

MACEP Risk Management Course

Module 1: Abdominal Pain

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Course Objectives

- Understand the risk management issues of emergency department evaluation and treatment of abdominal pain.
- Recognize high risk situations in patients presenting with abdominal pain.
- Know the high risk abdominal pain situations are appendicitis, ectopic pregnancy, abdominal aortic aneurysm, and geriatric patients.
- Be able to discuss the various risk factors that make these high risk presentations.
- Know the pertinent history, physical findings, testing, management and documentation needed when evaluating a patient with one of these high risk diagnoses.
- History: “It can be confidently asserted that a large number of acute abdominal conditions could be diagnosed by carefully considering the history.” – *Sir Zachary Cope; The Early Diagnosis of the Acute Abdomen*

Introduction

Abdominal pain presents many risk management issues for an emergency physician. Its causes are legion, the evaluation complex, and the risk great. Recognizing the need for a systematic approach to the patient with abdominal pain is the first step in risk management. Abdominal pain is a common symptom of emergency department patients, accounting for approximately 10% of all ED visits. Recognizing the patient with an acute abdomen is an essential goal of an emergency department evaluation. However, many patients present early in the course of their disease with vague complaints and without dramatic physical findings. In addition, the subjective nature of pain and its many potential causes make the diagnostic process difficult.

In many cases, the etiology of the abdominal pain will not be determined during the initial visit. As many as one quarter of patients will not have a specific diagnosis made, even after an extensive evaluation. When evaluating patients with abdominal complaints, it is just as important to recognize those patients requiring surgical consultation and/or admission, as it is to determine the exact diagnosis.

Remember that the cause of abdominal pain may be outside the abdomen. Potential sources include systemic diseases such as diabetes, leukemia and sickle cell disease, thoracic problems

(ischemic heart disease, pulmonary embolism, pneumonia), genito-urinary emergencies such as renal colic and testicular torsion, and various toxidromes. While many of these etiologies are life-threatening, others, like a child's streptococcal pharyngitis, are benign. Our task is to develop an organized approach to patients presenting with abdominal pain.

History

The evaluation of abdominal pain must begin with a thorough history. Elicit a detailed description of the pain (onset, duration, location, radiation and character), systemic symptoms (fever, dizziness, rash, etc.), and associated gastrointestinal (nausea, vomiting, diarrhea, anorexia) and genitourinary symptoms (dysuria, hematuria, vaginal bleeding or discharge). Obtain a past medical history from the patient, family or previous medical record regarding prior abdominal diagnoses and surgeries (known aortic aneurysm, previous appendectomy, cholecystectomy, etc.), as well as underlying medical conditions (atrial fibrillation, hypertension). Certain elements of the social history (alcohol use, recent exercise/activities including recent falls or trauma) and family history (inflammatory bowel disease) are important to identify potential sources of pain. A focused review of systems may help point to extra-abdominal etiologies. Menstrual, sexual practice and obstetric histories are particularly important in women of child bearing age. Medication history, including over-the-counter medications such as aspirin and NSAIDS, should be routine and may be the cause of symptoms or may alter the differential diagnosis (use of an antipyretic prior to arrival resulting in a lack of fever on initial vital signs or the use of immunosuppressive agents). Taking adequate time to obtain a comprehensive history can help formulate an accurate differential diagnosis. At the very least, it will guide your workup.

Physical Examination

Begin with the vital signs. Generally, they will be normal. However, fever, tachycardia, hypotension, and hypoxia in varying degrees and combinations will occur in sicker patients. From a practical point of view, these may each help determine the etiology. From a risk management perspective, abnormal vital signs need to be addressed. Tachycardia may be present initially in patients with significant abdominal pain. The importance of repeating vital signs throughout the course of the patient's stay in the emergency department cannot be overemphasized. Persistent tachycardia, both absolute and relative versus expected heart rate, can be a sign of sepsis, hemorrhage, or severe underlying illness, and should not be ignored. Normal vital signs can pose a similar threat, as certain populations may not mount the expected physiological response to illness (for example, lack of fever in the elderly or immunocompromised). Emergency physicians can frequently differentiate a sick versus not sick patient by general appearance, so don't be misled by normal vitals in an ill-appearing patient. Any abnormal vital sign needs to be recognized and explained.

