ABDOMINAL AND PELVIC EMERGENCIES: THE BEST THING TO DO

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ABDOMINAL AND PELVIC EMERGENCIES: THE BEST THING TO DO (Abstract): Patients with abdominal and pelvic pain who presented to the Emergency Department (ED) were studied with the **aim** of evaluating the correlation between symptoms at presentation and outcome. **Material and methods:** A systematic review of ED observation sheets between August 2022, and December 2024 was performed in order to identify and include all cases that met the predefined inclusion criteria, using specific keywords such as "abdominal and pelvic pain", and we choose 144 patients who presented to the ED of Sf. Spiridon County Clinical Emergency Hospital Iași, taking into account vital signs, laboratory tests, specialist consultations and imaging examinations performed during ED stay, with particular attention given to patients diagnosed with bowel obstruction and renal colic. **Results:** The most frequent causes of abdominal and pelvic pain included gastrointestinal (81/56.25% cases) and urological pathologies (30/20.83% patients). Laboratory markers of inflammation were frequently elevated but nonspecific. There are statistically high significant associations between abdominal X ray, ultrasound or computed tomography results and the discharge diagnosis for identifying cases with bowel obstruction, also between ultrasound and computed tomography findings and the discharge diagnosis regarding renal colic. **Conclusions:** Abdominal and pelvic pain in the emergency setting presents a diagnostic challenge due to varied and often nonspecific presentations. Blood and urine analyses along with specialist consultations are essential to confirm or exclude serious pathologies, although the correlation with imaging methods remains crucial to ensure good patient care. Imaging methods have the ability to provide accurate and detailed information about intra-abdominal pathologies allows for rapid and precise patient evaluation, significantly influencing management decisions and improving clinical outcomes. **Keywords:** ABDOMINAL AND PELVIC PAIN, VITAL SIGNS, LABORATORY TESTS, ULTRASOUND, COMPUTED TOMOGRAPHY.

INTRODUCTION

Abdominal and pelvic pain has various causes, sorted by Hammond in four categories: gastrointestinal (irritable bowel disease, constipation, acute diverticulitis, colitis, sigmoid volvulus, hernia, intestinal occlusion, intraperitoneal focal fat infarction, tumors, ischemic colitis, inflammatory bowel disease, foreign bodies), urological (urinary tract infections, renal colic, prostatitis, testicular torsion, orchitis), gynecological (pelvic inflammatory disease, ovulation pain, ruptured corpus luteum, endometriosis, ovarian torsion, tumors, hemor-

rhagic or ruptured ovarian cyst), obstetrical (ectopic pregnancy, miscarriage, preterm labor, placental abruption, uterine rupture) (1).

Irritable bowel disease (IBD) is one of the most common non-organic causes of abdominal pain. The pain is typically cramping and relieved by defecation, with alternating bowel habits. It's a diagnosis of exclusion made after ruling out other organic conditions, ultrasound (US), computed tomography (CT) and endoscopic examination playing a decisive role (2).

Severe constipation and fecalomas (sometimes mimicking bowel obstruction) are suspected based on an appropriate clinical history, digital rectal examination and confirmed using CT which depicts an iso or hyperdense image containing trapped gas with "dirty" ("mottled") appearance, thick and edematous adjacent colonic wall (3)

Colitis encompasses a range of conditions with non-specific clinical presentation, US and CT, offering suggestive signs that can aid in clarifying the underlying cause, for example: "comb sign" for active Crohn's disease, presence of enlarged lymph nodes in inflammatory colitis, "empty colon sign" as indicator of an infectious cause, fat stranding" (pericolic fat inflammation), vascular occlusion and pericolic fluid in case of ischemic colitis (4).

Patients might experience abdominal pain in case of intestinal obstruction or sub occlusion due to mechanical cause such as inflammation, intussusception, neoplasms (frequently colonic adenocarcinomas, rarely small bowel neuroendocrine tumors), ischemia, hernia, fibrous adhesions (5). The ability to differentiate a mechanical obstruction from paralytic ileus (functional impairment of intestinal motility, diffuse gaseous distension of small and large bowel loops, including the rectum, sometimes associating air-fluid levels with no transition point) and severe constipation is crucial in clinical practice, as their management strategies differ significantly (6).

