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Current Trends in the Diagnosis and Management of Acute Abdomen in Emergency Surgery

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Abstract

Background: Acute abdomen in emergency surgery remains a high-risk, heterogeneous syndrome in which delayed recognition of ischemia, perforation, obstruction, or complicated intra-abdominal infection can rapidly translate into preventable morbidity and mortality. Diagnostic uncertainty is magnified by changing case-mix, including frailty, multimorbidity, immunosuppression, pregnancy, and chronic anticoagulation.

Objective: To synthesize current trends in diagnostics, management, and systems of care for emergency general surgery presentations with acute abdominal pain.

Sources of evidence: PubMed/MEDLINE and the Cochrane Library were searched for relevant evidence from 2020–2024, complemented by international guideline and consensus documents (e.g., WSES, Surviving Sepsis Campaign, ACR Appropriateness Criteria, and emergency-surgery ERAS guidance).

Content: Diagnostic trends emphasize pathway-based imaging, with CT as the principal modality in many adult presentations, increased use of protocolized contrast strategies and CT angiography for suspected mesenteric ischemia, and broader integration of bedside ultrasound/POCUS when CT is delayed or unsuitable. Biomarkers and risk scores are increasingly used as adjuncts within decision pathways rather than stand-alone tests. Management trends include more selective non-operative strategies for uncomplicated syndromes, earlier laparoscopy in appropriate candidates, and clearer thresholds for conversion or open surgery when physiology deteriorates or ischemia/contamination is suspected. Cross-cutting operative trends highlight damage control surgery for physiologic exhaustion, sepsis-aligned resuscitation with timely source control, and perioperative optimization using emergency-adapted ERAS principles.

Keywords: Acute abdomen; Emergency general surgery; Diagnostic imaging; Damage control surgery; Sepsis and source control

Introduction

The term *acute abdomen* denotes an abrupt onset abdominal presentation in which urgent evaluation is required to identify conditions demanding time-sensitive intervention, frequently including operative source control, revascularization, or closely monitored non-operative pathways **[1]**. In contemporary Emergency General Surgery (EGS) practice, the "acute abdomen" construct is deliberately broader than classic single-diagnosis teaching (e.g., appendicitis), instead framing a syndrome-based differential that spans inflammatory processes (appendicitis, diverticulitis), obstruction (e.g., adhesive small bowel obstruction), visceral perforation with peritonitis, and vascular catastrophes such as acute mesenteric ischemia **[2]**. This syndromic framing is operationally aligned with EGS priorities—rapid diagnosis, early physiologic stabilization, and timely definitive management, particularly when infection, ischemia, or perforation is plausible and the window for benefit is narrow **[3]**.

The clinical burden of acute abdomen is substantial because it represents a high-frequency trigger for emergency presentations and surgical consultation, yet remains characterized by diagnostic uncertainty at the bedside **[4]**. Even for common index conditions, authoritative guideline summaries emphasize ongoing difficulty in diagnostic confirmation and persistence of management controversies across settings. Moreover, the downstream consequences of delayed or incorrect classification can be severe: complicated intra-abdominal infections are repeatedly described as major contributors to morbidity and mortality, with high mortality ranges reported in critically ill contexts **[5]**. At the extreme end of the spectrum, emergency laparotomy—often the definitive pathway for perforation, ischemia, or uncontrolled intra-abdominal sepsis—continues to be associated with high-risk outcomes and has been the focus of dedicated international perioperative guideline efforts. These realities jointly explain why acute abdomen remains a core patient-safety domain in emergency surgery, where diagnostic precision and timing of intervention are inseparable determinants of outcome **[6]**.

Against this background, "current trends" in acute abdomen care have become particularly consequential for three converging reasons. First, diagnostic pathways have shifted toward earlier and more standardized deployment of cross-sectional imaging, with expert criteria and pragmatic clinical reviews converging on CT and ultrasonography as dominant modalities for adult acute abdominal pain triage, while acknowledging the continuing role of plain radiography in specific scenarios and in resource-limited contexts **[7]**. Second, point-of-care ultrasound (POCUS) has transitioned from an adjunct to an increasingly institutionalized bedside capability for rapid problem-oriented assessment in acute abdomen workflows, supporting earlier decision-making and potentially reducing time-to-diagnosis when CT access is limited or patient transport is unsafe **[8]**. Third, antimicrobial stewardship has moved from a background principle to a central design constraint in emergency surgery, because inappropriate spectrum, duration, and sequencing of antibiotics in intra-abdominal infection contributes to resistance pressure while failing to substitute for definitive source control **[6]**. In parallel, major guideline initiatives in emergency surgery now explicitly integrate antibiotic decision-making with the adequacy and timing of source control, emphasizing that

antimicrobial therapy and operative (or interventional) source control function as a coupled system rather than independent choices **[9]**.

