked intraoperative and postoperative decision-making in acute appendicitis.

The statements were submitted to a Delphi panel of 50 international emergency surgeons affiliated with the WSES and involved in updating the WSES guidelines about the management of AA. In round 1, 37 of 50 invited experts (74%) rated each statement on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). Consensus was predefined as > 65% agreement, based on ratings of 4 or 5. Twelve statements failed to reach this threshold and were revised for wording and clarity before resubmission in round 2.

In round 2, 33 of 50 invited experts (66%) participated. For the second round, consensus was predefined as > 70% agreement. The Delphi findings are summarized

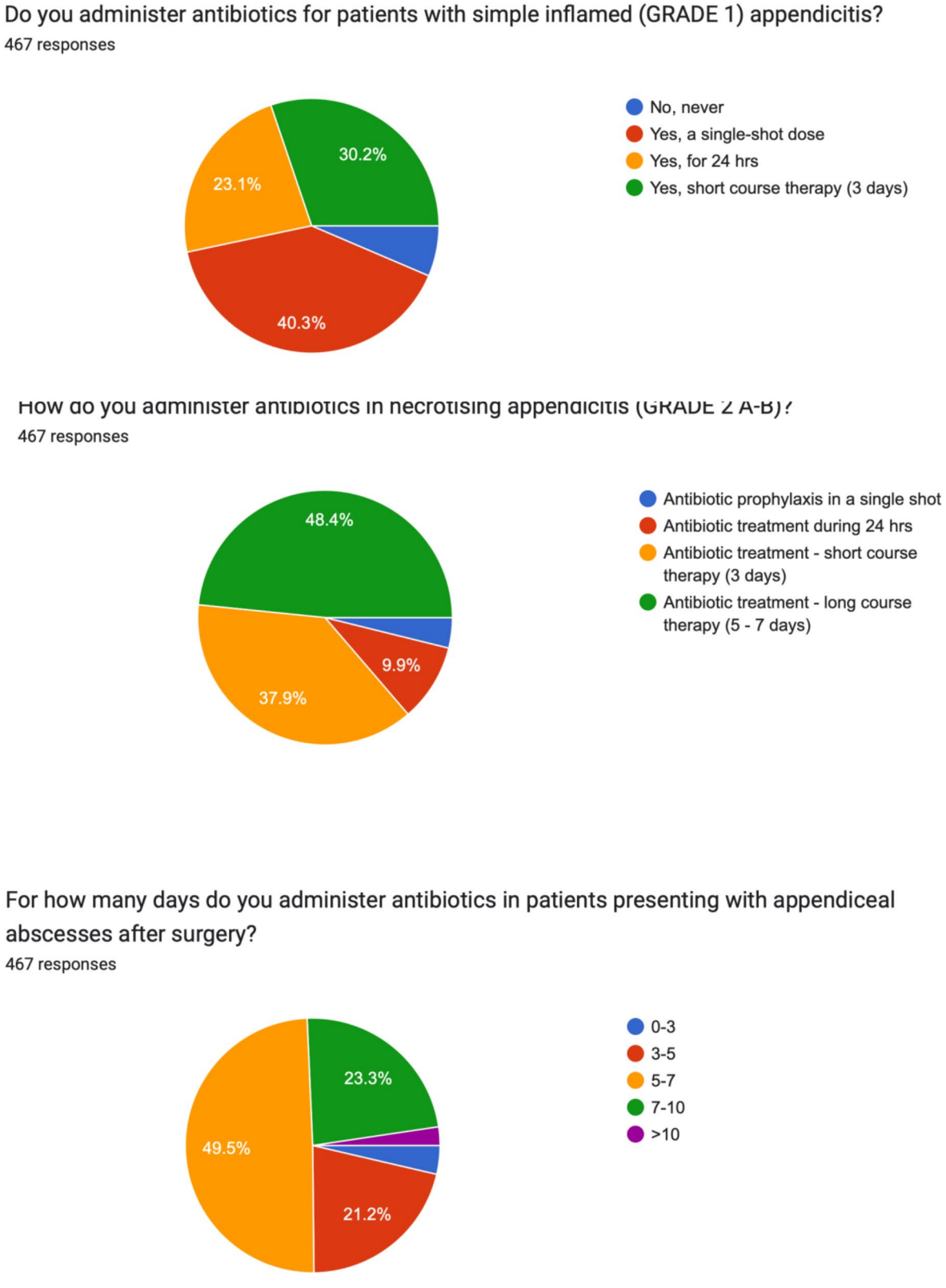

Fig. 5 The use of antibiotics managing acute appendicitis

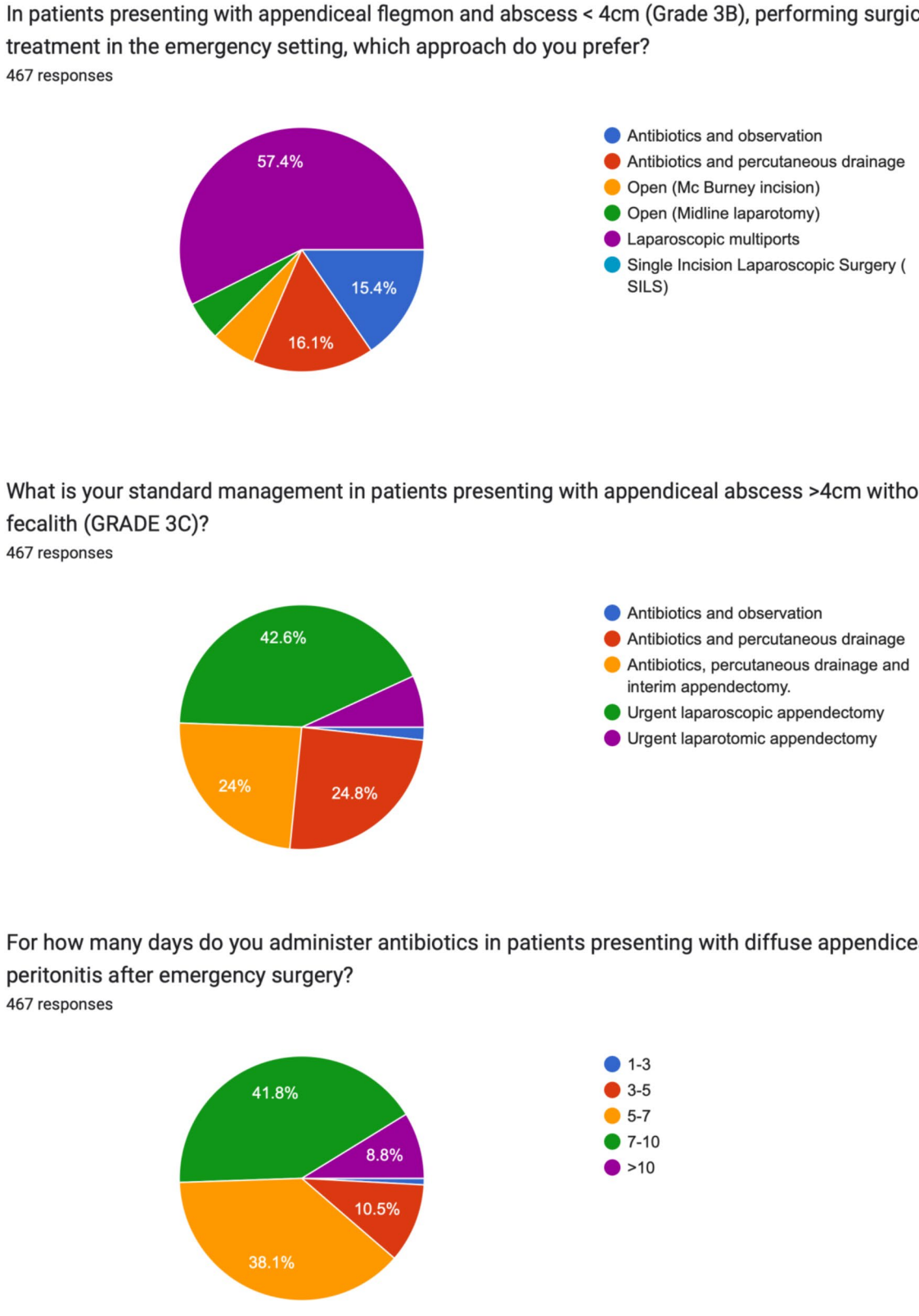

Fig. 5 (continued)

in Tables 4 and 5, while Table 6 reports the final set of consensus-supported grade-linked statements.

Discussion

The management of acute appendicitis continues to

Table 4 Delphi round 1 results

Appendicitis grade		Statement	Likert Scale 1 (totally disagree)	Likert Scale 2 (disagree)	Likert Scale 3	Likert Scale 4 (agree)	Likert Scale 5 (totally agree)	Overall agreement (4 + 5)	Accepted:yes -no
Grade 0	1	Performing an appendectomy for Grade 0 appendicitis is a reasonable standard approach	6/37 (16.2)	8/37 (21.6)	5/37 (13.5)	9/37 (24.3)	9/37 (24.3)	48.6	No
Grade 0	2	Preservation of the appendix should be considered if another diagnosis is identified intraoperatively	1/37 (2.7)	6/37 (16.2)	6/37 (16.2)	13/37 (35.1)	11/37 (29.7)	64.8	No
Grade 0	3	Endoloop should be the method of choice for stump closure in Grade 0	1/37 (2.7)	3/37 (8.1)	9/37 (24.3)	11/37 (29.7)	13/37 (35.1)	64.8	No
