

Abdominal pain: a synthesis of recommendations for its correct management

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ABSTRACT

Abdominal pain represents one of the most important diagnostic challenges for any physician and its correct interpretation and management require a proper systematic approach and sometimes an urgent action. Moreover the guidelines that can be referred to for indications about the most adequate management procedures are few and often focused only on radiologic management. Consequently, the approach to abdominal pain is often empirical. Therefore, we propose a review of the literature on the diagnosis of abdominal pain, which may contribute to improve the diagnosis and treatment of this complex condition through a systematic review of the evidences available in this field. As to our methodology, we conducted an extensive search in the main guideline databases (*SIGN, ICSI, NICE, National Guideline Cleringhouse, CMA Infobase, NZ Guidelines Group, National System Guidelines, Clinical Practice Guidelines Portal, eGuidelines*), using as key words *abdominal pain* and *abdominalgia*. The guidelines were assessed according to the 2010 Italian version of the AGREE (Appraisal of Guidelines, Research and Evaluation II) methodology. Afterwards we formulated our main recommendations associated with the corresponding levels of evidence and focused our attention on some grey areas, which we investigated with further research using *Medline* and the main systematic review databases (*Cochrane database*). The four main grey areas investigated were: hospital admission criteria, prognostic stratification, need for analgesic treatment and possibility of attributing abdominalgia to an abdominal pain syndrome. We then formulated our consensus-based recommendations on the grey areas. Abdominal pain management remains a complex issue for internists. As with other diagnostic challenges, it would be advisable to develop additional guidelines based on a multidisciplinary approach and not only focused on radiological management.

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Introduction

Abdominal pain represents one of the most important diagnostic challenges for any physician and its correct interpretation and management require a proper systematic approach and sometimes an urgent action. Moreover the guidelines that can be referred to for indications about the most adequate management procedures are few and often focused only on radiologic management. Therefore, we propose a review of the literature on the diagnosis of abdominal pain, which may contribute to improve the diagnosis and treatment of this complex condition through a systematic review of the evidences available in this field.

Definition of the subject

Abdominal pain is classified as acute or chronic based on an arbitrary cut-off of 12 weeks. To make a differential diagnosis is very complex and requires an accurate understanding of the medical history and a comprehensive physical examination. Nonetheless the cause remains unknown in 30% of cases.^{1,2}

Epidemiology

Some observational studies have reported that every year at least 1/3 of adults have an episode of abdominal pain. The annual incidence of admissions to Emergency Departments for this symptom is 44/1000, whereas the hospital admission rate ranges between 18 and 42% depending on the studies.

An even more demanding challenge is managing elderly patients: the admission rate of over 65s is as high as 63%, 20-33% require urgent surgery, total mortality is between 2 and 13%.³ Diagnostic errors can involve up to 70% of elderly patients.^{4,5}

In 30% of cases a conclusive diagnosis cannot even be made. The most common misdiagnosed causes are abdominal aneurysm, appendicitis, ectopic pre-

gnancy, diverticulitis, bowel perforation, mesenteric ischemia and bowel obstruction.

Despite the causes for acute abdominal pain can be >1000, about 80% of cases can be ascribed to acute appendicitis (26%), non specific abdominal pain (50%) and acute cholecystitis (8%).⁶⁻¹⁰

Physiopathology of abdominal pain

The physiopathological mechanisms of abdominal pain can be associated with peritoneal wall inflammation, obstruction of hollow bowels, vascular disorders and abdominal wall alteration. On the contrary, extra-abdominal referred pain, metabolic abdominal pain and neurogenic abdominal pain share a different physiopathology.

Table 1. Abdominal pain by physiopathologic classes.

Pain of abdominal origin

- Inflammation of the abdominal wall
 - Bacterial contamination (*e.g.*, pelvic inflammatory disease, perforated appendix)
 - Chemical irritation (*e.g.*, pancreatitis, perforated ulcer)
- Mechanical obstruction of hollow bowels
 - Small and large intestine obstruction
 - Biliary tract obstruction
 - Ureter obstruction
- Vascular diseases
 - Embolism or thrombosis
 - Vessel rupturing
 - Compression or torsion occlusion
 - Sickle-cell anemia
- Changes in the abdominal wall
 - Mesenteric torsion/stretching
 - Muscle trauma/infections
- Distension of visceral surfaces (*e.g.*, kidney/liver capsule)

