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Systematic review

Missed time-sensitive diagnoses following urgent primary care assessment: a systematic review of diagnostic failures and subsequent emergency or acute hospital care

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Abstract

Background: Urgent primary care is an important entry point for patients with serious acute illness. Diagnostic uncertainty complicates early recognition. This review examined missed diagnoses, diagnostic delays, and under-triage preceding emergency or acute hospital assessment. **Methods:** Published original studies available through 31 Jan 2026 were examined. Studies addressed initial general practice, urgent care, or out-of-hours assessment with subsequent diagnostic follow-up. Findings were grouped by condition and outcome definition, using narrative synthesis. **Results:** Ten original reports addressed coronary syndromes, sepsis, pulmonary embolism, stroke, and appendicitis. In 2,023 chest-discomfort callers, final telephone urgency allocation had 86% sensitivity for coronary syndromes or other life-threatening events. In a sepsis cohort, infection was unsuspected in 43 of 100 patients examined by

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general practitioners. Pulmonary embolism studies identified substantial primary-care delay, including delays exceeding seven days in 33 of 128 patients with preceding relevant consultations. Among 291 children with appendicitis in a primary-care cohort, 55 were initially misdiagnosed. A Danish stroke-pathway study reported 63.1% sensitivity for stroke or transient ischaemic attack recognition.

Conclusions: Diagnostic problems occurred in several urgent primary-care pathways. Under-triage represented a distinct outcome from confirmed diagnostic error. Findings support condition-specific assessment, explicit reassessment arrangements, and better linkage between primary-care encounters and subsequent emergency diagnoses, while restricting conclusions to the settings and outcomes studied.

Keywords: Diagnostic error; delayed diagnosis; primary care; urgent care; emergency department.

Introduction

Accurate diagnosis is a component of patient safety because treatment decisions depend on recognizing the underlying illness and communicating diagnostic uncertainty in healthcare encounters (1). In urgent primary care, clinicians evaluate undifferentiated symptoms before the full clinical course becomes apparent, creating difficulty when serious disorders resemble self-limiting illness. The diagnostic challenge includes atypical symptoms, nonspecific presentations, low disease prevalence, and coexisting conditions that influence interpretation of complaint (2).

The consequences of diagnostic failure extend beyond the initial consultation, with subsequent deterioration, additional investigation, and escalation to hospital care shaping the patient outcome (3). A systematic review of primary-care malpractice claims identified failure or delay in diagnosis as the leading allegation, with myocardial infarction and meningitis in children among the conditions represented. These selected claims describe failure patterns, although their distribution does not represent the incidence of missed diagnoses in all patients attending primary care (3).

Broader primary-care safety research identifies variation in incident definitions, ascertainment methods, and estimates of patient harm, making comparisons between services difficult without careful attention to study design (4). Telephone triage adds another diagnostic interface because urgency decisions rely on information

communicated remotely, often before direct physical examination or diagnostic testing. Research on out-of-hours telephone services distinguishes overall service safety from performance among patients with highly urgent conditions, indicating that aggregate safety measures obscure clinically important differences between patient groups (5).

Safety netting addresses the period after an uncertain assessment by explaining the expected illness course, warning symptoms, routes for seeking further care, and arrangements for follow-up (6). Its relevance is strong when an initial working diagnosis remains provisional and the patient returns with persistent, progressive, or newly localising symptoms. Clear documentation supports continuity when the assessment occurs in an emergency department rather than with the original clinician, although the effectiveness of safety-netting components requires additional evaluation (6).

A focused synthesis requires separation of confirmed diagnostic errors, delayed diagnoses, and low-urgency triage assignments, together with explicit identification of the healthcare setting and subsequent diagnostic reference. This review examined original studies concerning time-sensitive diagnoses after urgent primary-care assessment, focusing on reported diagnostic failures, associated characteristics, and emergency or acute hospital outcomes while preserving the distinctions between these related pathways.

Methods

This review was structured according to PRISMA 2020 and addressed patients initially assessed in family medicine, general practice, urgent care, or out-of-hours primary-care services. The publication eligibility cutoff was 31 Jan 2026, including articles published online before. The target pathway comprised initial assessment followed by emergency or acute hospital evaluation for a time-sensitive condition.

Eligible designs included cohort, case-control, cross-sectional, and diagnostic-accuracy studies reporting original patient data. Studies qualified when they examined missed diagnosis, diagnostic delay, or under-triage and established the subsequent diagnosis through hospital documentation, linked records, or clinical follow-up. Studies restricted to errors originating within emergency departments, elective diagnostic pathways, isolated case reports, reviews, and simulated consultations were excluded.

