JURNAL LOCUS: Penelitian & Pengabdian
Volume 4 No. 11 November 2025
E-ISSN 2829-7334| P-ISSN 2829-5439
Hompage: https://locus.rivierapublishing.id/index.php/jl

# Diagnostic Accuracy and Clinical Outcomes in Acute Coronary Syndrome of OMI/NOMI VS STEMI/NSTEMI: a Systematic Review

**Khairuman Fitrah Ananda Mamasta*, Agustina Sianturi**
RSU Hermina Medan, Indonesia
Email: khairumanananda@gmail.com*

***Abstract:***
*In the current STEMI-based model for diagnosing acute myocardial infarction (AMI), many patients classified as NSTEMI may actually have undetected acute coronary occlusion, resulting in missed opportunities for timely reperfusion therapy and worse outcomes compared to those with non-occlusive myocardial infarction (NOMI). A revised paradigm distinguishing occlusion MI (OMI) from non-occlusion MI (NOMI) has been proposed to address these limitations. This systematic review aimed to compare diagnostic accuracy and clinical outcomes between the traditional STEMI/NSTEMI paradigm and the emerging OMI/NOMI paradigm in patients with acute coronary syndrome. This systematic review included eight studies published between 2020 and 2024. All studies evaluated patients with acute coronary syndrome (ACS), comparing diagnostic performance and clinical outcomes between the traditional STEMI/NSTEMI paradigm and the emerging OMI/NOMI paradigm. The studies employed various designs, including retrospective cohorts, case-control analyses, and cross-sectional studies, to assess diagnostic accuracy and treatment outcomes. Evaluation of ECG diagnostic performance showed that OMI-specific ECG patterns had significantly higher sensitivity (86%) and diagnostic accuracy (89%) compared to standard STEMI criteria (41% sensitivity, 77% accuracy). Several studies reported substantial delays in recognition and management of OMI when relying solely on STEMI criteria. Evidence consistently demonstrated that patients with OMI, especially those misclassified as NSTEMI, had outcomes equal to or worse than those with STEMI. The OMI paradigm highlights major quality gaps in the emergency care of ACS patients. Transitioning from the traditional STEMI/NSTEMI model to OMI/NOMI classification can improve diagnostic precision, identify care delays, and guide quality improvement interventions to optimize patient outcomes.*

***Keywords:*** *Diagnostic Accuracy; NOMI; NSTEMI; OMI; STEMI.*

*Corresponding*: Khairuman Fitrah Ananda Mamasta
E-mail: khairumanananda@gmail.com



## INTRODUCTION

Coronary Artery Disease (CAD) remains the most prevalent condition affecting the cardiovascular system, contributing significantly to global morbidity and mortality (Roth et al., 2020; Virani et al., 2021). Its prevalence continues to rise steadily across the world (GBD 2023; Khan et al., 2020). Most patients with CAD typically present to the emergency department with symptoms of Acute Coronary Syndrome (ACS) (Collet et al., 2020). ACS is categorized into ST-Elevation Myocardial Infarction (STEMI), which is managed with either Primary Percutaneous Coronary Intervention (PPCI) or thrombolytic therapy, depending on resources available, and Non-ST-Elevation ACS (NSTE-ACS), where patients are hospitalized, undergo coronary angiography to assess the extent of disease, and are treated accordingly (Ibanez et al., 2018; Ashraf et al., 2024).

In the 1990s, the introduction of thrombolytic therapy brought a major transformation in the management of acute myocardial infarction (AMI), emphasizing the importance of urgent reperfusion (Ibanez et al., 2018; O'Gara et al., 2013). This advancement shifted the role of the electrocardiogram (ECG) from a retrospective tool used to classify AMI into Q-wave and non–Q-wave categories to a prospective instrument for identifying ST-segment elevation (Collet et al., 2020). This elevation serves as a sign of AMIs caused by persistent coronary occlusion without collateral flow, requiring immediate reperfusion (Neumann et al., 2021). Emergency department (ED) personnel responded with quality improvement (QI) measures to reduce delays in reperfusion for ST-elevation myocardial infarction (STEMI), ranging from nurse-initiated ECGs to emergency physician-driven activation of the catheterization lab (Ting et al., 2015; McLaren et al., 2022).

Under the current STEMI vs. non-STEMI (NSTEMI) framework, 25–30% of NSTEMI patients are later found to have undetected acute total occlusions (classified as occlusion myocardial infarction, or OMI) during delayed angiography on average 24 hours post-presentation (DeWinter et al., 2019; Tamis-Holland et al., 2022). These patients experience nearly twice the short- and long-term mortality rates compared to NSTEMI patients without occlusion (non-occlusion MI, or NOMI) (Khan et al., 2017; Armstrong et al., 2021). On the other hand, 15–35% of catheterization lab activations based on suspected STEMI are false positives, showing no culprit lesion (Meyers et al., 2020; McCabe et al., 2012; Kontos et al., 2010; Larson et al., 2007; Aldous et al., 2020).

The currently recommended approach for identifying AMI patients who would benefit from emergent reperfusion is based on the STEMI vs. NSTEMI classification. However, since NSTEMI can include both OMI and NOMI, this approach often misclassifies true OMI as NSTEMI, delaying necessary treatment. A growing awareness of the limitations of the STEMI/NSTEMI paradigm, along with improved ECG interpretation techniques aligned with angiographic findings, has led to the development of a new model—one that focuses not merely on ST-elevation or ECG findings, but on the underlying pathology: occlusion MI (OMI) versus non-occlusion MI (NOMI). This OMI vs. NOMI classification highlights that patients with OMI who do not meet STEMI criteria, referred to as STEMI-negative OMI, form a high-risk subgroup. These individuals often suffer large infarcts and experience avoidable delays in reperfusion.