Referred extra-abdominal pain

- Chest (*e.g.*, pneumonia, coronary occlusion)
- Spinal column (*e.g.*, radiculitis due to arthritis, *Herpes zoster*)
- Genitals (*e.g.*, testicular torsion)

Metabolic causes

- Exogenous causes
 - Poisoning caused by lead and other substances
 - Black widow spider bite
- Endogenous causes
 - Uremia
 - Diabetic ketoacidosis
 - Porphyria
 - Allergic factors (C1 esterase deficiency)

Neurogenic causes

- Organic causes
 - Tabes dorsalis
 - Herpes zoster*
 - Causalgia and other syndromes
- Functional causes

Hematologic causes

- Acute leukemia
- Hemolytic anemia
- Sickle-cell anemia
- Henoch-Shönlein purpura

Modified from Tintinalli, 2004.¹

Differential diagnosis of abdominal pain

The differential diagnosis of abdominal pain can be based on *physiopathologic categories* (Table 1), *type of symptoms* or *site of pain*.¹

Methodology

Abdominal pain management: collection of evidence

A search was made in the main databases using *abdominal pain* or *abdominalgia* as keywords:

- Scottish Intercollegiate Guidelines Network (SIGN);
- Institute for Clinical System Improvement (ICSI);
- National Institute for Health and Clinical Excellence (NICE) (NHS evidence);
- National Guideline Clearinghouse;
- Canadian Medical Association, CMA Infobase;
- New Zealand Guidelines Group;
- National System Guidelines;
- Clinical Practice Guidelines Portal;
- eGuidelines.

The guidelines were assessed using the 2010 Italian version of the AGREE (Appraisal of Guidelines, Research and Evaluation II) methodology.

We found and reviewed 7 guidelines (Table 2).¹¹⁻¹⁸ Next, we extrapolated the main recommendations associated with the corresponding levels of evidence and we conducted a methodological analysis.¹¹

Grading levels of evidence

We referred to the evidence grading scheme developed within the framework of the *Progetto Nazionale Linee Guida* (National Project Guideline), available online at <http://www.pnlg.it/doc/manuale>: i) level I: evidence from multiple clinical controlled trials and/or systematic reviews of randomized studies; ii) level II: evidence from a single randomized study with an ade-

quate design; iii) level III: evidence from non randomized cohort studies or their meta-analysis; iv) level IV: evidence from case-control retrospective studies or their meta-analysis; v) level V: evidence from case series with no control group; vi) level VI: evidence from opinions of experts or expert committees as indicated in the guidelines or consensus conferences.

We then focused our attention on the main 4 grey areas we identified, and which we then investigated with further research including also minor evidence: studies from primary bibliographic databases and other integrative reviews.

In particular, for hospital admission criteria, we used the following research criteria: (*“Abdominal Pain”*[Mesh]) AND (*“Hospitalization”*[Mesh], *Limits Activated: Humans, English, French, Italian, All Adult: 19+ years, years: 2000*).

For prognostic stratification and management, we adopted the following strategy published in Pubmed: (*“Abdominal Pain”*[Mesh]) AND (*“Sensitivity and Specificity”*[Mesh]) AND (*“Diagnosis”*[Mesh]), also (*“likelihood ratio”*[Mesh]) AND (*“Sensitivity and Specificity”*[Mesh]) and AND (*“abdominal pain”*[Mesh]), *Limits Activated: Humans, English, French, Italian, All Adult: 19+ years, years:2000*).

As to the need for analgesic treatment, we relied on the Cochrane Database and Pubmed with mesh *analgesia* AND *abdominal pain*.

Summary of abdominal pain guidelines

To create a more synthetic and systematic organization of recommendations extracted from the guidelines, we have divided them into four subchapters, which correspond to four clinical syndromes: *patients with abdominal pain/acute non-specific abdominal pain*, *patients with abdominal pain in one quadrant*, *patient with abdominal pain and fever or suspected*

Table 2. Evidence table.

