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Management of Acute Abdomen: Evidence-Based Approaches, Diagnostic Challenges, and Surgical Innovations

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ABSTRACT
Acute abdomen is an acute and severe pain in the abdomen that is a sign of underlying intra-abdominal pathology that may necessitate urgent or emergent action. It is characterised by a wide range of causes of obstructive, inflammatory, vascular and perforative etiologies, which demand different diagnoses and treatment efforts. Nonspecific symptoms augment the difficulty of timely diagnosis, particularly in elderly, immunocompromised and pregnant patients. Even though diagnostic instruments such as computed tomography (CT) and magnetic resonance imaging (MRI) have improved the precision of diagnosis, resource constraints in low- and middle-income countries (LMICs) continue to increase the delays and poorer outcomes. Diagnostic imaging overuse has led to an increase in healthcare expenditure and unnecessary radiation exposure in high-income countries. The development of surgical procedures, especially minimally invasive surgery such as laparoscopy and robotic surgery, has minimised recovery time and pain after surgery. Moreover, there are also Enhanced Recovery After Surgery (ERAS) protocols that have played a significant role in the improvement of the postoperative outcomes through the encouragement of early mobility, pain management and nutrition. This is a review of evidence-based practices in the diagnosis and treatment of acute abdomen, and it discusses the issues in diagnosis, management paradigms, and the importance of surgical innovations. There is a focus on the incorporation of new technologies and optimization of clinical pathways to enhance patient outcomes in the world.

Keywords: *Acute abdomen, diagnostics, laparoscopy, ERAS protocols, surgical innovations*

1. INTRODUCTION

The acute abdomen clinical syndrome is a sudden, often less than 24-hour-long abdominal pain that is an indicator of an intra-abdominal pathology necessitating urgent or emergent treatment (Meena et al., 2025; de Oliveira Varca and de Almeida Santos, 2024). The term has always been closely related to peritonitis and the so-called surgical abdomen, but today, a much wider etiological spectrum is identified, including inflammatory, obstructive, vascular, and perforative pathologies (Vaghef-Davari et al., 2019). In most countries, acute abdominal pain presentations are a major portion of case-loads in emergency medicine: one large urban emergency department study reported acute abdominal pain as about 7% -10% of adult emergency department visits (Cervellin et al., 2016). The scale of the problem is preordained by a high level of heterogeneity of cause-and-effect relations in different settings. The increased postoperative morbidity and mortality in resource-limited settings have been presented, which implies the delay in diagnosing, the constraints in the imaging and access to surgery, and fluctuations in the pathways of care. As an example, a narrative review reported in-hospital mortality of acute abdomen to be as high as 10-12% in certain centres. The urgency of timely and correct diagnosis is difficult to overestimate: the emergence of localised pathology in the systemic outcomes can be triggered by delays or misdiagnosis, sepsis, multi-organ

dysfunction, and death (Liu et al., 2024). The lack of specific symptomatology and similarities of the clinical picture further complicate the situation: older people, immunocompromised, and pregnant women can manifest unusually (Vaghef-Davari et al., 2019). In the meantime, the introduction of developed diagnostics requires clinicians to strike a balance between fast evaluation and reasonable use of resources. The acute abdomen management paradigm is moving in modern times away from the empiric decision-making (i.e., operate vs observe) to more complex and evidence-based approaches. The implementation of new biomarkers, artificial-intelligence-enhanced diagnostic tools, a high level of computer tomography (CT), magnetic resonance imaging (MRI), point-of-care ultrasound (POCUS), and innovative changes in the workflow are transforming clinical processes (Kumar et al., 2025). Simultaneously, surgical innovation (such as minimally invasive laparoscopy and robotic surgery), improved recovery after surgery (ERAS) practices, and multidisciplinary teams are relying on what constitutes optimal care in the emergency surgical setting (de Oliveira Varca & de Almeida Santos, 2024). In light of these dynamic developments, there is an urgent need to integrate existing evidence on diagnostics and therapeutic decision making as well as surgical innovation:

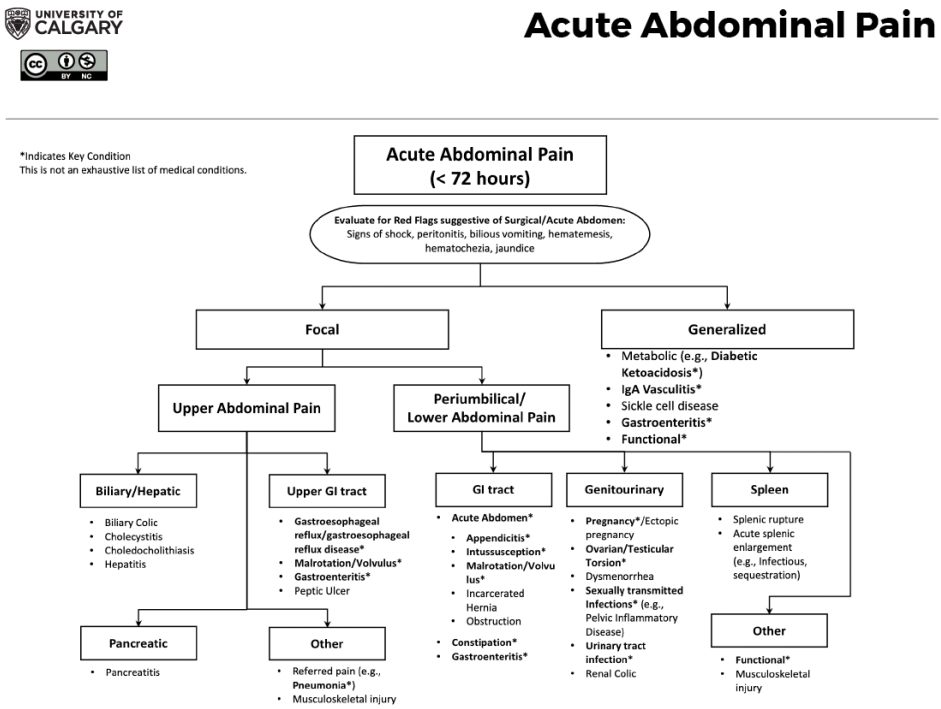

Figure 1: Acute Abdominal Pain (University of Calgary, 2025)

2. OBJECTIVES

This review aims to summarise existing evidence-based practice in the treatment of acute abdomen, deconstruct the diagnostic complex that is the heterogeneous and time-urgent presentation of acute abdomen, and discuss recent surgical and technological developments that are defining the modern practice of emergency abdominal surgery. In such a way, studies contribute to offering a complete, current resource to clinicians and scientists that fills the gap between pathophysiology and diagnostics and treatment pathways and prospects of caring for patients with an acute abdomen.

Etiological Spectrum and Pathophysiological Insights

Etiological Classification

Etiology of acute abdomen includes a wide spectrum of conditions, which could be divided into four main groups which are obstructive, inflammatory, vascular, and perforative causes. Mechanical obstructions like bowel obstruction due to adhesions, hernias, volvulus or intussusception, which obstruct the passage of intestinal contents, are considered obstruction causes that cause distension and ischemia (Börner et al., 2025). Inflammatory etiologies include such conditions as appendicitis, cholecystitis, diverticulitis, and pancreatitis that usually include local pain, fever, and inflammatory markers (de Jonge et al., 2021). The vascular causes typically involve acute mesenteric ischemia, which is an outcome of arterial embolism or thrombosis leading to a decrease in blood supply to the intestines, ischemia, and potential infarction (Bala et al., 2022). Finally, there are perforative etiologies, which involve tearing of hollow organs like the gastrointestinal tract,

which might lead to peritonitis, requiring emergency surgery. These etiologies are highly significant to adequate diagnosis and adequate management, as the treatment programmes vary widely depending on the cause of the issue.

Pathophysiological Mechanisms

The mechanisms involved in acute abdominal conditions should be understood so that they can be cured. Ischemia, in other words, is the reduction of blood flow to the abdominal organs that results in the following: tissue hypoxia, cell injury and tissue necrosis. In several cases, including acute mesenteric ischemia, bowel infarction occurs due to the stagnation of blood flow, and a systemic inflammatory reaction develops (Bala et al., 2022). This occurs because of infection (diverticulitis or appendicitis) and the local inflammation, which can evolve into sepsis unless it is addressed in the near future (Börner et al., 2025). Obstruction augments intraluminal pressure, which can be explained by mechanical obstructions and leads to bowel distension, ischemia and perforation can occur. Lastly, hollow organs become perforated and the contents spill into the peritoneal cavity, resulting in chemical peritonitis that may progress into bacterial peritonitis in case of non-attended care.

Implications for Targeted Intervention

The detailed understanding of etiologies and pathophysiological processes of acute abdomen is one of the major components of the informative side of clinical practice. The presence of advanced methods of diagnostic imaging using contrast-enhanced computed tomography (CT) plays a pivotal role in determining the underlying pathology, whether it is ischemia, infection or perforation (Börner et al., 2025). Such knowledge would help in the surgical planning process since, depending on the diagnosed pathology, the intervention can be customised (in the example of mesenteric ischemia, prompt intervention would save bowel tissue and allow the patient to improve patient outcomes (Bala et al., 2022). There is also the role of antimicrobial treatment of the infestation of inflammatory and infectious etiology, when the treatment is primarily carried out with the involvement of broad-spectrum antibiotics, which can be tailored depending on the outcomes of the culture and clinical reaction. Finally, supportive care, or fluid replacement, electrolyte replacement, and close monitoring of the abacus of sepsis or organ failure, is a significant facet of patient care when one has an acute abdominal condition.