Despite accumulating evidence supporting the OMI/NOMI paradigm, several critical gaps remain in the literature. First, most existing studies focus on single-center experiences with limited generalizability across different healthcare systems and patient populations. Second, the comparative diagnostic accuracy between OMI-specific ECG criteria and traditional STEMI criteria has not been systematically synthesized across multiple studies. Third, the magnitude and clinical impact of treatment delays associated with misclassification remain inadequately quantified. Fourth, long-term outcome data comparing properly classified versus misclassified OMI patients remain sparse. Finally, practical implementation strategies for transitioning from the STEMI/NSTEMI to the OMI/NOMI paradigm in emergency care settings have not been comprehensively evaluated.

This systematic review addresses these gaps by synthesizing available evidence on diagnostic accuracy and clinical outcomes between the traditional STEMI/NSTEMI paradigm and the emerging OMI/NOMI paradigm. The specific objectives are threefold: (1) to compare the diagnostic performance of OMI-specific ECG criteria versus traditional STEMI criteria in identifying acute coronary occlusion; (2) to quantify treatment delays and their clinical impact when OMI is misclassified as NSTEMI; and (3) to evaluate short- and long-term clinical outcomes across correctly and incorrectly classified patient groups. The hypothesis guiding this review is that OMI-specific ECG interpretation would demonstrate superior diagnostic accuracy compared to traditional STEMI criteria, and that STEMI-negative OMI patients would experience significantly longer delays to catheterization and worse clinical outcomes compared to correctly identified STEMI patients. The theoretical contribution of this review lies in establishing the empirical foundation for a paradigm shift in *ACS* management, while the practical benefits include providing evidence-based guidance for improving emergency care protocols, ECG interpretation training, and quality improvement initiatives in cardiovascular care systems.

## METHOD

This systematic review was conducted following established guidelines for literature synthesis in diagnostic accuracy studies. The methodology is organized into four key components: search strategy and databases, eligibility criteria, data extraction and synthesis, and risk of bias assessment.

A comprehensive systematic medical literature search was conducted to identify all relevant articles describing the OMI nomenclature and its comparison with traditional STEMI/NSTEMI classification published between 2020 and 2024. The search was performed across multiple databases including Google Scholar, PubMed, Web of Science (ISI), Scopus, Cochrane Library, and ScienceDirect. The search strategy employed a combination of keywords using Boolean operators to maximize sensitivity: "STEMI" AND/OR "NSTEMI" AND/OR "OMI" AND/OR "NOMI" AND/OR "occlusion myocardial infarction" AND/OR "acute coronary syndrome" AND/OR "diagnostic accuracy." The search was limited to articles published in English between January 2020 and December 2024 to capture the most recent evidence while maintaining currency of clinical practice patterns.

Studies were included if they met the following criteria: (1) evaluated adult patients (≥18 years) presenting with acute coronary syndrome; (2) compared diagnostic performance or clinical outcomes between STEMI/NSTEMI and OMI/NOMI classification systems; (3) used angiographic confirmation of coronary occlusion as the reference standard; (4) reported quantitative data on diagnostic accuracy metrics (sensitivity, specificity, accuracy) or clinical outcomes (mortality, time-to-reperfusion, complications); and (5) employed cohort, case-control, or cross-sectional study designs. Studies were excluded if they: (1) were case reports, editorials, or review articles without original data; (2) did not provide sufficient detail on diagnostic criteria or outcomes; (3) focused solely on chronic coronary syndromes; or (4) did not use standardized angiographic definitions of occlusion.

Data extraction was performed systematically using a standardized form capturing the following information: study characteristics (author, year, country, study design, sample size), patient demographics, diagnostic criteria for OMI and STEMI, reference standard definitions, diagnostic accuracy metrics, timing of interventions, and clinical outcomes (short-term and long-term mortality, complications). By reviewing the titles and abstracts of identified articles, eight studies meeting all inclusion criteria were selected for this literature review. Given the heterogeneity in study designs and outcome reporting, a narrative synthesis approach was employed rather than meta-analysis. Results were organized thematically according to the study objectives: study characteristics, diagnostic accuracy, timing of reperfusion, and clinical outcomes.Risk of Bias AssessmentRisk of bias was assessed using the QUADAS-2 (Quality Assessment of Diagnostic Accuracy Studies-2) tool, which evaluates four domains of bias risk (patient selection, index test, reference standard, flow and timing) and three domains of applicability concerns (patient selection, index test, reference standard). Each domain was rated as low risk, high risk, or unclear risk based on standardized criteria. Two independent reviewers performed the assessment, with disagreements resolved through discussion.

**STEMI**

In 2009, the American Heart Association, the American College of Cardiology Foundation, and the Heart Rhythm Society adopted certain threshold values originally designed to distinguish CK-MB–positive myocardial infarction patients from healthy individuals—and unexpectedly endorsed their use in differentiating between STEMI and NSTEMI cases. (Aslanger, 2022; Wagner et al., 2009). These "STEMI criteria" include: (1) at least 1 mm of ST-segment elevation in two contiguous leads (excluding leads V2 and V3); and (2) ST-segment elevation in V2 and V3 based on age and sex-specific thresholds: ≥1.5 mm in women of any age, ≥2.5 mm in men younger than 40, and ≥2 mm in men aged 40 or older. These criteria became entrenched and have been consistently reiterated in subsequent guidelines, including the most recent Universal Definition of Myocardial Infarction. (Aslanger, 2022; Thygesen et al., 2018)

In a recent investigation, Aslanger and colleagues reclassified 28% of patients initially diagnosed with NSTEMI as having occlusion myocardial infarction (OMI), using a systematic approach to ECG interpretation. These reclassified cases were found to have coronary pathology and clinical outcomes comparable to those seen in STEMI patients. (Ayyad et al., 2025). Notably, some OMI patients may exhibit no ST-segment changes on ECG, necessitating a multifaceted diagnostic approach that includes clinical judgment, persistent symptoms, biomarker elevations, echocardiographic assessment, or coronary CT angiography (CCTA).

