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Review Article

MANAGEMENT OF ACUTE ABDOMINAL PAIN

Dr. Khaled Hassan^{1*}, Ahmed Alnakhl², Ali Alasmari², Anas Thega², Osamah Aseeri³, Saud Almuammar⁴, Ibrahim Alazmi⁵, Ziyad Alharbi⁶, Batool Alsarhan⁷, Fahad Amjad bin Hussain², Abdullah Amjad bin Hussain², Qusai Abdurazzaq Sultan², Belal Barogaan², Tariq Alkaabi², Khaled Alwesabi⁶, Mohamed Saif Qayed Ahmed Obaid⁸, Hakeema Alfaraj⁹, Ahmed Albakaawi¹⁰, Ashwaq Albnyah¹⁰, Reem Muhammadishag A Kamal¹¹, Abdullah Alzahrani¹², Noor Alyousef¹³, Faisal Alassaf¹⁴, Zahra Al Mohsen¹⁵, Abdullaziz Mohammed Alghamdi¹⁶, Abeer Abdulaziz Alhareeri¹⁷, Abdullah Mohammed Alfozan¹⁸

¹Consultant Family Medicine, Saudi Arabia., ²Umm Al Qura University, Saudi Arabia., ³King Khalid University, Saudi Arabia., ⁴Al-Faisal University, Saudi Arabia., ⁵Aljouf university, Saudi Arabia., ⁶Dar Uloom University, Saudi Arabia., ⁷Alfarabi Colleges, Saudi Arabia., ⁸Jordan University, Jordan., ⁹Arabian Gulf University, Bahrain., ¹⁰University of Hail, Saudi Arabia., ¹¹King Abdulaziz University, Saudi Arabia., ¹²Albaha University, Saudi Arabia., ¹³Buraidah College, Saudi Arabia., ¹⁴Universitair Medisch Centrum Groningen, Netherlands., ¹⁵University of Groningen, the Netherlands., ¹⁶Masaryk University, Czechia., ¹⁷Princess Norah bint Abdulrahman University, Saudi Arabia., ¹⁸Ibn Sina Notional College, Saudi Arabia.

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Abstract:

Background Acute abdominal pain (AAP) is one of the most common causes of referral to an emergency department (ED), but information about its impact is limited.

Objectives The objectives of this article are to define the prevalence of AAP among ED visits in a large university hospital and analyze its main clinical features.

Methods All patients admitted at the Sant'Orsola, Malpighi University Hospital of Bologna ED on 12 a priori selected sample days in 2013 were included. General data were recorded for each patient. A total of 192 clinical variables were recorded for each patient with abdominal pain.

Results During the observation period the ED assisted 2623 patients with a daily admission rate of 219 ± 20 (mean \pm SD). Of these, 239 patients complained of AAP as their chief complaint at entry (prevalence = 9.1%). AAP prevalence was significantly higher in females than in males (10.4% vs. 7.8%; OR = 1.37; $p = 0.021$) as well as in foreign over Italian patients (13.2% vs. 8.5%; OR = 1.64; $p = 0.007$). The most frequent ED operative diagnoses were non-specific abdominal pain ($n = 86$, 36.0%) and gastrointestinal (GI) tract-related pain ($n = 79$, 33.1%; $n = 19$ upper GI, $n = 60$ lower GI).

Conclusions AAP is a common cause of referral at EDs. Despite technological advances, non-specific abdominal pain is still the main operative diagnosis.

