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## **Acute abdominal pain : considerations on diagnosis and management**

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# Chapter 2

**Standard outpatient re-evaluation for patients not admitted  
to the hospital after emergency department evaluation  
for acute abdominal pain**

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## **Abstract**

**Background:** The aim of the present study was to investigate the efficacy and safety of standard outpatient re-evaluation for patients who are not admitted to the hospital after emergency department surgical consultation for acute abdominal pain.

**Methods:** All patients seen at the emergency department between June 2005 and July 2006 for acute abdominal pain were included in a prospective study using a structured diagnosis and management flowchart. Patients not admitted to the hospital were given appointments for re-evaluation at the outpatient clinic within 24 hours. All clinical parameters, radiological results, diagnostic considerations and management proposals were scored prospectively.

**Results:** Five hundred patients were included in this analysis. For 148 patients (30%) the final diagnosis was different from the diagnosis after initial evaluation. Eighty-five patients (17%) had a change in management after re-evaluation, and 20 of them (4%) were admitted to the hospital for an operation. Only 6 patients (1.2%) had a delay in diagnosis and treatment, which did not cause extra morbidity.

**Conclusion:** Standard outpatient re-evaluation is a safe and effective means of improving diagnostic accuracy and helps to adapt management for patients that are not admitted to the hospital after surgical consultation for acute abdominal pain at the emergency department.

## Introduction

Approximately 4-5% of patients evaluated at an emergency department present with acute abdominal pain<sup>1</sup>. Some patients that require admission for surgical or medical treatment are easily recognized. Others may present during the early stages of surgical pathology and will be difficult to distinguish from patients with mild self limiting disease. Judgment errors in evaluating these patients with an ambivalent presentation may lead to therapeutic delay, possibly increasing morbidity and even mortality. For this reason diagnostic modalities such as ultrasound and computed tomography (CT) are often used to aid in the diagnostic process and subsequent clinical decision making<sup>2,3</sup>. Cross-sectional imaging may not, however, be beneficial in the diagnosis of all patients seen in the emergency department for acute abdominal pain. These examinations are costly, time consuming, and in the case of CT, subject the patient to ionizing radiation.

Another method often used for the differentiation of mild disease from more serious pathology in ambivalent cases is outpatient re-evaluation. Re-evaluation can allow the disease to present itself through natural progression, permitting surgical cases to become more typical and thus identifiable. In patients with non-specific abdominal pain or mild non-surgical diagnoses, the symptoms will regress allowing the patient to be safely discharged from follow-up.

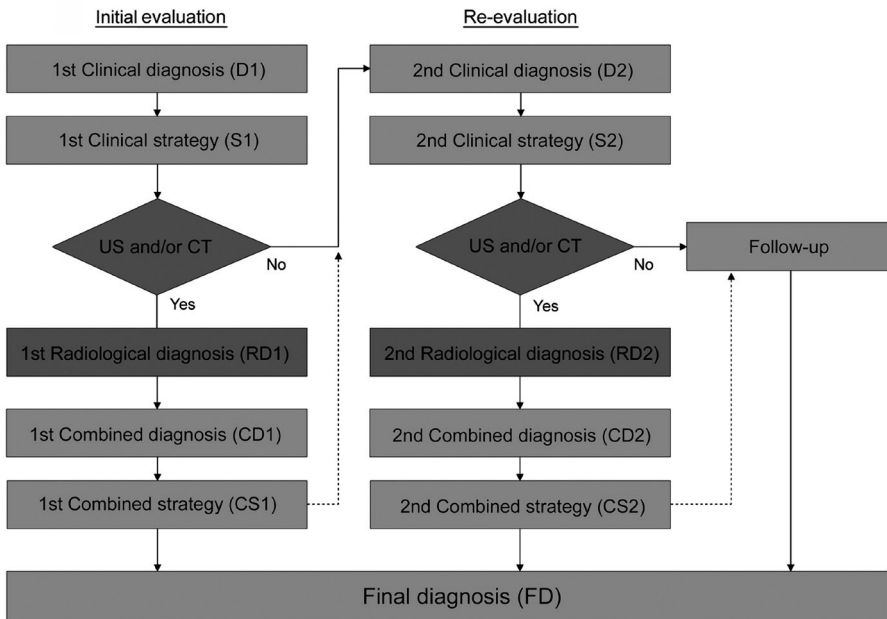
The present study was performed to assess the efficacy and safety of standard outpatient re-evaluation in a large series of patients with acute abdominal pain seen in our emergency department but who were not considered to require a hospital admission. Our hypothesis is that serial outpatient re-evaluation for patients with equivocal abdominal pain is safe, can improve diagnostic accuracy and will facilitate proper treatment selection.

