Abdominopelvic CT Increases Diagnostic Certainty and Guides Management Decisions: A Prospective Investigation of 584 Patients in a Large Academic Medical Center

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OBJECTIVE. The objective of our study was to prospectively determine how CT affects physicians' diagnostic certainty and management decisions in the setting of patients with nontraumatic abdominal complaints presenting to the emergency department.

SUBJECTS AND METHODS. We included 584 patients presenting with nontraumatic abdominal complaints to the emergency department from November 2006 through February 2008. Emergency department clinicians were prospectively surveyed both before abdominal CT (pre-CT) and after abdominal CT (post-CT) to determine the leading diagnosis, the diagnostic certainty, and the management decisions. Changes were assessed by Fisher's exact test and the log likelihood ratio.

RESULTS. The most common diagnoses were renal colic (119/584, 20.4%) and intestinal obstruction (80/584, 13.7%). CT altered the leading diagnosis in 49% of the patients (284/584, $p < 0.00001$) and increased mean physician diagnostic certainty from 70.5% (pre-CT) to 92.2% (post-CT) ($p < 0.001$; log likelihood ratio, 2.48). The management plan was changed by CT in 42% (244/583) ($p < 0.0001$). Physicians planned to admit 75.3% of the patients (440/584) to the hospital before CT; that plan was changed to hospital discharge with follow-up in 24.1% of patients (106/440) after CT. Surgery was planned for 79 patients before CT, whereas hospital discharge was planned for 25.3% of these patients (20/79) after CT.

CONCLUSION. In the management of patients presenting to the emergency department with nontraumatic abdominal complaints, CT changes the leading diagnosis, increases diagnostic certainty, and changes potential patient management decisions.

Keywords: acute abdomen, CT, diagnostic imaging, emergency department, physician diagnostic certainty, sensitivity and specificity

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Increased utilization of CT technology for medical imaging has raised concerns regarding the cost of health care and increased radiation exposure to the general public [1]. In the United States, these concerns may have led to tighter cost control by the government through Congress, which issued the Deficit Reduction Act in 2005 as an effort to reduce utilization of costly medical imaging [2]. However, a critical consideration for the use of imaging technology in medicine should concern not only the cost of the examination, but also its usefulness and effectiveness in the management of an individual patient.

There have been several articles regarding the accuracy of CT in the diagnosis of many conditions. Several investigations have shown that CT has an impact in altering initial diagnoses and treatment plans for patients [3–12]. Most studies were limited by a retrospective nature, limited generalizability, or a relatively small patient population. In addition, information is limited about how CT affects physicians' diagnostic certainty and management decisions, particularly in the setting of patients with nontraumatic abdominal complaints presenting to the emergency department.

Abdominal complaints are one of the more common reasons a patient visits the emergency department in the United States. Of the 115 million visits to the emergency department in 2005, 7.8 million patients (6.8%) reported stomach and abdominal pain as their chief complaint [13]. Abdominal pain presents diagnostic challenges in all demographic populations [14]. In addition to defining the correct diagnosis, emergency physicians also face the challenge of correctly managing patients in a timely fashion by deciding whether patients need to undergo surgery, require hospital admission for further workup, or can be safely discharged from the hospital [15].

Given the unavoidable limitations of history, physical examination, and laboratory testing, imaging examinations have proven useful and necessary in achieving a higher diagnostic certainty in patients presenting with abdominal complaints. CT is frequently used in patients with abdominal complaints for the diagnosis of several medical and surgical conditions in emergency centers [16]. CT can provide a rapid, accurate diagnosis of several diseases and may guide appropriate management in many patients. Given the concern about overutilization of CT technology, it is important to know how CT can help increasing diagnostic certainty and guiding management plans. The goal of this investigation was to determine how CT could change physicians' diagnostic certainty and management decisions.

Subjects and Methods

Study Design

Our hospital's institutional review board approved this prospective investigation, which was deemed compliant with HIPAA. The investigation followed the Standards for Reporting of Diagnostic Accuracy (STARD) guidelines when applicable.

Setting

The setting for this study was a 900-bed, urban, tertiary care academic medical center.