The database search framework comprised PubMed, Scopus, Web of Science, and the Cochrane Library. Complete strategies and retrieval dates accompanied each database. Search concepts combined primary-care settings, diagnostic error or delay, emergency referral or hospital attendance, and acute conditions, using controlled vocabulary and free-text synonyms adapted to each database. Reference lists of relevant reviews and eligible reports provided supplementary citations, and duplicate records were removed before screening.

Two authors independently screened titles and abstracts, assessed full texts, and extracted study data using a standardised form. Disagreements were resolved through discussion and re-examination of the source report. Extracted variables included country, service model, study design, recruitment period, population, sample size, diagnostic reference, follow-up interval, error

definition, relevant denominators, associated characteristics, and reported clinical outcomes.

Two authors appraised methodological limitations using design-appropriate Joanna Briggs Institute checklists. Assessment addressed selection methods, completeness of follow-up, diagnostic verification, exposure and outcome measurement, and confounding, with disagreements resolved by consensus. Appraisal informed interpretation rather than an arbitrary numerical exclusion threshold, and linked publications were checked for overlapping recruitment periods and patient populations before synthesis.

Confirmed missed diagnoses were distinguished from delays defined by elapsed time and from under-triage defined by urgency categories. Results were organized by condition and pathway directness, separating documented emergency attendance from hospital follow-up without an exclusively emergency-department denominator. Study-level proportions and associations were retained with their original denominators, and no pooled prevalence was calculated across these clinically different outcomes.

Narrative synthesis compared findings within diagnostic groups and examined the influence of symptoms, patient characteristics, triage decisions, and service organization. Associations were interpreted observationally without attributing causation to delayed recognition alone. Review documentation comprised the search strategies, screening decisions, exclusion reasons, extraction records, appraisal judgements, and PRISMA study-selection counts.

Results

We include 10 original articles in our review study. A case-control investigation evaluated missed coronary diagnoses using recorded out-of-hours calls and blinded expert assessment, examining

diagnostic safety through selected serious adverse events rather than a population-based prevalence denominator. Erkelens and colleagues compared 15 missed acute coronary syndrome calls with 120 controls and found that experts rated 73.3% of case triage assessments as unsafe (8). Among 2,023 chest-discomfort callers, Wouters and colleagues reported sensitivity of 73% for automated urgency allocation and 86% after final triage decisions (9). TRACE enrolled 1,803 chest-pain callers, with 1,471 completing follow-up; the triage protocol underestimated urgency in 17.0% of major events, a broader outcome than coronary syndromes alone (10).

Loots et al. examined 263 patients admitted to intensive care with community-acquired sepsis, including 127 with preceding out-of-hours primary-care contact. Among 100 patients assessed face to face by a general practitioner, infection was unsuspected in 43, and mortality was 41.9% in that group versus 15.8% when infection was suspected. These findings concerned a selected intensive-care population rather than all primary-care patients with infection (11). In 261 patients with pulmonary embolism, Walen and colleagues reported mean total diagnostic delay of 8.6 days, including 3.9 days attributed to the primary-care interval, with comorbidity associated with delayed referral (12).

Hendriksen et al. identified 180 pulmonary embolism cases, of whom 128 had preceding potentially related primary-care consultations, and 33 experienced diagnostic delay exceeding seven days. Age above 75 years and absence of chest symptoms were independently associated with delay, with odds ratios of 5.1 and 5.4, respectively (13). In a neurological triage study, Erkelens and colleagues analysed 1,269 callers, including 635 with transient ischaemic attack or stroke and additional patients with other life-threatening diagnoses. Sensitivity of the triage system was 72% for the combined neurological endpoint,

representing urgency classification rather than adjudicated physician diagnostic error (14).

Blok et al. examined 5,691 children presenting with acute abdominal pain in primary care, including 291 with appendicitis, of whom 55 were initially misdiagnosed (15). Their 18.9% proportion used confirmed appendicitis cases as the denominator rather than all abdominal-pain consultations (15). Srinivas and colleagues studied 856 children with complex appendicitis and identified 140 missed opportunities for initial diagnosis, with urgent care and primary care represented among preceding assessment settings (16).

Gude et al. analyzed 4,414 patients assessed at stroke centres following out-of-hours primary-care contact, including 2,738 with stroke or transient ischaemic attack. Telephone recognition sensitivity was 63.1%, and recognised acute ischaemic stroke was associated with higher intravenous thrombolysis use, with an adjusted difference of 8.9 percentage points. This outcome concerned identification during telephone contact rather than failure after an urgent-care examination (17). Across reports, differences in recruitment, diagnostic reference, initial service, and definitions prevented interpretation of these study-specific estimates as a shared prevalence of missed time-sensitive diagnoses after family medicine urgent care, particularly when emergency attendance was not separately documented for every participant (8-17).