Guidelines	AGREE
Cartwright and Knudson, 2008 ¹¹	(38+75+39)/3=50.6
ACR, 2008 ¹²	(56+67+75)/3=66
American College of Emergency Physicians, 2010 ¹³	(59+57+56)/3=57.3
Society of American Gastrointestinal and Endoscopic Surgeons, 2007 ¹⁴	(83+81+81)/3=81.6
ACR, 2008 ¹⁵	(57+55+75)/3=62.3
ACR, 2010 ¹⁶	(60+60+74)/3=64.6
ACR, 2010 ¹⁶	(59+86+75)/3=73.3
National Collaborating Centre for Nursing and Supportive Care, 2008 ¹⁷	(130+133+132)/3=131
World Gastroenterology Organisation, 2009 ¹⁸	(60+67+74)/3=67

AGREE, Appraisal of Guidelines, Research and Evaluation II; ACR, American College of Radiology.

acute appendicitis and, finally, patient with abdominal pain secondary to suspected irritable bowel syndrome (IBS) and, finally, patients with abdominal pain/acute non specific abdominal pain.

Guidelines for this clinical picture: two guidelines focus on patients with acute abdominal pain/diffuse non specific abdominal pain.^{14,19}

Recommended strategy: i) white blood cell count; ii) prescription of abdominal ultrasound (US); iii) prescription of abdominal computed tomography (CT) with contrast agent (CA); iv) prescription of additional imaging exams; v) diagnostic laparoscopy (DL).

Outcome: diagnosis.

Recommendations: i) the white blood cell count confirms, but does not exclude, appendicitis even if it is negative (level VI); ii) DL can be safely performed in selected patients (level III), but it is not indicated before non invasive procedures, despite it can be superior to observation (level III). This procedure can be considered for patients with acute abdominal pain of unknown origin, after an appropriate clinical assessment and imaging exams (VI).

Patients with abdominal pain in one quadrant

Guidelines for this clinical picture: four guidelines provide recommendations for this symptom.^{15,16,19}

Recommended strategy: i) request for amylase and lipase tests; ii) prescription of abdominal US; iii) prescription of abdominal CT with CA; iv) prescription of additional imaging exams.

Outcome: diagnosis.

Recommendations: i) for the preliminary differential diagnosis of *epigastric pain*, the pancreatic enzyme tests are recommended (level VI); ii) for the preliminary differential diagnosis of *pain in the upper right quadrant*, abdominal US is recommended (level VI); iii) for the differential diagnosis of *pain in the lower quadrants*, abdomen-pelvis CT is in general the most accurate method. However for *children*, US is preferable. Also for *pregnant women*, US is preferable and, if no diagnosis is obtained, abdominal nuclear magnetic resonance (NMR) imaging should be prescribed (level VI); iv) for the differential diagnoses of *pain in the lower left quadrant*, abdomen-pelvis CT is appropriate, but it is associated with a high risk of radiation exposure. Other techniques involve an intermediate appropriateness risk with lower radiation doses. During pregnancy, indications are similar, but the most appropriate techniques are US, also trans-rectal and trans-vaginal US, and, to a lesser extent, the barium enema (level VI).

Patient with abdominal pain and fever or suspected acute appendicitis

Guidelines for this clinical picture: two guidelines provide recommendations for these symptoms.^{13,16} Six

groups of patients are defined: i) adults with suspected acute appendicitis; ii) children with suspected acute appendicitis; iii) patients with acute abdominal pain and fever after surgery; iv) patient with acute abdominal pain and fever with negative CT for abscesses in the previous 7 days; v) patient with acute abdominal pain and fever not operated; vi) pregnant patient.

Recommended strategy: i) use of clinical elements (signs and symptoms); ii) use of abdomen-pelvis CT with intra-venous or oral CA; iii) abdominal US; iv) use of CT without CA; v) use of alternative techniques (abdominal MR imaging with and without CA, abdominal radiography with gastrografin, gallium and labelled leukocyte scintigraphy).

Outcome: diagnosis.

Recommendations: clinical elements (signs and symptoms) are useful to stratify the patients and make decisions on lab tests, *imaging, management* (discharge, observation, surgical assessment) (level III). The abdomen-pelvis CT scan confirms or excludes an acute appendicitis and the CA enhances the sensitivity of this technique (level III). Abdominal ultrasound confirms, but does not exclude an acute appendicitis and is recommended in children and, as a preliminary examination, in adults (level III). Alternative imaging techniques are less appropriate, but often pose fewer risks associated with radiation exposure.

Patient with abdominal pain and hemodynamic instability or severe abdominal distension and a clear indication for laparotomy

One guideline provides recommendations for this clinical picture.¹⁴

Recommended strategy: diagnostic laparotomy.