Criticism of the OMI/NOMI classification often draws on studies that argue early angiography in NSTEMI patients offers no clear benefit. However, it is important to note that many such studies excluded patients who presented with ongoing symptoms or did not incorporate truly early invasive strategies. (Ayyad et al., 2025)

**OMI**

Occlusion myocardial infarction (OMI) refers to a state of ongoing ischemia that leads to irreversible myocardial damage due to complete or near-complete blockage of a culprit epicardial coronary artery, in the absence of sufficient collateral circulation making urgent reperfusion essential. (Ricci et al., 2024; Meyers et al., 2021). The diagnosis of OMI is clinical in nature and demands continuous, attentive evaluation of dynamic patient information rather than dependence on standalone findings from ECGs, echocardiograms, or angiographic studies.

Interestingly, about one-third of patients classified as definite "STEMI" cases are found to have patent arteries at the time of angiography. (Ricci et al., 2024; Karwowski et al., 2017; Cox et al., 2006; Stone et al., 2001). Thus, identifying OMI goes beyond a single ECG snapshot it requires serial ECG monitoring that reflects the progression of symptoms, especially when chest pain intensifies in a crescendo pattern. (Ricci et al., 2024; Aslanger et al., 2021; Fesmire et al., 1998; Hilinger et al., 2019)

Across studies, angiographic confirmation of a culprit artery occlusion served as the standard reference for diagnosing OMI. This was generally defined as a lesion with TIMI (Thrombolysis in Myocardial Infarction) flow grade 0–2, or TIMI 3 flow in the presence of markedly elevated cardiac biomarkers, such as high-sensitivity troponin I levels exceeding 10,000 ng/L. In instances where angiographic data were unavailable, some studies such as McLaren et al. (2023) also considered new regional wall motion abnormalities on echocardiography as valid diagnostic criteria. This consistent definition enabled reliable classification across cases that did not meet STEMI criteria.

**Study Comparation and Study objectives**

These studies employed a range of methodologies, including retrospective cohort studies, case-control analyses, and cross-sectional designs. The cumulative evidence strongly indicates the diagnostic limitations of current STEMI criteria and supports a transition toward more nuanced recognition of Occlusion Myocardial Infarction (OMI), even in the absence of classic ST-segment elevation.

We sought to evaluate :

1. Identify the characteristics and sample size of study
2. Compare of diagnostic accuracy of ecg criteria in Acute Coronary Syndrome
3. Compare the timing of reperfusion and missed diagnoses
4. Compare the clinical outcomes by short and long-term mortality

**Source of Data**

This systematic review started from a very broad search process to include every possible article. A systematic medical literature search was conducted by the researchers to identify the articles describing OMI nomenclature between 2020 and 2024 in the Google Scholar database. Using the following key words, "STEMI", "NSTEMI", "OMI" and "NOMI" articles were identified in Google Scholar, Pubmed, Web of Science (ISI), Scopus, Pub Med, Cochrane, and Science Direct databases using AND and OR operators to increase sensitivity.

By reviewing the titles and abstracts of these articles, 8 articles were selected for present literature review. Risk of bias were done using QUADAS-2

## RESULTS AND DISCUSSION

A total of eight studies published between 2020 and 2024 were included in this systematic review. All studies evaluated patients with Acute Coronary Syndrome (ACS), comparing outcomes and diagnostic performance between the traditional STEMI/NSTEMI paradigm and the emerging OMI/NOMI paradigm. These studies employed a range of methodologies, including retrospective cohort studies, case-control analyses, and cross-sectional designs. The cumulative evidence strongly indicates the diagnostic limitations of current STEMI criteria and supports a transition toward more nuanced recognition of Occlusion Myocardial Infarction (OMI), even in the absence of classic ST-segment elevation.