A further and highly visible trend is the expansion of carefully selected non-operative management (NOM) strategies for specific acute abdomen phenotypes, reflecting both evidence maturation and patient-centered trade-off thinking. Acute appendicitis illustrates this shift: WSES guidance explicitly includes recommendations addressing clinical scoring and imaging, indications for non-operative management in uncomplicated disease, timing of appendectomy, laparoscopic approaches, and peri-operative antibiotics **[2]**. Complementing guideline synthesis, pragmatic randomized trial evidence has also compared antibiotics-first strategies with appendectomy, embedding non-operative appendicitis within a broader movement toward individualized risk–benefit discussions rather than uniform operative default **[10]**. Similarly, in acute diverticulitis, updated WSES guidance incorporates "recent changes" and integrates advances across left- and right-sided disease patterns, reflecting the contemporary move toward stratified management based on severity, abscess burden, and peritonitis rather than diagnosis alone **[3]**. For mechanical obstruction phenotypes, modern reviews highlight evolving conservative strategies and reassessment frameworks for adhesive small bowel obstruction, supporting structured non-operative pathways when immediate operative indications are absent. Collectively, these developments have redefined "management" trends as a dynamic selection problem—operative versus non-operative, and early versus delayed—rather than a binary decision tethered to diagnosis labels **[11]**.

Concurrently, demographic and systems pressures have intensified. Older age, multimorbidity, and frailty are increasingly prominent among emergency laparotomy candidates and have driven guideline attention to rapid assessment, optimization, and pathway-based delivery of care for high-risk emergency surgery **[12]**. The ERAS Society emergency laparotomy recommendations, delivered in multiple parts spanning preoperative assessment through postoperative care and organizational implementation, exemplify a trend toward treating emergency surgery as a pathway-managed condition rather than an exclusively surgeon-dependent event **[12, 13]**. In addition, modern EGS increasingly interfaces with standardized sepsis protocols and resuscitation bundles, particularly because perforation, ischemia, and complicated infection frequently present with systemic inflammatory derangements that must be stabilized in parallel with definitive source control. As a result, systems trends—ED-to-surgery pathways, escalation triggers, multidisciplinary coordination, and audit-driven quality improvement—have become as clinically consequential as specific operative techniques **[14]**.

Methods

Study design and reporting framework

This review was designed as a scoping review to map and synthesize the contemporary evidence base describing evolving diagnostic and management strategies for the acute abdomen within emergency surgery, with explicit attention to cross-cutting "system trends" (e.g., ED–surgery pathways, sepsis-aligned workflows, and resource-limited adaptation).

Protocol and registration

A prospective protocol was developed a priori specifying objectives, eligibility criteria, outcomes of interest, and analytical approach. The protocol was intended for registration on the Open Science Framework (OSF) for scoping reviews; if registration is completed, the registration link and identifier should be reported in the final manuscript.

Eligibility criteria (Population–Concept–Context; Outcomes)

Eligibility criteria were defined using a Population–Concept–Context (PCC) approach, with outcomes prespecified to maintain relevance to emergency surgical decision-making.

- **Population:** Human studies involving adults (≥18 years) presenting with acute abdominal pain or suspected acute abdominal pathology requiring emergency surgical assessment (including patients undergoing emergency laparotomy or emergency abdominal intervention). Studies enrolling mixed adult–pediatric populations were eligible if adult data were extractable or if the study addressed system-wide pathways applicable to both groups.

- **Concept:** Evidence addressing diagnostic and/or management strategies relevant to contemporary acute abdomen care, including but not limited to: imaging pathways (CT, CTA, ultrasound, MRI when applicable), POCUS integration, clinical risk scores, laboratory biomarkers, time-critical diagnostic strategies (e.g., mesenteric ischemia pathways), operative decision-making (timing and approach, including laparoscopy where relevant), non-operative management pathways (where appropriate), source control, damage control surgery principles, antimicrobial stewardship, and perioperative pathway optimization (e.g., ERAS-type elements adapted to emergencies).

- **Context:** Emergency department, acute surgical admissions units, emergency general surgery services, and perioperative environments managing acute abdominal pathology in emergency surgery settings, including resource-limited settings where diagnostic/therapeutic constraints influence pathway design.