Recommendation: diagnostic laparotomy should be avoided for the former clinical picture, while it has a limited role for the latter (level VI).

Patient with abdominal pain secondary to suspected irritable bowel syndrome

Two guidelines provide recommendations for this clinical picture.^{17,19}

Recommended strategy: i) examination and confirmation of the IBS; ii) investigation of *red flags*.

Recommendations: IBS must be suspected in case of: abdominal pain or *discomfort*, change in bowel habits, bloating for at least 6 months¹⁶ (level III), abdominal pain/*discomfort* and chronicity, intermittent pain, previous episodes, relief of pain with defecation, unusual night time diffuse and localized pain¹⁸ (level VI).

IBS can be confirmed if: abdominal pain/*discomfort* is relieved by defecation or is associated with altered bowel frequency or altered stool consistency accompanied by at least two of the following symptoms: straining, urgency, incomplete evacuation/abdo-

minal bloating/worsening by eating/mucus in the stools¹⁶ (level I-III); on the basis of the Roma III criteria: i) presence of symptoms for at least 6 months before diagnosis; ii) recurrent abdominal pain or *discomfort* for more than 3 days a month in the last 3 months; iii) at least 2 of the following features: clinical improvement by defecation; association with a change in bowel frequency or stool consistency¹⁸ (level I-III).

Patients should be examined to identify any *red flags*: unexplained or unintentional weight loss, rectal bleeding, family history of bowel or ovarian cancer, change in bowel habits to more frequent stools persisting for more than 6 weeks in a patient aged over 60 years; also: anemia, abdominal/rectal masses, inflammatory bowel disease^{17,18} (level I-III).

Main drawbacks of the assessed guidelines

These guidelines focus primarily on abdominal pain, therefore they exclude other diseases associated with other symptoms (such as a change in bowel habits or melaena/hematemesis). Therefore abdominal pain associated with inflammatory bowel syndrome or anaemia or a change in bowel habits should suggest a gastroenteric disease or an inflammatory bowel disease or, also, a neoplastic etiology based on clinical criteria. However this topic is outside the scope of this monograph.

Abdominal pain classified by quadrants is covered by various guidelines issued by radiological societies and can be a bias in terms of clinical methodology.

Grey areas

Four unanswered background questions have been identified in the guidelines examined: i) Are there any criteria to decide whether to keep at the hospital or discharge a patient with acute abdominal pain? ii) For the purpose of abdominal pain stratification what is the value of the abdominal pain severity scores? iii) Should the degree of pain be always assessed? Should the analgesic therapy be always deferred initially? iv) Are there any criteria to associate a patient with abdominal pain to a specific abdominal syndrome?

Background question 1

Are there any criteria to decide whether to keep at the hospital or discharge a patient with acute abdominal pain?

Recommendation: the decision should be substantially based on the clinical picture considering the usual state of health of the patient, the identification of any systemic involvement associated with the main disease and the potential evolution of the category of the suspected disorder (level VI). These variables should lead to a preliminary assessment of the severity

and the presence of any potential indications of surgical abdomen (level VI).²⁰⁻²²

Despite in some case reports, the rate of inappropriate abdominal emergencies ranges from 5% to 82%,¹⁸ at present the flow of patients with abdominal pain is not managed on a codified basis in emergency departments. In the literature some algorithms are reported that can be applied in hospitals. They are based on emergency level, maximum waiting time before treatment and most appropriate structures to treat these cases.

The primary goal is to define the severity of abdominal pain: i) *emergency* (abdominal pain with generalized signs of severity, signs of shock). In this case, the team should initiate resuscitation measures and refer the patient to the surgery ward or the intensive care unit; ii) *urgency* (abdominal pain with localized signs of severity). In this case (evident local signs: occlusive/peritoneal syndrome for suspected appendicitis, cholecystitis, sigmoiditis, strangulated hernia), the team should agree on the necessary tests and examinations to perform and the medical/surgical strategy to implement; iii) *relative urgency* (no signs of severity). If the case is relatively urgent (abdominal pain without local or generalized signs of severity), the team should assess the following: i) Is the diagnosis confirmed, suspected or unclear? ii) Should the patient be admitted to hospital and why? iii) Which radiographic examinations should be requested and when (are they urgent or can they be deferred)?