Keywords: Acute, Abdominal, Pain, Management

Corresponding author:

Dr Khaled Hassan,
Consultant Family Medicine, Saudi Arabia

QR code



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INTRODUCTION:

Acute abdominal pain (AAP) is a medical emergency, characterized by pain arising from the abdominal area, of non-traumatic origin with a maximum duration of five days. (1)

It is the most common surgical emergency, one of the most common reasons for referral to an emergency department (ED) and the most common cause for non-trauma-related hospital admissions. (2,3)

Abdominal pain represents the chief complaint at entry for about 8% of the total ED visits in the United States. (4) It is hard to precisely quantify the number of affected individuals in Italy because of the paucity of epidemiological data in this area of medicine. However, AAP is recognized as one of the leading causes of medical consultation and hospitalization

Acute abdominal pain can represent a spectrum of conditions from benign and self-limited disease to surgical emergencies. Evaluating abdominal pain requires an approach that relies on the likelihood of disease, patient history, physical examination, laboratory tests, and imaging studies. The location of pain is a useful starting point and will guide further evaluation. For example, right lower quadrant pain strongly suggests appendicitis. Certain elements of the history and physical examination are helpful (e.g., constipation and abdominal distension strongly suggest bowel obstruction), whereas others are of little value (e.g., anorexia has little predictive value for appendicitis). The American College of Radiology has recommended different imaging studies for assessing abdominal pain based on pain location. Ultrasonography is recommended to assess right upper quadrant pain, and computed tomography is recommended for right and left lower quadrant pain. It is also important to consider special populations such as women, who are at risk of genitourinary disease, which may cause abdominal pain; and the elderly, who may present with atypical symptoms of a disease.

Abdominal pain is a common presentation in the outpatient setting and is challenging to diagnose. Abdominal pain is the presenting complaint in 1.5 percent of office-based visits¹ and in 5 percent of emergency department visits.² Although most abdominal pain is benign, as many as 10 percent of patients in the emergency department setting and a lesser percentage in the outpatient setting have a

severe or life-threatening cause or require surgery. (2) Therefore, a thorough and logical approach to the diagnosis of abdominal pain is necessary. Abdominal pain is the most common reason for a visit to the emergency department (ED), accounting for 8 million (7%) of the 119 million ED visits in 2006. (2) Obviously, anyone practicing emergency medicine (EM) must be skilled in the assessment of abdominal pain. Although a common presentation, abdominal pain must be approached in a serious manner, as it is often a symptom of serious disease and misdiagnosis may occur. Abdominal pain is the presenting issue in a high percentage of medicolegal actions against both general and pediatric EM physicians. (2,3) The modern physician should be humbled by the fact that, despite diagnostic and therapeutic advances (computed tomography [CT], ultrasonography, and laparoscopy), the misdiagnosis rate of the most common surgical emergency, acute appendicitis, has changed little over time. (4)

History: The clinician should try to obtain as complete a history as possible as this is generally the cornerstone of an accurate diagnosis. The history should include a complete description of the patient's pain and associated symptoms. Medical, surgical, and social history should also be sought as this may provide important information.

Assessment of the patient's pain: the classic PQRST mnemonic for a complete pain history is as follows: (P3 – Positional, palliating, and provoking factors, Q – Quality, R3 – Region, radiation, referral, S – Severity, T3 – Temporal factors (time and mode of onset, progression, previous episodes)).

This mnemonic will help to ensure a thorough history, but rigidly following the above sequence does not allow for a smooth patient interview, so the authors prefer to ask the patient where they feel the pain (location), what kind of pain it is (character), when and how it began (onset), how bad it is (intensity), and where else they feel it, what makes it worse or better, how it has changed over time, and whether they have ever had it before.

Location: Embryology determines where a patient will “feel” visceral pain, which is generally perceived in the midline because afferent impulses from visceral organs are poorly localized. Visceral nociceptors can be stimulated by distention,

stretch, vigorous contraction, and ischemia. Pain from foregut structures, which include the stomach, pancreas, liver, biliary system, and the proximal duodenum, will be typically localized to the epigastric region. The rest of the small bowel and the proximal third of the colon including the appendix are midgut structures, and visceral pain associated with these organs is perceived in the periumbilical region. Hindgut structures such as the bladder, and distal two-thirds of the colon, as well as pelvic genitourinary organs usually cause pain in the suprapubic region. Pain is usually reported in the back for retroperitoneal structures such as the aorta and kidneys. (5,6)