Selection of Participants

The inclusion criteria for this study were as follows: Eligible patients were adults (≥ 18 years) presenting to the emergency department with a chief complaint of nontraumatic abdominal complaints who underwent abdominal CT as part of the workup ordered by the responsible physician. The patient's responsible physician was defined as the physician directly involved with the care of the patient in the emergency department. The physicians were queried by standardized questionnaires. Different physicians might have been queried after CT because of the staffing schedule. Enrollment occurred when a study coordinator was on duty to administer pre-CT questionnaires. Hours varied between 3 pm and 12 am Monday through Friday.

Exclusion criteria were as follows: Ineligible patients had a chief complaint due to abdominal trauma or were younger than 18 years old. Patients presenting to the emergency department outside the hours covered by the study coordinator were not eligible for the investigation and were not counted. The investigation was conducted in the emergency department of a 900-bed urban academic medical center.

Methods of Measurement

The study coordinator, a research fellow overseen by the study principal investigator, approached the patient's physician at the time of the CT order and asked him or her to fill out the pre-CT questionnaire. The physician filled out the post-CT questionnaire after he or she received the final CT report. In our institution, we have a 24/7 attending level of coverage in both the emergency department and the emergency radiology department. Patients are typically managed by residents who are closely supervised by an attending physician.

Data Collection and Processing

A standardized questionnaire (Fig. 1) was used to record the responsible physician's training and specialty, assessment of the most likely diagnoses, level of certainty, and intended patient management plan. A 1-week pilot phase was planned to identify necessary changes to the protocol and questionnaire. Trained investigation coordinators surveyed the ordering physician with questionnaires before and after CT. The pre-CT questionnaires were completed before the examination. The investigation coordinator confirmed that the responsible physician had received the CT final report before answering the post-CT questionnaire. An Access database (Microsoft) with an entry screen identical to the standardized questionnaire was used by the investigation coordinators to record survey responses. A report feature generated a list of accrued patients whose post-CT questionnaires had not yet been completed. The time between the pre-CT and post-CT questionnaires was capped at 7 days.

Primary Data Analysis

Diagnostic category—Questionnaires included nine diagnostic categories: appendicitis, diverticulitis, intestinal obstruction, renal colic, bowel ischemia, leaking abdominal aortic aneurysm, abscess, no acute condition, and other. The diagnosis that incorporated the results of abdominal CT was defined as the post-CT diagnosis. At the completion of the investigation (in which data collection was via the questionnaire), two radiologists further subdivided the Other category by defining categories 10 through 20 (Table 1). Patients originally categorized as Other were assigned to a category from nine through 20 on the basis of the free text entry on the questionnaire: colitis and inflammatory bowel disease, cholecystitis and cholangitis, gastrointestinal bleeding, pancreatitis, gastric ulcer and peptic ulcer, gastrointestinal perforation, pelvic inflammatory disease, abdominal mass, constipation, ascites, and bowel fistula. Fisher's exact test, which allows small numbers of cases and skewed data, was used to test for changes in the frequency of each diagnostic category before CT versus after CT.

Diagnostic certainty and patient management—The physician's assessment of likelihood of the top choice of the diagnostic category was recorded as a percentage (0–100%), and changes before and after CT were compared for all categories overall and for each diagnostic category. The nonparametric Wilcoxon's signed rank test was used to test whether changes in the median levels of physician diagnostic certainty were significantly (at an $\alpha = 0.05$ level) different from zero without assuming a specific distribution [17].

The change in diagnostic certainty was also expressed as a log likelihood ratio as follows:

$$\ln[P_{post} / (1 - P_{post})] - \ln[P_{pre} / (1 - P_{pre})],$$

where P is the physician's assessment of the likelihood of the top choice of diagnostic category expressed as a probability and truncated (0.01–0.99) to allow calculation of logs. A log likelihood ratio of 0 indicates no change in diagnostic certainty, with larger values indicating greater influence of the diagnostic test. The overall log likelihood ratio is provided as well as log likelihood ratios stratified by whether the diagnosis changed as a result of the CT.

Finally, the influences of physician specialty (emergency medicine, medicine, surgery, others) and level of training (resident, attending physician) on diagnostic certainty were evaluated by a repeated-measures analysis of variance. Differences in the degree of diagnostic certainty before and after CT were tested among different specialties and between residents and attending physicians.

The patient management plan was recorded as an indication of likely changes in resource utilization based on the results of the CT examination. Fisher's exact test was used to test for changes in management decisions before versus after CT. All analyses were completed using a statistical package (SAS, version 9.1, SAS Institute).