## Patients and methods

The present study was performed in a middle-sized teaching hospital with a 24 hour emergency service with surgery, radiology, intensive care and on call consultants in pediatrics, gynecology and internal medicine. All consecutive patients with acute

abdominal pain evaluated in the emergency department by a resident of the surgical department between June 2005 and July 2006 were included in the study. The surgical resident always made the primary assessment, and the consultant surgeon evaluated the patient if necessary. Patients who were evaluated at another hospital for the same complaint, patients with abdominal pain caused by trauma, and patients who had undergone additional radiological examination (ultrasound or CT) prior to surgical consultation were excluded. For all patients, a structured diagnostic and management strategy algorithm was followed (Figure 1). First, a “clinical diagnosis” (D1) was made based on the patient’s history, physical examination, and biochemical blood and urine analyses. The resident recorded his/her degree of certainty for the clinical diagnosis given on a scale from 1 to 5. An initial management proposal (S1) was then made based on the clinical diagnosis. All clinical parameters, the clinical diagnosis (D1) and the proposed strategy (S1) were registered on a study form. After a conference with the consulting surgeon, a decision was made about whether or not to perform additional radiological examinations. When such studies were performed, the radiologist was asked to confirm the clinical diagnosis or provide an alternative diagnosis. All ultrasound and CT examinations were performed by 1 of 5 certified radiologists with similar levels of experience. After learning the radiological results (RD1), the resident and the surgeon reassessed the initial clinical diagnosis and strategy, which were altered if necessary (CD1 & CS1). Again all results and considerations were registered on the study form. Patients were admitted to the surgical ward if they were thought to have an abdominal condition that required immediate surgery or a medical therapy necessitating admission. All patients that were not directly admitted to the surgical ward after surgical consultation at the emergency department were given appointments for re-evaluation at the out-patient clinic within 24 hours. There, the diagnosis and management strategies were reassessed (D2 and S2) by the consultant surgeon or a surgical resident under the supervision of a consultant surgeon. Additional radiological or endoscopic examinations were made if they were deemed necessary. Patients were discharged from out-patient follow-up when a definitive diagnosis was made and the treatment successfully initiated or completed, or if the patient no longer had abdominal complaints. The final diagnosis (FD) was based on intraoperative findings or pathological examination of the resected organs.

If patients were not operated, the final diagnosis was made from the clinical and/or radiological diagnosis in combination with the clinical response to medical therapy at standard re-evaluation and follow-up as described above.

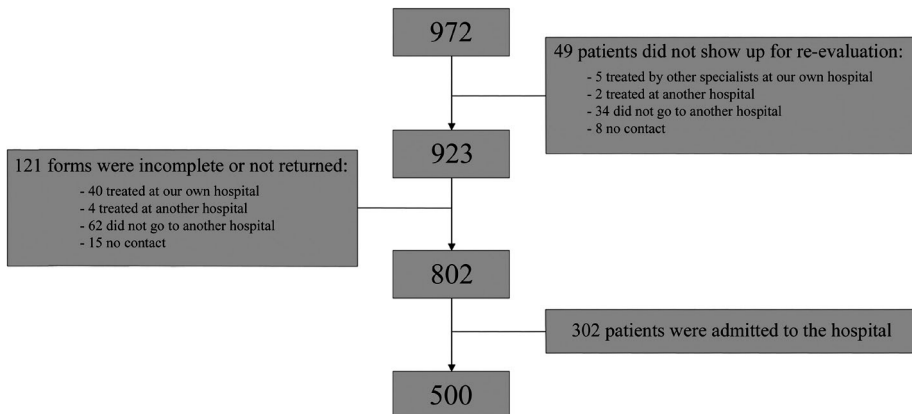


**Figure 1.** Study design for patients presenting with abdominal pain at the emergency department for surgical consultation. US, ultrasound.

