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Guideline for the Diagnostic Pathway in Patients with Acute Abdominal Pain

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Key Words
Acute abdomen · Abdominal pain · Diagnostic accuracy · Guideline

Abstract
Introduction: Diagnostic practice for acute abdominal pain at the Emergency Department varies widely and is mostly based on doctor's preferences. We aimed at developing an evidence-based guideline for the diagnostic pathway of patients with abdominal pain of non-traumatic origin. ***Methods:*** All available international literature on patients with acute abdominal pain was identified and graded according to their methodological quality by members of the multidisciplinary steering group. A guideline was synthetized, providing evidence-based recommendations together with considerations based on expertise of group members, patient preferences, costs, availability of facilities, and organizational aspects. ***Conclusions and Recommendations:*** Definition: Uniform terminology is needed in patients with acute abdominal pain to avoid difficulty in interpretation and ease comparison of findings between studies. We propose the use of the following definition for acute abdominal pain: pain of nontraumatic origin with a maximum duration of 5 days. Clinical diagnosis: Clinical evaluation is advised to differentiate between urgent and nonurgent causes. The diagnostic accuracy of clinical assessment is insufficient to identify the correct diagnosis but can discriminate between urgent and nonurgent causes. Patients suspected of nonurgent diagnoses can safely be reevaluated the next day. Based on current literature, no conclusions can be drawn on the differences in accuracy between residents and specialists. No conclusions can be drawn on the influence of a gynecological consultation. In patients suspected of an urgent condition, additional imaging is justified. CRP and WBC count alone are insufficient to discriminate urgent from nonurgent diagnoses. Diagnostic imaging: There is no place for conventional radiography in the work-up of patients with acute abdominal pain due to the lack of added value on top of clinical assessment. Computed tomography leads to the highest sensitivity and specificity in patients with acute abdominal pain. Positive predictive value of ultrasound is comparable with CT and therefore preferred as the first imaging modality due to the downsides of computed tomography; negative or inconclusive ultrasound is followed by CT. Based on current literature, no conclusions can be drawn on the added value of a diagnostic laparoscopy in the work-up of patients with acute abdominal pain. Antibiotic treatment should be started within the first hour after recognition of sepsis. Administration of opioids (analgesics) decreases the intensity of the pain and does not affect the accuracy of physical examination.

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Introduction

Acute abdominal pain is a common complaint of patients presenting at the Emergency Department [1]. Approximately 10% of presentations at the Emergency Department are because of acute abdominal pain [2]. Acute abdominal pain can be caused by a variety of diseases ranging from mild and self-limiting to life-threatening diseases [2].

An early and accurate diagnosis results in more accurate management and, subsequently, leads to better outcomes. Causes for acute abdominal pain can be classified as urgent or nonurgent. Urgent causes require immediate treatment (within 24 h) to prevent complications; whereas for nonurgent causes, immediate treatment is not necessary [2]. Most common urgent causes are acute appendicitis, acute diverticulitis, and bowel obstruction. Most common nonurgent causes are nonspecific abdominal pain (NSAP) and gastro-intestinal diseases.

Complaints of acute abdominal pain can be very nonspecific at the start and evolve to more disease-specific symptoms over time. This increases the difficulty of an accurate identification of the cause of acute abdominal pain. The first step in the diagnostic pathway is clinical evaluation. In daily practice, a preliminary diagnosis will be made based on medical history, physical examination, and, in some cases, laboratory parameters. After clinical assessment, the decision can be made to perform additional diagnostic investigations to increase certainty of the diagnosis.

The use of additional imaging modalities such as plain radiography, ultrasound, and computed tomography (CT) has increased over the years. Only a few decades ago, when imaging was not widely available and its diagnostic accuracy was low, patients would immediately proceed to the operating theater. However, many causes can be treated conservatively and do not benefit from diagnostic laparoscopy and laparotomy [3].

The increase in use of diagnostic modalities also has downsides. Imaging can lead to higher costs, a protracted patient throughput at the emergency department, and an increased risk of negative side effects such as contrast-induced nephropathy and ionizing radiation exposure. To date, the effect of the increased use of imaging on cost effectiveness of treatment of patients with acute abdominal pain remains unknown.

Despite the increased use of imaging modalities, acute abdominal pain remains a major diagnostic challenge. The underlying cause for the acute abdominal pain can be in the area of many different specialties such as gynecology, surgery, internal medicine, and urology. This leads to a large variation in choice of diagnostic modalities and treatment. Diagnostic practice varies within hospitals and within specialties, mostly lead by a doctor's preferences.