Clinical Evaluation and Diagnostic Challenges

Clinical Assessment

The first clinical assessment of the patient with acute abdominal pain is the most crucial one to determine the etiology of the condition and its urgency. An in-depth history and physical examination are the key to assessment. Critical features of the history involve the initiation, site, duration, and nature of the pain, the other symptoms relating to the pain, which include nausea, vomiting, fever and bowel changes. Physical examination must evaluate any evidence of peritonitis, abdominal distension, and localised tenderness and may present certain findings such as rebound tenderness or guarding, which is possible evidence of peritoneal irritation (Börner et al., 2025). Some populations, however, do offer some challenges in diagnosis because of unusual presentation. Older patients could have dulled inflammatory reactions and end up having vague or uncharacteristic symptoms. Individuals with diabetes can be perceived to experience lower levels of abdominal pain, which postpones the detection of severe conditions (Vaghef-Davari et al., 2019). Atypical signs and an increased risk of a rapid transition to sepsis can manifest in immunocompromised patients (those who are receiving chemotherapy, HIV/AIDS-related, etc.) (de Oliveira Varca & de Almeida Santos, 2024). Pregnant patients present special diagnostic problems, as their physiology changes, and they can have obstetric emergencies that resemble abdominal pathology.

Laboratory Evaluation

Laboratory tests are important in the context of diagnostic support of the clinical diagnosis and severity of acute abdominal conditions. The commonly used biomarkers are C- Reactive Protein (CRP), which is an acute-phase reactant, and increases in most cases of inflammation and is raised during conditions such as appendicitis and diverticulitis. Procalcitonin (PCT), which is a calcitonin precursor, increases considerably in case of bacterial infections and is applicable in the separation of bacterial and non-bacterial agents' inflammation. When tissues become hypoxic, serum Lactate levels tend to be elevated, and the upsurge of the values is linked to elevated mortality in critically ill patients. Finally, D-dimer, a degradation product of fibrin, can be increased in such conditions as mesenteric ischemia, but it can be less sensitive and specific. Although the biomarkers represent precious information, they are not to be interpreted alone; their clinical significance is to be considered together with the history of the patient, his or her physical examination, or any other imaging results, and further used to make decisions about the management.

Imaging Modalities

Imaging is very essential in the diagnosis confirmation and in planning therapeutic interventions in acute abdomen, and the modality of imaging is determined by the clinical scenario, the patient stability, and the available resources. Ultrasound (US) can be a first-line imaging modality because it is non-invasive and radiation-free, and therefore, is especially helpful in the assessment of cholecystitis, appendicitis, and gynaecological pathologies. Computed Tomography (CT) offers detailed and cross-sectional images, which are very effective in the diagnosis of abdominal conditions of greatly varied types, such as bowel obstruction, perforation, and vascular events like mesenteric ischemia. Contrast-enhanced CT is especially useful in

the evaluation of intra-abdominal infections and inflammatory processes. Magnetic Resonance Imaging (MRI) has a very good soft tissue contrast, which is non-ionising, hence it is very useful in assessing the liver, pancreas, and biliary system in pregnant women or even those who have contraindications to CT. Lastly, there is the Point-of-Care Ultrasound (POCUS) performed at a bedside, which can be rapidly evaluated, and which can be particularly useful in an emergency case regarding the evaluation of conditions such as free fluid, gallstones, or aortic aneurysms. The advantages and disadvantages of each modality are present, and the selection must be based on the clinical presentation of the patient and his or her suspected diagnosis.

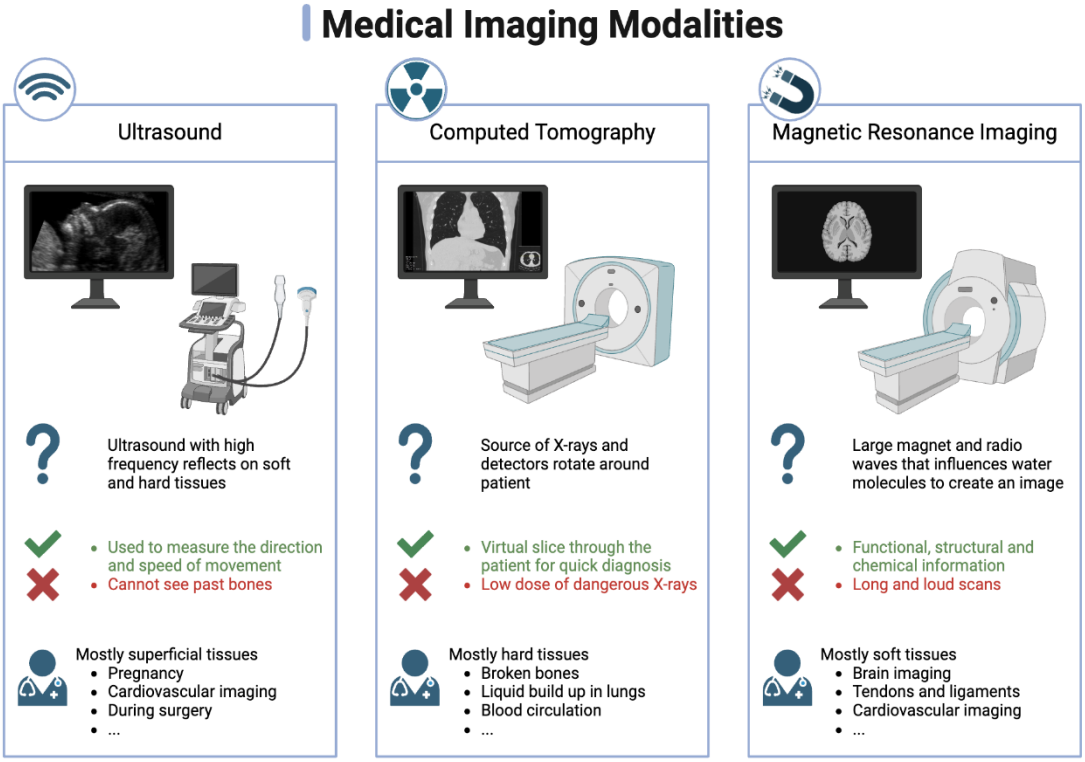

Figure 2: Medical imaging modalities (Orije, 2023)