While many emergency patients require only a focused examination, those patients presenting with abdominal pain must have a more comprehensive exam. Palpation of the abdomen will localize tenderness and occasionally identify masses (especially pulsatile). The location of pain

and/or the presence of a mass will guide further evaluation. Palpation may also reveal peritoneal signs. While much has been made of rebound tenderness, studies show it to have little predictive value. This is especially true in the elderly. A patient telling you it hurts to walk or that every bump on the way to the hospital “killed” may actually be a more reliable indicator of peritoneal irritation.

Examination of the other body areas may help determine an intra-abdominal cause for pain or an extra-abdominal cause. Abdominal pain may be the principle or only complaint of the pediatric streptococcal pharyngitis. Similarly, a lower lobe pneumonia may present as abdominal pain. The cardiac exam should document a regular rhythm, and if not present, a rhythm strip or ECG should be done to ensure atrial fibrillation is not present. The rectal examination will detect prostate and perirectal disease, but it generally contributes little to the diagnosis of abdominal pain. A rectal examination is most useful when looking for blood in the stool.

While some experienced clinicians may be able to detect ovarian cysts, ectopic pregnancy, and other masses during a pelvic examination, for most physicians the pelvic exam is most useful in detecting PID. Virtually every woman with PID will have a purulent cervical discharge. If no discharge is present, look for another cause of the abdominal pain.

Don't forget to perform a testicular exam on male patients with abdominal pain. This simple exam can easily identify important causes of pain, such as testicular torsion or incarcerated inguinal hernias. An associated rash with abdominal pain can indicate vasculitis, Henoch-Schönlein purpura, and many other conditions.

Repeat the abdominal exam: the evaluation of abdominal pain frequently takes time. Take advantage of the fact that prolonged emergency department evaluations allow for repeat abdominal exams. Time specific follow-up examination is also reasonable for reliable patients who are discharged. The findings on repeat examinations and arrangements made for follow-up examinations should be clearly documented.

Testing

Laboratory tests are ordered on virtually every emergency department patient presenting with abdominal pain. Unfortunately, few of these tests are helpful. While much is made of the white cell count, it contributes very little to common diagnoses like appendicitis. In terms of risk management it may lead one astray: it is unwise to assume a normal white count means all is well. Likewise, urinalysis is de rigeur in abdominal pain evaluations. However, hematuria or pyuria is not always renal colic or cystitis. Nearly a quarter of patients with appendicitis have an abnormal urinalysis. Many elderly patients have chronic mild pyuria and up to 87% of patients with symptomatic aortic abdominal aneurysms (AAA) will have hematuria. The first hematocrit is useful as a baseline, but it provides little indication of the seriousness of acute intra-abdominal bleeding. Complete blood counts and urinalyses must be interpreted in the context of the history and physical examination.

If you could only order one lab test for each (female of child bearing age) abdominal pain patient, the serum pregnancy test would be the choice. It is the single lab test that may really help you. It is both sensitive and specific, and, if negative, eliminates the high risk diagnosis of ectopic pregnancy.

Consider, especially in the elderly, a monitor strip or ECG to evaluate for atrial fibrillation as a risk factor for mesenteric ischemia which carries an estimated 70% mortality rate.

The radiology department is a common destination for patients with abdominal pain. Advances in radiological hardware have provided many choices for abdominal pain evaluation. Gone are the days when a KUB was the standard. Today, ultrasonography and computed tomography offer useful adjuncts for diagnosing abdominal pain. How should we use them? Unless you are looking for a foreign body, free air or a bowel obstruction, plain films of the abdomen are unlikely to be helpful. A young person who you suspect has appendicitis does not need plain radiographs and ordering them just delays the workup. Ultrasound is very useful, but you must recognize its limitations. The skill of the ultrasonographer determines the quality of the study. You must understand this when interpreting results. Ultrasound is especially useful when evaluating pelvic etiologies of abdominal pain. FAST exams, with their capability to rapidly detect intra-abdominal bleeding, have replaced peritoneal lavage as the initial study of choice while evaluating blunt abdominal trauma. However, CT scan is more sensitive for detection of solid organ and bowel injury and should be ordered if there is still concern for intra-abdominal trauma despite a normal FAST exam.