Grade 0	4	**The antibiotic treatment is not required in grade 0 appendix**		**4/37 (10.8)**	**3/37 (8.1)**	**7/37 (18.9)**	**23/37 (62.1)**	**81**	**Yes**
Grade 1	5	**Laparoscopic appendectomy should be the standard surgical approach for Grade 1 appendicitis**	**1/37 (2.7)**	**1/37 (2.7)**	**2/37 (5.4)**	**4/37 (10.8)**	**29/37 (78.3)**	**89**	**Yes**
Grade 1	6	**Endoloop should be used for managing the appendiceal stump in non-complicated appendicitis**	**1/37 (2.7)**	**1/37 (2.7)**	**9/37(24.3)**	**10/37 (27)**	**16/37 (43.2)**	**70.2**	**Yes**
Grade 1	7	Non-operative management with antibiotics could be a viable option for selected patients with Grade 1 appendicitis and this option has to be discussed with the patient, when it is possible	-	7/37(18.9)	6/37(16.2)	7/37(18.9)	17/37 (45.9)	64.8	No
Grade 1	8	**A single-shot dose of antibiotics is sufficient for postoperative management of simple inflamed appendicitis**	**4/37(10.8)**	**5/37(13)**	**3/37(8)**	**10/37(27)**	**15/37(40.5)**	**67.5**	**Yes**
Grade 2A	9	**Urgent laparoscopic appendectomy should be the preferred approach to Grade 2A appendicitis**	**-**	**1/37(2.7)**	**2/37(5.4)**	**10/37(27)**	**24/37(64.8)**	**91.8**	**Yes**
Grade 2A	10	Endoloop should be the preferred method for closing the appendiceal stump in Grade 2A, based on surgeon skill, materials availability, and appendiceal base quality		2/37 (5.4)	14/37 (37.8)	7/37(18.9)	14/37(37.8)	56.7	No
Grade 2B	11	**The cecal segment resection ("Napoleon's hat") with endostapler should be considered for stump closure in Grade 2B, according to the quality of the appendiceal base**		**1/37 (2.7)**	**10/37(27)**	**14/37(37.8)**	**12/37 (32.4)**	**70.2**	**Yes**

Table 4 (continued)

