Ruling Out Heart Attacks Faster: The PRESC1SE-MI Study's ED Impact

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Patients presenting to the emergency department (ED) with chest pain represent a significant diagnostic challenge, consuming substantial resources and often leading to prolonged observation periods. Distinguishing acute myocardial infarction (AMI) from other causes of chest pain quickly and accurately remains a critical unmet need. Rapid rule-out strategies could alleviate ED overcrowding and reduce unnecessary hospital admissions.

KEY TAKEAWAYS

- The Pivot: A 1-hour high-sensitivity cardiac troponin I (hs-cTnI) algorithm safely and effectively ruled out AMI in ED patients with suspected cardiac chest pain.
- The Data: The negative predictive value for AMI at 30 days was 99.8% (95% CI, 99.6-99.9) for the rule-out pathway.
- The Action: Clinicians should consider implementing validated 1-hour hs-cTnI algorithms to expedite safe discharge for low-risk chest pain patients, reducing ED length of stay and resource utilization.

Chest pain is a ubiquitous presentation in emergency departments, accounting for millions of visits annually across Europe. The immediate concern for clinicians is always to exclude acute myocardial infarction, a life-threatening condition requiring urgent intervention. Current standard practice often involves serial cardiac troponin measurements over several hours, leading to extended ED stays, significant resource consumption, and patient anxiety, even for those ultimately diagnosed with non-cardiac chest pain. The PRESC1SE-MI study aimed to validate a rapid 1-hour algorithm using high-sensitivity cardiac troponin I (hs-cTnI) to accelerate the rule-out process for AMI.

The PRESC1SE-MI study enrolled 12,820 consecutive patients presenting to 12 European EDs with suspected acute coronary syndrome (ACS). Investigators recruited patients aged 18 years or older who presented with symptoms suggestive of ACS, including chest pain, shortness of breath, or syncope. Patients with ST-elevation myocardial infarction (STEMI), clear non-cardiac diagnoses on presentation, or those already undergoing cardiac investigation were excluded. The primary objective was to evaluate the safety and efficacy of a 1-hour hs-cTnI algorithm for ruling out AMI, defined as the absence of AMI or cardiac death within 30 days. The study was an international, prospective, observational cohort study, designed to reflect real-world clinical practice across diverse healthcare settings.

The PRESC1SE-MI Algorithm and its Performance

The core of the PRESC1SE-MI strategy involved a 1-hour hs-cTnI algorithm. Patients had blood drawn at presentation (0 hours) and again at 1 hour. The algorithm classified patients into three groups: rule-out, rule-in, or observe. Rule-out

criteria were defined by a very low hs-cTnI concentration at 0 hours (e.g., <5 ng/L) or a low 0-hour concentration with no significant change at 1 hour (e.g., <12 ng/L and a change of <3 ng/L). Rule-in criteria involved high 0-hour concentrations or significant changes over 1 hour, indicating a high likelihood of AMI. Patients not meeting either rule-out or rule-in criteria were placed in an 'observe' zone, requiring further investigation, typically with a 3-hour troponin measurement.
The algorithm demonstrated exceptional performance in ruling out AMI. For patients classified as rule-out, the negative predictive value (NPV) for AMI at 30 days was 99.8% (95% CI, 99.6-99.9). This means that only 0.2% of patients discharged under the rule-out pathway experienced an AMI or cardiac death within the subsequent month. The sensitivity for AMI was 99.6% (95% CI, 99.1-99.9), indicating that the algorithm correctly identified nearly all patients who ultimately had an AMI. These figures provide strong reassurance regarding the safety of this rapid diagnostic approach, allowing clinicians to confidently discharge a substantial proportion of patients.
The rule-in pathway also performed well, identifying patients at high risk. The positive predictive value (PPV) for AMI was 78.2% (95% CI, 75.1-81.0). While not 100%, this high PPV means that most patients flagged by the rule-in criteria did indeed have an AMI, allowing for prompt initiation of appropriate cardiac care. The specificity of the rule-in pathway was 96.1% (95% CI, 95.7-96.5), indicating a low false-positive rate. This balance of high sensitivity for rule-out and high specificity for rule-in is crucial for an effective ED diagnostic tool.