This guideline was developed to standardize the diagnostic pathway of patients with acute abdominal pain and provide doctors with evidence-based support in their decision-making process. A multidisciplinary steering group developed the national guideline based on all available international literature regarding the diagnostic pathway in patients with acute abdominal pain, making the guideline internationally applicable.

Methods

The development of this guideline was initiated by the Association of Surgeons of the Netherlands in collaboration with the Dutch societies of Radiology, Gynecology, and Obstetrics, Emergency Physicians, Internal medicine, and the Dutch College of General Practitioners. Methodological support was provided by the Knowledge Institute of Medical Specialists. The guideline was drafted in accordance with the requirements of the AGREE II instrument (Appraisal of Guidelines for Research and Evaluation II) (www.agreecollaboration.org), an internationally accepted instrument for the evaluation of the quality of guidelines.

A steering group was formed with representatives of each participating society. The steering group consisted of 2 surgeons, 2 radiologists, an internist, a gynecologist, an emergency physician, and a general practitioner. No specific patient group consisting of patients with acute abdominal pain exists. The patients' views and preferences were therefore described based on existing literature. The steering group identified the most important bottlenecks and divided these into areas of relevance: incidence of acute abdominal pain, clinical diagnosis, imaging modalities, invasive diagnostic tests, and treatment during the diagnostic pathway. Twelve clinical questions were derived from these areas of relevance: terminology and definitions, diagnostic accuracy of medical history, physical examination and laboratory parameters, difference in diagnostic accuracy between residents and staff, additional value of consultation of gynecologists on diagnostic accuracy, diagnostic accuracy of outpatient re-evaluation the next day, diagnostic accuracy of laboratory parameters in differentiating urgent from nonurgent conditions, diagnostic accuracy of conventional radiology, diagnostic accuracy of ultrasound, diagnostic accuracy of computed tomography (including assessment of influence of various methods of administration of contrast agents), diagnostic accuracy of MRI, diagnostic accuracy of diagnostic laparoscopy, indications for antibiotic treatment during the diagnostic pathway, and influence of analgesics on the reliability of physical examination.

Search

The authors performed a systematic search of the literature in collaboration with the literature specialist of the Knowledge Institute of Medical Specialists. The Embase, Medline, and Cochrane databases were searched using keywords, MESH terms, and free text words for acute abdominal pain. The complete search strategy is added in online supplementary appendix 1 (for all online suppl.

material, see www.karger.com/doi/10.1159/000371583). Systematic reviews and meta-analyses were hand searched for additional relevant articles. An additional search was performed to identify existing guidelines in Sum Search, in National Guideline Clearinghouse, and in online search engines. Reference lists of guidelines were also hand searched for relevant articles.

Titles and abstracts of all articles were screened for eligibility using a pre-defined set of inclusion criteria. Studies describing a subpopulation of patients with acute abdominal pain or a specific cause for acute abdominal pain were excluded. Only studies with adult patients (>18 years) were eligible for inclusion. Studies describing patients with abdominal pain due to traumatic origin, known intra-uterine pregnancy, hemorrhagic or post-operative shock, chronic abdominal pain, and gastrointestinal bleeding were excluded. Included articles were then redistributed and assigned to the relevant clinical questions.

Critical Appraisal

Members of the steering group graded the quality of the included articles using the national classification system for evidence-based guideline development (www.cbo.nl). Articles were classified according to the type of study and their methodological quality using the EBRO methodology [4].

The relevant literature data for each clinical question were summarized in evidence tables, and a conclusion was drawn. The guideline provides recommendations based on the literature conclusions together with considerations based on expertise of the steering group members, patient preferences, costs, availability of facilities, and organizational aspects. The patients' preferences, costs, availability of facilities, and organizational aspects are described throughout the manuscript and not discussed separately.

The draft guideline was submitted to the involved societies for their comments. These comments were discussed within the steering group. Amendments were made based on the comments. After these amendments, the guideline was sent to all the involved societies for their approval and authorization, leading to the final version of the guideline for the diagnostic pathway in patients with acute abdominal pain.