Appendicitis grade		Statement	Likert Scale 1 (totally disagree)	Likert Scale 2 (disagree)	Likert Scale 3	Likert Scale 4 (agree)	Likert Scale 5 (totally agree)	Overall agreement (4 + 5)	Accepted:yes -no
Grade 2A-B	12	**In patients with Grade 2A-B appendicitis and no risk factors for poor outcomes, a short course of antibiotics (24–48 h) should be administrated as the postoperative management strategy to reduce unnecessary antibiotic exposure, according to the clinical features of the patients and considering risk factors for postoperative complications**	**2/37(5.4)**	**5/37(13)**	**4/37(10.8)**	**13/37(35.1)**	**13/37(35.1)**	**70.2**	**Yes**
Grade 3A	13	**Urgent laparoscopic appendectomy should be the standard approach for Grade 3A appendicitis in hemodynamically stable patients**		**3/37 (8)**	**4/37 (10.8)**	**14/37 (37.8)**	**13/37 (35)**	**72.9**	**Yes**
Grade 3A	14	Interval appendectomy after medical treatment could be appropriate for selected cases of Grade 3A appendicitis	5/37 (13.5)	6/37 (16.2)	6/37 (16.2)	15/37 (40.5)	5/37 (13.5)	54.0	No
Grade 3A	15	Endoloop and endostapler should be equally considered for stump management in Grade 3A, according to the appendiceal base quality, availability, and surgeon's skills		2/37 (5.4)	11/37 (29.7)	14/37 (37.8)	10/37 (27.0)	64.8	No
Grade 3A	16	**For postoperative management of Grade 3A appendicitis in patients without risk factors for poor outcomes, sepsis, or septic shock, a short course of antibiotics (48–72 h) should be considered to minimize unnecessary antibiotic use while ensuring adequate infection control**	**1/37 (2.7)**	**4/37 (10.8)**	**3/37 (8)**	**14/37 (37.8)**	**15/37 (40.5)**	**78.3**	**Yes**
Grade 3B	17	**Laparoscopic appendectomy should be the standard approach to Grade 3B appendicitis in stable patients**	**2/37 (5.4)**	**3/37(8)**	**2/37 (5.4)**	**17/37 (45.9)**	**13/37 (35.13)**	**81**	**Yes**
Grade 3B	18	**Antibiotics with percutaneous drainage is a viable alternative to urgent surgery for Grade 3B appendicitis in selected patients**	**3/37 (8)**	**1/37 (2.7)**	**3/37 (8)**	**19/37 (51.3)**	**11/37 (29.7)**	**81**	**Yes**

Table 4 (continued)

Appendicitis grade		Statement	Likert Scale 1 (totally disagree)	Likert Scale 2 (disagree)	Likert Scale 3	Likert Scale 4 (agree)	Likert Scale 5 (totally agree)	Overall agreement (4 + 5)	Accepted:yes -no
Grade 3B	19	**For postoperative management of Grade 3B appendicitis in patients without risk factors for poor outcomes, sepsis, or septic shock, a short course of antibiotics (≤ 5 days) should be considered to minimize unnecessary antibiotic use while ensuring adequate infection control**		**1/37(2.7)**	**2/37 (5.4)**	**21/37 (56.7)**	**13/37 (35.1)**	**91.8**	**Yes**
Grade 3B	20	**In the management of appendiceal abscess, the duration of antibiotic therapy should be determined based on the patient's clinical features, the levels of inflammatory markers, and the results of cultures performed on the fluid collected from the abdominal cavity**		**3/37 (8)**	**3/37 (8)**	**15/37 (40.5)**	**16/37 (43.2)**	**83.7**	**Yes**
Grade 3C	21	**Urgent laparoscopic appendectomy is suitable for selected cases of Grade 3C appendicitis**	**3/37 (8)**	**3/37 (8)**	**3/37 (8)**	**16/37 (43.2)**	**12/37 (32.4)**	**75.6**	**Yes**
Grade 3C	22	**Antibiotics with percutaneous drainage followed by interval appendectomy is appropriate for managing Grade 3C appendicitis**	**3/37 (8)**	**1/37 (2.7)**	**3/37 (8)**	**17/37 (45.9)**	**13/37 (35.1)**	**81.0**	**Yes**
Grade 3C	23	**In the management of appendiceal abscess, the duration of antibiotic therapy should be determined based on the patient's clinical features, the levels of inflammatory markers, and the results of cultures performed on the fluid collected from the abdominal cavity**	**1/37 (2.7)**	**2/37 (5.4)**	**2/37 (5.4)**	**17/37 (45.9)**	**15/37 (40.5)**	**86.4**	**Yes**
Follow-up practices in Non-Operative Management Grades 3A, B, C appendicitis	24	**Colonoscopy should be performed in all adult patients aged ≥ 40 years following non-operative management (NOM) of appendicitis graded as 3A, B, or C**		**1/37 (2.7)**	**6/37 (16.2)**	**12/37 (32.4)**	**18/37 (48.6)**	**81**	**Yes**
	25	Colonoscopy should only be performed in selected patients when NOM is implemented for Grade 3A, B, or C appendicitis	3/37 (8)	14/37 (37.8)	8/37 (8.1)	7/37 (18.9)	5/37 (13.5)	32.4	No

Table 4 (continued)

Appendicitis grade		Statement	Likert Scale 1 (totally disagree)	Likert Scale 2 (disagree)	Likert Scale 3	Likert Scale 4 (agree)	Likert Scale 5 (totally agree)	Overall agreement (4 + 5)	Accepted:yes -no
	26	**Interval laparoscopic appendectomy should be performed after ≥ 6–12 weeks following NOM for Grade 3A, B, or C appendicitis**	**1/37 (2.7)**		**3/37 (8)**	**13/37 (35.1)**	**12/37 (32.4)**	**67.5**	**Yes**
	27	Interval laparoscopic appendectomy should not be routinely performed for all patients medically treated for Grade 3A, B, or C appendicitis	5/37 (13.5)	10/37 (27)	2/37 (5.4)	10/37 (27)	10/37 (27.0)	54.0	No
	28	**Colonoscopy before interval appendectomy should be selectively performed based on age and risk factors**	**2/37 (5.4)**	**4/37 (10.8)**	**3/37 (8)**	**19/37 (51.3)**	**9/37 (24.3)**	**75.6**	**Yes**
Grade 4	29	The peritoneal cavity should be washed with saline solution according to the clinical features of the patient and the grade of contamination of the abdomen	8/37 (21.6)	4/37 (10.8)	4/37 (10.8)	10/37 (27)	11/37 (29.72)	56.7	No
	30	The drainage of the abdominal cavity should not be routinely performed for localised appendicular peritonitis management	5/37 (13.5)	6/37 (16.2)	3/37 (8)	9/37 (24.32)	14/37 (37.8)	62.1	No
Grade 5	31	**Urgent laparoscopic appendectomy should be the standard approach for managing diffuse appendicular peritonitis (Grade 4)**		**1/37 (2.7)**	**2/37 (5.4)**	**10/37 (27)**	**24/37 (64.8)**	**91.8**	**Yes**
	32	**Normal saline is the optimal solution for peritoneal lavage in cases of diffuse peritonitis**	**1/37 (2.7)**	**1/37 (2.7)**	**6/37 (16.2)**	**16/37 (43.2)**	**13/37 (35.1)**	**78.3**	**Yes**
	33	Draining the abdominal cavity should be considered when managing diffuse peritonitis, in selected patients	4/37 (10.8)	7/37 (18.9)	2/37 (5.4)	12/37 (32.4)	12/37 (32.4)	64.8	No
	34	**In patients with Grade 4 diffuse appendicular peritonitis, a short course of antibiotics (< = 5 days) should be considered as the postoperative strategy, with the duration guided by the resolution of clinical signs of infection, such as fever, leukocytosis, and peritoneal inflammation**		**2/37 (5.4)**	**2/37 (5.4)**	**12/37 (32.4)**	**21/37 (56.7)**	**89.1**	**Yes**