Impact on ED Flow and Resource Utilization

A major benefit of the 1-hour algorithm was its ability to significantly reduce the length of stay in the ED for a large proportion of patients. Approximately 60% of the study population was safely ruled out for AMI within one hour. This rapid disposition translates directly into reduced ED overcrowding, freeing up beds and staff for higher-acuity cases. It also means fewer patients endure prolonged, anxious waits for diagnostic clarity, improving patient experience and satisfaction. The average length of stay for rule-out patients was substantially shorter compared to those requiring further observation or admission.
The study also evaluated the impact on hospital admissions. By safely ruling out AMI in a large cohort, the algorithm led to a reduction in unnecessary hospital admissions for chest pain. This has significant implications for healthcare system efficiency and cost-effectiveness. Fewer admissions mean lower bed occupancy rates, reduced diagnostic testing, and less burden on inpatient cardiology services. The PRESC1SE-MI data supports a shift towards more efficient patient flow, a critical consideration for overstretched European healthcare systems. Clinicians managing these patients may find the Oxford Handbook of Cardiology a useful quick reference for the latest diagnostic and management pathways.

Subgroup Analyses and Limitations

Investigators conducted several subgroup analyses to assess the algorithm's performance across different patient characteristics. The 1-hour rule-out strategy maintained its high NPV and sensitivity across various age groups, sexes, and comorbidities, including patients with renal impairment, a group often challenging to assess due to elevated baseline troponin levels. This consistency across subgroups reinforces the broad applicability of the algorithm in a heterogeneous ED population. The performance was also consistent regardless of the specific hs-cTnI assay used, as the study incorporated data from multiple centers using different commercially available assays, adding to the generalizability of the findings.
But the study was not without limitations. The observational design, while reflecting real-world practice, means that

clinical decisions were made by treating physicians, potentially introducing some variability in patient management. While the algorithm's performance was robust, the 'observe' zone still required further evaluation, meaning not all patients could be discharged within the initial hour. This 'observe' group, representing about 20% of the cohort, still necessitates a longer ED stay or admission for serial troponin measurements or stress testing. The study also focused on 30-day outcomes; longer-term follow-up would provide additional insights into the prognostic implications of a rapid rule-out. Another consideration is the implementation challenge. While the algorithm itself is straightforward, successful adoption requires standardized protocols, staff training, and reliable access to rapid hs-cTnI testing with a 1-hour turnaround time. Not all EDs currently possess the infrastructure to consistently deliver such rapid results. The study also did not directly compare the 1-hour algorithm against other established rapid rule-out protocols, such as 2-hour or 3-hour algorithms, though it built upon previous research validating shorter timeframes. The generalizability to very low-resource settings, where hs-cTnI assays may not be readily available, also remains an open question.

The PRESC1SE-MI study provides compelling evidence for the safety and efficiency of a 1-hour hs-cTnI algorithm in ruling out AMI in the emergency department. Its high negative predictive value and sensitivity offer clinicians a powerful tool to expedite patient disposition, reduce ED burden, and improve patient experience. The next step involves widespread implementation and integration into clinical guidelines, ensuring that EDs can leverage this strategy to optimize care for patients presenting with chest pain.

CLINICAL IMPLICATIONS

The PRESC1SE-MI data offers a clear path for EDs to streamline the management of chest pain, a perennial bottleneck. Safely discharging 60% of patients within an hour, based on a 99.8% NPV, is a significant operational win. This should translate directly into reduced ED overcrowding and more efficient resource allocation, a welcome relief for overstretched healthcare systems.

Clinicians can now approach low-risk chest pain presentations with greater confidence, knowing that a rapid, validated algorithm supports early discharge. This reduces patient anxiety and the downstream costs associated with unnecessary admissions and prolonged observation. The focus can then shift to the remaining 20% in the 'observe' zone, where further investigation is genuinely warranted.

The challenge lies in widespread adoption. Implementing a 1-hour hs-cTnI protocol requires robust laboratory infrastructure capable of rapid turnaround times and consistent staff training. Guideline bodies should integrate these 1-hour algorithms more explicitly, providing clear pathways for implementation. This is not merely an academic exercise; it is a practical solution to a common clinical problem.

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