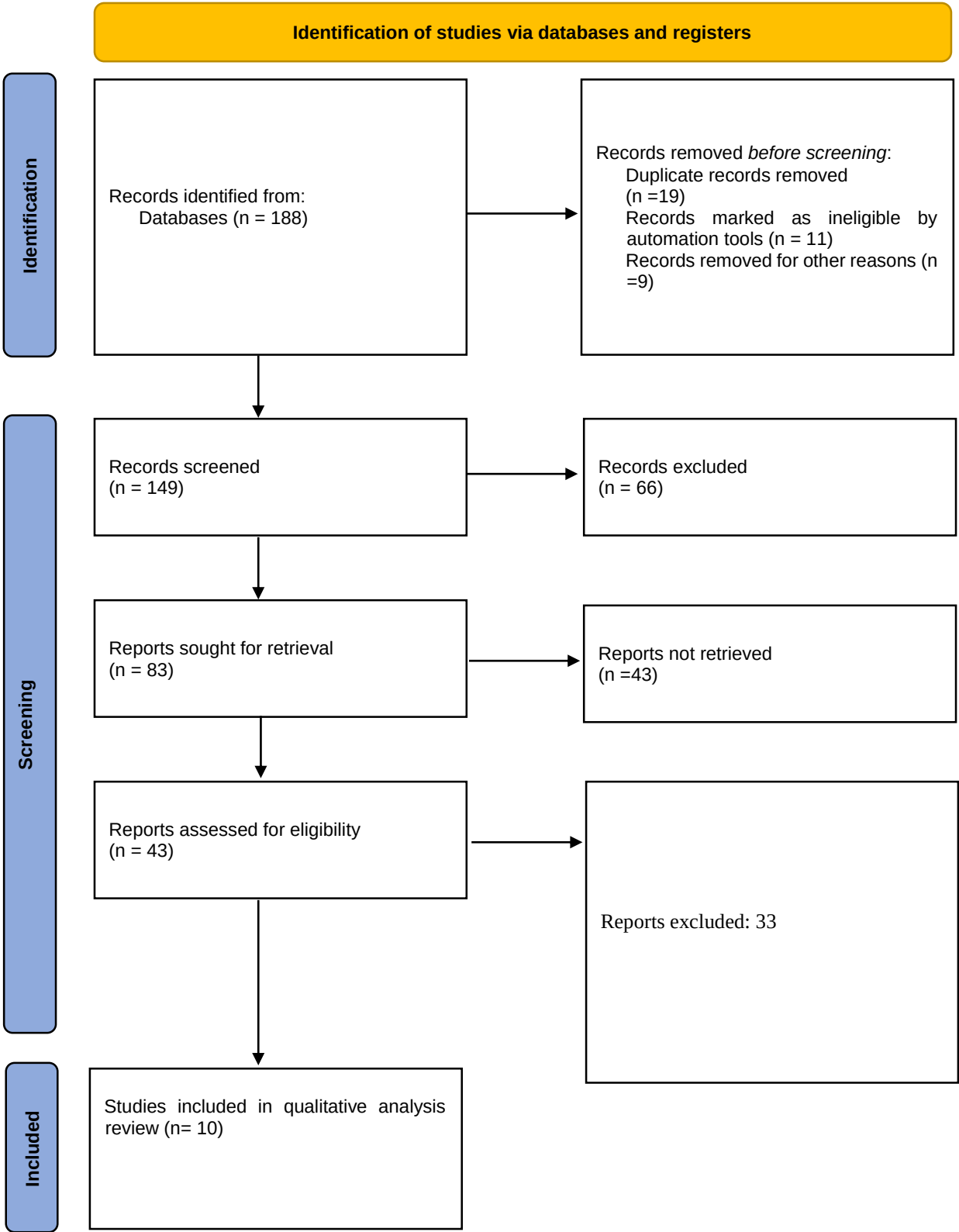


Figure 1: PRISMA flow chart

Table 1: risk of bias assessment

Study	Appropriate assessment tool	Methodological strengths	Risk-of-bias assessment
Erkelens (8)	JB1 Case-Control Checklist	Age- and sex-matched controls; standardised extraction from recorded calls; researchers and experts blinded to final diagnosis and case-control status; conditional logistic regression accounted for matching.	Case ascertainment and residual confounding concerns. Cases comprised registered serious adverse events, leaving unreported missed diagnoses outside the sampling frame. Missing symptom data were acknowledged, and analyses controlled principally for matching factors rather than a comprehensive set of potential confounders.
Wouters (9)	JB1 Diagnostic Test Accuracy Checklist	Actual telephone recordings and recorded triage decisions were examined. Symptom assessment and expert adjudication of ambiguous urgency assignments were blinded to the final diagnosis.	Differential verification and index-test reconstruction concerns. Final diagnoses came from hospital correspondence or GP diagnoses rather than a uniform diagnostic examination. Approximately 15% of calls required expert reconstruction of the final urgency. Blinding of reference-standard interpretation to triage results was unclear.
Manten (10)	JB1 Diagnostic Test Accuracy Checklist, for reported triage accuracy	Consecutive recruitment across a full year; standardised data collection; independent expert cross-validation of clinical diagnoses; six-week outcome assessment.	Incomplete follow-up and differential verification concerns. Outcome follow-up was available for 1,471 of 1,803 patients, leaving 18.4% without outcome data. Only patients referred to hospital received further hospital diagnostic investigation, creating differential verification between referral groups.
Loots (11)	JB1 Cohort Checklist, for recognition-mortality associations	Linked primary-care and hospital records; explicit definition of suspected infection; mortality analysis adjusted for age, multimorbidity, APACHE II, and SOFA scores.	Exposure measurement and residual confounding concerns. Recognition depended on documentation in routine clinical notes, which does not necessarily capture every clinical consideration. Some clinical measurements were missing. Adjustment addressed several measured differences without establishing a causal effect of recognition on mortality.