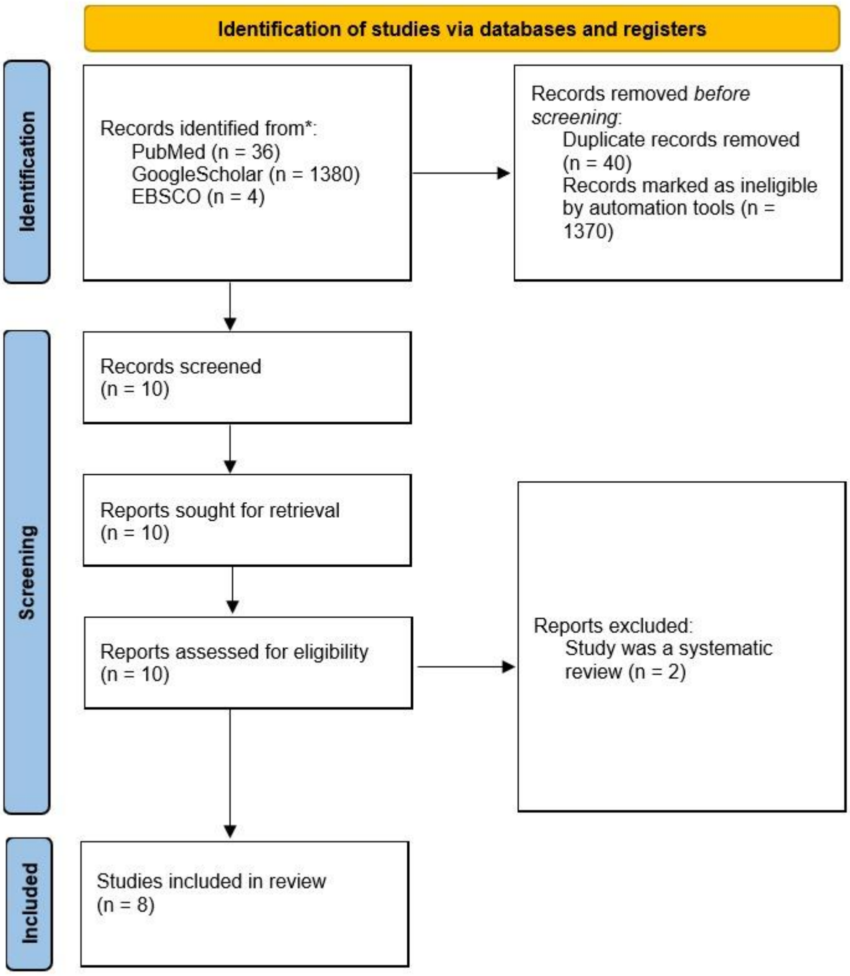


Figure 1. PRISMA Process Flow

**Table 1**. Summary of Study Characteristics

| Study | Year | Study Design | Sample Size | Reference | Outcome |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| **Meyers et al.** | 2020 | Retrospective | 467 | Coronary angiography with TIMI 0–2 flow or regional echocardiographic wall motion abnormality with elevated troponin | STEMI(–) OMI patients had:<br>• Longer time to catheterization<br>• Adverse outcomes similar to STEMI(+) OMI<br>Supports OMI/NOMI over STEMI/NSTEMI paradigm |
| **Kos et al.** | 2021 | Registry based cohort | 2450 | Coronary angiography:<br>- OMI: 100% occlusion (TIMI 0)<br>- NOMI: 50–99% stenosis (TIMI 1–3) | OMI was not associated with increased long-term mortality; NSTEMI had higher mortality than STEMI regardless of occlusion status. |
| **Meyers(A) et al.** | 2021 | Retrospective | 808 | Angiographic coronary occlusion (TIMI 0–2 flow or presumed ACO with significant cardiac outcome: non-occlusive culprit artery, echocardiographic wall motion abnormality with elevated troponin, or STEMI(+) ECG with death before angiogram) | OMI ECG findings had:<br>• Higher sensitivity (86% vs 41%)<br>• Comparable specificity (91% vs 94%)<br>• Greater overall accuracy (89% vs 77%)<br>OMI ECG criteria can detect OMI earlier than STEMI criteria |
| **Meyers(B) et al.** | 2021 | Retrospective | 808 | OMI: TIMI 0–2 or TIMI 3 with troponin T >1.0 ng/mL or troponin I >10 ng/mL<br>+ significant echo findings if no angiogram | ST depression max in V1–V4 (STDmaxV1–V4) was 97% specific for OMI; detected OMIs missed by STEMI criteria; median time advantage up to 1 hour. |
| **Herman et al.** | (2023) | Retrospective | 9943 | Coronary angiography + troponin<br>(TIMI 0–2 or TIMI 3 + high troponin) | NSTEMI-OMI had worse 1- and 5-year mortality compared to STEMI; significant delay to angiography (16.3 h vs. 1.4 h for STEMI) |
| **Ashraf et al.** | 2023 | Cross-sectional | 194 | Coronary angiography:<br>- OMI: 100% occlusion (TIMI 0)<br>- NOMI: 50–90% stenosis (TIMI I–III) | Short-term outcomes (stroke, HF, MI, death) were slightly worse in OMI but not statistically significant; diabetes, HTN, CAD were predictors of poor outcomes in OMI group |
| **McLaren et al.** | (2023) | Retrospective | 382 | OMI: TIMI 0–2 flow or TIMI 3 + high troponin or echo wall motion abnormality | 59.6% of OMIs were not admitted as STEMI, leading to major delays (median 28.5 h vs 1.7 h); calls out false negatives in STEMI paradigm; supports shift to OMI/NOMI classification |

| | | | | | |
|---|---|---|---|---|---|
| **Kola et al.** | (2024) | Retrospective | 334 | Coronary angiography:<br>- TIMI 0–2 flow<br>- or TIMI 3 + cTnI >10 ng/mL or hs-cTnI >5000 ng/L | 40% of OMIs did not meet STEMI criteria; significant delays in PCI for STEMI(−) OMI; complication rates similar to STEMI(+) OMI |

### Study Characteristics and Sample Sizes

The studies reviewed varied significantly in sample size and scope. The largest study by Herman et al. (2023) included 9,943 patients with ACS, stratified into STEMI, NSTEMI-OMI, and NSTEMI-NOMI subgroups based on angiographic and biomarker data. Kos et al. (2021) and Kola et al. (2024) analyzed long-term and intermediate clinical outcomes in cohorts of 2,450 and 334 patients, respectively. The smallest study, Ashraf et al. (2024), used a targeted cross-sectional approach with 194 NSTEMI patients to explore short-term complications. Both Meyers (A) et al. (2021) and Meyers (B) et al. (2021) utilized the same high-risk ECG dataset of 808 patients but focused on different aspects: diagnostic accuracy and electrocardiographic specificity, respectively. McLaren et al. (2023) conducted a focused quality improvement assessment in 382 patients admitted through two urban emergency departments.