- **Outcomes of interest:** Outcomes were extracted when reported, including diagnostic

accuracy metrics (sensitivity, specificity, predictive values, likelihood ratios), time-to-intervention (time-to-imaging, time-to-OR, time-to-source control), clinical outcomes (morbidity, mortality), healthcare utilization (length of stay, ICU admission), safety measures (e.g., negative laparotomy rate where reported), and resource outcomes (costs or cost-effectiveness when available). These outcomes were prioritized to enable clinically meaningful synthesis across diverse conditions within the acute abdomen spectrum.

Study types: Priority was given to international guidelines/consensus statements, systematic reviews/meta-analyses, randomized controlled trials, and large prospective or high-quality observational studies; diagnostic accuracy studies were included when they addressed pathway-relevant diagnostic strategies. Case reports and very small case series were excluded unless they addressed a rare but time-critical entity and provided pathway-level insights (e.g., systems failures), in which case inclusion was justified narratively.

Language and timeframe: Only English-language publications were included. The primary time window was last 5 years, with inclusion of landmark earlier guidance or foundational evidence only when necessary to define terms, establish historical baseline practice, or interpret the trajectory of trends.

Information sources

The literature search was conducted in PubMed/MEDLINE and the Cochrane Library, supplemented by targeted retrieval of international society guidelines and consensus documents relevant to emergency general surgery (e.g., WSES guidance and ERAS emergency laparotomy recommendations). Where feasible, citation chaining (backward and forward) was used to identify additional high-impact sources central to the topic. Scopus and Web of Science were planned as supplementary databases; however, where direct access was not available, this limitation was declared and compensated by prioritizing PubMed-indexed evidence and major guideline repositories.

Search strategy

A comprehensive search strategy was constructed using controlled vocabulary where applicable and free-text terms capturing (i) the acute abdomen/abdominal pain construct, (ii) emergency general surgery/emergency laparotomy, and (iii) diagnostic and management domains (imaging, POCUS, risk scores, biomarkers, non-operative management, laparoscopy, damage control, source control, sepsis, and ERAS). The full electronic strategy for at least one database was preserved for reproducibility and planned for inclusion as an appendix.

Example PubMed search string (to be placed in Appendix):

(("acute abdomen"[Title/Abstract] OR "acute abdominal pain"[Title/Abstract] OR "emergency general surgery"[Title/Abstract] OR "emergency surgery"[Title/Abstract] OR "emergency

laparotomy"[Title/Abstract]) AND (diagnos*[Title/Abstract] OR imaging[Title/Abstract] OR CT[Title/Abstract] OR ultrasonograph*[Title/Abstract] OR "point-of-care ultrasound"[Title/Abstract] OR POCUS[Title/Abstract] OR biomarker*[Title/Abstract] OR "risk score"[Title/Abstract] OR management[Title/Abstract] OR nonoperativ*[Title/Abstract] OR laparoscopy[Title/Abstract] OR "damage control"[Title/Abstract] OR "source control"[Title/Abstract] OR sepsis[Title/Abstract] OR "enhanced recovery"[Title/Abstract] OR ERAS[Title/Abstract])) AND English[lang] AND Humans[Mesh]

Study selection

All retrieved records were exported into a reference manager and duplicates were removed. Screening proceeded in two stages:
(1) title/abstract screening against eligibility criteria, followed by
(2) full-text assessment for all potentially eligible studies.

Data charting and extraction

A standardized data-charting form was developed and piloted to ensure consistent capture of study characteristics and trend-relevant variables. Extracted fields included: study design and setting, population and inclusion criteria, target condition or syndrome category (e.g., appendicitis, diverticulitis, obstruction, ischemia, perforation/sepsis), diagnostic strategy (risk scores, imaging modality/pathway, biomarkers, diagnostic laparoscopy), management strategy (operative vs non-operative; timing; approach), system/process elements (pathway implementation, multidisciplinary coordination, audit/quality metrics), and reported outcomes (diagnostic accuracy, time-to-intervention, morbidity/mortality, LOS, negative laparotomy, cost). Where multiple publications described overlapping cohorts or guideline updates, the most recent and comprehensive source was prioritized.

Diagnostic Trends (Core Section)

1. Bedside evaluation and “red flag” physiology

Acute abdominal pain remains a high-frequency emergency presentation in which the clinician’s initial task is not syndromic labeling (e.g., “appendicitis”) but early separation of time-critical physiology (shock, evolving peritonitis, sepsis, bowel ischemia, ruptured AAA) from lower-risk conditions that permit structured observation and staged testing. Contemporary emergency-surgery framing therefore emphasizes a structured bedside sequence: focused history (onset, migration, vascular risk, anticoagulants, prior surgery), targeted examination for peritonism and hernias, and repeated reassessment rather than a single “snapshot” assessment—particularly because early disease may be clinically subtle and because several acute abdomen phenotypes have limited diagnostic specificity on clinical grounds alone **[15]**.

