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# Diagnostic pitfalls of STI-related pelvic inflammatory disease

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ABSTRACT

*Objective:* To describe diagnostic and triage pitfalls in patients with CT-imaged, STI-confirmed pelvic inflammatory disease (PID) in the emergency department (ED) settings, and to identify factors associated with missed diagnosis and non-gynecologic admission.

*Methods:* Single-center, retrospective cohort (2016–2024) of women who underwent computed tomography (CT) scan during ED evaluation, tested positive for *Chlamydia trachomatis* and/or *Neisseria gonorrhoeae*, and clinically diagnosed with PID. Missed PID diagnosis was defined as (i) discharge after the initial gynecologic ED evaluation without a PID diagnosis or (ii) admission to Internal Medicine/General Surgery rather than Gynecology among hospitalized patients. Univariable comparisons used Chi-square and Mann–Whitney *U* tests.

*Results:* Forty-four women were included (mean age 32.7 years). GI symptoms were common (nausea 52.3%, vomiting 34.1%), while fever >38 °C was uncommon (6.8%). CT was interpreted as suggestive of PID in 52.3% of cases. Overall, 68.2% were discharged after the initial gynecologic ED evaluation without a diagnosis of PID. Among twenty-nine hospitalized patients, 51.7% were admitted to Gynecology and 48.3% to Internal Medicine/General Surgery. Correct PID diagnosis at initial evaluation was associated with CT interpreted as PID (78.6% vs 40.0%, $p = 0.02$). Non-gynecologic admission was associated with nausea (85.7% vs 33.3%, $p = 0.004$), fewer specific ultrasound findings (14.3% vs 57.1%, $p = 0.02$), and higher white blood cell count (15.8 vs 11.0 K/μL, $p = 0.02$).

*Conclusion:* In CT-imaged, STI-confirmed PID, missed diagnosis, and non-gynecologic triage were frequent, particularly in gastrointestinal-dominant presentations and when imaging lacked specific PID features. Integrating PID more explicitly into acute abdominal pain pathways may improve the timely recognition and treatment of PID.


## 1. Introduction

Pelvic Inflammatory Disease (PID) is a polymicrobial infection of the upper genital tract, frequently associated with sexually transmitted infections (STIs) such as *Chlamydia trachomatis* and *Neisseria gonorrhoeae*. It remains a significant cause of morbidity in women of reproductive age, leading to long-term sequelae including tubal factor infertility, ectopic pregnancy, and chronic pelvic pain [1].

Early recognition and initiation of antibiotic therapy are critical to preventing these complications [2]. However, diagnosing PID in the Emergency Department (ED) is notoriously difficult [3]. PID clinical presentation is often nonspecific [4], characterized mainly by lower abdominal pain and tenderness that mimics other acute abdominal pathologies such as appendicitis, diverticulitis, or urinary tract infections. Consequently, clinicians increasingly rely on Computed Tomography (CT) to exclude surgical emergencies before considering a gynecologic etiology [5].

Importantly, the present analysis does **not represent all ED presentations of PID or pelvic pain**. This study aims to characterize the clinical course of a specific high-risk cohort: women with confirmed chlamydial or gonococcal PID whose presentation was ambiguous enough to warrant CT imaging. Specifically, we sought to explore patterns of missed PID diagnosis by identifying the frequency with which these patients are discharged after an initial gynecologic ED evaluation without a correct diagnosis or admitted to non-gynecologic departments (Internal Medicine or General Surgery). Furthermore, we aimed to determine if specific clinical variables could predict missed PID diagnosis or non-gynecologic admission.

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## 2. Methods

We conducted a retrospective observational study of female patients evaluated at a single tertiary medical center between 2016 and 2024. Eligible patients were women who underwent CT imaging during their ED evaluation and subsequently tested positive for *C.trachomatis* or *N. gonorrhoeae*, with the clinical diagnosis of PID. Diagnosis was established according to the Centers for Disease Control and Prevention (CDC) diagnostic criteria, requiring the presence of at least one of the following minimum clinical findings on pelvic examination: cervical motion tenderness, uterine tenderness, or adnexal tenderness, in the absence of a more likely alternative diagnosis. In addition, all patients met at least one additional criterion - laboratory confirmation of *C. trachomatis* or *N. gonorrhoeae* infection [6].