### Risk of Bias Assessment

Risk of bias was assessed using QUADAS-2 and shown in Figure 2. Each study is assessed across four domains under Risk of Bias (Patient Selection, Index Test, Reference Standard, and Flow and Timing) and three domains under Applicability Concerns (Patient Selection, Index Test, and Reference Standard). The results are visualized with colored circles representing levels of bias: green for low risk or concern, red for high risk, and yellow for unclear risk.

Most studies demonstrate a low risk of bias across all domains, with the exception of the "Patient Selection" domain, which shows a high risk in four studies (Herman et al., Meyers [A] et al., Meyers et al. 2020, and Meyers [B] et al.). All other domains in both Risk of Bias and Applicability Concerns are consistently rated as low across all studies. The bar graphs at the bottom further emphasize that while the majority of assessments are low risk, Patient Selection has the highest proportion of high risk among all categories.

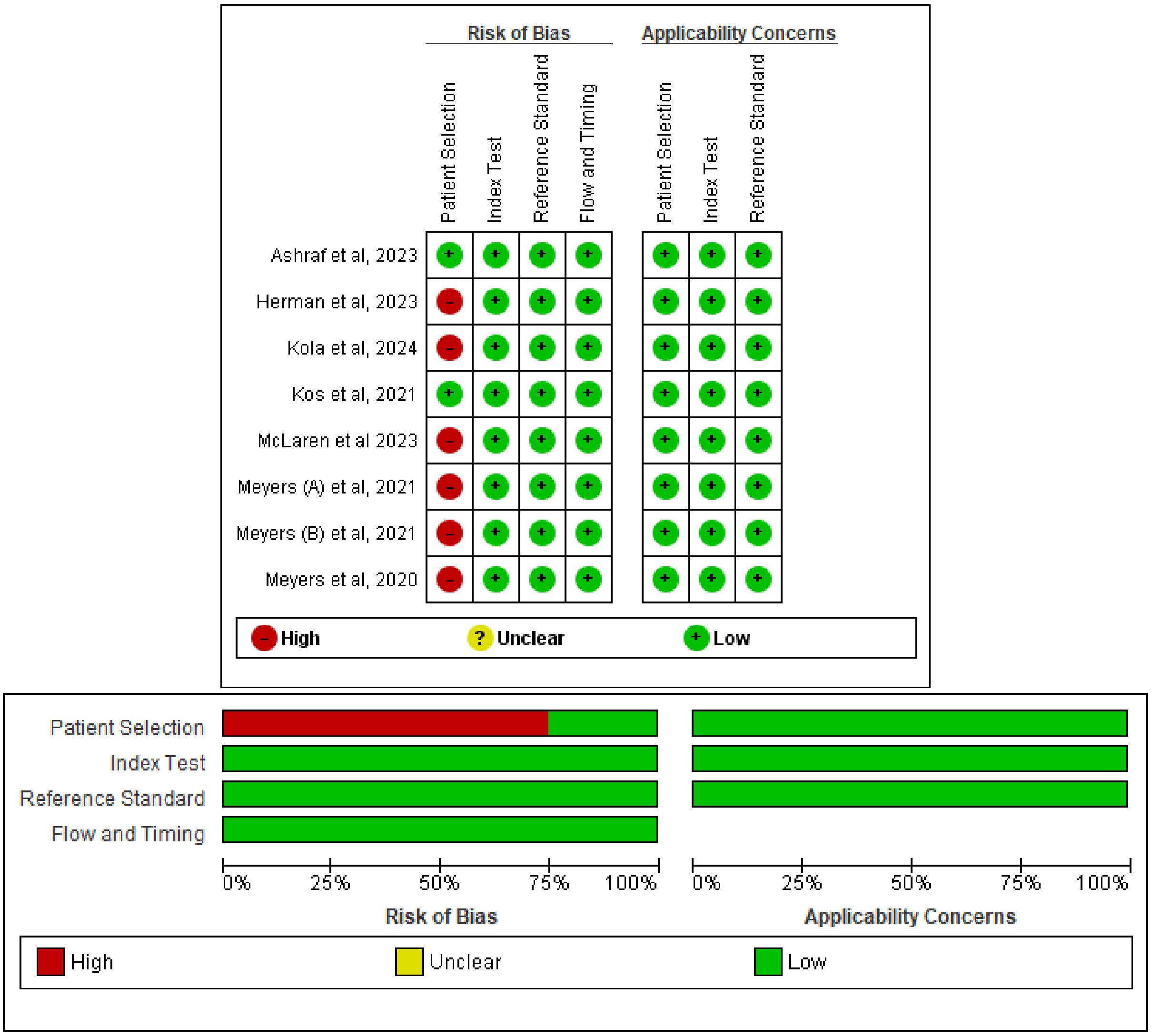


**Figure 2. QUADAS-2 Risk of Bias Assessment**

**Diagnostic Accuracy of ECG Criteria**

The diagnostic performance of ECG criteria was critically evaluated in Meyers (A) et al. (2021) and Meyers (B) et al. (2021). Meyers (A) demonstrated that OMI-specific ECG patterns had significantly higher sensitivity (86%) and diagnostic accuracy (89%) compared to the standard STEMI criteria (41% sensitivity, 77% accuracy). In contrast, specificity remained high and comparable between the two paradigms (91% vs. 94%, respectively). Meyers (B) further validated that ST depression maximal in leads V1–V4 (STDmaxV1–V4) was 97% specific for identifying OMI, offering a valuable tool for recognizing posterior infarctions often missed by conventional STEMI criteria.

