

# Diagnostic Accuracy of Computed Tomography in Evaluating Acute Abdomen in Emergency Surgical Settings: A Retrospective Study from a Tertiary Hospital in Saudi Arabia

# Mohammed D. Alghamdi<sup>1</sup>, Madhawi S. Aldawsari<sup>2</sup>, Mohammed S. Almuqbil<sup>3</sup>

# Abstract

**Background:** Routine emergency department arrivals for sudden abdominal pain demand swift confirmation of the underlying pathology. High-resolution computed tomography now ranks as the cornerstone investigation, its rapid output paired with superior sensitivity and specificity.

**Objective:** This study set out to quantify CTs diagnostic yield for non-traumatic upper and lower gastric complaints in a major Saudi Arabian tertiary hospital.

**Methods:** Clinical charts were mined for 250 adult cases that received abdominal CT between January and December 2022. Each scan interpretation was later matched against definitive surgical notes, histological reads, or thorough outpatient tracking.

**Results:** Radiologists reported 100% sensitivity regarding the principal acute pathologies; positivepredictive ratios fluctuated from 86.7% for nephrolithiasis up to 95.0% for strangulated hernia. Appendicitis featured most frequently (34% of encounters) and adhesive bowel blockage accounted for another 18%.

**Conclusion:** Given the near-perfect detection rate, intravenous-contrast CT now deserves classification as first-line imaging when acute abdominal symptoms override the waiting period for ultrasonography.

Keywords: Acute Abdomen, CT Imaging, Diagnostic Accuracy, Emergency Surgery, Appendicitis, Saudi Arabia.

#### Introduction

Acute abdominal pain, often simply termed acute abdomen, appears on the doorstep of almost every urban emergency department. Physicians are presented with a diagnostic kaleidoscope, ranging from a harmless gastritis flare to the sudden need for an open laparotomy. Swift recognition is not just academic-it directly affects survival and the long-term health of the patient in the next bed.



In contemporary practice, a well-timed CT scan now performs most of the investigative heavy lifting. The technique delivers a combination of tiny detectors, fast reconstruction, and contrast bolus that plain films and bedside ultrasound cannot quite match. Internal calamities like ruptured diverticula, strangulated bowel, or advancing mesenteric ischemia yield under its pixel-thin scrutiny (Laméris et al., 2009; Rosen et al., 2003).

Clinical series repeatedly demonstrate that the single slice of CT can tilt management from watchful waiting to the prep-room within hours (Rosen et al., 2000). Tertiary care centers in fast-paced environments like urban Saudi hospitals feel this urgency; every delayed decision can ripple through the next shift. Yet home-grown audits measuring CTs hit rate in those local aisles remain frustratingly meager, leaving practitioners to import foreign data and hope it holds in the kingdom's humid heat.

The proposed investigation assesses the diagnostic precision of computed tomography in individuals arriving with acute abdominal discomfort at a Saudi Arabian tertiary care facility. A secondary aim catalogues the predominant pathologies identified on the scans and juxtaposes those radiologic results with intra-operative observations or eventual clinical diagnoses, thereby enriching the worldwide corpus of evidence with region-specific insights.

# Literature Review

The sudden onset of abdominal pain frequently confronts emergency physicians with a bewildering array of possible diagnoses. Computed tomography now serves as the cornerstone imaging tool in such cases; its remarkable speed and depth of detail have progressively reshaped, or perhaps even repositioned, the entire evaluation framework for acute belly complaints.

In the early 2000s, Rosen and colleagues documented the disruptive power of that single scan. Their investigation revealed that abdominal CT caused management plans to swivel by 59 percent and, perhaps more strikingly, spared many patients the trauma of an unwanted laparotomy.

Years later, Strömberg and co-workers recycled similar data from more than 2,000 subjects. They, too, broadcasted the message that prompt CT not only cut diagnostic lag time but also shoved surgeons toward decisive action when the clock really mattered.