Table 5 Delphi round 2 results

	Revised statements	Agreement (%)	Accepted
1	Performing an appendectomy for Grade 0 appendicitis may be considered reasonable in selected cases, particularly when diagnostic uncertainty persists or alternative pathologies are excluded	84.8	✓ Yes
2	In cases where a normal-looking appendix is found intraoperatively and an alternative cause for abdominal pain is clearly identified, preservation of the appendix may be considered	72.7	✓ Yes
3	Endoloop can be considered a suitable option for stump closure in Grade 0 appendicitis, depending on surgeon preference and institutional resources	93.9	✓ Yes
4	In selected cases of Grade 1 appendicitis, non-operative management with antibiotics may be considered, particularly when discussed and agreed upon with the patient, based on clinical stability and shared decision-making	78.8	✓ Yes
5	In Grade 2A appendicitis, Endoloop may be considered an acceptable option for stump closure depending on the appendiceal base quality, available materials, and surgeon's expertise	87.9	✓ Yes
6	Interval appendectomy after medical management of Grade 3A appendicitis may be appropriate in selected patients based on clinical response and risk factors	78.8	✓ Yes
7	Both Endoloop and Endostapler may be used for stump closure in Grade 3A, according to appendiceal base quality, available resources and surgeon's experience	87.9	✓ Yes
8	Colonoscopy following NOM for Grade 3A-C appendicitis should be tailored to the patient's age, clinical course, and risk factors; in patients ≥ 40 years with complicated appendicitis managed non-operatively, colonoscopy should be routinely performed	87.9	✓ Yes
9	Routine interval appendectomy may not be necessary in all patients undergoing NOM for Grade 3A-C, and the decision should be based on clinical evolution and individual risk	66.7	✗ No
10	Peritoneal lavage with saline should be considered based on intraoperative findings and contamination severity	60.6	✗ No
11	Routine drainage of the abdominal cavity should be avoided in cases of localized peritonitis, unless intraoperative findings suggest otherwise	81.8	✓ Yes
12	Abdominal drainage should be considered in selected patients with diffuse peritonitis, especially in cases with significant contamination or risk of fluid collection	69.7	✗ No

Statements were considered accepted if ≥ 70% of respondents rated 4 (Agree) or 5 (Totally agree)

Table 6 Updated WSES acute appendicitis grading—definitions and accepted statements

Acute appendicitis classification	WSES grade	Definition	Accepted statements
Uncomplicated appendicitis		Acute appendicitis without perforation, abscess, or generalized peritonitis. Includes simple inflamed or catarrhal appendicitis, and may include cases with appendicolith but no local or systemic complication	
	Grade 0 (Normal Appendix)	Normal-looking appendix on laparoscopy, no signs of inflammation. May be found incidentally or when another diagnosis is identified	Appendectomy may be considered in selected cases, particularly when diagnostic uncertainty persists Preservation of the appendix is acceptable when another diagnosis clearly explains the clinical presentation Endoloop may be used for stump closure if appendectomy is performed Postoperative antibiotic treatment is not required
	Grade 1 (Simple Inflamed)	Inflamed appendix without signs of necrosis, perforation, abscess, or peritonitis	Laparoscopic appendectomy is the preferred operative approach Endoloop is the preferred option for stump management in most cases Non-operative management with antibiotics may be considered in selected cases following shared decision-making Single-dose perioperative antibiotic prophylaxis is the standard strategy
Complicated appendicitis		Acute appendicitis associated with perforation, intra-abdominal abscess, appendiceal phlegmon, necrosis, gangrene, or diffuse (purulent/fecal) peritonitis. Includes cases requiring more advanced surgical or non-operative management and typically postoperative antibiotics	
	Grade 2A (Segmental Necrosis)	Necrotic segment of appendix, no perforation, abscess or base involvement	Urgent laparoscopic appendectomy is the preferred approach Endoloop may be considered for stump closure depending on base quality and resources Short-course antibiotics (24–48 h) should be used in low-risk patients
	Grade 2B (Base Necrosis)	Necrosis involving the base of the appendix, without perforation or abscess	When necrosis involves the appendiceal base, segmental cecal resection with endostapler may be considered according to the extent of necrosis and local tissue conditions In low-risk patients with adequate source control, a short postoperative antibiotic course (24–48 h) may be considered
	Grade 3A (Phlegmon)	Inflammatory mass around the appendix, no fluid collection or abscess visible, no perforation	Laparoscopic appendectomy is the preferred approach when feasible and when appropriate expertise is available Non-operative management with antibiotics may be considered in selected cases following shared decision-making Interval appendectomy at 6–12 weeks may be considered in patients with persistent or recurrent symptoms, or when follow-up is concerning (e.g., cecal/appendiceal base thickening, appendiceal diameter ≥ 10 mm, mass-like or mucinous features, or abnormal endoscopy) Both Endoloop and Endostapler are acceptable stump closure options In selected low-risk patients, a short postoperative antibiotic course (48–72 h) may be appropriate
	Grade 3B (Abscess < 4 cm)	Localized abscess around the appendix smaller than 4 cm	Laparoscopic appendectomy is the preferred approach for stable patients, when feasible Antibiotic treatment with or without percutaneous drainage is a reasonable alternative in selected cases Antibiotic duration should be guided by clinical evolution, source control, and culture results when available

Table 6 (continued)