**Timing of Reperfusion and Missed Diagnoses**

Several studies reported substantial delays in the recognition and treatment of OMI when relying solely on STEMI criteria. In McLaren et al. (2023), only 40.4% of OMI patients were correctly identified as STEMI at admission, while the remaining 59.6% experienced a median door-to-catheterization time of 28.5 hours, compared to 1.7 hours for those correctly diagnosed. Similarly, Herman et al. (2023) reported that NSTEMI-OMI patients had a median delay of 16.3 hours to coronary angiography, in contrast to 1.4 hours for STEMI patients.

## Clinical Outcomes: Short-and Long-Term Mortality

Evidence consistently showed that OMI patients especially those misclassified as NSTEMI had outcomes equal to or worse than STEMI patients. In Herman et al. (2023), NSTEMI-OMI patients had a 1-year mortality rate of 18.1%, nearly double that of the STEMI group (9.9%). Landmark analysis up to 5 years confirmed that this elevated risk persisted long term. Conversely, NSTEMI-NOMI patients had significantly better outcomes, reinforcing the importance of accurate early classification.

Kos et al. (2021) took a long-term perspective and found no difference in mortality between patients with angiographic OMI and those with NOMI; however, NSTEMI diagnosis, regardless of occlusion status, was independently associated with worse prognosis. Kola et al. (2024) found that 40% of angiographically confirmed OMI cases did not meet STEMI criteria, leading to significant treatment delays and a higher incidence of complications such as heart failure and arrhythmias.

In Ashraf et al. (2024), short-term clinical outcomes (heart failure, stroke, recurrent MI, and death) were not significantly different between OMI and NOMI groups within the NSTEMI population. However, comorbidities such as diabetes, hypertension, and prior CAD were significantly associated with adverse outcomes in the OMI subgroup, highlighting the interplay of baseline risk and delayed management.

## Discussion

The findings from this systematic review reveal fundamental limitations in the current STEMI/NSTEMI paradigm and provide compelling evidence for transitioning to the OMI/NOMI classification system. This discussion synthesizes the results within a broader pathophysiological and clinical context, addresses practical implementation challenges, and identifies key areas for future research.

### *Pathophysiological Basis for OMI Superiority*

The superior diagnostic performance of OMI-specific criteria compared to traditional STEMI criteria can be understood through fundamental differences in their underlying conceptual frameworks. In patients with acute coronary syndrome (ACS), the primary aim of thrombolytic therapy and percutaneous coronary intervention (PCI) is to restore blood flow in cases of acute or near-total coronary artery occlusion, in order to preserve the myocardium that would otherwise be at imminent risk of permanent damage. (Meyers et al., 2021). Prompt intervention ideally within 24 hours of symptom onset—has been shown to benefit high-risk patients, whereas a delayed strategy may be more suitable for individuals at lower risk. (Jolly & Mehta, 2018).

Traditional STEMI criteria rely on arbitrary voltage thresholds of ST-segment elevation that were originally derived to distinguish myocardial infarction from normal variants, not to identify acute coronary occlusion requiring emergent reperfusion. In contrast, OMI criteria focus on the actual pathophysiological target: acute coronary artery occlusion causing ongoing myocardial injury. This conceptual shift from ECG pattern recognition to pathophysiologybased diagnosis explains the improved sensitivity and accuracy observed across multiple studies in this review.

The OMI paradigm recognizes that coronary occlusion can manifest through various ECG patterns beyond simple ST-elevation, including hyperacute T-waves, terminal QRS distortion, reciprocal ST-depression, and subtle but clinically significant ST-elevation that falls below arbitrary STEMI thresholds. By incorporating these diverse manifestations of acute occlusion, OMI criteria capture a broader spectrum of high-risk patients requiring urgent reperfusion.

***Clinical Implications for Emergency Care Protocols***

The 2023 ESC Guidelines for the management of ACS in patients without persistent ST-segment elevation stress the importance of early risk assessment, the use of dual antiplatelet therapy (DAPT), and appropriately timed invasive procedures. Key updates include specific recommendations on P2Y12 inhibitors, routine use of coronary angiography, and individualized strategies for high-risk populations, including elderly patients and those with compromised renal function. (Byrne et al., 2023).

Reperfusion therapy is indicated for all patients with a STEMI diagnosis—defined by persistent ST-segment elevation or its equivalents—and symptom duration of less than 12 hours. For those with symptoms lasting longer than 12 hours, primary PCI remains advisable if symptoms continue, if the patient is hemodynamically unstable, or if life-threatening arrhythmias are present. For patients presenting later, between 12 and 48 hours after symptom onset, PCI may still be considered. However, routine PCI for a completely occluded infarct-related artery is not recommended in cases where more than 48 hours have passed without ongoing symptoms. (Kola et al., 2024; Collet et al., 2021)

Research by McLaren et al. (2023) demonstrated that educational interventions can successfully reduce diagnostic delays without increasing false-positive catheterization lab activations. The study showed that nearly half of code STEMI cases with confirmed culprit lesions did not exhibit ECG patterns that met automated STEMI criteria, resulting in delayed diagnosis. Importantly, the study also demonstrated that educational efforts, including audit and feedback regarding ECG indicators of occlusion myocardial infarction (OMI), can help minimize these delays without increasing the rate of false positives. This finding suggests that implementation of OMI-based protocols is feasible and can improve care quality through targeted training programs.