The CT Scan has become an invaluable tool in the evaluation of nearly all the high risk diagnoses: appendicitis, solid organ injury associated with trauma, abdominal aortic aneurysm, renal colic, diverticulitis and various abscesses. It is especially helpful in the elderly and those patients with non-specific abdominal pain who you suspect have serious pathology. However, there has recently been a growing recognition of the long term risks associated with the radiation exposure of CT Scans, especially from high dosage in the typically co-ordered abdomen/pelvis CT scan. The risk is especially high for younger patients. Although not yet demonstrated to be a liability concern, this radiation risk can easily be imagined to become a future issue. The emergency physician should be mindful of the radiation risk associated with CT scanning in their risk/benefit decision process and clearly document the high risk diagnoses of concern when a CT scan is ordered. Alternatives to an immediate CT scan may include expanded use of ultrasound to diagnose appendicitis, earlier surgical consultation, serial evaluations in the ED, admission for observation/serial observations, and even close outpatient follow-up, but these must be utilized very prudently: failure to diagnose or delayed diagnosis remains the most common reason for closed claims with liability payments for emergency physicians.

Finally, think twice about sending an unstable patient to the radiology suite for a diagnostic study.

Treatment

The emergency treatment of patients with abdominal pain can be summed up in two words: resuscitate and comfort. Patients with unstable vital signs from hemorrhage (leaking abdominal aortic aneurysm or ectopic pregnancy) or sepsis (ruptured viscus) require aggressive resuscitation. An important part of resuscitation may be early surgical intervention. Mobilize your resources early when a catastrophic etiology for abdominal pain is suspected. Abdominal pain can be severe. Withholding analgesia from patients with abdominal pain is no longer the standard of care. Making your patient comfortable with appropriate parenteral analgesics does not significantly mask symptoms and usually makes both the history and examination more reliable.

Consult liberally when evaluating a patient with abdominal pain. Immediate consultation is necessary for the unstable surgical patient. When in doubt, use your consultant to discuss an appropriate course for evaluating and/or managing a patient. You may also use your consultant for follow-up for those patients discharged home and require re-examination.

Documentation is your best defense. It is particularly important to thoroughly document your examination. Re-examinations are always useful in patients with abdominal pain, and these should be included in the medical record. Document conversations with consultants in detail, not just that the consultant was consulted but also time of the discussion, the diagnoses or concerns discussed and the resultant evaluation or treatment plan. Don't forget to review and reconcile the nursing notes and specifically address any differences between the physician and nursing documentation. The chart should be consistent and comprehensive, without conflicting information. If the patient's condition improves, vital signs stabilize, or abdominal exam changes, document your findings in the medical record. Also, be sure to note the patient's condition at the time of admission or discharge.

High Risk Diagnoses

Between 2005 and 2009, abdominal problems were associated with approximately 20% of emergency medicine malpractice claims to ProMutual in Massachusetts, third highest after neurologic and cardiovascular etiologies. Of these, roughly 25% resulted in payment to the plaintiff, either as judgment or settlement. Failure to diagnose was the most common reason for claims, with the following factors most commonly noted: poor documentation, failure to perform diagnostic CT scan, failure to recognize splenic injury in blunt abdominal trauma, and failure to consult surgery. There are several etiologies of abdominal symptoms that are especially high risk for litigation. These are appendicitis, ectopic pregnancy, and abdominal aortic aneurysm.