The ingestion of foreign bodies, particularly non-digestible food components like chicken bones, fish bones, or toothpicks, is a frequently encountered problem in daily practice at the ED. While the good news is that the majority of ingested foreign bodies will pass spontaneously through the digestive tract without incident, sharp or large objects, and bones can cause severe complications: obstruction, perforation, or bleeding. X-rays, endoscopy, and CT are the most common modalities to diagnose and treat gastrointestinal foreign bodies. A critical point to understand is that pneumoperitoneum may not always be visible on X-rays but is obvious on CT (7).

Other common causes of abdominal and pelvic pain are renal colic (diagnosed with plain abdominal X-ray, US and unenhanced CT - considered the gold standard), pyelonephritis (primarily a clinical and laboratory diagnosis and secondary evaluated with US and contrast enhanced CT) (8,9, 10). Gynecological and obstetrical conditions like pelvic inflammatory disease or complicated ovarian cysts are evaluated with US (particularly transvaginal) as the first-line imaging or MRI (considered the gold standard), while CT is used in acute settings, with limited indications due to radiation exposure and less detailed soft tissue differentiation compared to MRI. Both US and CT scans can effectively demonstrate intraperitoneal free fluid, signs of complicated or malignant ovarian cysts (11, 12, 13).

Rare conditions which can present with abdominal and pelvic pain are ruptured ectopic pregnancy or abdominal aortic aneu-

rysm, disease recurrence or metastasis in case of patients with history of cancers (digestive tract, ovaries, breasts, thyroid, testes), iliopsoas abscess or hematoma (14, 15).

MATERIALS AND METHODS

A systematic review of Emergency Department (ED) medical documents between August 2022, and December 2024 was performed with the aim of identifying and including all cases that met the predefined inclusion criteria, using specific keywords such as "abdominal and pelvic pain". 144 patients were chosen, who presented to the ED of Sf. Spiridon County Clinical Emergency Hospital Iași for these complaints. For each patient, relevant data were extracted into a structured database and were considered patients' demographics (age, gender), vital signs, laboratory tests, specialist consultations and imaging examinations performed during the ED stay, with particular attention given to patients diagnosed with bowel obstruction and renal colic, studying real-negative, false-negative, false-positive, real-positive and Pearson Chi-squared test.

RESULTS

The retrospective study included 144 patients who presented to the ED of with abdominal and pelvic pain, mostly females (76 - 52.64%), with an age range between 18 and 93 years old (mean age of 53.9 years).

Vital signs. Five main vital signs routinely monitored (temperature, pulse rate, respiratory rate, blood pressure and oxygen saturation) are indicators of hypoxemia and hypoperfusion, final common pathways of clinical deterioration and death (tab. I).

TABLE I.
Vital signs

Vital signs	Normal	Decreased	Increased
Axillar temperature	95(65.97%)	1 (0.69%)	48 (33.33%)
Heart rate	130 (90.27%)	6 (4.16%)	8 (5.55%)
Respiratory rate	131 (91%)	0 (0%)	13 (9%)
Blood pressure (BP)	14 (9.72%)	0 (0%)	Elevated 71 (41.3%) Arterial hypertension 59 (41%)
Oxygen saturation	129 (89.58 %)	15 (9.02%)	0 (0%)

Laboratory tests. To guide the diagnostic process, blood and urine samples were collected from patients. Additionally, stool samples were obtained from those presenting with diarrhea to test for Clostridium difficile toxins A and B. We have extracted the significant data from the blood and urine analyses for potential pathologies causing abdominal pain. The inflammation markers used in our study consisting of complete blood count – hemoglobin (Hb), white blood cells (WBC), C-reactive protein (CRP), fibrinogen, ferritin- are not sufficient alone as a differential diagnostic tool in abdominal pain (16, 17).