Character: Clinicians should seek to distinguish between the dull, poorly localized, aching, or gnawing pain generated by viscerally innervated organs, compared with the characteristically “sharp”, more defined and localized somatic pain caused by irritation of the parietal peritoneum or other somatically innervated structures. Somatic pain is transmitted via the spinal nerves from the parietal peritoneum or mesodermal structures of the abdominal wall. Noxious stimuli to the parietal peritoneum may be inflammatory or chemical in nature (eg, blood, infected peritoneal fluid, and gastric contents). (7,8)

Onset: Acute-onset pain, especially if severe, should prompt immediate concern about a potential intra-abdominal catastrophe. The foremost consideration would be a vascular emergency such as a ruptured abdominal aortic aneurysm (AAA) or aortic dissection. Other considerations for pain of acute onset include a perforated ulcer, volvulus, mesenteric ischemia, and torsion; however, these conditions may also occur without an acute onset. For example, only 47% of elderly patients with a proven perforated ulcer report the acute onset of pain. (8) Likewise, volvulus, particularly of the sigmoid colon, can present with a gradual onset of pain. (9) Serious vascular issues such as mesenteric ischemia may present with a gradual onset of pain. Conversely, one would expect a gradual onset in the setting of an infectious or inflammatory process. Pain that awakens the patient from sleep should be considered serious until proven otherwise. (10) The time of onset establishes the duration of the pain and allows the physician to interpret the current findings in relation to the expected temporal progression of the various causes of abdominal pain.

Intensity Pain that is severe should heighten the concern for a serious underlying cause; however, descriptions of milder pain cannot be relied on to exclude serious illness, especially in older patients who may under-report symptoms.

Patterns of radiation and referral of pain The neural pathways give rise to predictable patterns of referred pain and radiation. Kehr’s sign is a classic example where diaphragmatic irritation, usually from free intraperitoneal blood, causes shoulder pain. (11) Any other inflammatory process or organ contiguous to the diaphragm can also cause referred shoulder pain. Another well described example is ipsilateral scapula pain caused by biliary disease. Radiation may also reflect progression of disease such as with continued aortic dissection, or ongoing passage of a ureteral stone. While considering referred pain, it is important to remember that deep musculoskeletal structures (especially of the back) are innervated by visceral sensory fibers with similar qualities to those arising from intra-abdominal organs. These fibers converge in the spinal cord, giving rise to “sclerotomes”: regions of referral in the abdomen and flanks. Thus, in cases where a patient’s perceived location of symptoms appears to be completely unrevealing on physical exam, a careful assessment of musculoskeletal structures should be made. (12)

Duration and progression Persistent worsening pain is worrisome, while pain that is improving is typically favorable. Serious causes of abdominal pain generally present early in their course; however, delays in presentation can occur, especially in the elderly. Certain patterns of progression can be diagnostic, such as the migration of pain in appendicitis where the initial distention of the appendix causes a periumbilical visceral pain that shifts to the right lower quadrant once the inflammatory process is detected by the somatic sensors of the parietal peritoneum. Although labeled “colic,” gallbladder pain is generally not paroxysmal, and it almost never lasts less than 1 hour, with an average of 5–16 hours’ duration, and ranging up to 24 hours. (13) Small bowel obstruction typically progresses from an intermittent (“colicky”) pain to more constant pain when distention occurs. One would only expect somatic pain (arising from transmural ischemia or perforation contiguous to the parietal peritoneum) late in the course of a bowel obstruction.

Method:

A web-based search utilizing the advanced characteristics of different databases like PubMed, Google Scholar, Embase, Scopus, and Cochrane electronic databases was carried out. The major MeSH and other keywords like Evaluation of Abdominal Pain, Management of Abdominal Pain, Diagnosis of Abdominal Pain, etc., were used to search the databases. The search included the latest studies published from 2010 to 2020, and the search was limited to studies published in English.

Patient selection

The study included all the admissions at the ED of the Sant'Orsola, Malpighi University Hospital of Bologna, Italy, on 12 days of the first semester in 2013.