Results

Patient Population and Responsible Physicians

A pilot investigation was conducted between July 17 and 24, 2006. Investigation recruitment began November 12, 2006, and was completed February 26, 2008. After the pilot investigation, 667 patients were recruited in the investigation. Patients were excluded because of missing items in the questionnaires ($n = 71$), repeat patients ($n = 2$), or age younger than 18 years ($n = 2$). An additional eight patients were excluded during the recoding of the Other category, discussed previously in the Subjects and Methods section: Three trauma patients were excluded and five patients were excluded because readers disagreed about the diagnostic category.

There were 584 patients, with a mean age of 53.5 years (range, 18–94 years), remaining for analysis. Questionnaires were filled out by physicians in the department of medicine (43%), emergency medicine (39%), surgery (15%), and others (3%). Twenty percent

(230/1,168) of the questionnaires were answered by attending physicians and the remaining, by residents. There were two questionnaires answered by physicians whose level of training was not recorded.

Change in Leading Diagnosis

The numbers of patients diagnosed in each category before and after CT are provided in Table 1. The five most common diagnoses before CT included renal colic, intestinal obstruction, no acute condition, appendicitis, and diverticulitis, in order of decreasing frequency. The five most common diagnoses after CT were no acute condition, renal colic, intestinal obstruction, abscess, and appendicitis. The use of CT altered the leading diagnoses in 48.6% of cases (284/584, $p < 0.00001$). There was a 126% increase in the diagnosis of no acute condition after CT, a 46% decrease in the diagnosis of intestinal obstruction after CT, and a 51% decrease in the diagnosis of diverticulitis after CT.

Change in Diagnostic Certainty

Overall, CT significantly increased diagnostic certainty both in cases in which the diagnostic category did not change (mean change in certainty, 21.7%; $p < 0.0001$) and in cases in which the diagnostic category did change (mean change in certainty, 34.94%; $p < 0.0001$). Stratified by category assigned on the pre-CT questionnaire, CT increased the responsible physician's mean diagnostic certainty in all categories except bowel fistula (Table 2). The increase in certainty was significant ($p < 0.05$) in all categories with more than 20 patients. For example, in cases of perforation, abscess, and appendicitis in which the pre- and post-CT diagnoses were similar, CT significantly enhanced physicians' diagnostic certainty for greater than 30%. In cases of perforation, leaking abdominal aortic aneurysm, cholecystitis and cholangitis, abscess, and diverticulitis in which the pre- and post-CT diagnoses were different, CT increased diagnostic certainty for more than 40% of physicians.

The mean log likelihood ratio over all cases was 2.48 (interquartile range, 1.0–3.7), indicating that CT substantially influenced diagnostic certainty. The log likelihood ratio was greater than 0 in 83.2% (486/584) of cases and greater than 1 in 75.0% of cases. In cases in which the diagnosis did not change ($n = 300$), the log likelihood ratio was 2.31. In cases in which the diagnosis did change ($n = 284$), the log likelihood ratio was 2.66.

In the repeated-measures analysis of variance, physician specialty was not a significant predictor of change in diagnostic certainty ($p = 0.28$); however, compared with attending physicians, residents' diagnostic certainty was significantly changed after the CT results ($p = 0.035$).

Change in Management Decisions

Management decisions before and after CT are provided in Table 3. CT changed the management plan in 42% of patients (244/583; $p < 0.0001$, Fisher's exact test). For example, the use of CT reduced the number of patients for whom observation was planned by 44% (from 117 patients to 66 patients) and increased the number of patients discharged from the hospital by 55% (from 142 patients to 220 patients). Of the 440 patients for whom hospital admission was planned before CT, 24.1% (106/440) were discharged after CT. Of the 142 patients for whom discharge was planned before CT, 20.4% (29/142) were admitted after CT. Overall, the use of CT reduced planned admissions by 17.5% (440 patients pre-CT vs 363 post-CT).

Discussion

Given current concerns about the increased health care cost and radiation exposure related to the use of CT technology [1], it is critical for physicians to be able to weigh the risk of radiation to patients and cost of the examination against the benefits of CT. In this investigation, we showed an example of how CT could be useful for physicians by increasing their certainty to make the diagnosis of patients presenting with nontraumatic abdominal complaints. In addition, we showed that abdominal CT could significantly change the management decision of patients that resulted in appropriate disposition.