Appendicitis

Despite being the most common cause of an acute surgical abdomen, roughly one third of patient with appendicitis are initially misdiagnosed. Those at higher risk for misdiagnosis include the elderly, very young, and females. Patients at extremes of age are more likely to

have atypical presentations, while females are often misdiagnosed with ovarian pathology. One of the most common discharge diagnoses for patients with missed appendicitis is gastroenteritis, and in many of these cases there was no diarrhea or vomiting. In Massachusetts between 2005-2009, 39% of lawsuits related to abdominal pain were attributed to missed appendicitis.

The classic presentation of vague abdominal pain migrating to the right lower quadrant occurs in only about half of all cases. The progression of symptoms can occur rapidly over just a few hours, or gradually over days. It is important to remember that appendicitis can occur in patients of all ages, including the very old and very young. In the elderly, the pain is often diffuse while children are often unable to localize the pain. Some patients have an atypical location of the appendix that can localize to areas other than the right lower quadrant. For example, a retrocecal appendix can cause flank pain, while some pregnant patients can have an appendix displaced towards the gallbladder. Consider the diagnosis in every patient with an appendix and abdominal or back pain.

Recently, as noted above, there has been a significant push to limit the number of CT scans performed to minimize radiation exposure. In some patients, history and physical exam alone may determine the diagnosis, making CT unnecessary and a call to the surgeon the next step. For those cases where the diagnosis is in question, develop a rational approach based on your resources. Scoring criteria, such as the Alvarado score (combining patient symptoms, physical exam findings, and labs values) can be used to stratify patients into high, low, and moderate risk for appendicitis. For the most part, labs will not help. Remember, there is no lab test for appendicitis. Plain films are essentially useless. This leaves your clinical acumen, repeated exams and special radiological studies.

Ultrasound has been advocated as the first-line diagnostic test, using CT scanning if US is inconclusive, or negative with a high clinical suspicion. Ultrasound is quick and non-invasive and is especially useful in women with right lower quadrant pain. However, it is only as good as your ultrasonographer and may not be reliable in obese patients and patients with significant tenderness. The negative ultrasound criteria used in most research studies was a visualized appendix that is less than 6 mm in size and no periappendicular inflammation, pericecal fluid, or abscess. In one study, the sensitivity of ultrasound was 77-94% for appendicitis, with a PPV of 90-97%. A diagnostic pathway of using ultrasound as first-line, followed by CT scan if negative or inconclusive yielded a sensitivity of 100% and PPV of 92%.

Abdominal CT scans are widely used, but have limitations and inter-observer variation. In one study, sensitivity for appendicitis ranged from 81% for a radiology resident, 88% for a community radiologist, and 95% for an academic radiologist. BMI has also been shown to influence the radiologist confidence in the diagnosis of appendicitis, with less confidence in thinner patients due to decreased mesenteric fat and difficulty identifying periappendiceal stranding. However, these thinner patients have the highest sensitivity with ultrasound. Remember that the sensitivity of abdominal CT in detecting appendicitis is high, but not perfect. Be careful not to put the result of the CT scan above your clinical judgment. If

appendicitis is still suspected after an unremarkable scan, consult your surgeon or at a minimum, observe the patient for serial abdominal exams.

The utility of oral and intravenous contrast in abdominal CT scans is still under debate. One study showed similar detection rates with and without oral contrast. IV contrast, which aids more in the diagnosis of solid organs, has limited evidence to support its use in appendicitis. However, if other diagnoses remain high on your differential, this may be useful.

The utility of MRI in diagnosis of appendicitis is currently being investigated, but has limited evidence at this time. Also, the use of narcotics before surgical evaluation has **not** been shown to worsen the diagnostic accuracy of appendicitis.

In summary, no test for appendicitis is 100% accurate. If you have a patient with a high likelihood of appendicitis, don't waste time making a definitive diagnosis; call your surgeon. Several patient factors, such as age, BMI, and gender, influence the accuracy of clinical findings and radiological testing. Each patient must be looked at individually with consideration given to the available resources.