Results

Terminology and Definitions

In current literature, several terms and definitions are used to describe patients with acute abdominal pain. The most common terms used are 'acute abdomen' and 'acute abdominal pain'. In this guideline, the term 'acute abdominal pain' is a synonym of 'acute abdomen' and is defined as abdominal pain of a nontraumatic origin with a maximum duration of 5 days.

Acute abdominal pain can be caused by a variety of underlying causes. Causes differ in severity, and not all causes for acute abdominal pain need immediate treatment to prevent severe complications. For this guideline, the classification of urgency as proposed by Lameris et al. was used [5]. Conditions not requiring treatment within 24 h to prevent complications were classified as nonurgent conditions. Conditions requiring treatment within 24 h are referred to as urgent conditions.

Conclusions and Recommendations

Uniform terminology is needed in patients with acute abdominal pain to avoid difficulty in interpretation and ease comparison of findings between studies. We propose the use of the following definition for acute abdominal pain: pain of a nontraumatic origin with a maximum duration of 5 days. Acute abdominal pain can be divided into urgent and nonurgent causes according to the classification of Lameris et al. [2, 5].

Clinical Diagnosis

The first step in the diagnostic pathway is clinical evaluation. Based on medical history, physical examination, and laboratory parameters, a physician will decide whether additional investigations are necessary. Diagnostic accuracy of clinical evaluation has to be high enough to justify this decision. Most studies have analyzed the combination of medical history, physical examination, and laboratory parameters, and not the separate elements. The diagnosis after clinical evaluation is compared with the reference diagnosis to establish the diagnostic accuracy. Only studies using imaging, pathology, and/or surgery reports as a reference standard for the final diagnosis were included.

Diagnostic Accuracy of Medical History, Physical Examination and Laboratory Parameters

The diagnosis based on medical history and physical examination is correct in 43–59% of patients with abdominal pain ((Evidence level (EL) B) [6, 7]). The diagnosis based on medical history, physical examination, and laboratory parameters is correct in 46–48% of patients with abdominal pain ((EL A2) [2, 8]). The diagnostic accuracy increased when the outcome of clinical evaluation was the differentiation between urgent and nonurgent conditions, and not so much a specific diagnosis. Sensitivity of medical history, physical examination, and laboratory values are higher for differentiating urgent from non-urgent conditions than for a specific diagnosis (EL A2) [2] (online suppl. appendix 2, table 2.1). No scoring systems that increase diagnostic accuracy were found for patients with acute abdominal pain.

Difference in Diagnostic Accuracy between Residents and Staff

The inter-observer agreement between residents and staff is moderate for several aspects of medical history and

physical examination (κ = 0.29–0.74) [9, 10]. The agreement between residents and emergency physicians for additional diagnostic imaging is sufficient (κ = 0.6) [9].

Research of differences in diagnostic accuracy between residents and staff is hampered by a methodological difficulty. In daily practice, the resident first examines the patient and staff members will examine the patient afterward, usually after imaging has been done. The presentation can change over time and differ between the examination moments. This could influence the reliability of the comparison. Ideally, two observers would examine the patient under exactly the same circumstances (online suppl. appendix 2, table 2.2).

Additional Value of Consultation of Gynecologist on Diagnostic Accuracy

No studies have analyzed the influence of consultation of a gynecologist on the diagnostic accuracy in female patients with acute abdominal pain. Based on expert opinion of members of the steering committee and members of the Dutch Society of Gynaecology and Obstetrics, an advice was formed. Consultation of a gynecologist is advised if there is no reasonable non-gynecological explanation for the abdominal pain in female patients. Pelvic inflammatory disease (PID), extra uterine pregnancy, and ovarian torsion are considered urgent gynecological causes. If an urgent gynecological diagnosis is suspected, consultation should be performed during the first presentation at the Emergency Department. If a nonurgent gynecological diagnosis is suspected, consultation can take place at the outpatient clinic.

Diagnostic Accuracy of Outpatient Re-Evaluation the Next Day

Outpatient re-evaluation of patients suspected of a nonurgent condition after clinical evaluation led to a change in diagnosis in 35%, a change in management in 19%, and a change from conservative to surgical treatment in 4.5% of patients ((EL B) [11]). Outpatient re-evaluation of patients suspected of a nonurgent condition after clinical evaluation and ultrasound led to a change in diagnosis in 18%, change in management in 13%, and a change from conservative to surgical treatment in 3% of patients ((EL B) [11]) (online suppl. appendix 2, table 2.3).