For the purposes of the present study, all hospital records were reviewed by 2 surgical residents (B.T. and R.B.), double checking the available information and verifying the final diagnoses for all patients entered into database. Patients were excluded from analysis if they did not show up for the re-evaluation appointment or if the study form was not returned or was incomplete. For all these patients, the hospital records were searched and patients were contacted for additional information. If a patient could not be contacted, that patient's general practitioner was consulted. All diagnoses were categorized according to the 10<sup>th</sup> version of the international classification of diseases (10-ICD)<sup>4</sup>. Complications noted during hospital admission were scored twice daily in a prospective database as reported earlier<sup>5</sup>. Statistical analysis was performed with SPSS 16.0. Chi square tests were used to compare binomial proportions with Yates continuity correction;  $p < 0.05$  was considered significant.

## Results

During the study period 972 patients were evaluated. Forty-nine patients (5.0%) were excluded when they did not show up for their re-evaluation appointment, and another 121 (12.4%) patients were excluded as the study forms were incomplete or not returned. Twenty-three patients were lost to follow-up (2.4%). The diagnosis and management data for excluded patients are shown in table 1. Of the 802 patients eligible for inclusion, 302 patients (37.7%) were admitted to the hospital, and 123 (15.3%) underwent an operation on the day of first evaluation. The other 500 patients (62.3%) were not admitted and re-evaluated according to the study protocol. (Figure 2)



**Figure 2.** Summary of the inclusion process for eligible patients.

**Table 1.** Diagnosis and management data for 170 excluded patients.

Lost to follow-up	No form			No show			Total
	H	O	N	H	O	N	
Self-limiting nonspecific abdominal pain	1	1	44			27	73
Viral intestinal infection, unspecified			8	1		2	11
Abdominal pain due to metastasized cancer	6	1		1			8
Calculus of gallbladder without cholecystitis	6(5†)	1(1†)					7
Constipation			4	1		2	7
Acute appendicitis, not perforated	6(6*)						6
Gynecological pathology, NOS	1		2	1(1†)	1		5
Calculus of kidney and ureter	3		1				4
Irritable bowel syndrome	1		1		1	1	4
Pneumonia	2						2
Pancreatitis	2						2
Extra-uterine gravidity	2(2*)						2
Gastritis and duodenitis		1	1				2
Cystitis						2	2
Peptic ulcer, site unspecified	1						1
Acute appendicitis, perforated	1(1*)						1
Inguinal hernia with obstruction, without gangrene	1(1*)						1
Ventral hernia with obstruction, without gangrene	1(1*)						1
Crohn's disease	1						1
Ileus, unspecified	1						1
Diverticular disease of the large intestine	1(1†)						1
Acute tubulo-interstitial nephritis	1						1
Functional diarrhoea	1						1
Benign neoplasm of the colon	1						1
Inguinal hernia			1				1
Moderate pre-eclampsia				1			1
<b>Total</b>	<b>40(17)</b>	<b>4(1)</b>	<b>62</b>	<b>5(1)</b>	<b>2</b>	<b>34</b>	<b>170</b>

No form, study form was incomplete or not returned; No show, patient did not show up for the re-evaluation appointment at the surgical outpatient clinic; H, patient was treated at our own hospital; O patient was treated at another hospital; N, patient did not contact another caregiver for abdominal complaints. Numbers in parentheses indicate the number of patients that underwent an operation. †, elective operation; \*, acute operation.



All patients were evaluated by one of 16 surgical residents with different levels of experience. Eighty-eight percent of the patients, however, were seen by residents in their first 3 years of training.