The identification of an emergency should be based on: clinical signs (signs of shock: tachycardia, hypotension, bleeding, confusion, respiratory distress, anuria); biological signs (anaemia, dehydration, acidosis, kidney failure). The diagnosis is sometimes evident and requires immediate surgery, whereas on other occasions an urgent abdominal CT scan may be required.

The main causes for an emergency are: i) ruptured ectopic pregnancy or other cause of hemoperitoneum; ii) ruptured aneurysm; iii) occlusion and peritonitis detected late or in fragile patients (children, elderly, immunodepressed); iv) mesenteric ischemia or colic necrosis; v) acute necrotizing-hemorrhagic pancreatitis.

These causes require prompt resuscitation measures and often surgery, which correlates to the state of the patient at time of admission, the decision-making speed and the quality of the resuscitation procedure.

The second goal is to rule out a surgical abdomen, which can be identified by a clinical examination in 70% of cases. Sometimes the clinical findings are not specific, therefore either the patient is promptly admitted to hospital and kept under observation or an US-CT is performed to find more indications and refer him/her to a medical department or to the surgical ward.

The following should be assessed in particular: worsening of pain on palpation, a defensive reaction (peritoneal irritation), peritonism (sign of abdominal sepsis),

more peritoneal signs (pain when breathing in and out and coughing), no peristalsis or peristalsis with metallic sounds. These signs are associated with hospital admission in 70% of the cases, if they are simultaneous.

Background question 2

For the purpose of abdominal pain stratification what is the value of the abdominal pain severity scores?

Recommendation: scores are helpful to grade the risk, however they cannot lead to a conclusive diagnosis (level I).²³⁻³⁴

In a recent health technology assessment³⁶ the use of a diagnostic tool seems useful to confirm the diagnosis of acute appendicitis, but not to exclude it.

Among potentially helpful *scores*, we can name:

- *Alvarado score*: it can be used to assess pain in the right iliac fossa [a score ≥ 7 has a positive predictive value (PPV) of 84% for appendicitis and, in some studies, if ≥ 4 , it suggests admission to hospital]. Furthermore, it can also be used outside hospital settings.
- *APACHE score II, Ranson score*: scores for acute pancreatitis (Table 3).

Ranson score: early assessment system (mortality of 0-3% if score < 3 , 11-15% if score ≥ 3 , 40% if ≥ 6). Although the system is still in use, a recent meta-analysis has shown it has a poor predictive value.²²

APACHE score II: originally it was used in the Intensive care Unit for critically-ill patients. At present it is also used in acute pancreatitis. It has a good negative predictive value (NPV) and a modest PPV for severe acute pancreatitis. If the score is < 8 , mortality is below 4%; if it is > 8 , mortality is 11-18%. *Drawbacks*: it is complex and does not differentiate necrotizing and interstitial pancreatitis from sterile and infected necrosis. Furthermore it has a PPV in the first 24 h [the predictive value can be enhanced using the addition of a body mass index score to APACHE II (known as APACHE O)].

- *Ripasa score*: it is used when acute appendicitis is suspected. Cut-off is 7.5, sensitivity (SE) is 88%, specificity (SP) is 67%, PPV is 93% and NPV is 53%.

Among other relevant factors we can include: i) marked lymphopenia and neutropenia;^{23,24} ii) the Roma III criteria and the *Carnet's* sign for functional etiology; iii) plasma lactates; iv) pain chronicity seems to be associated with low education, female gender and a history of abuse in young age.

Background question 3

Should the degree of pain be always assessed? Should the analgesic therapy be always deferred initially?

In case of discharge from hospital, an analgesic treatment can be prescribed and followed up in the short term. In case of admission to hospital, analgesics can be administered, while the patient is waiting in the emergency department (sometimes for hours). Actually both a rehydration therapy (particularly in case of sepsis) and an analgesic therapy are recommended and don't seem to affect the management of the patient (level I).³⁶⁻³⁸

A recent Cochrane systematic review recommends the use of opioid analgesics to control acute abdominal pain, since they cannot affect the diagnosis, nor the selection of treatment.³⁹

Background question 4

Are there any criteria to associate a patient with abdominal pain to a specific abdominal syndrome?