A parallel trend is explicit incorporation of physiologic “red flags” into the diagnostic pathway: abnormal vital signs, altered mental status, oliguria, and biochemical evidence of hypoperfusion (notably elevated lactate) are increasingly treated as triggers for escalation to

rapid imaging, early senior decision-making, and resuscitation bundles when sepsis or ischemia is plausible. This approach is consistent with international sepsis guidance that centers early recognition and lactate-informed resuscitation goals, and with emergency surgery guidelines that stress "as soon as possible" imaging for mesenteric ischemia when suspected **[16]**.

2. Risk stratification scores and decision support

Across acute abdomen syndromes, the dominant pattern is risk stratification that deliberately couples a clinical score (or rule) to an imaging decision, rather than using scores as stand-alone "diagnostic" tests. Appendicitis has the most mature score ecosystem, and WSES guidance explicitly positions clinical scoring as the pre-imaging step: imaging is recommended following initial assessment and risk stratification using clinical scores, with downstream pathways that differ for low-, intermediate-, and high-risk patients. In this model, low-risk adults (e.g., by AIR/Alvarado) may be discharged with safety-netting, high-risk patients may proceed toward surgery, and intermediate-risk patients benefit most from systematic imaging **[2]**.

Diverticulitis demonstrates a similar direction of travel but with a stronger warning against clinical diagnosis alone. WSES guidance advises complete assessment incorporating history, inflammatory markers, and radiology, and explicitly recommends relying only on clinical examination. Moreover, clinical decision rules that integrate localized LLQ tenderness, CRP thresholds, and symptom features illustrate how decision support is increasingly designed to identify subsets who can be diagnosed clinically versus those who require cross-sectional imaging **[3]**.

For bowel obstruction, decision support is less score-centric and more CT-sign-driven, with guideline frameworks emphasizing CT to define transition point, severity, and features concerning for ischemia/strangulation, thereby informing operative versus non-operative decisions. In practice, this represents the broader trend in acute abdomen: decision support is moving from "probabilistic bedside labels" toward imaging-anchored severity staging that directly links diagnosis to management **[17]**.

3. Laboratory biomarkers (what is useful vs overhyped)

Current evidence supports laboratory biomarkers primarily as adjuncts for triage, severity estimation, and pathway integration, not as replacements for imaging in most acute abdomen syndromes. Lactate is central when ischemia or sepsis is plausible: sepsis guidance embeds lactate measurement within early evaluation and resuscitation targets, while mesenteric ischemia guidance underscores that CTA should not be delayed when suspicion exists, reflecting the limited specificity of biomarkers in isolation **[18]**.

Inflammatory markers (WBC and CRP) remain useful but context-dependent. In diverticulitis, WSES notes that clinical LLQ pain with elevated inflammatory markers is common, but also emphasizes that clinical diagnosis lacks accuracy and that imaging substantially improves

diagnostic performance; CRP also appears useful for severity discrimination at higher thresholds, while low CRP early in the course may be misleading due to delayed rise. Appendicitis guidance likewise frames inflammatory markers and emerging biomarker panels as supportive rather than definitive, with explicit interest in combining biomarkers with scores and ultrasound to reduce unnecessary CT rather than to supplant imaging altogether **[2, 3]**.

Accordingly, the "trend" is not proliferation of new biomarkers per se, but pathway-level use: biomarkers inform urgency (e.g., sepsis physiology), support staging (e.g., complicated diverticulitis risk), and help determine the next diagnostic step (observation vs imaging vs operative exploration). Claims that single biomarkers can reliably diagnose heterogeneous acute abdomen etiologies should be treated cautiously unless supported by syndrome-specific diagnostic accuracy data **[19]**.

4. Imaging pathways

CT has consolidated its role as the principal "workhorse" imaging modality across many acute abdomen phenotypes, with utilization data demonstrating increasing CT use in ED abdominal pain over time, consistent with wider reliance on cross-sectional imaging for diagnosis and staging. Appropriateness criteria and syndrome-specific guidelines increasingly standardize when CT is first-line (e.g., LLQ pain/diverticulitis), when a step-up strategy is appropriate (expert ultrasound followed by CT if nondiagnostic), and when special protocols are time-critical (CTA for suspected mesenteric ischemia) **[18]**.