Of the 500 patients enrolled in the study, 205 patients were under 17 years old (41.0%) and 290 patients were female (58.0%). Thirty-nine patients (7.8%) had a fever defined as a temperature above 38° Celsius, 160 patients (32.0%) had a C-reactive protein (CRP) of more than 8, and 111 patients (22.2%) had a leukocyte count of more than 12. Plain abdominal radiographs were acquired in 211 patients (42.2%), and 31 (6.2%) had chest X-rays. An ultrasound study of the abdomen was done in 139 patients (27.8%), a CT of the abdomen was done in 8 (1.6%), and 17 patients (3.4%) underwent both an ultrasound and a CT at initial evaluation. At re-evaluation 145 patients (29.0%) had an ultrasound, 15 (3.0%) had a CT, and 14 (2.8%) had both an ultrasound and a CT. Sixteen patients (3.2%) underwent additional cross sectional imaging at initial evaluation as well as at re-evaluation.

The final diagnoses for the 500 patients that had a standard re-evaluation are given in table 2. The average follow-up was 12 days (range 1-275 days), but most of the patients (46.2%) could be discharged from follow-up after just one outpatient visit. For 148 patients (29.6%) the final diagnosis (FD) was different from the initial clinical diagnosis (D1) or the combined diagnosis (CD1) after additional radiological imaging on the day of first evaluation (table 3). Eighty-five (17.0%) patients had a change in management, 20 of which (4.0%) were considered major (table 4). A change in management was regarded as major if the clinical strategy changed to a surgical procedure when the initial strategy was conservative. Seventeen patients underwent operation after re-evaluation for presumed appendicitis (1 negative appendectomy), one for an incarcerated umbilical hernia, another for an incarcerated ventral hernia and one patient underwent laparotomy for intestinal obstruction due to adhesions.

**Table 2.** The final diagnoses for 500 patients that were not admitted to the hospital but who underwent standard outpatient re-evaluation after presentation at the emergency department for acute abdominal pain.

Final diagnosis (FD)	> 16 years		≤ 16 years		Total	
	n	%	n	%	n	%
Other and unspecified abdominal pain	53	18.0	36	17.6	89	17.8
Constipation	35	11.9	46	22.4	81	16.2
Viral intestinal infection, unspecified	25	8.5	45	22.0	70	14.0
Nonspecific mesenteric lymphadenitis	3	1.0	33	16.1	36	7.2
Cystitis	25	8.5	8	3.9	33	6.6
Calculus of kidney and ureter	27	9.2	0	0	27	5.4
Calculus of gallbladder without cholecystitis	21	7.1	0	0	21	4.2
Diverticular disease of intestine	20	6.8	0	0	20	4.0
Gynaecological pathology, NOS	17	5.8	1	0.5	18	3.6
Gastritis and duodenitis	12	4.1	4	2.0	16	3.2
Acute appendicitis, not perforated	8	2.7	6	2.9	14	2.8
Ileocaecitis	6	2.0	6	2.9	12	2.4
Pneumonia, organism unspecified	1	0.3	7	3.4	8	1.6
Acute tubulo-interstitial nephritis	5	1.7	1	0.5	6	1.2
Myalgia (abdominal wall)	3	1.0	2	1.0	5	1.0
Bronchitis, not specified as acute or chronic	0	0	4	2.0	4	0.8
Peptic ulcer, site unspecified	3	1.0	0	0	3	0.6
Other	31	10.5	6	2.9	37	7.4
Total	295		205		500	

NOS, not otherwise specified.

**Table 3.** Changes in the diagnosis after standard outpatient re-evaluation.

D1 or CD1	Final Diagnosis (FD)								
	VII	NML	GD	AA	CO	NSAP	GYN	Other	Total
Viral intestinal infection, unspecified (VII)		2	2	2	5	6	1	10	28
Nonspecific mesenteric lymphadenitis (NML)	1			2	1	2		1	7
Acute appendicitis, not perforated (AA)	5	4	1		2	2			14
Constipation (CO)				1		8	3	5	17
Calculus of kidney and ureter						2		5	7
Non specific abdominal pain (NSAP)	6	1	2	2	10		2	11	34
Other	2	1	2	1	2	17	1	15	41
Total	14	8	7	8	20	37	7	47	148

D1, first clinical diagnosis; CD1, 'combined' diagnosis after additional radiological imaging (on the day of initial evaluation); GD, gastritis and duodenitis; GYN, gynecological pathology; NOS, not otherwise specified.