At our institution, testing for sexually transmitted genital infections in women is performed on urine samples using the Allplex STI-7 multiplex PCR assay (Seegene, South Korea).

Clinical and administrative data were extracted from institutional electronic records using the MDClone platform. Collected variables included demographic characteristics, gynecologic and obstetric history, presenting symptoms, vital signs, physical examination findings, laboratory parameters, imaging findings, and diagnostic workflow measures such as specialty consultations, provisional diagnoses, and admitting department. For analytic purposes, cervical motion tenderness, uterine tenderness, and adnexal tenderness were grouped into a single variable termed "pelvic tenderness," representing the presence of any of the CDC minimum clinical examination criteria.

Because this was a retrospective study based on routinely collected documentation, some variables were incompletely recorded. Analyses were therefore performed using an available-case approach (i.e., denominators reflect the number of patients with non-missing data for each variable), and missing values were not imputed.

Descriptive statistics were used to summarize cohort characteristics. We then sought to identify patient- or presentation-related factors associated with missed PID diagnosis, defined in two ways:i) **Missed PID diagnosis at the initial gynecologic ED evaluation**, defined as discharge without documentation of PID diagnosis; ii) **Non-gynecologic admission**, defined as hospitalization to Internal Medicine or General Surgery rather than Gynecology. Univariable logistic regression analyses were performed to compare clinical, laboratory, and imaging variables between patients discharged without a diagnosis and those correctly diagnosed, and between patients admitted to Gynecology versus non-gynecologic services. Categorical variables were analyzed using the Chi-square test for categorical variables, and the Mann-Whitney *U* test for continuous variables.

The institutional review board approved the study protocol and waived informed consent requirements due to its retrospective design and the use of anonymized patient data.

## 3. Results

A total of 44 women with *C.trachomatis* and/or *N.gonorrhoeae*–associated PID who underwent CT imaging during their emergency evaluation were included. Thirty-three patients (75.0%) tested positive for *C. trachomatis*, nine (20.5%) for *N. gonorrhoeae*, and two (4.5%) were co-infected. The mean age was 32.7 years (SD 9.9). Active smoking was reported by 34.1% of patients, 27.3% had a history of abdominopelvic surgery, and 13.6% had a prior episode of PID.

Abdominal pain was the main complaint in 95.5% of cases. Gastrointestinal symptoms were frequent, with nausea reported by 52.3% and vomiting by 34.1%. Urinary symptoms were present in 29.5% of patients. Fever >38 °C was uncommon (6.8%). On physical examination, abdominal tenderness was commonly diffuse (40.9%), while 36.4% had right lower quadrant tenderness. Peritoneal signs were found in 31.8% of patients. Pelvic examination demonstrated tenderness in 52.3% of cases. No abnormal discharge was documented in 45.5%; among those with abnormal discharge, bloody discharge was slightly more frequent than purulent discharge (22.7% vs. 18.2%). Laboratory inflammatory markers were elevated despite infrequent fever. Median WBC was 12.5 K/μL (range 8.4–29.0) and median CRP was 80.9 mg/L (range 0.5–537.0). Gynecologic ultrasound was normal in 36.4% of patients. Among abnormal findings, free pelvic fluid was most common (31.8%). Ultrasound findings specific to PID were observed in 31.8% of the cohort, including tubo-ovarian abscess (TOA) and hydrosalpinx/pyosalpinx in 18.2% of the cohort each. CT interpretation was suggestive of PID in 52.3% of the cohort.

Most patients (90.9%) underwent assessment in both the gynecologic and general EDs, and 86.4% received a consultation with a general surgeon. Before CT imaging, the differential diagnosis was broad: appendicitis (27.3%), gastroenteritis (20.5%), and urinary tract infection/pyelonephritis (15.9%) were most frequent. Only 36.4% were initially suspected to have PID.