Radiation stewardship is a distinct modern sub-trend within CT pathways. For suspected appendicitis, evidence syntheses and randomized trial data support low-dose CT strategies designed to preserve diagnostic performance while reducing exposure, and this has contributed to broader acceptance of dose-optimized protocols within standardized imaging pathways **[20]**.

Ultrasound has bifurcated into (i) formal radiology ultrasound as first-line in biliary syndromes (aligned with ACR guidance for RUQ pain) and as an expert-dependent first test in some LLQ pathways, and (ii) POCUS as an increasingly operational tool for rapid bedside answers in time-critical or high-pretest-probability scenarios. Recent systematic reviews/meta-analyses support emergency-physician POCUS performance for acute cholecystitis and for AAA in appropriate contexts, reinforcing POCUS as an extension of bedside assessment rather than a replacement for definitive imaging when uncertainty persists **[21]**.

MRI occupies a selective niche—principally pregnancy/younger patients where radiation avoidance is paramount—within appropriateness frameworks for suspected appendicitis and related syndromes; however, MRI pathway adoption remains resource- and workflow-dependent, so its "trend" signal is strongest in high-resource centers and well-defined algorithms **[22]**.

Diagnostic laparoscopy

A persistent diagnostic challenge in acute abdomen is the patient with concerning physiology and/or peritonism in whom noninvasive tests are equivocal or impractical. Here, diagnostic laparoscopy retains value as both a diagnostic and therapeutic platform, particularly in abdominal emergencies where minimally invasive access can shorten time-to-source-control when imaging is inconclusive and can prevent delays in conditions that are predominantly operative diagnoses. Contemporary consensus statements in emergency surgery increasingly advocate a laparoscopy-first posture for selected abdominal emergencies where expertise and resources allow, reflecting both diagnostic utility and the potential to deliver definitive treatment through the same access **[23, 24]**.

Management Trends by Syndrome

1) Appendicitis

Across contemporary emergency surgery practice, the major management trend has been the transition from "clinical diagnosis → routine appendectomy" toward imaging-confirmed phenotyping (uncomplicated vs complicated; presence of appendicolith; abscess/phlegmon) followed by shared decision-making regarding antibiotics-first versus immediate surgery. In the largest modern randomized trial, antibiotics were shown to be an acceptable initial strategy for many patients, while also demonstrating predictable trade-offs—most importantly, a non-negligible probability of subsequent appendectomy and higher downstream utilization in specific subgroups **[25]**. These trial-level findings have been incorporated into international emergency surgery guidance, which frames non-operative antibiotics as an option only in carefully selected uncomplicated cases, emphasizes the need for reliable follow-up, and generally supports operative management when complicated disease is suspected or confirmed **[2]**.

2) Acute cholecystitis / biliary emergencies

In acute calculous cholecystitis, the dominant global direction remains early laparoscopic cholecystectomy for operable patients, paired with structured severity/risk stratification to identify those who may require temporizing measures or higher-level perioperative support. **[26]** A key "high-risk" inflection point is whether percutaneous gallbladder drainage is used as definitive therapy versus a bridge; evidence from a multicentre randomized trial in high-risk patients demonstrated clinically important outcome differences favoring cholecystectomy over catheter drainage in that specific context, reinforcing the principle that drainage should not be treated as equivalent to definitive source control when surgery is feasible. Parallel Tokyo guidance continues to operationalize escalation based on severity and physiology, and it explicitly emphasizes immediate stabilization and early treatment in urgent suspected biliary infection rather than waiting for definitive diagnostic closure**[27]**.

3) Diverticulitis and perforated colonic disease

Condition-based synthesis in modern diverticulitis management increasingly differentiates (i) uncomplicated disease, in which carefully selected patients may be managed with outpatient pathways and selective antibiotic use, from (ii) complicated disease, where abscess size/physiology guides drainage and escalation, and from (iii) diffuse peritonitis, where operative strategy selection is explicitly individualized. Contemporary WSES guidance consolidates these decision points into a severity- and patient-factor–driven framework, recognizing that the choice among resection strategies (including staged approaches) is primarily governed by hemodynamic stability, contamination burden, and patient reserve rather than a single universally superior operation **[28]**.