Walen (12)	JB1 Cohort Checklist, for determinants of diagnostic delay	Radiologically confirmed pulmonary embolism; defined patient, primary-care, and hospital delay intervals; supplementary information requested from GPs; multivariable regression.	Selection and delay-measurement concerns. Patients with unavailable records or unresolved missing information were excluded. Symptom-onset dates depended partly on recollection, and intervals reported in weeks or months were converted into estimated days. Attribution of earlier symptoms to pulmonary embolism remained uncertain.
Hendriksen (13)	JB1 Cohort Checklist, for determinants of diagnostic delay	Objective diagnostic confirmation in the analysed pathway; independent record review by at least two researchers; multivariable analysis and alternative delay-definition sensitivity analysis.	Case ascertainment, hindsight, and missing-data concerns. Identification depended on diagnostic coding, and records of deceased patients were not consistently available. Earlier consultations were interpreted with knowledge of the eventual diagnosis. Several clinical variables, including vital signs, were insufficiently recorded.
Erkelens (14)	JB1 Diagnostic Test Accuracy Checklist	Random sampling of calls; standardised extraction; researchers blinded to clinical outcomes; blinded expert adjudication of ambiguous final urgency assignments.	Missing outcomes and differential verification concerns. Final clinical outcomes were unavailable for approximately 25% of reviewed recordings. Referred patients were verified through hospital correspondence, whereas non-referred patients were assessed through GP follow-up. Reference-standard assessor blinding was unclear.
Blok (15)	JB1 Diagnostic Test Accuracy Checklist, for clinical-feature accuracy	Large primary-care cohort; explicit eligibility criteria; standardised coding procedures; expert reassessment of appendicitis diagnoses.	Information bias, differential verification, and missing-predictor concerns. Outcome information was accessible during extraction of clinical features. Diagnostic verification differed between specialist assessment and

Table 1: risk of bias assessment

Study	Appropriate assessment tool	Methodological strengths	Risk-of-bias assessment
			six-week follow-up. Clinical-feature recording was incomplete and related to diagnostic suspicion, restricting interpretation of feature-specific accuracy estimates.
Srinivas (16)	JBICohort Checklist, for missed-opportunity–complication comparisons	Operative criteria defined complex appendicitis; explicit seven-day missed-opportunity definition; postoperative outcomes assessed over 30 days; multivariable analysis examined sociodemographic determinants.	Exposure misclassification and confounding concerns. Earlier encounters were identified from available records, and patients without documented missed opportunities were classified as single-encounter diagnoses. Un