Overall, diagnostic ambiguity was common. Thirty patients (68.2%) were discharged from the gynecologic ED after initial evaluation without a diagnosis of PID. In some cases, empiric treatment or later diagnostic clarification may have occurred but was not consistently captured in the structured dataset. Twenty-nine patients were hospitalized; of these, 15 (51.7%) were admitted to the Gynecology department and 14 (48.3%) to Internal Medicine or General Surgery. Eight patients (18.2%) had previously presented to another hospital with the same complaints before being evaluated at our institution. All descriptive results are provided in a supplementary.

In univariable analyses comparing patients diagnosed with PID in the initial gynecologic ED evaluation ($n = 14$) and those discharged without a PID diagnosis ($n = 30$), the only statistically significant categorical factor was CT interpretation suggestive of PID (78.6% vs. 40.0%, $p = 0.02$). Prior PID history (28.6% vs. 6.9%, $p = 0.06$) and tachycardia (42.9% vs. 16.7%, p = 0.06) showed trends but did not reach statistical significance (see Table 1).

In the analysis of hospitalized patients admitted to Gynecology ($n = 15$) versus Internal Medicine/General Surgery ($n = 14$), nausea (85.7% vs 33.3%, $p = 0.004$), lower rate of specific ultrasound findings (14.3% vs. 57.1%, $p = 0.02$), and higher white blood cell count (15.79 vs. 10.99 × 10^9/L, $p = 0.02$) were significantly associated with non-gynecologic admission (see Table 2).

## 4. Discussion

This retrospective cohort study underscores the diagnostic and triage challenges of STI-related PID in the emergency setting. PID frequently manifests with features that overlap with gastrointestinal and surgical emergencies, contributing to diagnostic uncertainty, delayed recognition, and frequent assignment to non-gynecologic services. Importantly, these findings arise from a **highly selected cohort of women with CT-imaged, microbiologically confirmed STI-related PID**, and therefore should not be interpreted as reflecting diagnostic performance for PID or pelvic pain presentations in the ED more broadly.

Importantly, the outcomes examined in this study reflect documentation of diagnosis and admitting service rather than formally diagnostic error. Some patients discharged without a documented PID diagnosis may have received empiric treatment or had diagnostic clarification after STI results became available. Similarly, admission to Internal Medicine or General Surgery may in certain cases represent clinically appropriate triage in the setting of diagnostic uncertainty or concern for alternative pathology.

We found that a history of prior PID was more common among patients correctly diagnosed at the initial gynecologic ED evaluation, suggesting that this background may have heightened clinicians' suspicion.

Although not statistically significant, this finding highlights the potential value of structured history-taking in ambiguous cases, including prior PID/STI, recent sexual exposures, and contraceptive methods.