Acute appendicitis classification	WSES grade	Definition	Accepted statements
	Grade 3C (Abscess > 4 cm)	Large localized abscess (> 4 cm), no diffuse peritonitis	Urgent laparoscopic appendectomy is the preferred operative approach for stable patients when adequate expertise and equipment are available Antibiotic treatment with percutaneous drainage is an appropriate alternative in selected cases Antibiotic duration should be tailored according to clinical response, source control, and culture results
	Grade 4 (Regional/ localised peritonitis)	free purulent/turbid fluid and fibrin outside the appendix, limited to the right iliac fossa/ adjacent pelvic recesses, without a walled cavity	Laparoscopic appendectomy is the preferred approach in stable patients Routine peritoneal lavage is not recommended If lavage is selectively considered because of substantial contamination, normal saline is the preferred solution; antiseptic solutions should be avoided Drains are not recommended, but may be considered in selected patients with substantial contamination or high risk of postoperative collection Postoperative antibiotic duration should be individualized according to clinical response, adequacy of source control, and microbiological data when available, while favoring short-course (up to 3 days) treatment where appropriate
	Grade 5 (Diffuse Peritonitis)	Generalized purulent or fecal peritonitis due to appendiceal perforation	Laparoscopic appendectomy is the preferred approach in hemodynamically stable patients when technically feasible and when appropriate expertise is available. In patients presenting with fecal peritonitis associated with hemodynamic instability or septic shock, laparotomy should be considered according to the principles of damage control surgery, with priority given to rapid and effective source control. Routine lavage of the abdominal cavity is not recommended; however, it may be considered in the presence of major contamination, particularly in fecal peritonitis. If lavage is performed, normal saline is the preferred solution, and antiseptic solutions should be avoided. After adequate source control, a short postoperative antibiotic course (up to 5 days) may be appropriate, with duration guided by clinical response and microbiological findings. Drainage is not recommended routinely, but may be considered in selected patients at high risk of persistent contamination or postoperative collection.
Follow-Up After Non Operative Treatment	**3 A-C**	Post-management considerations after non-operative treatment of Grades 3A (phlegmon); 3B–3C (PAA)	Phlegmon (3A): interval appendectomy may be considered in patients with persistent or recurrent symptoms, or when follow-up imaging or endoscopy is concerning Periappendicular abscess (3B–3C): in adults aged ≥ 35 years initially treated non-operatively, laparoscopic interval appendectomy at 6–12 weeks is recommended because of the higher risk of missed appendiceal neoplasm Colonoscopy should be considered in adults aged ≥ 35 years after non-operative management, particularly when abscess, persistent mass, cecal base thickening, abnormal FIT, iron-deficiency anemia, or other concerning features are present In lower-risk patients, follow-up with colonoscopy and interval appendectomy should be individualized according to clinical evolution and cancer risk factors

NOM non operative management, *FIT* fecal immunochemical test, *PAA* peri-appendicular abscess

These statements should be interpreted in light of resource availability, which may vary across countries and healthcare systems. They combine evidence-aligned recommendations with expert Delphi-supported operational guidance. Appendicolith status should be documented separately as absent, intraluminal, or extraluminal/free. An intraluminal appendicolith should be considered a prognostic and management modifier, particularly when non-operative management is contemplated, but does not by itself determine the anatomical grade. An extraluminal or free appendicolith indicates perforation, and the final grade should be assigned according to the associated abscess and the extent of peritoneal contamination. The 2025 WSES Jerusalem Guidelines remain the primary reference for clinical practice

evolve, with ongoing debate surrounding the definition of "complicated" versus "uncomplicated" disease, the optimal timing and technique of surgery, the role of non-operative management, and the indication and duration of antibiotic therapy. The PAMAP-W survey provided real-world insights from 467 emergency surgeons worldwide, showing how intraoperative findings are interpreted in daily practice and how they influence decisions regarding stump closure, antibiotic use, drainage, and follow-up. These findings informed the formulation of grade-linked statements that were subsequently appraised through a Delphi process and contributed to the operational refinement of the 2025 WSES Appendicitis Grading System. In the first Delphi round, 37 of 50 (74%) internationally recognized emergency surgeons participated, many of whom had also contributed to previous WSES guideline initiatives.

The updated 2025 WSES Appendicitis Grading System includes 6 appendicitis grades. In this revised framework, each grade is associated not only with radiological findings, the macroscopic aspect of the appendix, and peritoneal findings, but also with key operative and postoperative management domains, including preferred surgical approach (laparoscopy vs open surgery), stump

management (e.g., Endoloop, polymeric non-resorbable clip, or stapler), antibiotic treatment and duration, the role and timing of interval appendectomy, and the use of abdominal drainage and cavity lavage. In this sense, the classification is intended to support intraoperative decision-making through a grade-linked operative framework, while treatment recommendations should be interpreted in parallel with the evidence-based 2025 WSES Jerusalem Guidelines for the diagnosis and treatment of acute appendicitis [18].

This represents an important evolution of the classification. Rather than remaining a purely descriptive tool, it moves toward a clinical decision-support framework intended to reduce heterogeneity in intraoperative judgment and management, improve antibiotic stewardship through grade-linked strategies, clarify when interval appendectomy and colonoscopy should be considered, and enhance reproducibility and comparability across studies and surgical audits. At the same time, because PAMAP-W was conceived and conducted before formal publication of the updated 2025 guidelines, its value lies in documenting contemporary real-life practice and expert operational preferences that complement, rather than replace, the subsequent evidence-based recommendations [18]

Current definitions and limitations

The definition of complicated appendicitis (CA) is still not fully consistent across the literature. Although perforation, purulent peritonitis, and intra-abdominal abscess are widely accepted markers of complicated disease, other features, such as gangrenous changes, the presence of a fecalith, or even purulent fluid without frank perforation, are applied less consistently [19]. Not surprisingly, this lack of uniformity translates into variability in operative decisions and antibiotic strategies.

Gomes et al., with WSES support, proposed a comprehensive staging system based on clinical, imaging, and intraoperative findings, stratifying acute appendicitis into grades 0–4 and offering a structured framework for both research and clinical decision-making [10, 20]. The POSAW study further supported the global applicability of intraoperative appendicitis grading, confirming Grade 1 as the most common stage encountered worldwide [3]. However, the original WSES intraoperative grading system remained mainly descriptive and did not systematically link each grade to specific treatment pathways. In addition, discrepancies between intraoperative and histological diagnosis have been reported, particularly in pediatric populations, where surgical findings may predict postoperative outcomes more accurately than histopathology [12].

Within this context, the strength of PAMAP-W lies not in replacing earlier classifications, but in exploring how surgeons actually use intraoperative severity grading when making practical treatment decisions. The survey and subsequent Delphi process therefore address a complementary and clinically relevant question: how a grading system can move from being merely descriptive to becoming a usable framework for grade-linked management.

The management of the "normal-looking" appendix

The management of a macroscopically normal appendix remains one of the most debated situations encountered during surgery, particularly when no alternative pathology is identified. The PAMAP-W survey shows that appendectomy is still commonly performed when no alternative pathology is identified. At the same time, a substantial proportion of surgeons reported that they would preserve the appendix if another convincing diagnosis were established intraoperatively, reflecting a more selective and individualized approach [21, 22].