Diagnostic Decision-Making

The acute abdomen needs to be managed effectively, and this involves a proper diagnosis; several clinical scoring systems have been designed to help in the diagnosis. Alvarado Score, a popular instrument that considers clinical evidence, symptoms, and lab results to determine the possibility of the disease, involves the use of clinical manifestations, symptoms, and laboratory results to approximate the likelihood of the disease (Noori et al., 2023). The RIPASA Score, which is a modification of the Alvarado score, was specially made to fit the Asian population, where alterations are made to enhance diagnostic accuracy. AIR Score has the parameters: age, the level of white blood cells, and the duration of the symptoms to determine the likelihood of appendicitis. Though these scoring systems can be instrumental in stratification of patient risk and management decisions, they must serve as complements of clinical judgement and cannot be used as the final determinants of surgical intervention. Alongside these conventional devices, there has been a growing role of advancement in artificial intelligence (AI) in abdominal imaging. Artificial intelligence algorithms, especially ones based on the deep learning approach, demonstrate the potential to replace radiologists in interpreting images, enhance the accuracy of their diagnosis, and decrease the workload of radiologists. Nonetheless, the clinical use of AI in abdominal diagnostics has yet to be validated and has not been incorporated into clinical practice on a large scale.

Evidence-Based Management Paradigms

Initial Resuscitation and Stabilization

Management of an acute abdomen patient starts with a good assessment followed by urgent resuscitation, especially for the critically ill patients. The ABC method (Airway, Breathing, Circulation) is the main foundation of resuscitation. Firstly, it is crucial to ensure sufficient airway patency, oxygenation, and ventilation prior to working on circulatory problems (Seccombe & Sapey, 2018). The other essential part is fluid resuscitation. In the initial stages, crystalloid fluids (e.g., normal saline,

lactated Ringer solution) are usually administered to maintain perfusion and to counter dehydration, particularly in bowel obstruction, perforation or sepsis. In patients with shock or severe fluid losses, colloids can be taken into consideration, but their application is a controversial issue because of the risks of such complications as pulmonary edoema (Martin and Bassett, 2019). Resuscitation involves the management of sepsis. Earlier goal-oriented therapy (EGDT) is a therapeutic approach relying on the Sepsis-3 guidelines and focused on identifying sepsis early and administering broad-spectrum antibiotics and aggressive fluid resuscitation, and vasopressor use when needed (Chen et al., 2017). Appropriate antimicrobials should be administered to patients after getting cultures within the first hour of presentation. Furthermore, analgesia is also a major issue in the treatment of an acute abdomen. Although opiates can be essential to provide relief of severe pain, it is necessary to use them in a balanced manner to prevent the obscuration of clinical manifestations of peritonitis or other surgical emergencies (Vitiello et al., 2023). In stable patients, it might be better to use multimodal analgesia, such as nonsteroidal anti-inflammatory drugs (NSAIDs) or regional anaesthesia methods to minimise the use of opioids and the adverse events related to them (Vitiello et al., 2023).

Non-Surgical Management

Not every acute patient who has abdominal pain needs surgery. As a matter of fact, however, conservative management is suitable when dealing with non-surgical conditions. As an example, an instance of mild diverticulitis can be treated with broad-spectrum antibiotics, bowel rest, and close observation, especially in immunocompetent patients with no evidence of peritonitis (Mirzamohamadi et al., 2024). It has been established that in patients with uncomplicated diverticulitis, antibiotic therapy alone leads to positive outcomes in 70% to 80% of patients. Nonetheless, patients who develop complicated diverticulitis, i.e. have abscesses, perforation, or a great deal of bleeding, might eventually need surgery. On the same note, ordinary management of acute pancreatitis is through conservative means, through supportive therapy, such as IV fluids, nutritional support, and analgesics. Most of the cases are self-limiting and only a few cases necessitate interventions on complications such as pancreatic necrosis or pseudocysts (Seccombe & Sapey, 2018). In most non-surgical cases, pharmacological interventions are necessary. Empirical use of antibiotics in the environment of probable infectious aetiology, such as in diverticulitis, appendicitis, or biliary tract disease, awaits the results of a culture. Fluids should be started as soon as possible in patients with pancreatitis to keep hemodynamic stability and avoid additional organ dysfunction (Lakananurak & Gramlich, 2020). The paramount is also nutritional support, with enteral nutrition being preferred to parenteral nutrition, as it contributes to the preservation of gut integrity and minimises the chances of bacterial translocation. Additionally, all non-surgically handled patients should be carefully observed, and re-imaging or laboratory work carried out to determine the indications of worsening. Signs such as persistent fever, growing white blood cell count, and pain or tenderness progression should be a reason to reconsider surgical intervention (Martin & Bassett, 2019).