Table 2. Characteristics of the original reports

Study	Design	Population
Erkelens (8)	Case-control	15 missed-ACS cases; 120 controls
Wouters (9)	Cross-sectional	2,023 chest-discomfort callers
Manten (10)	Retrospective cohort	1,803 chest-pain callers
Loots (11)	Retrospective cohort	263 ICU sepsis admissions
Walen (12)	Retrospective cohort	261 pulmonary-embolism cases
Hendriksen (13)	Retrospective observational	180 pulmonary-embolism cases
Erkelens (14)	Cross-sectional	1,269 neurological-symptom callers
Blok (15)	Retrospective cohort	5,691 children with abdominal pain
Srinivas (16)	Retrospective cohort	856 complex-appendicitis cases
Gude (17)	Retrospective cohort	4,414 stroke-centre assessments

Table 3. Selected findings and their relevant populations

Condition	Finding	Relevant population
Coronary syndromes	Final triage sensitivity: 86%	ACS/other life-threatening events (9)
Sepsis	Infection unsuspected: 43%	100 GP-examined ICU patients (11)
Pulmonary embolism	>7-day delay: 26%	128 patients with preceding relevant GP contact (13)
Stroke/TIA	Recognition sensitivity: 63.1%	2,738 confirmed stroke/TIA cases (17)
Appendicitis	Initially misdiagnosed: 18.9%	291 confirmed appendicitis cases (15)

Discussion

The finding is that diagnostic vulnerability spans coronary, infectious, thromboembolic, neurological, and abdominal presentations, with each study examining a different point in the pathway from primary care to hospital assessment. The findings support a condition-specific interpretation because delayed recognition, inappropriate urgency allocation, and a documented missed diagnostic opportunity represent related clinical problems with different measurement requirements. The reported percentages describe their individual study populations and do not establish the overall risk among patients attending family medicine urgent care.

Telephone triage studies illustrate the importance of examining both decision-support output and the final clinical disposition, because performance changed after human review and subsequent assessment (9,10). The neurological findings indicate that urgency assignment and recognition deserve separate reporting, particularly when evaluating associations with stroke treatment and admission pathways (14,17).

Atypical presentation provides a plausible connection between several diagnostic groups, particularly pulmonary embolism without chest symptoms and serious infection without an initial suspicion of infection (11,13). The wider literature on diagnostic difficulty describes nonspecific symptoms and comorbidity as recurring challenges, while research on cognitive biases associates anchoring, information bias (2,18). The included observational reports did not test these cognitive mechanisms, so attributing individual missed cases to a specific bias exceeds the information available from their recorded associations (8,11-13,18).

Paediatric appendicitis highlights the importance of patient selection when interpreting outcomes, since

an abdominal-pain cohort and a cohort restricted to complex appendicitis answer different clinical questions (15,16). The association between prior missed opportunities and complications in the complex-appendicitis study does not isolate the effect of an initial primary-care encounter from the effects of other presenting facilities and clinical factors (16). Interpreting emergency escalation therefore requires attention to the original clinical information, symptom evolution, referral opportunities, and subsequent course, avoiding automatic classification of every return visit as preventable diagnostic failure (2,19).

The practical implications favour documenting diagnostic uncertainty, communicating specific deterioration triggers, arranging reassessment, and maintaining reliable transfer of information between primary care and emergency services (6,19). These measures follow established diagnostic-safety principles, although the included reports do not quantify their effectiveness as interventions across urgent-care settings (6,8-17,19). Important limitations include retrospective designs, selected hospital populations, incomplete restriction to emergency-department outcomes, and concentration in European gatekeeping systems (8-17,19). Outcome interpretation also requires separating clinical deterioration related to the underlying disease from harm attributable to a missed diagnostic opportunity, since hospital admission after an earlier consultation establishes a sequence of encounters without, by itself, establishing that an avoidable error occurred at the first assessment (19). Further research requires prospective linkage of urgent primary-care encounters with emergency diagnoses, standardised definitions of missed opportunities, complete follow-up, and adjustment for disease severity and presentation characteristics to distinguish diagnostic failure from evolving illness and patient-related delay.

Conclusion

Missed diagnoses, delayed recognition, and under-triage affected several time-sensitive conditions in urgent primary-care pathways. The reviewed studies identified diagnostic difficulties involving acute coronary syndromes, sepsis, pulmonary embolism, stroke, and paediatric appendicitis. Reported frequencies differed because populations, follow-up pathways, and outcome definitions were inconsistent, preventing a single pooled estimate for family medicine urgent care. Several reports included broader hospital outcomes rather than exclusively subsequent emergency-department management. Clinical priorities include recognising atypical presentations, documenting diagnostic uncertainty, arranging reassessment, and strengthening communication during emergency escalation.

Abbreviations

ACS, acute coronary syndrome; GP, general practitioner; ICU, intensive care unit; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses; TIA, transient ischaemic attack; TRACE, TRIage of Acute Chest pain Evaluation.

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