4) Small bowel obstruction

For adhesive small bowel obstruction, the prevailing trend is protocolized non-operative management in the absence of peritonitis/strangulation features, supported by standardized imaging review and time-bounded reassessment to reduce delays to surgery when ischemia is likely. The Bologna guideline update remains a central framework for this approach, including structured triggers for operative management and the use of water-soluble contrast agents (WSCA) as part of an evidence-based pathway. However, the WSCA literature illustrates an important contemporary nuance: while WSCA can be used to track resolution and inform the likelihood of needing surgery, estimates of its *therapeutic* benefit vary by trial design and pathway implementation, and modern synthesis emphasizes the need for explicit protocols rather than ad hoc use. With respect to operative technique, the trend toward laparoscopy is best framed as selection-dependent; systematic review evidence supports feasibility and safety in selected patients, while underscoring that outcome advantages are not universal and depend heavily on patient selection and surgeon capability **[11]**.

5) Perforated peptic ulcer

In perforated peptic ulcer, current emergency surgery guidance continues to prioritize rapid resuscitation, early source control when indicated, and adjunct medical therapy. The major "trend" is not liberal non-operative care—because truly safe non-operative selection remains uncommon—but rather more explicit selection criteria for the rare patient in whom a sealed perforation is plausible, alongside increasing adoption of minimally invasive repair in physiologically suitable patients and routine incorporation of antimicrobial and acid-suppression strategies into care bundles **[29]**.

6) Acute mesenteric ischemia

Acute mesenteric ischemia has increasingly been framed as a time-critical vascular emergency, where outcomes are highly sensitive to delays in diagnosis and revascularization. Updated WSES guidance explicitly supports a CTA-driven diagnostic pathway, early multidisciplinary coordination, and individualized revascularization (including endovascular options when

appropriate and feasible), paired with intraoperative assessment strategies such as planned reassessment/second-look when bowel viability is uncertain. Importantly, current guidance also highlights that biomarkers such as lactate may be misleading if treated as a screening tool, and that diagnostic strategy should not be deferred pending biochemical evolution in a patient with compatible clinical/imaging features **[18]**.

7) Acute pancreatitis with surgical abdomen mimics/complications

The modern emergency-surgery-relevant trend in acute pancreatitis is the systematic avoidance of "early surgery" for inflammatory disease itself, coupled with early severity stratification to distinguish patients who require ICU-level support from those suitable for early oral feeding and standard monitoring. Contemporary gastroenterology guidance—highly influential in EGS practice—reinforces delayed, stepwise intervention for necrotizing complications whenever feasible, favoring drainage-first strategies and postponing definitive necrosectomy until collections have matured, while simultaneously emphasizing that suspected infected necrosis, persistent organ failure, or abdominal compartment physiology may necessitate earlier escalation within a structured pathway **[30]**.

8) Abdominal trauma overlap

If trauma overlap is included in an "acute abdomen" review, the most defensible synthesis is to frame damage-control concepts as a physiology-led strategy (not a default operative style), used in patients with profound derangement where abbreviated source control and staged reconstruction improve the probability of survival. WSES open abdomen guidance remains a central reference for indications and management principles across trauma and non-trauma contexts. **[31]** The non-trauma emergency literature also reflects expanding DCS use, but systematic synthesis emphasizes that evidence quality is variable and patient selection is decisive, which should temper extrapolation beyond clearly unstable cohorts. REBOA remains a controversial, highly systems-dependent adjunct; systematic synthesis supports discussion of potential benefits and important risks, but it should be treated as optional content unless the review explicitly includes major hemorrhage pathways **[32]**.

Operative Strategy Trends

Laparoscopy in emergencies

A consistent international trend is the expansion of laparoscopy from "selected index operations" into a broader laparoscopic-first philosophy for emergency abdominal surgery—conditional on physiological stability, appropriate expertise, and the ability to avoid harmful delay. The WSES consensus statement supports laparoscopy as an initial approach for stable patients undergoing emergency abdominal surgery, while emphasizing that in hemodynamically unstable patients, laparotomy remains the default due to the time-critical need for rapid control and limited tolerance for pneumoperitoneum-related physiological perturbations **[23]**.

Large contemporary registry evidence suggests that, in appropriately selected patients, attempted laparoscopy can be associated with improved short-term outcomes compared with open surgery. In the NELA-linked propensity score–matched analysis (England/Wales), laparoscopically attempted cases demonstrated lower mortality and shorter length of stay than matched open cases, while also illustrating real-world conversion patterns and the interpretive constraint of selection bias despite statistical adjustment **[33]**.

Operationally, the "trend" is not simply more laparoscopy, but structured thresholds for early conversion to avoid prolonged non-therapeutic time: conversion should be viewed as a safety mechanism when visualization is inadequate, bleeding control is uncertain, the degree of contamination is greater than anticipated, or when definitive repair cannot be achieved safely within a time window compatible with the patient's physiology and resuscitation trajectory. Contemporary guidance highlights stability and feasibility as the central determinants, rather than a dogmatic minimally invasive mandate **[23]**.