In the literature, just like in the clinical practice, no structured approach to the differential diagnosis is available. The clinical assessment should lead to the identification of a specific syndrome on the basis of the characterization of pain and the concomitant symptoms (*e.g.*, *dull pain indicative of acute mesenteric ischemia, some types of bleedings and chemical peritonitis; progressive pain associated with inflammation, sepsis, distension of solid organs; colic pain usually associated with occlusion of hollow organs*), vital signs (*the most sensitive are heart rate, body temperature, respiratory rate, blood pressure and urinary*

Table 3. Predictive severity scores in pancreatitis.

Time (h)	SE (%)	SP	PPV	NPV	Accuracy
0					
Clinical	44	95	65	87	84
Apache II	63	81	46	89	77
24					
Clinical	59	96	75	90	88
Apache II >10	71	91	67	93	87
48					
Clinical	66	95	76	92	89
Ranson >2	75	68	37	91	69
Apache II >9	75	92	71	93	88

SE, sensitivity; SP, specificity; PPV, positive predictive value; NPV, negative predictive value.

output), assessment of the clinical picture (such as history of unoperated abdominal aneurysm, use of anti-coagulants) (level VI).

Abdominal pain can be included in one of the following clinical syndromes: i) localized or diffuse peritonitic syndrome; ii) unspecific abdominal pain: pain syndrome of non-gastric or medical origin, irritable bowel disease; iii) vascular syndrome; iv) occlusal syndrome.⁴⁰

Peritonitic syndrome

The diagnosis of peritonitis is generally clinical, although the onset is often insidious. Recommendations are based on consensus (level VI).^{41,42}

Symptoms include: fever and shivering; abdominal pain or discomfort (70% of patients); unexplained or rapidly progressive encephalopathy; diarrhea; ascites unresponsive to diuretic therapy; ileus; nausea and anorexia (that can precede pain) and vomiting (secondary to organ pathology, such as peritoneum obstruction or inflammation). The patient appears to be very unwell, temperature is often above 38°C, although sepsis may also be accompanied by hypothermia. Subsequently the patient becomes oliguric and anuric until shock develops.

Initially pain can be poorly localized (abdominal wall), then it becomes more severe and localized (abdominal wall) and can be exacerbated by coughing, breathing in and out (SE 37%, SP 94%, PPV 70%, NPV 79%).

Signs and symptoms can be misleading or concealed by: diabetes mellitus or other immunodepressed conditions; advanced age; ascites (cirrhosis or nephrotic syndrome); peritoneal dialysis; steroid treatment.

Accurate management includes differentiation between primary and secondary peritonitis.

Primary peritonitis is diffuse and/or is not associated with a history of gastro-intestinal disease. In other cases (localized or diffuse peritonitis with known gastro-intestinal disease), peritonitis is likely to be secondary.

In case of primary peritonitis, it is recommended to perform a chemical and physical test and a culture of a sample of ascitic tissue or from the peritoneal dialysis and to initiate an antibiotic and support treatment to be continued for 7 days. If the patient does not respond, repeat the culture tests and remove the catheter.

The clinical history includes recent abdominal surgery, previous episodes of peritonitis, travels, immunosuppressive therapy, comorbidity (chronic inflammatory bowel disease, diverticulitis, peptic ulcer), which can predispose to abdominal infections.

Non-specific abdominal pain

Non-specific abdominal pain is defined as a pain of unknown origin at the time of admission to hospital and requires surgery (in particular the patient has no

fever, no tachycardia and no abdominal tenderness).^{43,44} In general this is a self-limiting disorder (in some more favorable cases the patient has no symptoms at 5 years in 77% of cases), which, however, leads to 13-40% of admissions for surgery. In this case, observation can be important. The patient should be re-assessed within 24 h, because this might be an unusual presentation of other acute diseases, such as acute myocardial infarction and ischemic colitis.

Recent cases from etiological studies have shown that 10% of patients have a neoplastic disease (in particular above 50 years of age). Sometimes it is caused by gynecologic and urologic diseases, functional diseases, such as the irritable bowel syndrome (see guidelines previously examined); sometimes it is caused by coeliac disease. Two disorders are often reported: mild alcoholic pancreatitis, crisis secondary to sickle-cell anemia.

Furthermore, a drug-related etiology should also be considered: non-steroidal anti-inflammatory drugs, erythromycin, other antibiotics (colitis due to clindamycin, cephalosporins, ampicillin, amoxicillin) and sub-occlusion secondary to constipation.