**Table 1**
Clinical characteristics: PID diagnosis vs. missed PID diagnosis in initial ED gynecologic evaluation.

| Variable | PID Diagnosis in intial Gyn ED evaluation ($n = 14$) | Missed PID Diagnosis in initial Gyn ED evaluation ($n = 30$) | *p*-Value |
|---|---|---|---|
| Demographics & Background | | | |
| Age, years (median) (ragne) | 29.5 (19.9–52.2) | 29.3 (18.8–50.0) | 0.92 |
| Smoking | 4/6 (66.7%) | 12/19 (63.2%) | 0.88 |
| Contraception | 8/12 (66.7%) | 13/26 (50.0%) | 0.34 |
| Prior PID | 4/14 (28.6%) | 2/29 (6.9%) | 0.06 |
| Presenting Symptoms | | | |
| Nausea | 5/14 (35.7%) | 18/30 (60.0%) | 0.13 |
| Vomiting | 3/14 (21.4%) | 12/30 (40.0%) | 0.23 |
| Back pain | 1/14 (7.1%) | 4/29 (13.8%) | 0.52 |
| Urinary symptoms | 3/14 (21.4%) | 9/30 (30.0%) | 0.55 |
| Intermenstrual bleeding | 6/14 (42.9%) | 11/29 (37.9%) | 0.76 |
| Vital Signs | | | |
| Fever >38° | 1/14 (7.1%) | 2/30 (6.7%) | 0.95 |
| Tachycardia (Heart rate > 100 BPM) | 6/14 (42.9%) | 5/30 (16.7%) | 0.06 |
| Physical Examination | | | |
| Peritoneal signs | 3/12 (25.0%) | 11/30 (36.7%) | 0.47 |
| Pelvic tenderness | 9/14 (64.3%) | 12/27 (44.4%) | 0.56 |
| Abnormal discharge | 8/14 (57.1%) | 12/25 (48.0%) | 0.29 |
| Imaging | | | |
| Specific PID features in the US scan | 7/14 (50.0%) | 7/29 (24.1%) | 0.09 |
| CT interpreted as PID | 11/14 (78.6%) | 12/30 (40.0%) | 0.02 |
| Laboratory Findings | | | |
| WBC K/μL (median) | 12.0 | 13.5 | 0.25 |
| CRP mg/L (median) | 60.5 | 95.8 | 0.28 |

BPM – beats per minute; US – ultrasound; CT – computed tomography; WBC – white blood cell count; CRP – C-reactive protein.
Denominators reflect the number of patients with available data for each variable; percentages were calculated accordingly (available-case analysis).

**Table 2**
Comparison of hospitalized patients by admitting service (gynecology vs. internal medicine/surgery).

| Variable | Admission to the Gynecology department ($n = 15$) | Admission to Internal Medicine/Surgery ($n = 14$) | p-Value |
|---|---|---|---|
| Demographics & Background | | | |
| Age, years (median) (ragne) | 30.5 (18.8–50.0) | 28.0 (20.8–51.4) | 0.93 |
| Smoking | 5/7 (71.4%) | 5/10 (50.0%) | 0.38 |
| Contraception | 8/12 (66.7%) | 6/13 (46.2%) | 0.30 |
| Prior PID | 4/14 (28.6%) | 1/14 (7.1%) | 0.14 |
| Presenting Symptoms | | | |
| Nausea | 5/15 (33.3%) | 12/14 (85.7%) | 0.004 |
| Vomiting | 5/15 (33.3%) | 9/14 (64.3%) | 0.10 |
| Back pain | 1/15 (6.7%) | 1/14 (7.1%) | 0.96 |
| Urinary symptoms | 4/15 (26.7%) | 4/14 (28.6%) | 0.91 |
| Intermenstrual bleeding | 3/14 (21.4%) | 7/14 (50.0%) | 0.12 |
| Vital Signs | | | |
| Fever >38° | 1/15 (6.7%) | 2/14 (14.3%) | 0.50 |
| Tachycardia (Heart rate > 100 BPM) | 6/15 (40.0%) | 4/14 (28.6%) | 0.52 |
| Physical Examination | | | |
| Peritoneal signs | 5/14 (35.7%) | 5/14 (35.7%) | 1.00 |
| Pelvic tenderness | 9/15 (60.0%) | 4/12 (33.3%) | 0.19 |
| Abnormal discharge | 7/15 (46.7%) | 6/12 (50.0%) | 0.54 |
| Imaging | | | |
| Specific PID features in the US scan | 8/14 (57.1%) | 2/14 (14.3%) | 0.02 |
| CT interpreted as PID | 10/15 (66.7%) | 5/14 (35.7%) | 0.10 |
| Laboratory Findings | | | |
| WBC K/μL (median) | 11.0 | 15.8 | 0.02 |
| CRP mg/L (median) | 73.0 | 133.0 | 0.10 |

BPM – beats per minute; US – ultrasound; CT – computed tomography; WBC - white blood cell count; CRP – C-reactive protein.
Denominators reflect the number of patients with available data for each variable; percentages were calculated accordingly (available-case analysis).