International journals increasingly expect the laparoscopy discussion to explicitly acknowledge that much comparative evidence remains observational, influenced by surgeon/system case-mix, and heterogeneous across syndromes—so conclusions should be framed as "benefit in selected patients within capable systems," not universal superiority **[33]**.

Table 1: When laparoscopy is preferred vs when open is safer (cross-cutting framework)

Domain	Laparoscopy generally preferred/feasible	Open generally safer/priority
Patient physiology	Hemodynamically stable; tolerates pneumoperitoneum; resuscitation goals largely achieved	Hemodynamic instability/physiologic extremis; inability to tolerate delay or pneumoperitoneum
Disease factors	Localized pathology; anticipated controllable contamination; feasible definitive repair	Massive contamination; uncontrolled bleeding; suspected extensive ischemia/need for rapid wide exposure
System factors	Skilled team; rapid access to equipment; ability to convert immediately	Limited laparoscopic capability; delayed access; high likelihood of prolonged non-therapeutic time
Safety threshold	Low threshold for conversion when visualization/control inadequate	Primary open approach when rapid, reliable source control is needed

Evidence base underpinning the framework: WSES laparoscopic-first consensus + large registry comparative outcomes in selected patients.

Special Populations

Elderly and frailty

Older adults presenting with acute abdominal pain frequently represent a diagnostic and management "high-risk phenotype" because baseline multimorbidity, polypharmacy, and attenuated physiological reserve can reduce the sensitivity of classical peritonism and amplify the consequences of delay, thereby shifting the safety threshold toward earlier definitive assessment and time-critical exclusion of ischemia, perforation, and complicated obstruction. Contemporary emergency surgery literature increasingly frames frailty—rather than chronological age—as the more discriminant construct for operative risk, postoperative functional decline, and the appropriateness of escalation, including ICU admission and damage-control strategies, and therefore recommends routine frailty screening early in the acute abdomen pathway rather than late, post hoc "risk labeling" **[34]**.

In practice, the most implementable approach in emergency settings is the use of brief, validated frailty instruments that can be completed at the bedside (for example, the Clinical Frailty Scale, Edmonton Frail Scale, or deficit-accumulation/modified frailty indices), followed by explicit alignment of operative intent with goals-of-care and predicted postoperative trajectory.**[34]** Where emergency laparotomy is required, ERAS Society guidance and pathway-based EGS evidence support embedding early senior decision-making,

standardized perioperative optimization, and structured escalation triggers, with frailty status informing the intensity of postoperative surveillance, delirium prevention bundles, and early involvement of geriatric medicine when available **[35]**.

Pregnancy

In pregnant patients with suspected surgical acute abdomen, contemporary guidance emphasizes that diagnostic accuracy and maternal stabilization remain primary because delayed diagnosis and delayed source control can increase maternal morbidity, which secondarily threatens fetal well-being; accordingly, imaging should be selected to maximize diagnostic yield while minimizing fetal radiation exposure. A widely endorsed principle is an ultrasound-first approach, with MRI as the preferred second-line modality when ultrasound is nondiagnostic and MRI is available, while CT is reserved for situations in which a timely, accurate diagnosis is required and alternative modalities are inadequate **[36, 37]**.

When operative management is indicated, current surgical society guidance supports laparoscopy in pregnancy when performed by appropriately trained teams with pregnancy-adapted technical considerations (for example, entry technique, patient positioning, and close maternal physiological monitoring), while maintaining a low threshold for conversion when visualization is inadequate or rapid source control cannot be achieved laparoscopically. A multidisciplinary model integrating obstetrics, anesthesia, radiology, and emergency surgery is recommended for shared risk assessment, fetal considerations, and perioperative planning, particularly in late gestation and in the presence of maternal sepsis or hemodynamic instability **[38]**.

Immunosuppressed and oncology patients

Immunosuppressed and oncology patients (including those receiving cytotoxic chemotherapy, corticosteroids, biologics, or transplant immunosuppression) represent a distinct acute abdomen subgroup in whom inflammatory responses may be blunted, typical laboratory and clinical thresholds may be unreliable, and the balance between early operative source control and non-operative stabilization is often altered by neutropenia, thrombocytopenia, and treatment-related mucosal injury. International emergency surgery guidance specifically addressing the immunocompromised acute abdomen stresses earlier imaging and lower thresholds for senior review, while prioritizing time-critical diagnoses and tailoring antimicrobial strategies to colonization risk and local resistance patterns **[39]**.