Vascular abdominal syndrome

Vascular abdominal syndromes represent a severe abdominal emergency, are typical of advanced age and, although rare (1% of causes for acute abdominal pain), they are associated with a high mortality rate (10-90% of cases).⁴⁵⁻⁴⁹

The clinical picture in the early stages is unspecific and similar to other abdominal syndromes (peritonitis, occlusion). Pain can be acute, sudden (arterial embolism or thrombosis) or slowly progressing (ischemia by non occlusal causes or venous mesenteric thrombosis), associated with nausea, vomiting and change in bowel habits.

Initially the physical examination is unspecific, whereas at later stages (>6 h, necrotic evolution), the patient develops typical signs of peritonitis, hemodynamic instability and signs and symptoms of sepsis with failure of multiple organs.

For an accurate and early diagnosis it is fundamental to identify the main risk factors when the medical history is assessed.

Various pathogenic entities can be recognized with the following characteristics: myocardial infarction/intestinal ischemia; aortic aneurysm rupturing or fissure, abdominal aneurysm rupturing; abdominal blood vessel thrombosis.

The main consensus-based recommendations for a diagnosis of acute intestinal ischemia (level VI) include: i) significant risk factors: age >60 years; atrial fibrillation or history of paroxysmal atrial fibrillation, recent myocardial infarction, heart failure, shock, previous arterial embolism; history of abdominal pain

after eating and weight loss; abdominal pain inconsistent with physical examination findings; nausea, vomiting; ii) *suggestive test results*, if associated with significant risk factors: leukocytosis, increase of lactate dehydrogenase and creatine phosphokinase, metabolic acidosis.

In case of significant risk factors and hemodyna-

mic stability, angiography is recommended with a simultaneous vasodilator infusion or papaverine infusion in the superior mesenteric artery, if readily available; otherwise CT angiography is recommended.

If signs of peritonism and hemodynamic instability are present, emergency exploratory laparotomy is recommended with resection of the necrotic intestinal