Surgeons from high-income countries and academic or tertiary referral centers were more likely to adopt a conservative management strategy (i.e., preserving the appendix) [23, 24]. Conversely, younger surgeons and those with < 10 years of experience tended to favor routine appendectomy, possibly reflecting training background or institutional protocols [25, 26]. These findings indicate a transition toward individualized decision-making, emphasizing diagnostic precision, patient-specific risk factors, and shared decision-making rather than a one-size-fits-all surgical response.

This is a meaningful finding. It suggests that Grade 0 appendicitis remains an area of genuine clinical uncertainty, where operative judgment depends not only on the appearance of the appendix itself, but also on diagnostic confidence, the plausibility of an alternative diagnosis, perceived recurrence risk, and the surgeon's training background. The Delphi consensus reflected this variability: statements supporting both appendectomy and preservation of a normal-looking appendix were accepted by expert panelists, depending on the intraoperative context.

This interpretation can now be read alongside the 2025 WSES Jerusalem Guidelines, which suggest removal of a macroscopically normal appendix during diagnostic laparoscopy for suspected appendicitis when no other intra-abdominal pathology explains the clinical presentation [18]. PAMAP-W therefore captures real-world variation around what remains a weak and context-dependent recommendation.

Surgical technique across appendicitis grades

Laparoscopy is now widely regarded as the global standard approach for acute appendicitis, in both uncomplicated and complicated presentations [27–29]. This was

clearly confirmed by the PAMAP-W survey, in which the vast majority of respondents favored laparoscopic appendectomy regardless of intraoperative grade.

In uncomplicated appendicitis (Grade 1), laparoscopic multiport appendectomy was the preferred approach in 373 of 467 respondents (79.9%). This is consistent with the existing literature, which has shown lower postoperative pain, fewer wound infections, shorter hospital stay, and faster recovery, without an increased risk of intra-abdominal abscess [3, 30]. In more advanced disease, including necrotic, phlegmonous, or perforated appendicitis (Grades 2A, 2B, and 3A-C), laparoscopy also remained the preferred approach. More than 80% of respondents favored it in Grades 2A and 2B. In Grade 3A and Grades 3B-C, laparoscopy was still widely used when technically feasible and in stable patients, although a minority of surgeons preferred non-operative management or delayed surgery in selected abscessed presentations.

The Delphi process supported laparoscopic appendectomy as the preferred approach in Grade 1, Grade 2A, Grade 3A, and Grade 3B appendicitis, and as an appropriate option in selected Grade 3C cases and peritonitis, provided that the patient is clinically stable and appropriate expertise and resources are available. At the same time, experts emphasized that patient stability and surgeon experience remain central when choosing to proceed laparoscopically in more advanced disease. Some variability persists according to geographic region, resource availability, and level of expertise. Surgeons in low-resource settings or district hospitals may still choose an open approach, especially when imaging or laparoscopic equipment is limited [31]. Likewise, more experienced surgeons (>10 years) were more likely to attempt laparoscopy in Grades 3 and 4, underscoring the importance of training, technical confidence, and familiarity with advanced minimally invasive emergency surgery [32, 33].

In diffuse peritonitis (Grade 5), laparoscopy was still reported as the preferred approach by nearly 70% of respondents, particularly in high-income settings. This supports the growing evidence that laparoscopy may be safe and effective even in generalized peritonitis, provided adequate source control can be achieved [27, 34]. Taken together, these findings reinforce laparoscopic appendectomy as the gold standard operative strategy across the disease spectrum, while also acknowledging that the final choice still depends on patient hemodynamics, surgeon expertise, and local resources. This is in line with the updated WSES recommendations [18].

Appendiceal stump closure techniques

Stump closure remains a key technical step in appendectomy, particularly in complicated cases. The PAMAP-W survey showed that in uncomplicated appendicitis (Grades 0 and 1), Endoloop was the most commonly preferred method. This likely reflects its wide availability, low cost, and well-established safety profile in non-complex cases. Among survey respondents in Grades 0 and 1, Endoloop was selected by 76.9% and 74.3%, respectively. Delphi consensus supported the routine use of Endoloop in Grade 0 and 1. This is consistent with several studies and meta-analyses showing no significant difference in postoperative complications, including intra-abdominal abscess and stump leak, between Endoloop and stapled closure in uncomplicated appendicitis [35–39].

The situation becomes more nuanced in complicated appendicitis, particularly in Grades 2A and 2B, where necrosis may involve the appendiceal base. In these cases, the survey showed a shift toward mechanical closure methods such as endoscopic staplers, especially when tissue integrity is compromised. The Delphi consensus supported the use of both Endoloop and Endostapler in Grades 2A–2B, leaving the final decision to surgeon expertise, stump quality, and material availability.

For Grades 3A-C and 4, including phlegmon, abscess, and localized peritonitis, the approach becomes even more individualized. Although laparoscopic stump closure is often feasible, surgeons highlighted concerns about base fragility and distorted anatomy, which often favor stapled closure in more inflamed fields. At the same time, the literature does not clearly show superiority of one stump closure technique over another in these advanced settings [40]. This is one of the areas in which PAMAP-W is particularly useful, because it shows how a grade-linked framework can accommodate technical flexibility when strong comparative evidence is lacking. Some centers may also adopt hybrid approaches, such as loop ligatures reinforced with sutures or clips, depending on institutional protocols, materials availability and expertise.

Peritoneal lavage and drainage in the management of appendiceal peritonitis

The intraoperative management of peritoneal contamination through lavage and abdominal drainage remains one of the most debated aspects of appendicitis surgery, particularly in complicated disease. The PAMAP-W survey confirmed substantial variability in practice.

In localized peritonitis (Grade 4), many surgeons reported routinely performing peritoneal lavage with normal saline. However, Delphi agreement did not reach the predefined threshold for a universal recommendation, and expert opinion favored a selective rather than indiscriminate approach. This is clinically relevant, because it suggests that many surgeons still perceive lavage as useful in selected circumstances, particularly

depending on the degree of contamination and the intraoperative findings [41, 42].

At the same time, the available evidence suggests that saline lavage does not significantly reduce mortality, intra-abdominal abscess, incisional surgical site infection, postoperative complications, reoperation, or readmission [41]. Excessive irrigation may also increase the risk of fluid dissemination or peritoneal injury [34]. Some studies suggest that suction alone may be safely used in localized appendicitis, whereas lavage may still be considered selectively in diffuse peritonitis [42]. Both survey respondents and Delphi experts identified normal saline as the preferred solution whenever lavage is deemed necessary, with no demonstrated benefit from antiseptic or antibiotic-containing fluids [8, 43].