For neutropenic syndromes such as neutropenic enterocolitis, recent reviews emphasize that management must integrate prompt recognition, aggressive supportive care, broad-spectrum antimicrobial therapy, and early surgical consultation, with operative intervention reserved for complications such as perforation, uncontrolled bleeding, or clinical deterioration despite optimized medical management. In broader oncology practice, condition-based reviews highlight that bowel obstruction, perforation, ischemia, and treatment-associated colitis can present atypically and require early multidisciplinary decision-making (surgery–oncology–

ICU–radiology) to avoid harmful delays while minimizing iatrogenic risk in physiologically fragile patients **[40]**.

Chronic anticoagulation / DOACs

A structured "bleeding-risk pathway" is now a core systems requirement for acute abdomen surgery because emergency laparotomy frequently cannot await full drug clearance, and perioperative decisions must reconcile bleeding control with thrombosis prevention. The most recent ISTH SSC guidance summarizes contemporary reversal strategies, distinguishing specific reversal agents (for example, idarucizumab for dabigatran and andexanet alfa for factor Xa inhibitors) from non-specific strategies (for example, prothrombin complex concentrates in selected contexts), while emphasizing that reversal should be reserved for clinically significant bleeding or urgent surgery where bleeding risk is unacceptable **[41]**.

In parallel, major cardiology consensus pathways provide operational frameworks for triage, reversal selection, supportive measures, and escalation, which can be integrated into ED–surgery pathways as "time-critical enablers" of safe source control **[42]**. Systematic review evidence further informs the comparative effectiveness and uncertainties surrounding specific reversal agents (including heterogeneity of outcome reporting and confounding by indication in observational datasets), underscoring the need for institutional protocols linked to laboratory capabilities, renal function assessment, and postoperative restart planning tailored to thrombotic risk and surgical hemostasis.

Table 2: Special-population modifications to an acute abdomen pathway

Special population	Pathway modification (practical)	Primary rationale / risk addressed
Elderly/frail	Early frailty screening at triage; senior review; explicit goals-of-care discussion before high-risk laparotomy when time permits	Frailty better discriminates operative risk and trajectory than age alone; supports proportional escalation
Pregnancy	US-first; MRI second-line when available; CT only when justified by need for timely diagnosis; MDT (OB–anesthesia–radiology–surgery)	Minimize fetal radiation while preventing harmful diagnostic delay; pregnancy-adapted operative planning
Immunosuppressed/oncology	Lower threshold for imaging and senior review; early broad-spectrum antimicrobials when sepsis suspected; oncology/ICU involvement	Blunted inflammatory response and higher complication risk; time-critical source control may still be required
Chronic anticoagulation/DOACs	"Bleeding-risk" algorithm: drug/last dose/renal function; reversal strategy when indicated; postoperative restart plan	Prevent catastrophic hemorrhage while balancing thrombosis risk; standardize reversal decision-making

Evidence informed by emergency surgery frailty guidance and frailty outcome syntheses, pregnancy imaging and laparoscopy guidance, immunocompromised acute abdomen guidance, and DOAC reversal frameworks.

Table 3: Pregnancy imaging and operative considerations in suspected surgical acute abdomen

Decision point	Preferred approach	Caveat/exception
First-line imaging	Ultrasound	If nondiagnostic and suspicion persists, escalate rather than "observe indefinitely"
Second-line imaging	MRI (when appropriate/available)	Access constraints may necessitate CT to avoid dangerous delay
CT use	Reserved for justified scenarios needing timely diagnosis	Use when benefits outweigh fetal radiation concerns, especially for time-critical pathology
Operative approach	Laparoscopy when indicated and expertise available	Convert early if visualization inadequate or rapid source control cannot be achieved

Derived from ACOG diagnostic imaging guidance, ACR appropriateness narratives, and

Conclusion

Acute abdomen will remain a core safety challenge in emergency surgery because heterogeneity, atypical presentations, and narrow therapeutic windows make delay more harmful than diagnostic uncertainty alone. Contemporary practice is increasingly defined by pathway-based care: early recognition of physiological "red flags," score-informed triage, biomarker use as adjuncts, and rapid access to definitive imaging—particularly CT/CTA when ischemia or perforation is suspected. Management trends favor syndrome-specific stratification, selective non-operative pathways where evidence supports them, and wider adoption of minimally invasive surgery within clear conversion thresholds. Cross-cutting improvements depend on sepsis-aligned resuscitation, timely source control, and multidisciplinary systems that are adaptable to resource constraints.

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