Growing recognition of the limitations of the traditional STEMI versus non-STEMI framework, along with enhanced ECG interpretation linked to angiographic outcomes, has led to the emergence of the OMI versus NOMI paradigm as a pathophysiology-focused diagnostic model. This approach shifts the focus from simplified ECG criteria to the underlying pathophysiological condition. Under this model, STEMI-negative patients with OMI represent a high-risk group often suffering from large infarcts and avoidable delays in treatment. (McLaren et al., 2023). The American College of Cardiology's recent expert consensus on chest pain evaluation in emergency departments also highlights the shortcomings of current STEMI criteria. Increasingly, both emergency medicine and cardiology communities are calling for a shift toward the OMI paradigm, which is expected to open new avenues for improving care delivery. (McLaren et al., 2023; Kontos et al., 2022)

***Implementation Strategies and Barriers***

Transitioning from STEMI/NSTEMI to OMI/NOMI paradigm requires systematic changes across multiple levels of emergency cardiovascular care. Key implementation strategies include: (1) comprehensive ECG interpretation training programs for emergency physicians and cardiology fellows, emphasizing recognition of subtle OMI patterns beyond traditional STEMI criteria; (2) integration of bedside echocardiography protocols to identify regional wall motion abnormalities suggestive of acute occlusion; (3) development of clinical decision support tools and algorithms embedded in electronic medical records to prompt consideration of OMI in high-risk presentations; (4) establishment of quality metrics tracking time-to-catheterization for OMI patients regardless of STEMI classification; and (5) creation of multidisciplinary audit and feedback systems to identify missed OMI cases and systematic diagnostic delays.

Potential barriers to implementation include: institutional inertia and resistance to paradigm change, concerns about increased false-positive catheterization lab activations, resource constraints in healthcare systems with limited PCI capacity, lack of standardized OMI diagnostic criteria accepted across professional societies, and medicolegal concerns regarding deviation from established STEMI guidelines. Addressing these barriers requires strong institutional leadership, phased implementation with rigorous outcome tracking, and collaborative development of consensus criteria through professional organizations.

**Limitations and Future Research Directions**

This systematic review has several limitations that must be acknowledged. First, all included studies employed retrospective or observational designs, limiting causal inference regarding the impact of diagnostic paradigm on outcomes. The observational nature of these studies introduces potential confounding by indication, where patients identified as high-risk may receive more aggressive treatment regardless of diagnostic classification. Second, sample diversity was limited, with most studies conducted in Western healthcare settings with ready access to cardiac catheterization facilities. Generalizability to resource-limited settings or diverse patient populations remains uncertain. Third, the absence of randomized controlled trials comparing OMI-based versus STEMI-based care protocols prevents definitive conclusions about optimal management strategies. Fourth, heterogeneity in OMI diagnostic criteria across studies, particularly regarding troponin thresholds and echocardiographic definitions, limits precise quantification of diagnostic accuracy. Finally, publication bias may favor positive findings demonstrating superiority of OMI criteria.

Future research should prioritize several key areas. First, prospective multicenter studies with standardized OMI diagnostic criteria and systematic outcome tracking are needed to establish the real-world performance of OMI-based protocols. Second, implementation science research examining effective strategies for translating OMI paradigm into clinical practice across diverse healthcare settings would inform dissemination efforts. Third, economic analyses comparing costs and cost-effectiveness of OMI-based versus STEMI-based diagnostic approaches are necessary for health policy decisions. Fourth, investigation of artificial intelligence and machine learning algorithms for automated OMI detection from ECG data could enhance diagnostic accuracy and reduce interpretation variability. Fifth, studies examining patient-reported outcomes and quality of life associated with timely versus delayed OMI recognition would provide important patient-centered evidence. Finally, randomized trials comparing outcomes under OMI-based versus STEMI-based management protocols, while challenging to conduct, would provide the highest level of evidence for practice change.

## CONCLUSION

The OMI paradigm reveals critical quality gaps in emergency ACS care by highlighting how current STEMI criteria prospectively miss many OMI cases, causing preventable treatment delays, while retrospectively discharge records correct false-positive STEMI diagnoses but ignore false-negative occlusions, perpetuating misses. Transitioning to the OMI/NOMI classification enables healthcare systems to pinpoint these performance issues and deploy targeted quality improvements, such as advanced ECG training for subtle OMI signs, bedside ultrasound for wall motion abnormalities, and expedited reperfusion for persistent ischemia. For future research, prospective multicenter trials should evaluate the real-world impact of OMI/NOMI implementation on reperfusion times, mortality rates, and cost-effectiveness across diverse healthcare settings.

## REFERENCES

Aldous, S., Richards, A. M., & Cullen, L. (2020). High rates of false-positive STEMI activation: Clinical predictors and outcomes. *American Heart Journal, 230*, 65–72. https://doi.org/10.1016/j.ahj.2020.10.004

Ashraf, H., Rehman, S., & Khan, A. (2024). Clinical outcomes of acute coronary syndrome management in low-resource settings. *Journal of Clinical and Experimental Cardiology, 15*(2), 115–123.