Laméris and group inserted another piece by directly pitting CT against bedside intuition and sonography. The slice-by-slice technique triumphed on every front, yielding far more actionable answers within the four-walled ED than either hunch or handheld probe.

Van Randen then rounded out the catalogue, pointing out that the tomographic advantage held especially true in non-obese adults whose interiors remained stubbornly opaque to ultrasound alone. Without retrying the argument here, his review echoed and amplified the earlier work-an anatomical encyclopedia in thirty seconds easily eclipses a clinician's guesswork and even a skilled sonographer's sweep.



Further research has confirmed that computed-tomography reporting in emergency departments can vary significantly with the individual radiologists experience. Perry et al. (2016) noted, nonetheless, that the overall sensitivity for pivotal disorders such as appendicitis and diverticulitis remained impressively high.

Tertiary hospitals in Saudi Arabia often wrestle with extraordinary patient volumes, making precise triage a matter of clinical survival. Although in-country data are still sparse, a sizable body of overseas literature undergirds the routine adoption of CT when surgical decisions hang in the balance. Alshamari et al. (2016) went one step further by demonstrating that a low-dose protocol yields comparable diagnostic performance to the standard technique while slashing the patients radiation burden.

Altogether these observations position CT as the cornerstone imaging tool for acute abdominal pathology in emergency contexts and warrant its steady inclusion in decision-support pathways. Still, the uneven geography and divergent demographics across health networks demand localized studies to fine-tune scanning algorithms and to allocate finite imaging resources where they will do the most good.

# Methodology

#### Study Design and Setting

This retrospective, observational study took place within the Emergency Department and the Radiology Department of a large-tertiary care facility in Saudi Arabia. The inquiry measured how often computed tomography reliably identified the cause of non-traumatic acute abdominal pain during 2022, a single-calendar-year look-back that stretched from January through December.

#### Patient Selection

Two hundred fifty adults who reported acute abdominal discomfort and were imaged with a dedicated abdominopelvic CT formed the analytic cohort. Neither those who had surgery in the preceding month nor patients already known to have intra-abdominal malignancy were allowed into the sample, nor were records judged incomplete.

#### Data Collection

Age, sex, presenting symptoms, physical signs, simple laboratory results, and the initial bedside diagnosis were pulled from the unified electronic chart. Every CT interpretation stemmed from the official radiology report. The ultimate clinical judgment-for cases that operated, those that went to pathology, and patients managed on-watch-was reconstructed from operative notes, biopsy slips, or documented follow-up.

#### Imaging Protocol

Scans were carried out on a 64-slice multi-detector unit, a workhorse still seen in many emergency departments. Some patients received no contrast at all; others were bolstered with iodine, depending on the immediate clinical picture and the kidneys visible on the biochemistry log. In-house technologists defaulted to axial, coronal, and sagittal stack-ups that could later be twiddled as needed. First



impressions sat with the on-call resident or registrar; a senior radiologist then double-checked everything for peace of mind.

# Outcome Measures

The headline result searched for reading accuracy: what the scan stated as wrong versus which entities wound up confirmed in theatre or ward. A sidelight list kept score of the most frequent villains-bowel obstruction, appendicitis, perforation, and so on-alongside troublesome isolates where the image and clinical course simply would not shake hands.

#### Statistical Analysis

True-positive or false flags fed a  $2\times 2$  box that spat out sensitivity, specificity, PPV, NPV, and the catchall hit rate, while SPSS v. 26 wore the number-crunching hat throughout. Counts and integer rates flew in as rounded percentages, continuous bits landed as means plus their errant standard devs, and everything financial was brushed off at p < 0.05, because tradition has its rough edges.

# Findings

Between January and June 2023, a cohort of 250 individuals presented with acute non-traumatic abdominal discomfort and subsequently underwent contrast-enhanced CT at the emergency department. Appendicitis accounted for 34 percent of reports, bowel obstruction for 18 percent, and diverticulitis for 12 percent. Each reading was cross-checked against definitive proof from surgical notes, biopsy microscopy, or thorough clinical follow-up.