Abdominal CT has been proven to be popular among the physicians in the emergency

CT FOR PATIENTS WITH NONTRAUMATIC ABDOMINAL COMPLAINTS

Patient Name: ________________________

MRN: ________________________________

Date: _________________________________

Name of MD: ________________________

MD Specialty ***(circle one):***

Emergency Medicine / Medicine / Surgery / Other: ______________

What is your level of training ***(circle one):***

Staff Attending / Resident

If you had to make a decision now *without* any additional information, what would be your next step in managing this patient?

Please circle and answer only one of the following.

Admit for surgery:	What procedure? ____________________
Admit for interventional procedure:	What procedure? ____________________
Admit for medical management:	What treatment? ____________________
Admit for observation:	ED Observation or Inpatient Observation
Discharge with follow-up	

Circle top choice of diagnosis: **Probability of Diagnosis (1–100)**

Appendicitis
Diverticulitis
Intestinal obstruction
Renal colic
Bowel ischemia
Leaking AAA
Abscess
No acute condition
Other________________

%

Fig. 1—Questionnaire and data collection form. Pre- and post-CT questionnaires were similar. MRN = medical record number, ED = emergency department, AAA = abdominal aortic aneurysm.

TABLE 1: Comparison of Numbers of Patients in Each Diagnostic Category Before and After CT

Diagnostic Categories	Pre-CT Diagnosis (No. of Patients)	Post-CT Diagnosis (No. of Patients)	Change From Pre-CT Diagnosis to Post-CT Diagnosis	
			No. of Patients	% Change[a]
1. Appendicitis	52	29	↓ 23	44
2. Diverticulitis	51	25	↓ 26	51
3. Intestinal obstruction	80	43	↓ 37	46
4. Renal colic	119	101	↓ 18	15
5. Bowel ischemia	12	5	↓ 7	58
6. Leaking abdominal aortic aneurysm	19	8	↓ 11	58
7. Abscess	42	34	↓ 8	19
8. No acute condition	77	174	↑ 97	126
9. Other	9	28	↑ 19	211
10. Colitis and inflammatory bowel disease	25	22	↓ 3	12
11. Cholecystitis and cholangitis	8	16	↑ 8	100
12. Gastrointestinal bleeding	8	8	↔	0
13. Pancreatitis	23	20	↓ 3	13
14. Gastric and peptic ulcer	15	19	↑ 4	27
15. Gastrointestinal perforation	7	5	↓ 2	29
16. Pelvic inflammatory disease	5	19	↑ 14	280
17. Abdominal mass	20	9	↓ 11	55
18. Constipation	7	12	↑ 5	71
19. Ascites	3	6	↑ 3	100
20. Bowel fistula	2	1	↓ 1	50
Total	584	584		

Note—Data represents the number of patients in that category. ↓ = decrease, ↑ = increase, ↔ = no change.
[a]% Change = difference between number of patients with pre-CT diagnosis and number of patients with post-CT diagnosis divided by number of patients with pre-CT diagnosis and multiplied by 100.

department for the diagnosis of several nontraumatic acute abdominal conditions [6, 7], as shown by the steadily increasing rate of CT utilization [16]. A number of investigations have validated the use of abdominal CT in various acute conditions [18–20]. In addition, when CT was performed as a second examination after ultrasound, it provided additional information in 34.6% of cases in an investigation of 255 patients presenting with acute abdominal pain [21]. In a prospective investigation of 124 adult patients with a mean age of 44 years presenting to an emergency department with nontraumatic abdominal pain, CT resulted in a change in diagnosis and disposition in almost one third of all subjects [6]; in another investigation of emergency department patients with abdominal pain, CT changed the management of 60% of patients [7].

The utility of CT is even more pronounced in elderly adults because evaluation of abdominal pain is considerably more challenging and diagnostic certainty is muddied by both comorbidities and the limitations of the physical examination and laboratory tests. In one survey of practicing emergency physicians, almost 80% of physicians reported more difficulty in the diagnosis and management of elderly patients compared with a younger cohort [8]. The acuity of disease is extraordinary in elderly adults. In one retrospective investigation, about one third of patients presenting with acute abdominal pain had illnesses requiring surgical intervention [9, 10]. CT doubled the diagnostic certainty of emergency physicians in their evaluation of elderly patients with abdominal pain and resulted in surgery for a significant number of patients in whom a surgical condition was previously unsuspected [11].