Surgical Management

Although most patients can indeed be handled by adopting a conservative approach, surgery has been the mainstay of treatment in some acute abdominal cases. Appendicitis is a type of surgery that is most frequently performed in an emergency, and the quality of the surgery is greatly dependent on the time taken to perform it. Early appendectomy has been linked to reduced incidences of perforation, peritonitis and long hospitalisation (Seudeal et al., 2018). Late surgical operation, especially when perforation is observed or an abscess develops, predisposes the surgical patient to suffer complications like sepsis, wound infection and necessitates more comprehensive surgeries. The issue of the optimal time of surgical intervention in acute cases of cholecystitis is also contentious. Laparoscopic cholecystectomy done within 72 hours of symptom onset is less risky and hospital admission than late intervention (Mannam et al., 2023). In the case of bowel obstruction, surgery is justified in case of bowel strangulation, perforation, or no response to conservative treatment (Mirzamohamadi et al., 2024). Conversely, elective laparotomy is done in patients with non-strangulated obstructions, and one can resect and place a stent in some cases. It is up to it to decide whether open surgery or laparoscopic surgery should be performed, which is based on a number of factors, which are condition of the patient, the experience of the surgeon and the suspected underlying pathology. Laparoscopy surgery has gained a gold standard in most procedures, such as appendectomy, cholecystectomy, and even bowel resection, because it has gained an advantage in terms of less postoperative pain, faster recovery, and shorter hospital stay (Seudeal et al., 2018). A systematic review of the open and laparoscopic appendectomy did not show any significant difference in the complications, but reported that laparoscopic surgery involved a shorter length of stay and less pain in the postoperative phase. Open surgery can be required in situations of complex or advanced disease, especially in situations of perforation or massive peritonitis. Multidisciplinary coordination plays a very significant role in the management of patients with acute abdomen, especially when it is more complex with more than one organ system involved. To achieve the best patient outcomes, surgical teams have to collaborate with radiologists, infectious disease experts, and intensivists. Moreover, a critical care team is essential to interact with the patient early in cases of high risk or comorbidity (or those who need intensive supervision after surgery) (Mannam et al., 2023). Pre-operative mobilisation, the use of Enhanced Recovery After Surgery (ERAS) practices, and effective treatment of post-operative pain have been identified as beneficial in abdominal surgery (Lakananurak and Gramlich, 2020).

Surgical Innovations and Technological Frontiers

Laparoscopy and Robotics

Laparoscopic surgery coupled with robotic surgery has in the recent years revolutionised the manner in which acute abdominal conditions are managed. They are minimally invasive procedures with significant advantages of the classical open surgery that include a reduction in the postoperative state of pain, shortened hospitalisation period, and revenue recovery (Parker et al., 2023). Laparoscopy is especially the most viable choice, currently, in the execution of all the different surgical tasks, including appendectomy, cholecystectomy, and bowel resection. It has also been demonstrated in the studies that laparoscopic appendectomy is associated with a decreased wound infection, a lower rate of post-operative pain, and less normal activity readmission than open surgeries (Al-Jaberi et al., 2023). In addition to this, robotic surgery, particularly with the aid of the da Vinci Surgical System, has been found to be more precise and has a greater effect of visualisation, particularly during complex surgery, such as bowel resections and gastrostomy (Zhao et al., 2024). Robotic-assisted laparoscopic surgery also provides the advantage of three-dimensional visualisation and provides better dissection and suturing accuracy, which results in fewer complications, such as bowel injury or anastomotic leaks (Zhao et al., 2024). However, although the advantages of the two laparoscopic and robotic surgery are numerous, challenges are also present and, in particular, the learning curve of the mentioned techniques. Still not competent surgeons may require a significant period of training to begin the minimally invasive operations that potentially may be more expensive in terms of time and money (Al-Jaberi et al., 2023). Moreover, robotic surgery should not be an immediate limitation to its use because, despite its potentially higher accuracy, it is expensive; thus, it might not be accessible in a limited-resource setting (Parker et al., 2023). However, such challenges do not reduce the benefits of such technologies in patient recovery and clinical outcomes, that is why they become increasingly important to the process of the treatment of acute abdominal conditions.