This is one of the clearest areas where PAMAP-W captures real-life practice before the publication of more explicit evidence-based recommendations. The 2025 WSES Jerusalem Guidelines now favor suction alone rather than routine lavage in complicated appendicitis [18]. In that light, lavage within the grading framework should not be interpreted as a routine standard because it is not recommended but rather as a selective intraoperative option whose use may still depend on the clinical scenario.

A similar pattern emerged for abdominal drainage. Survey responses showed marked heterogeneity: 34.22% of respondents reported always placing a drain in severe inflammatory appendicitis, whereas others reserved drains for selected cases. Delphi consensus supported avoiding routine drainage in localized peritonitis unless significant contamination, uncertain hemostasis, or a high perceived risk of postoperative abscess was present. This is consistent with the literature, which generally shows no benefit of prophylactic drains in reducing infectious complications after appendectomy [44–50].

For diffuse peritonitis (Grade 5), Delphi statements suggested that drainage is generally not recommended, although it may still be considered in selected high-risk or immunocompromised patients. However, current evidence and the updated WSES recommendations do not support routine abdominal drainage after appendectomy [18]. PAMAP-W therefore highlights lavage and drainage as operator-dependent areas in which real-world practice preceded, and helped frame, later evidence-based refinement.

Antibiotic use and duration according to appendicitis grade

One of the most important findings of the survey was the progressive increase in antibiotic duration from single-dose prophylaxis in uncomplicated appendicitis to prolonged 5–10-day courses in diffuse peritonitis. This reflects a cautious, severity-driven approach and clearly shows how heterogeneous postoperative antibiotic management remained worldwide before publication of the 2025 WSES Jerusalem Guidelines [18].

In uncomplicated appendicitis (Grades 0 and 1), both the survey and Delphi findings supported a single preoperative dose or a very short perioperative regimen. For Grade 1 appendicitis, single-dose prophylaxis was the most common survey response, selected by 40.3% of respondents, and the Delphi panel supported a single-dose strategy. For Grade 0, Delphi consensus indicated that postoperative antibiotic treatment is not required. This is consistent with the literature and with current recommendations showing no benefit from prolonged postoperative antibiotics in these cases [43, 51–59]. This approach reduces unnecessary antibiotic exposure and supports antimicrobial stewardship.

In complicated appendicitis (Grades 2A and 2B), the picture was more nuanced. Many surgeons still favored longer courses, but the survey and Delphi panel pointed toward a risk-stratified approach. Short postoperative courses (24–48 h) were considered acceptable in selected low-risk patients without sepsis or major contamination, whereas longer treatment was reserved for higher-risk patients. This approach is consistent with recent trials and observational studies suggesting that shorter courses (≤ 3–5 days) are non-inferior to longer durations in reducing postoperative infectious complications in selected patients [60]. In the setting of intra-abdominal infections (IAIs), whether community-acquired or postoperative, "low-risk" patients are generally those who have a favorable prognosis, a low likelihood of treatment failure, and a minimal risk of death or severe morbidity when managed according to standard protocols. The definition comes from a combination of host factors, disease severity, infection source, and physiological status. Commonly used criteria to define a "low risk patient" are categorised in [8, 61, 62]:

A. *Clinical and physiologic stability* which includes: 1) No septic shock (MAP ≥ 65 mmHg without vasopressors); 2) SOFA score: ≤ 2; 3) APACHE II score: < 10–12 (threshold varies in literature); and No acute organ failure at presentation.
B. *Infection source and extent* which includes: 1) Localized peritonitis (e.g., peri-appendicular abscess, contained perforation); 2) No evidence of diffuse fecal peritonitis; 3) Infection source easily accessible for control (laparoscopy, percutaneous drainage); and 4) Early intervention possible (within 24 h of diagnosis).
C. *Host factors* which includes: 1) Age < 70 years (some guidelines use < 65 years); 2) No severe immunosuppression; 3) No neutropenia; 4) No solid organ transplant; 5) No ongoing chemotherapy or

high-dose steroids; and 6) No severe chronic organ dysfunction (e.g., Child–Pugh C cirrhosis, end-stage renal disease).

In Grades 3A-C and 4, the survey showed even greater heterogeneity. The accepted Delphi statements indicated that antibiotic duration should be individualized, based on clinical response, inflammatory marker trends, and microbiology results from abscess fluid, when available according to evidence in literature [7, 8, 34]. Notably, for patients treated non-operatively (e.g., with percutaneous drainage), accepted statements support tailored antibiotic therapy guided by clinical features, radiological resolution and laboratory trends, avoiding a fixed-duration approach.

In diffuse peritonitis (Grade 5), prolonged regimens of 7–10 days were still common in real-world practice, although the Delphi panel agreed that shorter courses (≤ 5 days) may be appropriate in selected low-risk patients if clinical signs of infection resolve. This reflects the broader shift toward de-escalation and stewardship-oriented care. In light of the 2025 WSES Jerusalem Guidelines, which recommend no postoperative antibiotics in uncomplicated appendicitis and short-course treatment after adequate source control in complicated disease [18], prolonged regimens should now be viewed less as equivalent alternatives and more as a relevant evidence–practice gap documented by PAMAP-W. The 2025 WSES intraoperative grading system integrates these insights to guide antibiotic decisions across the appendicitis spectrum, aiming to reduce overtreatment without compromising outcomes.

Follow-up strategies after non-operative management of appendicitis

The role of interval appendectomy (IA) and colonoscopy after non-operative management (NOM) of complicated appendicitis remains a clinically important and evolving area. According to the PAMAP-W survey, many surgeons consider IA after successful NOM for appendiceal phlegmon or abscess, although follow-up strategies remain highly variable across institutions and practice settings. The Delphi process reflected this heterogeneity, showing that many experts still favor a selective, case-by-case approach based on recurrence risk, patient preference, age, and concern for underlying malignancy.