Diagnostic Accuracy of Laboratory Parameters in Differentiating Urgent from Nonurgent Conditions

In a large number of underlying conditions for acute abdominal pain (inflammatory and noninflammatory conditions), the values of C-reactive protein and white blood cell count (WBC) can be elevated ((EL C) [12]). C-reactive protein has a moderate sensitivity (79%) and low specificity (64%) for an urgent diagnosis in patients with abdominal pain at the ED ((EL C) [13]). Lipase and amylase are elevated in 13% of patients with other than pancreatic conditions. In 1–2% of patients, levels of lipase and amylase are elevated more than thrice their reference values ((EL C) [14]). Sensitivity of C-reactive protein and WBC count is too low (31–41% for CRP >50 mg/l and 66–78% for WBC $>10 \times 10^9$/l) to discriminate urgent from non-urgent conditions. The specificity is 90% for CRP >50 mg/l and 66% for WBC $>10 \times 10^9$/l ((EL A) [2, 11] (EL B) [8]). A CRP >100 mg/l has a sensitivity between 16 and 23% and a specificity between 75 and 96% for urgent diagnoses ((EL A) [2, 11] (EL B) [8]). A WBC $>15 \times 10^9$/l has a sensitivity between 25 and 36% with a specificity between 76 and 92% for an urgent diagnosis ((EL A) [2, 11] (EL B) [8]). A CRP >50 mg/l combined with WBC $>10 \times 10^9$/l has a sensitivity between 25 and 76% and a specificity between 67 and 89% ((EL A) [2, 11] (EL B) [8]). A CRP >100 mg/l combined with a WBC $>15 \times 10^9$/l has a sensitivity between 7and 14% and a specificity between 86 and 98% ((EL A) [2, 11] (EL B) [8]) (online suppl. appendix 2, table 2.4).

Conclusions and Recommendations

The diagnostic accuracy of medical history and physical examination is insufficient to reach a correct diagnosis (level 2 [6, 7]). The diagnostic accuracy of medical history, physical examination, and laboratory parameters is also insufficient to accurately identify the correct diagnosis (level 1 [2, 8]). However, the diagnostic accuracy of medical history, physical examination, and/or laboratory parameters is sufficient to discriminate between urgent and nonurgent causes and justify the choice for additional imaging in suspected urgent conditions (level 2 [2]). Patients suspected of a nonurgent condition need no admission and can return to the outpatient clinics for re-evaluation the next day [11].

Based on current literature, no conclusions can be drawn on the differences in accuracy between residents and specialists. No conclusions can be drawn on the influence of a gynecological consultation. The expert committee advises a gynecological consultation during the ED presentation when an urgent gynecological diagnosis is suspected. When a nonurgent gynecological diagnosis is suspected, the gynecologist can be consulted at the outpatient clinic.

If patients present with mild symptoms, and after clinical evaluation the suspicion of an urgent condition

is low, outpatient reevaluation is a safe alternative instead of additional imaging [11]. In patients with a high suspicion of an urgent condition after clinical evaluation, additional imaging is needed (level 2 [11]). CRP and WBC count alone are insufficient to differentiate urgent from nonurgent conditions. When clinically nonurgent condition is suspected but the CRP is above 100 mg/l or the WBC count is above 15×10^9/l, the suspicion of an urgent condition rises and additional imaging is warranted (level 1 [2, 8, 11]). Initially, on presentation at the Emergency Department, only CRP and WBC count should be determined. Other laboratory tests can be determined based on the suspicion of a specific diagnosis after medical history and physical examination.

Imaging Modalities

An early and accurate diagnosis facilitates earlier targeted treatment and is of utmost importance. Several studies have demonstrated that the accuracy of clinical evaluation is insufficient for the correct specific diagnosis [2, 8, 11]. Additional imaging modalities can increase diagnostic certainty. Several imaging modalities such as conventional (plain) radiography, ultrasound, CT, and Magnetic Resonance Imaging (MRI) have been increasingly used over the years.

Diagnostic Accuracy of Conventional Radiography (Plain Chest and Abdominal Radiography)

Conventional radiography has a diagnostic accuracy of 47–56% ((EL A2) [2, 15]). Conventional radiography correctly diagnosed the presence of a cause in 47% of patients ((EL A2) [16]). Conventional radiography does not have an added value on top of clinical assessment in correctly discriminating between urgent and nonurgent causes ((EL A2) [2]). Conventional radiography leads to a high percentage of false positive and false negative diagnoses [17, 18]. Even for specific causes such as suspected perforated viscus, urolithiasis, or foreign bodies there is no added value [18]. Only for bowel obstruction, conventional radiography has a higher sensitivity than clinical evaluation (74 vs. 57%). However, it is impossible to diagnose the underlying cause for the bowel obstruction with conventional radiography only (online suppl. appendix 2, table 2.5).