The group of patients younger than 18 years was left out of the analysis since pediatric patients present with different symptoms due to different disorders.

In order to minimize selection bias, the study days were a priori selected as follows:

January: a working day (Thursday, 3rd) in the first week and a holiday (Saturday, 19th) in the third week; February: a working day (Wednesday, 13th) in the second week and a working day (Tuesday, 19th) in the third week; March: a holiday (Sunday, 3rd) in the first week and a working day (Monday, 25th) in the last week; April: a working day (Friday, 5th) in the first week and a holiday (Saturday, 13th) in the second week; May: a working day (Wednesday, 8th) in the second week and a working day (Thursday, 16th) in the third week; June: a holiday (Sunday, 2nd) in the first week and a working day (Tuesday, 25th) in the last week.

Study setting

The ED is part of Sant'Orsola, Malpighi University Hospital of Bologna. It is a large medical center that every year handles approximately 72,000 admitted cases and 400,000 outpatient visits by medical specialists.

The ED is divided into three units: 1) a higher intensity unit, in which it is possible to simultaneously manage eight patients with a high degree of severity/risk and four with an extreme degree of severity/risk; 2) a lower intensity unit, where it is possible to manage 10 patients with a mild degree of severity/risk, as well as patients with a moderate degree of severity/risk; and 3) a short-stay observation unit, with nine beds for patients who do not need to be hospitalized, but require some observation time before discharge.

The ED staff consists of 31 physicians, 58 nurses and 25 health care support workers, with rotating shifts.

Methodology A standard Excel table was developed to retrospectively collect, on the study days, general data for each ED admission, and specific data for the patients who arrived in the ED with AAP as one of the complaints prompting a search for medical care. Both generic and specific data were obtained from the ED clinical record stored in the ED's computerized databases. General Data included gender, nationality, year of birth, severity admission code, ambulance arrival and chief complaint for admission. To collect the chief complaints for admission, 28 causes were listed, according to the National Hospital Ambulatory Medical Care Survey (NHAMCS) table,³ the International Classification of Diseases (ICD-10) and a previously established international coding system.¹⁸ Specific data included 192 clinical attributes that were grouped as follows: vital signs, past and recent history, physical examination, imaging, consultation, blood and urine tests, diagnosis (operative diagnosis of ED physicians), duration of stay and discharge, onsite and prescribed treatments. In this article all the data presented have been sufficiently anonymized and do not contain any personal information about an identifiable living individual. The study was carried out in accordance with the Helsinki Declaration and all patients gave their consent to the handling of their clinical data at entry.

Statistical analysis

Absolute and relative frequencies were reported as descriptive statistics of discrete data. Mean and standard deviation (SD) of daily admission rate was computed as well as median and range of age and duration of hospital stay. The Pearson and the linear-by-linear chi-squared tests and the Fisher's exact test were applied to nominal, ordinal and dichotomous discrete variables, respectively. The odds ratios (ORs) related to the prevalence of AAP were also calculated together with their 95% confidence intervals (CIs). Scale variables were analyzed by means of the Kruskal-Wallis test. The IBM SPSS package (version 21, IBM Co., Armonk, NY, USA) was used to analyze the data. Two-tailed *p* values less than 0.05 were considered significant.

Results:

During the 12 days of observation between January and June 2013, the ED of the Sant'Orsola,

Malpighi University Hospital of Bologna assisted 2623 patients, with a mean \pm SD daily admission rate of 219 ± 20 . Among those patients, 1296 were males and 1327 females (49.4% vs. 50.6%). The median age of the 2623 available patients was 57 years (range 18–104 years). The two largest age groups were the 70–79 ($n = 375$) and the 80–89 ($n = 405$) decades

The majority of included individuals were native Italians: 2274 patients (86.7%), while the 349 foreign patients (13.2%) were from 50 different nations, with more than half of them ($n = 190$, 54.4%) originating from Morocco ($n = 60$, 17.2%), Romania ($n = 46$, 13.2%), Moldova ($n = 26$, 7.4%), Pakistan ($n = 25$, 7.2%), Ukraine ($n = 17$, 4.9%) and Albania ($n = 16$, 4.6%).