Creatinine is correlated with muscle metabolism and kidney function; normal values are different for women: 0.5-1

mg/dL and for men 0.5-1.2 mg/dL. A normal creatinine level is necessary for CT investigation with contrast medium. Contrast use can trigger contrast-induced nephropathy (CIN) defined as an absolute increase in serum creatinine ≥ 0.5 mg/dL or a relative increase ≥ 25%. Pre-existing kidney disease is a risk factor for developing CIN. The incidence of CIN among patients who underwent tomography with contrast was 11.29% in our study. The utility of prophylactic measures remains uncertain (18). The number and percentage of patients from the studied cohort who underwent each specific test is indicated in the second table.

TABLE II.
Laboratory tests

Lab test / Pts. No. / %	Normal	Pts. No. / %	Low	Pts. No. / %	High	Pts. no / %
Arterial pH / 16 / 11.11	7.35-7.45	9 / 6.25	<7.35	3 / 2.08	>7.45 4	4 / 2.77
Seric Na (mmol/L) / 132 / 91.66	136-145	108 / 75	<136	23/15.97	>145	1 / 0.69
Seric K (mmol/L) /129 / 89.57	3.5-5.1	118 / 82.94	<3.5	7 / 4.86	>5.1	4 / 2.77
AR (nmol/L) / 132 / 91.66	22-29	83 / 57.63	<22 / 36	36 / 25	>29	4 / 2.77
Hb (g/dL) / 141 / 97.91	F / B = 12-16/12-17	100	<12/<13	34	>16/>17	7
WBC (x1003/μL) / 141 / 97.91	4-10	63 / 43.75	<4	2 / 1.38	>10	76 / 52.77
Fibrinogen (mg/dL) / 43 / 29.86	200-400	24 / 16.66	<200	3 / 2.08	>400	16 / 11.11
CRP (mg/dL) / 135 / 93.75	0-0.5	37 / 25.69	0	0	> 0.5	98 / 68.05
Ferritin (ng/mL) / 52 / 36.11	20-300	40 / 27.77	<20	3 / 2.08	> 300	9 / 6.25
Alkaline phosphatase (U/L) / 65/ 45.13	35-150	58 /40.27	<35	2 / 1.38	>150	5 / 3.47
Lactate dehydrogenase distribution (U/L) / 84 / 58.33	135-220	55/38.19	<1 35	14/9.72	>220	15/10.41
Seric Creatinine (mg/dL) 140 / 97.22	F / B= 0.5-1.1 / 0.5-1.2	120 / 83.33	<0.5	2 /1.38	>1.1 / 1.2	18/12.5

Urine analysis is a routine, accessible, non-invasive, inexpensive, and quick examination providing information on the excretory system, liver function, and the body's metabolic and acid-base balance. Among the 71 patients (49.30%) who underwent urine analysis, 11 (7.63%) had normal results, 52(36.11%) showed changes suggestive of urinary tract infections, 6 (4.16%) had isolated hematuria, and 2 (1.38%) presented only increased salts (oxalates and urates). It's important to note that patient-collected samples can yield false positive infection results due to inadequate hygiene. This issue might be compounded by potentially suboptimal hygiene conditions in hospital sanitary facilities (19).

Specialist examination

Every patient admitted to the ED is evaluated by the emergency physician, who

may request one or more specialist consultations based on the patient's symptoms, laboratory results, comorbidities and imaging. 25 patients with urinary symptoms, had solely evaluation conducted by the emergency physician, supported by laboratory tests and US, confirming the presumptive clinical diagnosis of renal colic and urinary tract infection. 52 patients required one specialist consultation (general surgery or gastroenterology), while 57 patients needed both consultations (general surgery and gastroenterology). 10 patients required more than two consultations: nine underwent three, and one underwent four, involving cardiology, diabetology, internal medicine, and vascular surgery.

Imaging methods used to complete diagnosis were abdominal X ray, ultrasound (US) and computed tomography (CT) and we studied the contribution of these three methods for evaluation of normal cases, bowel obstruction and renal colic.