**Table 4.** Strategy changes after standard outpatient re-evaluation.

S1 or CS1	Final strategy after re-evaluation				Total
	LAP	ADM	OPFU	COS	
Laparotomy (LAP)			2		2
Outpatient re-evaluation	20	5		52	77
Consultation of other specialty (COS)			5	1	6
Total	20	5	7	53	85

S1, first clinical strategy; CS1, 'combined' strategy after additional radiological imaging (on the day of initial evaluation); ADM, admission; OPFU, outpatient follow-up.

Subgroup analysis was performed for sex, age, additional radiological imaging on the day of evaluation, the diagnosis 'non specific abdominal pain' (NSAP) after initial evaluation (D1 or CD1) and the resident's degree of certainty for the initial clinical diagnosis (table 5). Female patients had more strategy changes than male patients ( $p < 0.05$ ), and patients older than 16 years had significantly more strategy changes than children ( $p < 0.0001$ ). When patients underwent additional imaging (ultrasound and or CT) on the day of initial evaluation, they had fewer diagnostic changes when compared to those that did not ( $p = 0.0002$ ). This however, did not lead to a significant change in management ( $p = 0.106$ ). Those patients, whose abdominal complaints could not be differentiated and were given the diagnosis NSAP after initial evaluation ( $n = 90$ ), had more diagnostic changes at re-evaluation ( $p = 0.006$ ). This occurred irrespective of whether they underwent additional radiological imaging on the day of initial evaluation: 39 of the 90 patients (43.3%) underwent additional radiological imaging, and 18 of those 39 patients (47.4%) had diagnostic changes at re-evaluation. When a resident had a high degree of certainty about his/her initial clinical diagnosis (4 or 5), there were significantly fewer diagnostic changes at re-evaluation ( $p < 0.0001$ ). There were no significant differences for major changes in management in any of the subgroups.

**Table 5.** Subgroup analysis for diagnostic and strategy changes.

	N	$\Delta D$	% $\Delta D$	$\Delta S$	% $\Delta S$	M $\Delta S$	%M $\Delta S$
All patients	500	148	29.6	85	17.0	20	4.0
Male	210	54	25.7	27*	12.9	10	4.8
Female	290	94	32.4	58*	20.0	10	3.4
>16 years	295	87	29.5	67**	22.7	11	3.7
≤16 years	205	61	29.8	18**	8.8	9	4.4
US / CT on day 0	164	30*	18.3	21	12.8	5	3.0
No US / CT on day 0	336	118*	35.1	64	19.0	15	4.5
NSAP	90	38*	42.2	13	14.4	2	2.2
Non NSAP	410	110*	26.8	72	17.6	18	4.4
Degree of certainty (4-5)	231†	50**	21.6	33	14.3	8	3.5
Degree of certainty (1-3)	206†	81**	39.3	42	20.4	12	5.8

\*,  $p < 0.05$ ; \*\*,  $p < 0.0001$ ;  $\Delta D$ , change in diagnosis;  $\Delta S$ , change in strategy; M $\Delta S$ , major change in strategy; US, ultrasound; †, missing data: n=63.

Of the 500 patients, only 6 (1.2%) had diagnoses that should preferably have been made on the initial day of evaluation, leading to immediate treatment. Three of those patients had acute perforated appendicitis, one patient had an incarcerated ventral hernia without gangrene, one patient had an incarcerated umbilical hernia without gangrene and another patient had intestinal adhesions with obstruction, but also without gangrene. After recovering from their operations, these patients were discharged from the hospital without complications.