This variability is understandable, as accumulating evidence has shown that complicated appendicitis, particularly in the presence of periappendicular abscess, may be associated with an increased incidence of appendiceal or colonic neoplasia in adult patients [63–66]. Salminen et al. reported a high rate of appendiceal tumors in patients with periappendicular abscess, especially in those older than 35 years [67]. In light of these data, the 2025 WSES Jerusalem Guidelines now recommend performing interval appendectomy between 6 and 12 weeks after initial non-operative management in adult patients aged 35 years or older with complicated acute appendicitis and periappendicular abscess, in order to reduce the risk of missed appendiceal neoplasm [18]. This recommendation is strong, with moderate certainty of evidence.

Accordingly, the Delphi-derived selective approach should not be interpreted as opposing interval appendectomy in this higher-risk subgroup, but rather as reflecting real-world variation in practice before formal publication of the updated evidence-based recommendations. In younger adults and in settings where early laparoscopic appendectomy is feasible, the management pathway may remain more individualized, and current WSES recommendations suggest early laparoscopic appendectomy in patients younger than 35 years with periappendicular abscess, while initial NOM followed by interval appendectomy at 6–12 weeks remains an acceptable alternative when laparoscopic expertise or resources are limited [18].

Similarly, the use of colonoscopy after conservative treatment should not be considered routine in all patients, but it remains particularly relevant in adults with appendiceal abscess or phlegmon and in older age groups, given the increased likelihood of underlying colonic neoplasia [67–72]. The PAMAP-W survey showed that follow-up strategies are strongly influenced by local protocols, patient age, and clinical evolution. Some centers routinely schedule IA at 6–12 weeks, whereas others rely on surveillance and reserve surgery for recurrent or persistent symptoms. Overall, these findings underscore the real-world heterogeneity that preceded the updated WSES framework; however, in current practice, interval appendectomy after NOM should be regarded as the preferred strategy in adults aged 35 years or older with periappendicular abscess, in line with the 2025 guidelines [18].

Global practices and WSES guidelines

The PAMAP-W survey and subsequent Delphi consensus are broadly consistent with the principles that were later formalized in the WSES guidelines on acute appendicitis [1, 18]. Both emphasize the importance of standardized severity classification and grade-linked management across operative treatment, non-operative management, postoperative care, interval appendectomy, and follow-up. However, they address different scientific purposes.

The guidelines process provides evidence-based recommendations through systematic review and GRADE methodology [73]. PAMAP-W, in contrast, captured how appendicitis severity was interpreted and operationalized in everyday emergency surgical practice across a large international network before those updated recommendations became available. For that reason, the study

should not be viewed as superseded by the later guideline publication. Rather, it represents a complementary and chronologically antecedent contribution: it mapped global practice variation, identified areas of uncertainty, and supported the development of grade-linked operational thinking before the updated guideline process was completed.

Where strong or moderate evidence now exists, such as for laparoscopic appendectomy as the standard approach, avoidance of postoperative antibiotics in uncomplicated appendicitis, short-course therapy after adequate source control in complicated disease, and avoidance of routine lavage or drains, the survey findings should mainly be read as a real-world benchmark and as an assessment of evidence–practice gaps [18]. Where the evidence remains weaker or more context-dependent, such as in the management of the macroscopically normal appendix, technical aspects of stump closure, or individualized follow-up after NOM, the Delphi-derived statements retain particular value as consensus-supported operational guidance.

The specific contribution of PAMAP-W, therefore, is not simply that it anticipated later evidence-based refinement. It is that it helped define the practical questions, exposed the heterogeneity of current care, and supported the transformation of the WSES classification from a descriptive grading system into a clinically usable decision-support framework. To facilitate standardized application of the proposed WSES acute appendicitis grading system in routine surgical practice, a concise operative-report template is provided in Supplementary Material 2.

Study limitations and generalisability

Several limitations of this study should be acknowledged. First, although the survey reached a large and diverse group of emergency surgeons worldwide, the response rate was limited, which introduces the possibility of selection bias. Surgeons with greater interest in appendicitis management or stronger academic engagement may have been more likely to respond. Second, self-reported data are inherently subject to recall bias and social desirability bias, particularly in relation to intraoperative decision-making and perceived adherence to guidelines. Third, the survey responses reflected stated practices and attitudes rather than prospective clinical outcome data, and therefore may not fully mirror actual behavior in all settings. Fourth, regional imbalances remained, with some countries and healthcare systems underrepresented, which may limit generalizability to certain low-resource settings or patient populations.

Finally, although the Delphi process provided structured expert appraisal and consensus support for key grade-linked management statements, expert consensus cannot replace empirical validation through prospective clinical studies. Interobserver reliability of grading, implementation feasibility, and the outcome impact of grade-linked decision-making still require dedicated evaluation. Even so, PAMAP-W remains a robust and timely effort to capture international practice patterns and expert operational preferences, and it provides an important foundation for the refinement and implementation of the updated WSES acute appendicitis classification.

Conclusions

The PAMAP-W global survey provides a broad overview of contemporary surgical practice and expert attitudes toward the intraoperative and postoperative management of acute appendicitis. Although considerable variability persists in several areas, notably in the management of macroscopically normal appendices, postoperative antibiotic strategies, and follow-up after non-operative treatment, the study also identified important points of convergence across an international emergency surgery community.

Together with the Delphi process, these findings supported the development of the proposed 2025 WSES acute appendicitis grading framework, moving from a purely descriptive intraoperative classification toward a more practical, grade-linked decision-support tool. In this way, the proposed WSES framework links appendicitis severity not only to morphological assessment, but also to key management domains that are directly relevant to clinical and surgical decision-making. By integrating real-world practice patterns, expert consensus appraisal, and alignment with the available evidence, this framework may help improve consistency in severity assessment and grade-linked management, and provide a stronger basis for future clinical research. Further work is needed to promote implementation across different healthcare settings and to evaluate the impact of the WSES Acute Appendicitis grade-linked decision-making on clinical outcomes through prospective studies.

Abbreviations

AA	Acute appendicitis
CA	Complicated appendicitis
WSES	World Society of Emergency Surgery
PAMAP-W	Practices and attitudes of emergency surgeons in managing acute appendicitis worldwide
SILS	Single incision laparoscopy

Supplementary Information

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Additional file1 (DOCX 459 KB)

Additional file2 (DOCX 56 KB)

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Author contributions
CAG, FC, FAZ and BDS conceived and designed the study. BDS wrote the survey and coordinated the Delphi consensus; she collected, analysed data and wrote the manuscript. FC, CAG, FAZ read and revised the manuscript. All the authors read the final manuscript and approved it.

Data availability
The datasets generated and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
Formal ethics approval was not required according to local institutional policy because the study was anonymous, voluntary, and did not involve patient-level data.

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