A key observation was the predominance of symptoms and exam patterns that readily activate an "acute abdomen" frame. Right lower quadrant tenderness and prominent gastrointestinal symptoms were common, which presumably directs clinicians toward appendicitis or other surgical pathology, given the perceived urgency and consequences of missed surgical disease. However, this pathway may increase vulnerability to anchoring, in which an initial surgical hypothesis can lead to subsequent findings supportive of PID being underweighted or interpreted as nonspecific. Consistent with this mechanism, gastrointestinal-dominant presentations, and particularly nausea, were strongly associated with admission to Internal Medicine or General Surgery rather than Gynecology, suggesting that symptom framing may influence downstream triage.

Another clinically important pitfall was the absence of fever. Most patients in our cohort were afebrile despite elevated laboratory inflammatory markers. This finding aligns with previous studies and clinical guidelines indicating that fever is neither sensitive nor required for diagnosing PID [6,7]. Nevertheless, a higher WBC count was associated with admission to non-gynecologic services. This finding may indicate that patients with more severe inflammatory responses were more likely to be admitted to Internal Medicine or General Surgery departments. It should be emphasized that PID can present with diffuse peritonitis and, in rare cases, even progress to severe sepsis. Thus, it is important to consider PID even in patients who appear to have a systemic severe illness [8].

Classic gynecologic examination findings, including pelvic tenderness and abnormal vaginal discharge, were not consistently associated with correct PID diagnosis. In contrast, specific sonographic findings, such as TOA and hydro/pyosalpinx, were significantly associated with a correct diagnosis at the initial evaluation. However, these imaging features were relatively infrequent and therefore cannot be relied upon as routine diagnostic triggers.

The clinical consequences of diagnostic ambiguity in PID are substantial. Many patients were discharged after the initial gynecologic ED evaluation without a PID diagnosis, and a sizable fraction were admitted to non-gynecologic services. Notably, nearly one-fifth of patients presented to our institution after having been evaluated and discharged from another hospital without recognition of PID, suggesting that diagnostic uncertainty may persist across encounters and healthcare settings. These patterns can delay guideline-concordant therapy and timely gynecologic reassessment, plausibly increasing the risk of established PID sequelae. Embedding PID more explicitly into acute abdominal pain pathways for reproductive-aged patients, along with cross-disciplinary education and clinical decision support, may help reduce anchoring bias and improve early diagnosis and treatment.

Our study has several strengths, mainly the focus on highly selected patients with both microbiologic PCR-based confirmation and a thorough evaluation, including advanced imaging. Study limitations include the retrospective single-center design, the small sample size, and incomplete documentation for some variables. Moreover, our results may not be generalized to milder PID presentations that do not prompt advanced imaging.

## 5. Conclusion

In this cohort of women with CT-evaluated, STI-confirmed PID, missed PID diagnosis and non-gynecologic triage were common. More than two-thirds of patients were initially misdiagnosed, and one-third received care outside the Gynecology department. Notably,

gastrointestinal presentations often led to referral to medical or surgical services, delaying appropriate therapy. Maintaining a high index of suspicion and avoiding overreliance on classic symptoms and findings are essential to improving recognition of PID in the emergency setting. Improving cross-disciplinary awareness through education and updated protocols is crucial for earlier recognition of atypical presentations of PID and for initiating timely, guideline-directed treatment.

## Authors contribution

All authors contributed to the study conception and design. MN and RP performed material preparation and data collection. Analysis was performed by MN, LH, LS and RP. MN and RP wrote the first draft of the manuscript. OS and EG commented on the draft and contributed to data analysis. All authors read and approved the final manuscript.

## CRediT authorship contribution statement

**Nir Meller:** Writing – original draft, Project administration, Methodology, Investigation, Conceptualization. **Lior Hassidov-Rosenberg:** Investigation, Data curation. **Olga Saukhat:** Writing – review & editing, Methodology. **Lital Shaham:** Methodology, Investigation, Conceptualization. **Efrat Keren Gllat:** Methodology, Investigation, Conceptualization. **Ravit Peretz-Machluf:** Writing – review & editing, Methodology, Conceptualization.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ajem.2026.03.006.

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