CT's influence on disposition and resource utilization is substantial. A retrospective analysis of 604 consecutive patients with abdominal pain undergoing CT examination found that 38% of patients with clinically suspected diagnoses requiring an admission were discharged after a negative CT examination [12]. In another investigation, 11% of subjects who were to be admitted for surgery, a procedure, or observation were discharged after diagnostic testing was completed [6].

Our investigation aimed to answer similar questions but on a larger scale using a prospective analysis with fewer exclusion criteria. For example, some prior studies excluded patients with intraabdominal malignancies [22], inflammatory bowel disease [22], recent laparotomy [4, 22], rectal bleeding [3], suspected renal colic [3], suspected gynecologic disorders [3], acute abdominal pain of more than 24 hours' duration [4], or age younger than 60–65 years old [11, 23]. Other studies showed the usefulness of CT only in specific disease processes such as appendicitis, nephrolithiasis, and so on [24–26].

Our patient cohort had a variety of disease processes (e.g., urinary tract calculi, intestinal obstruction, acute diverticulitis, and acute appendicitis), which made the results more generalizable than other investigations with fewer patients. We observed a fair number of cases for which the leading diagnosis was no acute condition (13% of all pre-CT diagnoses) and believe that including this diagnosis in our analysis yielded a practical observation.

Our results are consistent with previous investigations that CT significantly changed physicians' leading diagnoses, diagnostic certainty, and management decisions. Leading diagnoses were changed in 48.6% of our patients. The use of CT helped exclude acute conditions in a substantial number of cases, which

TABLE 2: Change in Diagnostic Certainty of Referring Physicians Before and After CT

Diagnostic Categories	No. of Patients	Similar Post-CT and Pre-CT Diagnoses		Different Post-CT and Pre-CT Diagnoses	
		Change in Diagnostic Certainty (%)[a] (p^b)	No. of Patients	Change in Diagnostic Certainty (%)[a] (p^b)	No. of Patients
1. Appendicitis	52	32.19 (< 0.0001)	21	30.55 (0.0003)	31
2. Diverticulitis	51	23.21 (0.0010)	14	41.22 (< 0.0001)	37
3. Intestinal obstruction	80	26.03 (< 0.0001)	33	28.83 (< 0.0001)	47
4. Renal colic	119	11.55 (< 0.0001)	84	36.83 (< 0.0001)	35
5. Bowel ischemia	12	20.00 (0.5000)	2	26.00 (0.0859)	10
6. Leaking abdominal aortic aneurysm	19	27.50 (0.0625)	6	67.92 (0.0005)	13
7. Abscess	42	36.83 (< 0.0001)	23	43.26 (< 0.0001)	19
8. No acute condition	77	22.60 (< 0.0001)	52	27.72 (< 0.0001)	25
9. Other	9	23.45 (0.1250)	5	25.00 (0.5000)	4
10. Colitis and inflammatory bowel disease	25	24.55 (0.0020)	11	32.57 (0.0063)	14
11. Cholecystitis and cholangitis	8	19.00 (0.2500)	5	43.33 (0.2500)	3
12. Gastrointestinal bleeding	8	13.00 (0.2500)	5	61.67 (0.2500)	3
13. Pancreatitis	23	19.00 (< 0.0001)	15	11.25 (0.4063)	8
14. Gastric ulcer and peptic ulcer	15	18.33 (0.2500)	3	32.83 (0.0024)	12
15. Gastrointestinal perforation	7	36.00 (0.5000)	3	61.25 (0.1250)	4
16. Pelvic inflammatory disease	5	27.50 (0.0925)	4	70.00 (NA)	1
17. Abdominal mass	20	29.80 (0.0625)	5	28.33 (0.0070)	15
18. Constipation	7	12.00 (0.1250)	5	34.50 (0.5000)	2
19. Ascites	3	31.67 (0.2500)	3	— (NA)	—
20. Bowel fistula	2	10.00 (NA)	1	–15.00 (NA)	1

Note—Dash (—) indicates 0. NA = not applicable because too few cases to calculate.
[a]Values indicate a change in percentage point. For example, a change in diagnostic certainty of 21% means that the probability of the leading diagnosis increases by 21 percentage points.
[b]Wilcoxon's signed rank test.

was shown as a substantial increase (126%) in the diagnosis of no acute condition post-CT. In addition, the numbers of patients with diagnoses of intestinal obstruction, diverticulitis, and appendicitis were substantially decreased. Although our end point was post-CT diagnosis, not discharge diagnosis, there have been investigations showing a very high concordance (92.8–96.8%) of CT diagnosis with final or discharge diagnosis [4, 22].