## Discussion

Patients presenting with acute abdominal pain at the emergency department need to be diagnosed correctly and treated accordingly. As the majority of patients will have self-limiting pathology not requiring surgical intervention, most will not require an admission to the hospital. Patients with abdominal pathology requiring surgical treatment however should not be missed. To diagnose patients with abdominal pain, many diagnostic modalities can be used to compliment the 'basic' clinical evaluation of patient history, physical examination and blood and urine analysis. Diagnostic

measures such as ultrasound, CT, laparoscopy and clinical observation have all been reported in the literature. Ultrasound for example can assist in the diagnosis of many gastrointestinal causes of acute abdominal pain<sup>6</sup> and its routine use by surgeons for such patients has been shown to increase diagnostic accuracy<sup>7</sup>. Computed tomography has also been reported to increase diagnostic accuracy, reduce hospital admission by 24%<sup>8</sup>, and is said to be the best predictor of the need for an urgent intervention<sup>9</sup>. The use of cross-sectional imaging for all patients presenting with acute abdominal pain however, is costly, time consuming and in the case of CT exposes patients to ionizing radiation. The last issue is important as the growing use of CT is steadily increasing the collective dose of medical radiation to which patient populations are subjected. Even though the cancer risk from an abdominal CT is small for the individual, the increasing use of CT scans may create a future health concern, especially for children<sup>10</sup>. The indications for ordering a CT should therefore always be carefully scrutinized by medical personnel, especially when other diagnostic modalities can attain similar results<sup>11</sup>.

Laparoscopy can also accurately distinguish patients that require surgery from those that can be treated conservatively<sup>12</sup> and it has been proposed as routine management for patients with acute abdominal pain for whom the decision to operate is uncertain<sup>13</sup>. Nevertheless, laparoscopy in itself is an operation, and can be regarded as too invasive as a first line diagnostic measure when similar accuracy can be achieved without an operation.

Hospital admission for patients with equivocal abdominal complaints has been a common practice for many years. The effectiveness of this practice is limited because most patients ultimately have NSAP for which an admission to hospital is in fact not required<sup>14-16</sup>. In recent years the percentage of hospital admissions for patients with acute abdominal pain has decreased, possibly as a result of advances in diagnostic technology and improved emergency department faculty presence<sup>1</sup>.

Another method often used to help distinguish surgical pathology from mild self-limiting disease in patients with equivocal abdominal pain is outpatient re-evaluation. Patients with abdominal pathology requiring surgery who initially present during the early stages of the disease will become more easily identifiable, whereas the symptoms will regress in those patients with self limiting disease allowing them to be

safely discharged from follow-up. Outpatient re-evaluation for patients with equivocal abdominal complaints has not been reported extensively in the literature. Only one study comparing outpatient follow-up to active clinical observation for patients with NSAP in the emergency department concluded that outpatient evaluation seems to be a safe option that is not accompanied by an increased incidence of complications<sup>17</sup>.

The present study is the first to report the value of standard outpatient re-evaluation for patients that are presumed not to require a hospital admission after evaluation at the emergency department for acute abdominal complaints. After standard re-evaluation 30% of the patients had a different final diagnosis than the diagnosis initially given after evaluation at the emergency department. A change in management was seen in 17% of the cases after re-evaluation, and 4% of the patients were admitted to hospital for surgery. These are important changes from the patient's point of view, demonstrating that standard outpatient re-evaluation is a valuable method that improves diagnostic accuracy and helps to select the proper management strategies in this patient population. The initial management decisions made by the evaluating physician at the emergency department regarding whether or not patients should receive additional imaging or be admitted to the hospital were not scrutinized in this study. The study was designed to mimic daily practice, and allowed for these management decisions to be made just as they are in daily routine where basic clinical judgment plays a fundamental role. Apparently these clinical assessments are precise enough to triage accurately without detrimental effects for the patient. Only 6 patients (1.2%) had diagnoses that should preferably have been made at initial evaluation. This however did not lead to increased morbidity.

### **Conclusion**

This study supports the hypothesis that serial outpatient re-evaluation is safe, and will improve diagnostic accuracy and facilitate proper treatment selection for patients that are not admitted to the hospital after surgical consultation for acute abdominal pain at the emergency department.

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