Upon arrival at the ED, the majority of patients were given a moderate degree of severity/risk: ($n = 1526$, 58.2%), the second largest group received a high degree of severity/risk (770, 29.4%), whereas a minority received either a mild (250, 9.5%) or an extreme degree of severity/risk: (77, 2.9%). Only a third of the patients (938, 35.8%) were referred at ED by ambulance. Of these, 496 (52.9%) were attributed a high or extreme degree of severity/risk.

The patients who underwent abdominal X-ray turned out to show a pathological alteration in 53 cases (63.1%), the majority of which were represented by ileal loop distension. Nevertheless, 27 cases had to also undergo an abdominal US, and eight cases a CT.

The CT performed showed a pathological alteration in 34 cases (87.2%) that significantly contributed to the diagnosis. As a matter of fact, among the patients who underwent CT, only 11 cases (28.2%) received an unspecific diagnosis.

As for abdominal US, it revealed an organic disease potentially responsible for AAP in 57 cases (52.8%), and 33 patients (31.4%) who underwent US received an unspecific diagnosis.

Among the patients who underwent other imaging techniques, the vast majority ($n = 83$, 94.3%) had chest X-rays, and in 71 cases (86.5%) no new findings were discovered.

The majority of AAP patients ($n = 153$, 64.0%) were discharged to a general practitioner's care, whereas 86 patients were hospitalized. The most

frequent hospital wards to which patients were sent were internal medicine ($n = 38$, 44.2%), gastroenterology ($n = 15$, 17.4%) and emergency surgery ($n = 13$, 15.1%)

CONCLUSION:

AAP is one of the most frequent causes of referral to the ED of a large university hospital in Italy. The observed prevalence of 9.1% is consistent with previously published data. A lower prevalence was reported in previous studies in which patients with urinary symptoms or flank pain were excluded from the diagnosis of acute abdominal pain. (3)

Other results of our study describing clinical activities of our ED are consistent with data from other countries. Patients older than 70 years represent the largest referred group in Italy as well as in other countries.¹⁹⁻²¹ Also, the majority of AAP patients were given a moderate or high degree of severity/risk at our ED similarly to patients seen in other hospitals.¹⁹⁻²¹ Demographics data reveal that age and gender distribution among AAP patients is similar worldwide. They tend to be relatively young patients, with a prevalence of females, ranging from 51% (20) to 65% (19) and with a high hospital admission rate, ranging from 25%¹⁹ to 35%. (21)

A large proportion of cases of AAP remain classified as non-specified abdominal pain, in all published series ranging from 15.5% at the Institute of Surgery of La Sapienza, Roma, Italy, 21.1% at the Virginia Hospital, United States, 36.0% in our ED and up to 39.9% at the Department of Surgery, Royal Devon, United Kingdom. (20-21)

Our data about resource utilization deserve some further considerations: the rates of abdominal X-ray, US and CT performed poorly reflect current international guidelines indications:³ In our ED X-ray still remains more frequently (35.1%) used than CT (16.3%) despite a lower diagnostic yield. Chest X-ray appears to be overprescribed, since a large number of AAP patients had undergone this procedure without new findings being discovered. On the other hand, the treatment management at our ED seems to reflect current international guidelines given the significant difference of specific drug use among the different diagnostic groups and the little use of antibiotics that probably started after admission on the ward. Despite technological advances, AAP diagnosis and treatment still represents a major clinical challenge

for ED doctors. It would be a good practice, for future research works, to keep collecting data about AAP patients. (24)

This may provide the opportunity to find more correlations between the patient's presentation, imaging data, laboratory test results and the actual diagnosis, in order to define a less invasive and less expensive workup for AAP patients seen in EDs.

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