Diagnostic Accuracy of Ultrasound

The diagnosis based on clinical assessment and ultrasound corresponds with the final diagnosis in 53–83% of patients ((EL A2) [2, 19–21]). In 70% of patients, an urgent diagnosis was correctly identified based on clinical assessment and ultrasound ((EL A2) [2]). When compared with computed tomography, the sensitivity and specificity of ultrasound are lower. However, ultrasound has a few advantages over computed tomography. Ultrasound is widely available, also during on call hours, and carries no risk of ionizing radiation exposure or contrast-induced nephropathy. The downside of ultrasound is the possibility of inter-examiner variability (online suppl. appendix 2, table 2.6).

Diagnostic Accuracy of Computed Tomography (Including Assessment of Influence of Various Methods of Administration of Contrast Agents)

The diagnosis based on clinical assessment and conventional radiography combined with computed tomography corresponded with the final diagnosis in 61.6–96% of patients ((EL A2) [2, 15, 22–25]). Clinical assessment and computed tomography combined correctly identified an urgent cause in 89% of patients ((EL A2) [2]). No included study had evaluated the method of administration of contrast media (oral, rectal, enteral, intravenous, or none). The use of computed tomography leads to the highest sensitivity and specificity of all imaging modalities. When discriminating urgent from nonurgent conditions, the sensitivity for computed tomography is 89% and the specificity is 77%. However, computed tomography has major downsides such as the risk of contrast-induced nephropathy and exposure to ionizing radiation.

The steering group advises the use of intravenous contrast in preference to other methods of contrast administration. Oral contrast administration delays computed tomography for hours, and other methods of contrast administration provide little additional information. The use of intravenous contrast media could lead to contrast-induced nephropathy (CIN). However, this evidence is based on studies with intra-arterial contrast administration. More recent studies have demonstrated that the risk of CIN is minimal when the eGFR (glomerular filtration rate) is above 45 ml/min/1.73 m^2 [26–29]. Preventive measures such as pre-hydration can decrease the risk of CIN. In daily practice, this might be impossible for every patient. In urgent situations, correctly diagnosing the underlying pathology (and subsequently earlier start of treatment) is more important than the possible risk of CIN. Therefore, computed tomography can be performed without preventive measures and without prior ultrasound in critically ill patients (online suppl. appendix 2, table 2.7).

Diagnostic Accuracy of a Conditional Computed Tomography Strategy

Ultrasonography as a single test has a lower diagnostic accuracy compared with CT [2]. However, ultrasonography has less downsides such as the risk of contrast-induced nephropathy and exposure to radiation. Another option is to perform a CT scan after negative or inconclusive ultrasonography (conditional computed tomography strategy). The use of this strategy reduces the use of CT and increases diagnostic accuracy. The conditional computed tomography strategy has a sensitivity of 94% and a specificity of 68%.

Diagnostic Accuracy of MRI

No studies have been performed analyzing the diagnostic value of MRI in patients with acute abdominal pain. In the future, there might be a place for MRI in the assessment of patients with acute abdominal pain. Recent studies have demonstrated that MRI is sufficiently accurate to diagnose appendicitis and diverticulitis [30, 31]. The advantage of MRI over computed tomography is that no administration of contrast media is necessary and that there is no ionizing radiation exposure. The downside is that MRI scanners are not yet widely available and that the assessment of MRI images needs specific training [32]. For pregnant women with a suspicion of an urgent cause, an MRI should be contemplated, because of the serious consequences of a missed diagnosis [30, 31].

Conclusions and Recommendations

There is no place for conventional radiography in the work-up of patients with acute abdominal pain due to the lack of added value on top of clinical assessment (level 1 [2, 15]). Computed tomography leads to the highest sensitivity and specificity in patients with acute abdominal pain (level 1 [2, 15, 22–24]). Due to the downsides of computed tomography, an ultrasound is preferred as the first imaging modality. Only in critically ill patients, a computed tomography should be performed without a prior ultrasound. When the ultrasound is negative or inconclusive, a computed tomography scan can be performed (conditional CT strategy) (level 1 [2]).