The statistical correlation between the 3 types of investigations and the discharge diagnosis for normal cases were as following: on X-rays, 24 normal cases were recorded out of 52 (46.2%); on ultrasounds, only 22 (17.5%), normal cases were identified out of 126 and on CT scans, only 6 normal cases were found (5.7% of all CTs done). At discharge, 11 patients were diagnosed with no pathology (8.1% of the cases). No significant statistical correlation was found between the diagnosis made on X-ray and the discharge diagnosis – thus, the proportion of matches recorded is 54.9% of total cases, with 51.0% true negative cases and 3.9% true positive cases; there was a fairly high percentage of false positive cases, meaning normal on X-ray but with pathology identified at discharge, and only 3.9% false negative cases, meaning diagnosed with pathology on X-ray but not confirmed at discharge. On the other hand, a statistically significant association is found between ultrasounds and the discharge diagnosis, as well as between CT scans and the discharge diagnosis – in the first case the match rate is 84.7%, and in the second case 97.0%. However, no statistically significant associations are found between X-rays and ultrasounds or CT scans, nor between ultrasound and CT (tab. III).

TABLE III.
The correlation between imaging methods and the discharge diagnosis in case of normal patients

Normal cases	RN (real-negative)		FN (false-negative)		FP (false-positive)		RP (real-positive)		Pearson Chi-squared
	n	%	n	%	n	%	n	%	
X-ray *vs.* discharge diagnosis.	26	51.0	2	3.9	21	41.2	2	3.9	p = 1.000
US *vs.* discharge diagnosis.	95	80.5	3	2.5	15	12.7	5	4.2	p = 0.003*
CT *vs.* discharge diagnosis.	94	94.0	-	-	3	3.0	3	3.0	p <0.001*
X ray *vs.* US	24	50.0	2	4.2%	15	31.%	7	14.6	p = 0.061
X ray *vs.* CT	23	51.1	1	2.2	20	44.4	1	2.2	p = 1.000
US *vs.* CT	68	76.4	3	3.4	16	18.0	2	2.2	p = 0.265

Bowel obstruction is suspected when imaging methods identify dilated bowel loops (DBL). On X-ray, 28 cases (53.8% of patients) were identified with hydro-aeric levels, while ultrasound identified only 13 cases (10.3%) and CT identified 15 cases (14.3% of the total), and at discharge, 18 patients were identified with bowel obstruction (13.1% of the total). However, there are highly statistically significant associations between all three types of imaging investigations and the discharge diagnosis of bowel obstruction. The match rate between X-rays and discharge diagnoses is 70.6%, of which 29.4% are true positive cases; the match rate between ultrasounds and discharge diagnoses is 93.2%, most of the matches being true negatives (83.9%). The match rate between CT scans and discharge diagnoses is 97.0%, of which 15.0% are true positive cases; the match rate between X-rays and ultrasounds is 72.9%, of which 27.1% are true positive cases; similarly, the match rate between X-rays and CT scans is 71.1%, of which 28.9% are true positive, and the match rate between ultrasounds and CT scans is 93.3%, of which 12.4% are true positive (tab. IV).

TABLE IV.

The correlation between imaging methods and the discharge diagnosis in case of bowel obstruction

Bowel obstruction	RN (real-negative)		FN (false-negative)		FP (false-positive)		RP (real-positive)		Pearson Chi-squared
	n	%	n	%	n	%	n	%	
X ray *vs.* discharge diagnosis	21	41.2	2	3.9	13	25.5	15	29.4	p <0.001**
US *vs.* discharge diagnosis	99	83.9	6	5.1	2	1.7	11	9.3	p <0.001**
CT *vs.* discharge diagnosis	82	82.0	3	3.0	-	-	15	15.0	p <0.001**
X ray *vs.* US	22	45.8	-	-	13	27.1	13	27.1	p <0.001**
X ray *vs.* CT	19	42.2	2	4.4	11	24.4	13	28.9	p = 0.002**
US *vs.* CT	72	80.9	4	4.5	2	2.2	11	12.4	p <0.001**

The diagnosis of ureterohydronephrosis (UHN), which is an indicative of renal colic, was identified in almost a quarter of cases on ultrasound (23.8%), in only 4 patients on CT (3.8% of the total), and in 17.8% of patients at the time of discharge. Once again, significant statistical associations are observed between both types of imaging investigations and the discharge diagnosis. The correlation between US and the discharge diagnosis is 97.5%, of which 19.5% are true positives. The correlation between CT scans and discharge diagnosis is 99.0%, even though the vast majority of cases (95.0%) are true negatives. Between ultrasound and CT, the match rate is 95.5%, with 3.4% true positives and 92.1% true negatives – there were 4 false positives, where the diagnosis was identified on ultrasound but ruled out by CT (tab. V).