Ectopic Pregnancy

Ectopic pregnancy should be considered in every female patient of childbearing age presenting with abdominal pain. A serum or urine pregnancy test should be obtained in each of these patients. If positive, the test of choice in early pregnancy is transvaginal ultrasound either by an emergency physician or by radiology. If the patient is suspected of being past the first trimester, a transabdominal ultrasound can be used initially, followed by transvaginal ultrasound if an intrauterine pregnancy is not visualized. However, in most situations transvaginal ultrasound will be the first-line for imaging.

The goals of ED transvaginal ultrasound (TVUS) should be to visualize the intrauterine pregnancy in order to essentially rule out the diagnosis of ectopic. In order to be considered an intrauterine pregnancy, both a gestational sac and either a yolk sac or fetal pole must be visualized. ED TVUS has been shown to have both high sensitivity and negative predictive value for visualization of an intrauterine pregnancy, with pooled values of 99.3% and 99.9% respectively. Visualizing the ectopic pregnancy itself is beyond the training of most emergency physicians without ultrasound fellowship training. Although rare, there is a possibility of both an intrauterine and ectopic pregnancy (heterotopic pregnancy) in 0.003% of patients. This number increases to 0.016% in patients who have undergone assisted reproduction.

A positive serum or urine pregnancy test without a visualized intrauterine pregnancy necessitates further testing. A quantitative serum HCG, formal ultrasound (if possible), and an OB/GYN consult are the next steps.

Abdominal Aortic Aneurysm

Abdominal aortic aneurysm (AAA), defined as a focal dilatation of at least 50% compared to normal, or any dilation greater than 3cm, is present in 4-9% of persons over age 60. Prevalence increases with each decade of life. Abdominal aortic aneurysm is a high risk diagnosis because it can be a difficult diagnosis to make and is associated with significant morbidity and mortality. Death from AAA is the 13th leading causing of death in the United States. Mortality from ruptured AAA approaches 90%, with only half of these patients surviving to reach the hospital. Historically, abdominal aortic aneurysms have accounted for as high as 20% of malpractice claims in Massachusetts related to intra-abdominal pathology. Between 2005 and 2009, there was only one indemnity case involving AAA, however, this case was one of the highest payouts at \$500,000.

Detection of AAA can be difficult if the diagnosis is not entertained from the outset. Approximately half of the patients with AAA are initially misdiagnosed. Men are affected 4-5 times more often than women. Other major risk factors are advanced age, smoking, atherosclerotic disease (including coronary artery disease and peripheral vascular disease), hypertension, family history, and connective tissue disorders such as Ehlers-Danlos and Marfan syndrome. The classic triad of abdominal or back pain, hypotension, and pulsatile abdominal mass is only found in a minority of patients. Patients who present with ruptured AAA usually do not have a known history of aneurysm, and the majority of patients with ruptured AAA will have microscopic hematuria. This along with a complaint of flank pain can delay the diagnosis or lead to a diagnosis of renal colic, the most commonly misdiagnosed condition for AAA. Ruptured AAA should always be on the differential for any patient over the age of 50 with back, flank, or abdominal pain with any risk factor for AAA. Unexplained syncope and hypotension without significant abdominal pain are other high risk presentations of ruptured AAA.

Physical examination is unreliable: an abdominal aortic aneurysm is frequently not palpable, and the status of femoral pulses is not helpful. Plain films are neither sensitive nor specific. They show a calcified aorta only about 60% of the time, so that absence does not rule out the diagnosis.

Ultrasound is the preferred method of screening and is an appropriate test in patients when AAA is suspected. It is a relatively quick and easy test that can be performed at the bedside, so it is ideal for an unstable patient who cannot safely be transferred for formal imaging. Ultrasound is highly sensitive and specific for AAA when performed by trained emergency physicians. Keep in mind, however, that ultrasound studies are limited by technician ability, patient body habitus, and bowel gas. Another significant limitation is that while ultrasound can determine that an aneurysm is present, it cannot determine whether it has ruptured. Computed tomography, ideally with IV contrast, is another appropriate imaging modality for stable patients and can visualize a leaking aneurysm. It also evaluates the shape of the aorta to define tortuosity, as well as evaluating the renal, mesenteric, and iliac arteries, and can detect retroperitoneal bleeding. However, you must be wary of sending an unstable patient to the CT scanner. When you strongly suspect an AAA or have an unstable patient, mobilize your resources early. In the patient with abdominal pain and shock, the diagnosis may have to be made in the operating room.