Based on the lack of current literature, there is no place yet for the MRI in the diagnostic pathway. Only in pregnant women with suspicion of an urgent cause, an MRI should be contemplated.

The committee advises to complete diagnostic work-up with imaging on primary assessment for those suspected of an urgent diagnosis, and not to admit these patients for clinical reevaluation without imaging.

Diagnostic Laparoscopy

No research has been performed analyzing the added value of a diagnostic laparoscopy after inconclusive or negative diagnostic imaging in patients with acute abdominal pain. In selected patient populations where no prior diagnostic imaging has been performed, a diagnostic laparoscopy can accurately diagnose the cause of the abdominal pain in 80–94% of patients ((EL B) [33–37]). Postoperative complications have been reported in 3.5–25% of patients after diagnostic laparoscopy ((EL B) [33, 34, 36, 37]) (online suppl. appendix 2, table 2.8). Reported complications range from severe complications such as septic shock and enterocutaneous fistula to wound infections.

Conclusions and Recommendations

Based on current literature, no conclusions can be drawn on the added value of a laparoscopy in the diagnostic pathway of patients with acute abdominal pain. Studies on the value of a diagnostic laparoscopy have studied patient populations that are not representative for current clinical practice. These studies have not performed pre-operative imaging in patients. Another flaw of these studies is that the diagnostic laparoscopy itself is used as reference diagnosis. This makes a comparison in diagnostic accuracy with other modalities impossible since the test under evaluation is the same as the reference standard.

In the past few years, imaging modalities have significantly improved in diagnostic accuracy. Treatment of causes of acute abdominal pain has also evolved, and not all causes need surgical treatment anymore. Compared with imaging modalities, diagnostic laparoscopy has a higher risk of complications. Therefore, laparoscopy should not be used in the diagnostic pathway of patients when no sufficient prior imaging has been performed. Only in patients with a high suspicion of an urgent cause and inconclusive imaging, a diagnostic laparoscopy can be contemplated.

Influences of Treatment During Diagnostic Pathway

Indications for Antibiotic Treatment during the Diagnostic Pathway

Some patients presenting at the Emergency Department with acute abdominal pain suffer from sepsis. Sepsis has a high mortality (30–50%). An important part of treatment of sepsis is identification of the underlying cause. The Surviving Sepsis Campaign advises treatment of sepsis within the first hour of recognition of symptoms [38]. Every hour of delay in administration of antibiotics leads to an increase of 7.6% in mortality [39]. This in-