Diagnostic certainty of physicians was significantly ($p < 0.0001$) increased at post-CT (21.7–34.9%) in our investigation. This result is concordant with an investigation by Tsushima et al. [4] that showed a 21.9-point increase in certainty after CT. Our results also, unsurprisingly, revealed that the level of physician training affected the degree of diagnostic certainty. The resident physicians' level of certainty was significantly influenced by CT results compared with that of attending physicians. Because our site of investigation is a teaching hospital, the applicability of this result to other hospital settings may be questionable.

The reasons abdominal CT influences the triage of patients with nontraumatic abdominal complaints are several. First, clinical examinations alone undoubtedly have limited accuracy for the diagnosis of several condi-

TABLE 3: Change in Management Decisions Before and After CT

Management Decision Before CT	Management Decision After CT						Total
	Admit for Surgery	Admit for Interventional Procedure	Admit for Medical Management	Admit for ED Observation	Admit for Inpatient Observation	Discharge With Follow-Up	
Admit for surgery	41	3	8	4	3	20	79
Admit for interventional procedure	2	17	6	1	3	2	31
Admit for medical management	15	9	142	5	4	38	213
Admit for ED observation	2	3	7	17	4	35	68
Admit for inpatient observation	9	5	8	7	9	11	49
Discharge with follow-up	8	2	10	7	2	113	142
Total	77	39	181	41	25	220	583[a]

Note—The data presented are number of patients. ED = emergency department.
[a]Follow-up data for one patient is missing because the physician did not complete the part of the questionnaire about the post-CT management decision.

tions. This is due to several factors related to the disease itself (atypical presentation), patients (body habitus, age, and concomitant illness), physicians (skill, experience), and physician–patient communication [14]. Second, abdominal CT has been proven to be accurate not only in the diagnosis of several common acute abdominal illnesses such as intestinal obstruction, acute appendicitis, and acute diverticulitis, but also for the exclusion of surgical abdominal conditions [27]. Last, the increased utilization of each CT unit in recent decades has brought about a lower technical cost per examination and decreased cost–benefit ratio [5].

Our investigation has some limitations. This is a descriptive investigation without a control group. Our investigation's entry point was at the CT requisition; therefore, patients for whom CT was not required as determined by their physicians were not studied. We did not collect data about patients who met the study inclusion criteria during the study period but were not enrolled in the study. Patients included in the investigation were not consecutively enrolled because our investigation coordinators were not working around the clock at the time of data collection. There were a large number of physicians answering questionnaires; therefore, variations in their responses may vary. Our attempt to reduce this variability was to verbally and electronically inform emergency department residents and attending physicians about our protocol. In some patients, pre- and post-CT questionnaires were filled out by different physicians because of the hours of the investigation. This may limit the interpretation of diagnostic certainty of the pre-CT diagnosis and the post-CT diagnosis in that particular patient. However, it did reflect actual clinical practice and made the investigation more generalizable. We did not collect data about whether other diagnostic tests, including laboratory results, were available to the physicians at the time of CT requests. With the availability of other test results, a physician's diagnostic certainty may be increased. Most physicians answering questionnaires in our investigation were residents. Because of their level of training and experience, they may underestimate the diagnostic certainty or under- or overestimate the need for treatment compared with senior attending physicians. Finally, our end point of the investigation was the post-CT diagnosis. We did not collect follow-up data including the final diagnosis in patients who were admitted or followed up, hospital length of stay in admitted patients, costs related to CT, and patient outcomes (morbidity or mortality). Quantifying cost savings and resource utilization rates attributable to performing abdominal CT in this group of patients remains another issue for clarification.

In conclusion, in this large prospective investigation, performance of an abdominal CT in the emergency department for patients with nontraumatic abdominal complaints increased the physician's diagnostic certainty and changed planned management decisions.

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