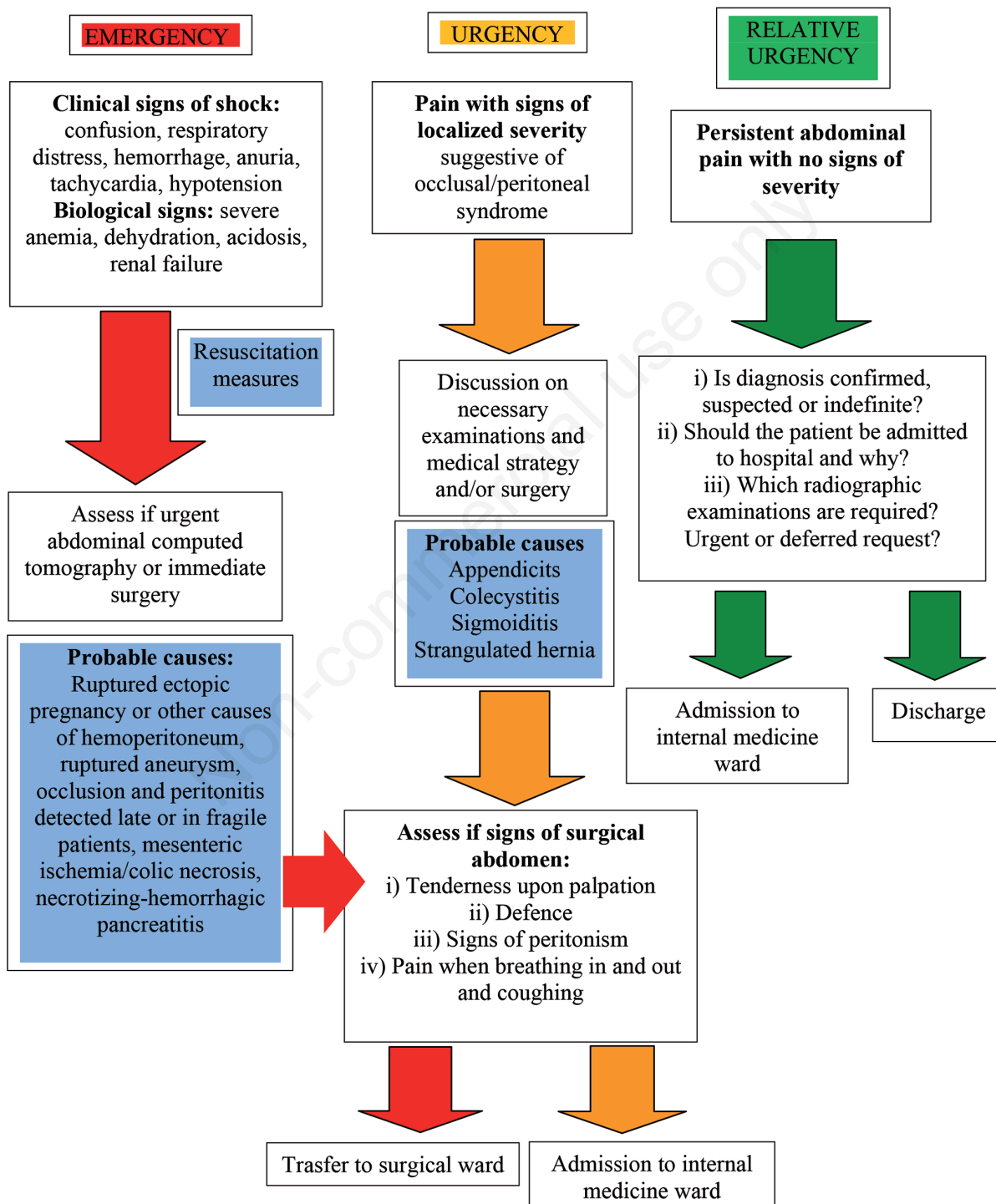


Figure 1. Abdominal pain: diagnostic flow-chart.

tract and revascularization (embolectomy, thrombectomy and intra-arterial infusion of papaverine and vasodilators).

The following clinical factors are suggestive of aortic aneurysm fissure or rupturing (the main prognostic factor is the size of the aneurysm): abdominal and lumbar pain, shock, pulsating abdominal mass, synchronous or asynchronous femoral pulses, risk factors (smoking, family history, age > 70 years, history of atherosclerosis, female sex, diabetes, African race).

Among the diagnostic factors suggestive of a thrombosis of abdominal blood vessels, we highlight (level VI): lower limb ischemia (no pulse, pallor, paresthesia, pain), signs of mesenteric ischemia, signs of spinal cord infarction.

The preliminary management of a patient with suspected aortic thrombosis requires an immediate CT angiography of the abdomen. In case of acute aortic thrombosis, emergency laparotomy is required with thrombectomy or embolectomy or coronary artery bypass graft. In case of chronic or sub-acute occlusion, the need for emergency surgery depends on the severity of the clinical picture and the occlusion progression. The strategy required most often in these cases is observation and anti-aggregating or anti-coagulating therapy.

Occlusal abdominal syndrome

The suspicion of an occlusal abdominal syndrome is based on the clinical history of the patient and a number of symptoms: abdominal pain, which is initially cramp-like and then becomes continuous; meteorism, tympanic abdomen, peristalsis with metallic sounds, which, on the contrary are absent in paralytic ileus. Vomiting is frequent in particular in upper occlusions (small intestine); in distal occlusions, fecaloid vomiting can be present.

The main recommendations are based on consensus (level VI).^{50,51}

Suggestive clinical history: previous abdominal surgery, radiation therapy, bowel inflammatory disorders, weight loss, constipation, pain in the upper abdominal quadrant (biliary ileus).

An accurate preliminary *management* of abdominal occlusal syndrome includes a differential diagnosis between a mechanical obstruction and a paralytic ileus.

In case of mechanical ileus of unknown origin, an abdominal CT scan with intravenous CA must be performed immediately. In case of complications, such as strangulation and intestinal ischemia, the patient must be referred to the surgeon for emergency surgery. If no indication for emergency surgery is present, a conservative strategy must be implemented with support therapy (fluids), intestinal decompression (insertion of naso-gastric tube and/or rectal tube) and subsequent assessment; in case this clinical picture persists, an exploratory laparotomy can be useful.

In case of a likely occlusion of the small intestine, oral administration of CA (gastrografin) is required; after 8 h bowel transit must be assessed in the colon by abdominal radiography. If bowel transit is positive, the patient must be kept under observation for 4-5 days. If no bowel transit is present, an exploratory laparotomy is indicated.

A summary of the *management* procedure proposed is reported in Figure 1, whereas online Appendix summarizes the proposed management procedure for abdominal pain and the differential diagnosis factors.

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