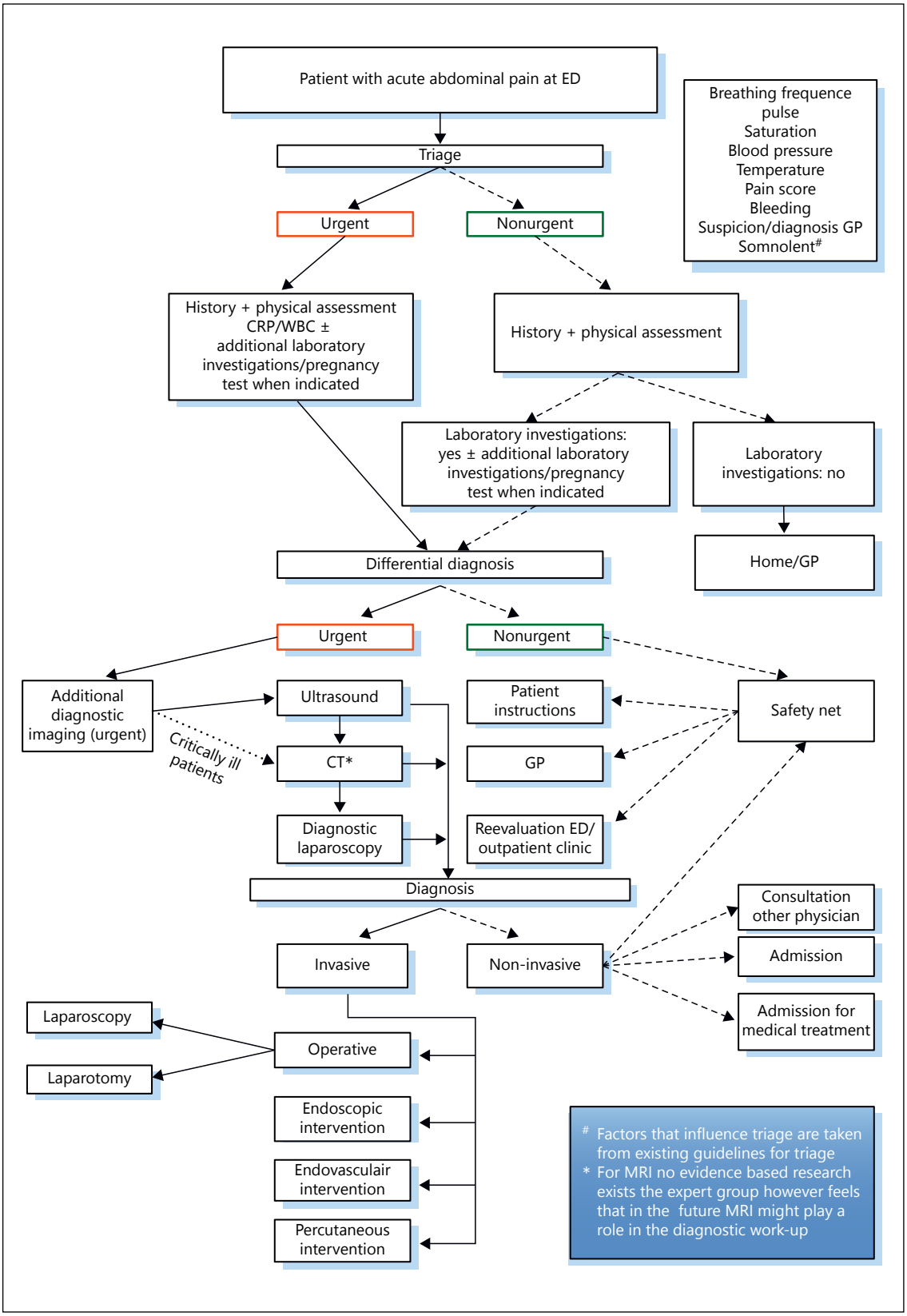

Fig. 1. Flowchart from the guideline for acute abdominal pain.

volves the start of treatment during the diagnostic pathway, and this may be long before a definite diagnosis is established. Blood cultures should be taken before the start of antibiotic treatment. Choice of antibiotics is dependent on local resistance patterns and national guidelines (online suppl. appendix 2, table 2.9).

The Influence of Analgesics on the Reliability of Physical Examination

Administration of analgesics at the Emergency Department is usually delayed to prevent masking of the symptoms. Administration of opioids does not decrease the diagnostic accuracy of physical examination ((EL A2) [40–46]), nor does it influence choices made in treatment ((EL A2) [40, 42]).

The influence of other analgesics such as NSAIDs has not yet been evaluated. Sixty per cent of patients were satisfied with their analgesics. Satisfaction of patients was mostly dependent on a decrease in VAS score of more than 20 mm from their initial VAS score at arrival [47] (online suppl. appendix 2, table 2.10).

Conclusions and Recommendations

Antibiotic treatment should be started within the first hour after recognition of sepsis. Delay in treatment of septic shock leads to a decrease of survival of 7.6% every hour within the first 6 h (level 2 [39]). Choice of antibiotics is dependent on local pathogens and national guidelines. Administration of opioids (analgesics) decreases the intensity of the pain and does not affect the accuracy of physical examination (level 1 [40–44]).

Conclusion

This review of the guideline of the diagnostic pathway in patients with acute abdominal pain summarizes all the available literature on diagnostic modalities. The guideline was developed to provide an evidence-based overview of the diagnostic options in patients with acute abdominal pain. Many different disciplines assess patients with acute abdominal pain at the Emergency Department. Therefore, standardization of the diagnostic pathway is necessary (fig. 1). Not all topics had sufficient evidence to draw firm conclusions. Despite the lack of literature in some areas, this review is the best evidence-based approach currently available. The guideline was developed and focused on the Dutch health-care system. Nevertheless, this guideline was based on best available international evidence and is therefore applicable to all developed countries. This guideline provides a review of all available evidence and can be used as a reference guideline for clinicians who treat patients with acute abdominal pain. In parallel with the guideline, several quality indicators have been developed (online suppl. appendix 3). Monitoring these quality indicators will check adherence to the guideline.

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