Enhanced Recovery After Surgery (ERAS)

Enhanced Recovery After Surgery (ERAS) guidelines represent a change of paradigm in the case of post-operative patients who have undergone an abdominal surgery. These evidence-based practises helped to focus on the fast recovery and decrease of complications and patient outcomes through maximising the use of the perioperative care (Katikam et al., 2025). The ERAS guidelines consist of preoperative, intraoperative and postoperative interventions aimed at decreasing surgical stress response and improving tissue healing and decreasing the postoperative problems such as infection and ileus. Measures that are involved in preoperative are patient education, carbohydrate loading, reduction of the fasting time, whereas the intraoperative measures concern normothermia and minimization of invasive procedures when possible. ERAS is also interested in the premature mobilisation, nutrition by the mouth, and proper management of pain with the use of non-opioid analgesics in the process of postoperative work to prevent opioids and adverse events that happen in relation to opioid use. ERAS protocols have been demonstrated to make an enormous beneficial effect on the results of emergency abdominal surgery. In one of their studies, Moore et al. concluded that ERAS protocols to patients undergoing an emergency abdominal surgery resulted into reduction of length of stay, decrease in the number of postoperative complication, and decreased deaths (Moore et al., 2023). In particular, this protocol was related to the reduced recovery period of patients who have undergone the enactments to treat acute appendicitis and cholecystitis and bowel obstruction (Moore et al., 2023). The emergence of ERAS within the emergency department is not an easy process, with or without the good evidence, in part, because of the nature of patient-specific care and the urgency of the patients in the emergency departments (Katikam et al., 2025). But as the number of institutions turn to ERAS strategies, presumably, the evidence base to support its use in emergency abdominal surgery will only keep expanding and extend its applications in the maximisation of patient outcomes.

Advanced Technologies

The shift in the treatment of acute abdomen may occur with the introduction of high technologies into the diagnosis and surgery of this disease. The artificial intelligence (AI) concept, in particular, is beginning to claim a significant portion in the sphere of abdominal diagnostics and surgical planning. The machine learning and deep learning algorithms used in image interpretation have shown that they may have potential in automation and increase the accuracy of diagnostic results, and reduce human error. The CT scans of acute appendicitis, gallstones, and abdominal aortic aneurysms, among others, are some of the examples that AI has managed to screen with a comparable accuracy rate as with seasoned radiologists (Mervak et al., 2023). With the further development of AI, it will have an even greater focus on personalised medicine, and more personalised treatment regimes would be offered based on predictive analytics. Besides AI, 3D printing and augmented reality (AR) have started to become increasingly popular in surgery (Alowais et al., 2023). 3D printing allows the creation of patient-specific models of the anatomy with the use of imaging data, like a CT scan or MRI. Surgeons can utilise these models to do preoperative planning where complex anatomical variations can be better understood or difficult surgeries like biliary surgery or bowel resections can be planned (Cornejo et al., 2022). Instead, augmented reality (AR) offers real-time visualisation of the anatomy of the patient during surgery by overlaying computer-generated images on the visual of surgeon's on the surgical area. The technology can increase precision, shorten the duration of operations, and improve patient outcomes, as it will make the surgeon have more precise and instant data at any time during the procedure (Lin et al., 2024). Moreover, tele-surgery and remote robotic surgery have become one of the newest technologies that are being used in the treatment of acute abdomen. In certain settings, tele-surgery, which implies operating robots remotely to control them, has been proven to be an effective method of conducting surgeries in places with scarce access to specialised care (Reddy et al., 2021). Despite

the latency concerns, the adoption of 5G networks will hopefully eliminate these factors, and remote surgery will become a feasible solution to working with a patient in an underserved area. Lastly, the use of wearable postoperative monitoring represents a new trend in the management of patient care that needs investigation after abdominal surgery. These machines are fitted with sensors that monitor vital signs like the heart rate, blood pressure, oxygen saturation and respiratory rate and relay these to the health care system in real time. Such technology can be used to identify the existence of postoperative complications, including infection or respiratory distress, at an earlier stage and offer another level of control in the environment, not only within the hospital (Bignami et al., 2025). These data can be used in early intervention and result in a high index of patient outcomes and readmission. With the further improvement of the technology and its affordability, the wearable monitoring systems can become an ordinary part of the postoperative assistance provided to patients who have undergone the acute abdominal surgery (Amin et al., 2021).

Postoperative Care and Complication Management

Good postoperative care is the most significant in reducing the cases of complications and improving recovery after abdominal surgery. This part discusses the postoperative surveillance strategies, infection control strategies, anastomotic leaks management, and the importance of the multidisciplinary teams in patient optimization.

Postoperative Surveillance and Infection Control

Surveillance during the postoperative period is necessary to identify complications at an initial phase, including infections, bleeding, and organ dysfunction. The routine checkups involve checking the vital signs, laboratory (e.g., complete blood count, electrolytes), and imaging (when needed) (Dyas et al., 2022). Sepsis, which is usually characterised by fever, tachycardia, and leukocytosis, should be identified as early as possible. The timely use of broad-spectrum antibiotics and the timely initiation of treatment based on the results of the cultures and obtaining timely source control are the basic elements of dealing with infections (Sartelli et al., 2021). Surgical site infections (SSIs) continue to be a major issue. Among the preventive measures there is proper antibiotic prophylaxis, normothermia during surgery, and the reduction of perioperative glucose levels (Bassetti et al., 2020). Sterile technique and reasonable use of drains are also intraoperative practices that help prevent the risk of infections.