For patients in whom an asymptomatic AAA is found incidentally, it is extremely important that the patient be informed of the finding and instructed to obtain appropriate follow-up. This information needs to be transmitted to the appropriate follow-up healthcare providers so that appropriate follow-up monitoring and evaluation can be arranged. Careful documentation of the finding and associated communications with the patient and follow-up providers is essential. Since the annual risk of rupture for abdominal aortic aneurysms larger than 5cm is 25-40% and rupture is usually fatal, most AAA larger than 5cm should be evaluated for elective surgery.

Geriatrics

Elderly patients present unique difficulties and pitfalls in the evaluation and diagnosis of abdominal pain. Abdominal pain is associated with significantly higher morbidity and mortality in elderly patients, and with associated increased litigation risk. Multiple co-morbid conditions, higher rates of cognitive disorders, polypharmacy, atypical presentation, and less reliable physical exam findings are all contributing factors. Look carefully for causes outside of the abdomen and recognize that older patients tend to have more significant past medical histories and longer medication lists. The geriatric population is at much higher risk of catastrophic outcomes. Approximately 50% of older patients presenting with abdominal pain will require hospital admission and 20% will need surgery. Two-week mortality in patients over age 60 who present to the ED with abdominal pain is about 5%.

Most importantly, remember that it is absolutely reasonable to admit an elderly patient when a younger patient with the same symptoms may be sent home. Undifferentiated abdominal pain is an acceptable diagnosis and admission for serial exams and observation is warranted in patients in whom there is any question of significant pathology.

Discharge Instructions

The etiology of abdominal pain is frequently not determined during a single visit to the emergency department. If the cause of the pain is inconclusive, it is best to avoid suggesting a specific diagnosis. The most common diagnosis that appears in emergency department medical-legal cases is gastroenteritis. When you have determined that your patient needs neither surgical intervention nor admission, you must provide good discharge instructions. Inform patients that symptoms may recur or progress and further evaluation may be required. Give thorough instructions and always provide a clear mechanism for follow-up. For patients with ongoing pain, especially if it is of uncertain etiology, a short-term time and location-specific follow-up should be arranged. Patients should always be instructed to return to the Emergency Department for persistent or worsening symptoms, or any other concerns.

Summary Points

Pearls

- SUSPECT THE WORST.
- Be especially suspicious of the elderly patient with abdominal pain.
- Assume every woman of childbearing age is pregnant.
- Don't forget the pregnancy test.
- Be aware of the potential for those at the extremes of age or who are immunocompromised to have unusual presentations for abdominal problems.
- Remember that extra-abdominal organs may cause abdominal pain (cardiac ischemia, testicular torsion).
- Evaluate and reevaluate your patient and document that you have done so.
- Order studies when appropriate and follow up on any abnormal result.
- Have a high index of suspicion for splenic injury in Blunt Abdominal Trauma.
- Remember: there is no lab test for appendicitis.
- Analgesia is appropriate; a relatively comfortable patient is usually easier to evaluate.
- Mobilize your resources early when a catastrophic etiology for abdominal pain is suspected (abdominal aortic aneurysm, splenic injury, unstable ectopic pregnancy).
- Know when to call your consultants.
- Always consult when in doubt.

Pitfalls:

- Failure to perform repeat exams.
- Not addressing abnormal vital signs.
- Poor documentation.
- Inadequate follow-up (time and action specific).
- Using "Gastroenteritis" as final diagnosis.
- Failure to consider intra-abdominal injuries in trauma patients.
- Sending unstable patients to the CT scanner.
- Skipping the pelvic or testicular exam.
- Overreliance on labs.

Module 1: Abdominal Pain References

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