TABLE V.
The correlation between imaging methods and the discharge diagnosis in case of ureterohydronephrosis

UHN	RN		FN		FP		RP		Pearson Chi-squared
	n	%	n	%	n	%	n	%	
US *vs*. discharge diagnosis	92	78.0	-	-	3	2.5	23	19.5	p <0.001**
CT *vs*. discharge diagnosis	95	95.0	1	1.0	-	-	4	4.0	p <0.001**
US *vs*. CT	82	92.1	-	-	4	4.5	3	3.4	p <0.001**

DISCUSSION

The spectrum of pathologies identified by clinical examination, laboratory tests and imaging in our cohort study included complicated or uncomplicated acute diverticulitis, renal colic with or without urinary tract infections, uretero-vesical, intestinal or adnexal tumors, intestinal obstructions mainly due to adhesions, intestinal inflammations, appendicitis, intra-abdominal or abdominal wall abscesses, ruptured abdominal aortic aneurysm, ectopic pregnancy or ruptured ovarian cyst. The diverse nature of these pathologies highlights the limitations of clinical examination and laboratory tests in establishing a precise diagnosis in the ED and underscores the necessity of using advanced imaging methods (20).

The high prevalence of elevated BP and hypertension upon arrival at the ED in this study cohort (almost 90% of patients) is a noteworthy finding. It is well-established that factors commonly associated with the ED environment, such as acute pain, stress related to the medical condition and the unfamiliar setting, and anxiety or fear of the unknown diagnosis and treatment, can significantly impact blood pressure readings. Therefore, while these initial BP measurements are important for immediate risk stratification, it is crucial to consider the potential influence of these transient factors when interpreting the data in the broader context of the patients' underlying conditions and the need for long-term BP management.

Laboratory testing serves to narrow the differential diagnosis based on the patient's history and clinical examination. The inflammation tests are not an indicator of localization; they only show the presence of inflammation.

In emergency conditions clinical examination and laboratory tests can have divergent results, so imaging is required to establish the diagnosis, US being preferred because it is noninvasive and widely available. CT is more accurate than US but uses ionizing radiations and the iodinated contrast medium with potential for adverse reactions Although in the studied cohort no major adverse reactions to the contrast agent injection were recorded, the indication for performing a CT scan must be well-documented and justified because benefits of the diagnostic information must outweigh the risks associated with radiation and contrast agents. CT is useful to differentiate an organic disease (pathological findings) from a functional one (normal findings). In these cases, it must be considered that there may be minimal changes on the CT scan that are overlooked, especially

in emergency conditions, and may result in false negatives. In case of false negatives at imaging, if the symptomatology persists, the investigations are continued, and/or the CT images are reanalyzed. It is important that radiologists do not miss significant subtle diagnoses that need urgent intervention. Errors can be reduced by having time to reviewing all available clinical and paraclinical note (currently and previously), working in a team, analyzing all medical imaging, especially all CT phases (noncontrast and postcontrast: arterial, portal and late), having a systematic approach and by using multiple windows and MPR (multiplanar reconstruction) (21, 22).

CONCLUSIONS

Abdominal and pelvic pain in the emergency setting presents a diagnostic challenge due to varied and often nonspecific presentations. Blood and urine analyses along with specialist consultations are essential to confirm or exclude serious pathologies, although the correlation with ultrasound and computed tomography remains crucial to ensure good patient care. Imaging methods have the ability to provide accurate and detailed information about intra-abdominal pathologies allows for rapid and precise patient evaluation, significantly influencing management decisions and improving clinical outcomes.

CONFLICT OF INTEREST AND FUNDING

The authors declare that there is no conflict of interest, and they received no specific funding regarding this scientific research.

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