Figure 3: Postoperative care: Nursing (Osmosis, 2025)

Management of Anastomotic Leaks, Sepsis, and Wound Complications

One of the worst complications linked with post-gastrointestinal surgery is anastomotic leaks, which cause peritonitis and sepsis. The symptoms early in the disease are fever, abdominal pain and tachycardia. This diagnosis can be made by imaging studies, including contrast-enhanced CT scans, which could display extraluminal contrast or free air (Hedrick and Kane, 2021). The approaches to management are determined by the level of the leak and the condition of the patient. Small and contained leaks in stable patients may be treated by conservative treatment using antibiotics and percutaneous drainage. Large or diffuse leaks are, however, major necessities in surgery involving reoperation to contain the source, anastomotic revision or diversion surgery. Intra-abdominal sepsis would require a planned intervention including prompt identification of the complication, the use of relevant antimicrobial therapy, and control of the source. Early goal-oriented treatment, such

as the use of fluid resuscitation and vasopressors, is suggested in critically ill patients (Sartelli et al., 2021). The effects of abdominal surgery include wound complications, which include dehiscence and infection. Obesity, malnutrition, and diabetes mellitus are some of the risk factors. The management includes wound management, nutrition, and possible surgical revision in case of necessity (Bassetti et al., 2020).

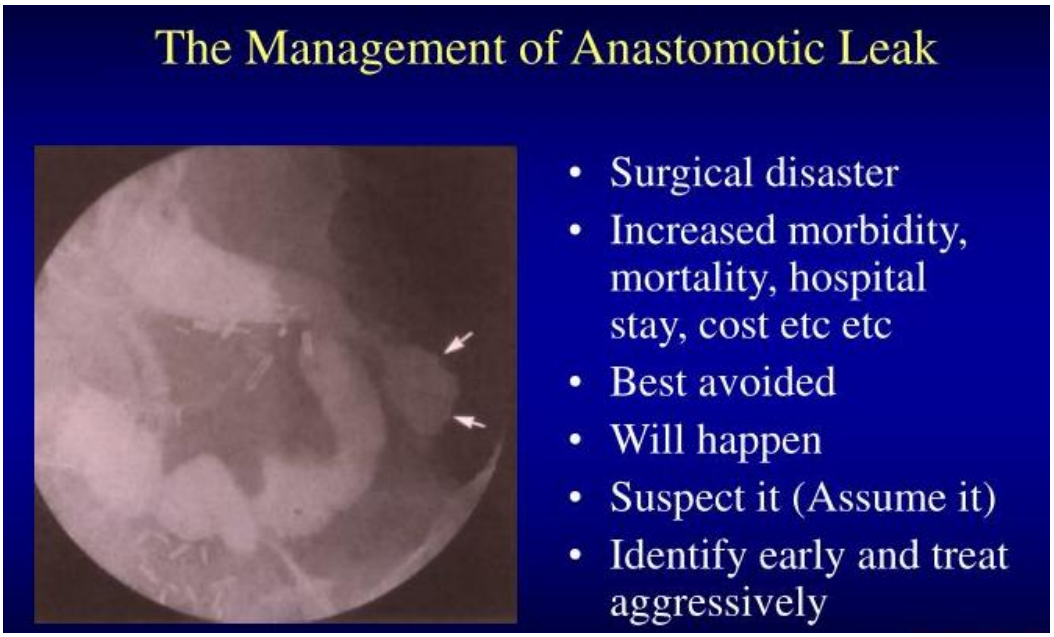

Figure 4: The management of anastomotic leak (Hartley, 2012)

Role of Critical Care Teams in Optimizing Outcomes

In the case of abdominal surgery, the postoperative care can be too complex to warrant single-disciplined treatment; thus, the need for interdisciplinary teams, where surgeons, intensivists, nurses, nutritionists, and pharmacists work together. It has also been demonstrated that collaborative care models can lead to better patient outcomes, including fewer complications and reduced hospital stays (Brusasco et al., 2024). Intensive monitoring and support of patients with severe complications is offered in critical care units. The interventions might be when mechanical ventilation, renal replacement therapy, and hemodynamic monitoring are involved. These therapies can be initiated in time and ensure better survival rates (Jackson & Cairns, 2021). Enhanced Recovery After Surgery (ERAS) protocols, which focus on early mobilisation, optimal pain management, and early enteral nutrition, have been successfully applied to abdominal surgery. These guidelines will help accelerate the recovery process, better the incidence of complications and shorten the hospital stay (Katikam et al., 2025).

Global and Public Health Perspectives

The issue of acute abdomen management is a problematic issue within the numerous healthcare facilities across the globe. Unlike rich countries, where people are afforded the luxury of better equipment and surgical expertise in their diagnostics, low and middle-income countries (LMIC) often must contend with high barriers, which translate to patient outcomes. In this part, the author examines the difference in acute abdomen care in these settings as compared to the difference in care in the rest of the world and how it has endeavoured to improve the care.