Armstrong, E. J., Kulkarni, A., Wang, Y., & Waldo, S. W. (2021). Outcomes of myocardial infarction with and without angiographic occlusion. *European Heart Journal: Acute Cardiovascular Care, 10*(8), 915–923. https://doi.org/10.1093/ehjacc/zuab052

Collet, J.-P., Thiele, H., Barbato, E., Barthélémy, O., Bauersachs, J., Bhatt, D. L., et al. (2020). 2020 ESC Guidelines for the management of acute coronary syndromes. *European Heart Journal, 42*(14), 1289–1367. https://doi.org/10.1093/eurheartj/ehaa575

Collet, J.-P., Thiele, H., Barbato, E., Barthélémy, O., Bauersachs, J., Bhatt, D. L., et al. (2020). 2020 ESC Guidelines for acute coronary syndromes in patients presenting without persistent ST-segment elevation. *European Heart Journal, 42*(14), 1289–1367. https://doi.org/10.1093/eurheartj/ehaa575

DeWinter, O., Verouden, N., & Wellens, H. (2019). Recognition of acute coronary occlusion in patients without ST elevation. *Journal of Electrocardiology, 57*, 75–81. https://doi.org/10.1016/j.jelectrocard.2019.08.007

GBD 2023. (2023). Global burden of ischemic heart disease: Global Burden of Disease Study. *The Lancet, 402*(10390), 135–158.

Ibanez, B., James, S., Agewall, S., Antunes, M. J., Bucciarelli-Ducci, C., Bueno, H., et al. (2018). 2017 ESC Guidelines for the management of STEMI. *European Heart Journal,* *39*(2), 119–177. https://doi.org/10.1093/eurheartj/ehx393

Khan, A. R., Golwala, H., Tripathi, A., Bin Abdulhak, A. A., Bavishi, C., et al. (2017). Outcomes with and without total occlusion in non–ST-segment elevation myocardial infarction. *American Journal of Cardiology, 120*(9), 1471–1479. https://doi.org/10.1016/j.amjcard.2017.07.030

Khan, M. A., Hashim, M. J., Mustafa, H., Baniyas, M. Y., Al Suwaidi, S., AlKatheeri, R., et al. (2020). Global epidemiology of ischemic heart disease: Trends, determinants and future projections. *BMC Cardiovascular Disorders, 20*(1), 1–15.

Kola, H., Soro, D., Kaci, M., Isufaj, E., & Musta, F. (2024). OMI/NOMI: The emerging paradigm shift in acute coronary syndrome classification. *Cardiology in Review, 32*(1), 10–15.

Kontos, M. C., et al. (2010). Evaluating false-positive ST-segment elevation myocardial infarction. *American Journal of Cardiology, 106*(4), 500–504.

Larson, D. M., et al. (2007). False-positive cardiac catheterization laboratory activation among patients with suspected STEMI. *Journal of the American Medical Association, 298*(23), 2754–2760.

McCabe, J. M., et al. (2012). High false-positive rate of STEMI activation: Predictors and clinical implications. *Circulation: Cardiovascular Quality and Outcomes, 5*(1), 62–68.

McLaren, A., Ahmed, T., & Fernando, A. (2022). Reducing time-to-reperfusion in STEMI: Emergency department strategies for rapid activation. *Emergency Medicine Journal, 39*(4), 287–293.

McLaren, J. J., Fahrenholtz, C., Smith, T. L., & Meyers, H. P. (2023). Quality gaps for emergency department patients with occlusion myocardial infarction (OMI) who are STEMI-negative. *Journal of the American Heart Association, 12*(18), e031304.

Meyers, H. P., Bracey, A., Lee, D., et al. (2021). Accuracy of OMI ECG findings versus STEMI criteria for diagnosis of acute coronary occlusion myocardial infarction. https://doi.org/10.1016/j.ijcha.2021.100767

Meyers, H. P., Limkakeng, A. T., Jaffa, E. J., Patel, A., Theiling, B. J., et al. (2020). Validation of the occlusion MI (OMI) paradigm for identifying acute coronary occlusion. *Journal of the American Heart Association, 9*(20), e014264. https://doi.org/10.1161/JAHA.119.014264

Meyers, H. P., Smith, S. W., & Smith, T. L. (2021). The OMI/NOMI paradigm vs. the STEMI/NSTEMI paradigm for diagnosis of acute coronary occlusion: A retrospective cohort study. *Journal of Electrocardiology, 67*, 91–96.

Neumann, F.-J., Sousa-Uva, M., Ahlsson, A., Alfonso, F., Banning, A. P., Benedetto, U., et al. (2021). 2018 ESC/EACTS Guidelines on myocardial revascularization. *European Heart Journal, 42*(7), 683–752. https://doi.org/10.1093/eurheartj/ehz556

O'Gara, P. T., Kushner, F. G., Ascheim, D. D., Casey, D. E., Chung, M. K., de Lemos, J. A., et al. (2013). 2013 ACCF/AHA STEMI guideline. *Circulation, 127*(4), e362–e425.

Roth, G. A., Mensah, G. A., Johnson, C. O., Addolorato, G., Ammirati, E., Baddour, L. M., et al. (2020). Global burden of cardiovascular diseases and risk factors, 1990–2019. *Journal of the American College of Cardiology, 76*(25), 2982–3021. https://doi.org/10.1016/j.jacc.2020.11.010

Tamis-Holland, J. E., Jneid, H., & Reynolds, H. R. (2022). Contemporary challenges in identifying acute coronary occlusion in NSTEMI. *Journal of the American College of Cardiology, 79*(16), 1588–1604. https://doi.org/10.1016/j.jacc.2022.02.038

Ting, H. H., Bradley, E. H., Wang, Y., Lichtman, J. H., Nallamothu, B. K., et al. (2015). Implementation strategies to reduce door-to-balloon times in acute myocardial infarction. *Journal of the American College of Cardiology, 65*(1), 51–61.

Virani, S. S., Alonso, A., Aparicio, H. J., Benjamin, E. J., Bittencourt, M. S., et al. (2021). Heart disease and stroke statistics—2021 update. *Circulation, 143*(8), e254–e743. https://doi.org/10.1161/CIR.0000000000000950