Statistical review revealed impressive diagnostic performance. Sensitivity for every major entity-stated without any false-negative exceptions-anchored at a perfect 100. Positive predictive values settled between 86.7 and 95.0, underscoring robust concordance between the scan interpretation and the ultimate, laboratory-confirmed label.

| Diagnosis            | CT Diagnosed<br>Cases | Confirmed Final<br>Diagnosis | ТР | FP | FN | Sensitivity<br>(%) | PPV<br>(%) |
|----------------------|-----------------------|------------------------------|----|----|----|--------------------|------------|
| Appendicitis         | 85                    | 80                           | 80 | 5  | 0  | 100.0              | 94.1       |
| Bowel<br>Obstruction | 45                    | 42                           | 42 | 3  | 0  | 100.0              | 93.3       |
| Diverticulitis       | 30                    | 28                           | 28 | 2  | 0  | 100.0              | 93.3       |
| Cholecystitis        | 25                    | 23                           | 23 | 2  | 0  | 100.0              | 92.0       |
| Pancreatitis         | 20                    | 19                           | 19 | 1  | 0  | 100.0              | 95.0       |
| Others               | 15                    | 13                           | 13 | 2  | 0  | 100.0              | 86.7       |

 Table 1. Diagnostic Accuracy of CT Imaging in Acute Abdomen (n=250)

Across all categories, CT demonstrated excellent sensitivity and consistently high PPVs, confirming its reliability in the emergency diagnosis of acute abdomen.



# Discussion

A cohort of patients with spontaneous, non-traumatic abdominal pain presented to the emergency department of a large Saudi tertiary center. Radiologists then performed contrast-enhanced computed tomography and rated it on the spot. The scan achieved a striking 100% sensitivity for all primary surgical entities, while positive predictive values fluctuated between 86.7% and 95%.

Among the surgical specimens ultimately examined, acute appendicitis claimed the largest share of diagnoses, a pattern frequently documented in unrelated contemporary registries. The PPV for appendicitis exceeded 94, a figure that echoes the accuracy metrics published by Rosen and colleagues more than two decades ago. Similar reliability extended to small-bowel obstruction and diverticulitis, findings that parallel earlier assessments by Laméris and by Strömberg.

The investigation recorded no false-negative scans, indicating that negative computed-tomography results in this sample reliably ruled out serious abdominal pathology. A finding of that sort directly alleviates the need for many unnecessary exploratory laparotomies and overnight admissions, a point first underscored by Rosen and colleagues twenty-three years ago.

Given those results, radiology departments with a fast-turnaround CT workflow might justifiably elevate cross-sectional imaging to their first-choice modality for acute abdomen. The advantage also stems, at least in part, from having a senior radiologist review the films; Perry et al. warned in 2016 that without such expertise, interpretation drift can obscure true disease prevalence.

All studies have their limits. The present review is retrospective and drawn from a single teaching hospital, so the conclusions may not travel well to smaller centers. Children and postoperative patients were kept out of the dataset, leaving a gap for those populations. Plus, no one scan can do every job; ultrasound sometimes trumps CT when radiation is a worry, and MRI remains essential for a handful of specific clinical puzzles.

#### **Clinical Implications**

The persistently elevated sensitivity and positive predictive value indicate that computed tomography reliably identifies acute abdominal disorders. Emergency departments in Saudi Arabia-and comparable settings-may therefore benefit from broader CT availability and uniform imaging guidelines that expedite diagnosis and treatment.

#### Conclusion

Recent work establishes that computed tomography scans deliver outstanding diagnostic precision for immediate abdominal discomfort presenting in the emergency department. Reported sensitivity recently reached 100 percent, while positive predictive values remained robust for the usual array of surgical diagnoses. Such metrics bolster the case for embedding CT as the default frontline probe in tertiary



centers, where clearer pictures let teams trim diagnostic doubt and guide treatment with greater confidence.

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