Low- and Middle-Income Settings: Challenges in Resource Allocation and Imaging Access

The unavailability of medical facilities needed to diagnose and treat acute abdomen cases affects the situation in the LMICs. In a study by de Oliveira Varca and de Almeida Santos (2024), it was proven that the absence of such imaging methods as computed tomography (CT) and magnetic resonance imaging (MRI) leads to morbidity and mortality and delayed diagnosis. The patients count on the clinical examination, and, in most cases, they cannot diagnose such conditions as appendicitis, perforated peptic ulcers, and intestinal obstructions correctly, relying on the clinical examination and simple laboratory tests. What is more, these limitations are aggravated by the shortage of qualified medical personnel. The ratio of surgeons and radiologists is much different in LMICs in rural areas. The corresponding shortage of nurses introduces the problem of long queues in surgical practice and, in some cases, the inability to carry out the procedures, which worsens the patient outcomes (Phelan et al., 2022).

High-Income Contexts: Overuse of Diagnostic Imaging and Cost-Effectiveness Debates

Conversely, the problem of overutilization of diagnostic imaging in acute abdomen treatment is likely to be experienced in high-income countries. High-quality imaging technologies are now accessible to large and this has led to increased use of these technologies, not all necessarily have clear clinical implications. This overuse is not only contributing to the rising costs of healthcare but also is leading to patients receiving unnecessary radiation and even the potential incidental findings that may lead to further invasive procedures (Shinde et al., 2024). To address those problems, initiatives like the Choosing Wisely have been organised to foster evidence-based practice and avoid needless tests. Such programmes have clinicians engage in shared decision-making with patients by raising awareness about the necessity to integrate proper imaging to balance the advantages of diagnostic imaging with potential risks and costs (Cliff et al., 2021).

Policy and Training: WHO Initiatives for Emergency Surgical Care Improvement

The World Health Organisation (WHO) came up with the Global Initiative of Emergency and Essential Surgical Care (GIEESC) in order to identify the difference between the global surgical care. The project would enhance the supply of timely, safe and affordable surgical services in the world and more so in LMICs. GIEESC creates the guidelines and resources needed to develop the surgical systems, improve the quality of care, and make the surgical services reimbursed through the national health plans (WHO, 2020). The GIEESC-based training programmes are aimed at developing the skills of the surgical process, enhancing the perioperative care and introducing the safety measures, including the WHO Surgical Safety Checklist. These procedures are expected to minimise cases of complications and mortality rates of acute abdominal conditions during surgery (Qaiser et al., 2024). Moreover, the project is interested in the need to incorporate emergency surgical service into health systems of the countries, which leads to the treatment of all people who are available and efficient.

3. LIMITATIONS

The diagnosis and the treatment of acute abdomen have advanced, however, it has a number of weaknesses. The lack of facilities of proper healthcare is one of the greatest obstacles, as it affects patient outcomes in relation to the lack of quality imaging and surgical facilities, especially in low- and middle-income countries (LMICs). Second, the minimally invasive surgery procedures like laparoscopy and robotics still have variabilities in their performance owing to the learning curve and high cost of this surgery. The excessive use of diagnostic imaging in affluent countries also results into wasteful health care and radiation expenditure and therefore the necessity to have additional evidence based imaging recommendations. Finally, the agreement on the best management practises of acute abdomen among the global community is low, and that contributes to the additional complexity in the provision of care in various healthcare institutions.

4. FUTURE DIRECTIONS

The management of acute abdomen in the future involves the use of artificial intelligence (AI) to enhance the accuracy of diagnosis and automation of clinical decision-making. AI can be used to improve the interpretation of the image, providing more accurate early detection and individual treatment. Moreover, other developments of minimally invasive technologies, such as robotic surgery, will probably be extended to more complicated cases, minimising the recovery time and complications. The wider implementation of Enhanced Recovery After Surgery (ERAS) procedures in various healthcare environments may maximise the quality of postoperative care and lead to savings of healthcare expenditures. Lastly, current international programmes, such as the Global Initiative on Emergency and Essential Surgical Care by WHO, should persist in their efforts to reduce disparity of resources in LMICs to create equal access to quality surgical services.

5. CONCLUSION

Treatment of acute abdomen has greatly transformed due to the introduction of new high-quality diagnostic equipment, less invasive operations, and organised post-operative care regimes. As high-income nations are enjoying these advancements, the low- and middle-income environments are still grappling with a lack of resources, which hinders the timely diagnoses and the best treatments of patients. In this regard, international efforts such as the WHO Global Initiative for Emergency and Essential Surgical Care (GIEESC) play a critical role in reducing inequality through enhancing surgery facilities and educating medical workers. Artificial intelligence (AI) and machine learning in diagnostic imaging have potential in enhancing early diagnosis and patient outcomes, but more evidence is required to be practised on a large scale. The surgery of acute abdomen, which uses laparoscopic and robotic surgery, has transformed the approach, resulting in a shorter duration at the hospital and quicker recovery period. ERAS protocols in both elective and emergency abdominal surgery have been proven to improve recovery, minimise complications and hospital stay, and should therefore be considered as a vital instrument of contemporary surgical care. Going forward, surgery innovation, evidence-based guidelines, and universal healthcare programmes have a lot of potential in solving the acute abdomen crises burden globally, making the care efficient as well as effective.

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