

A systematic review of the barriers and facilitators influencing emergency department nurses' competency and adherence to triage protocols for acute myocardial infarction

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Abstract:

Acute Myocardial Infarction (AMI) continues to be one of the leading causes of mortality and disability worldwide and remains a major public health concern. Timely recognition and appropriate emergency department (ED) triage play a decisive role in reducing treatment delays and improving survival outcomes. Emergency department nurses serve as the first point of clinical contact and are responsible for the rapid assessment, prioritisation, and initiation of evidence-based triage protocols for patients presenting with suspected AMI. Their competency in recognising both typical and atypical clinical manifestations, performing early electrocardiographic assessment, and activating institutional chest pain pathways directly influences door-to-electrocardiogram (ECG) time, reperfusion therapy, and overall patient prognosis.

Despite the availability of internationally accepted triage protocols and clinical guidelines, variations in emergency nursing competency and adherence remain common. Factors such as overcrowded emergency departments, workforce shortages, limited clinical experience, inadequate continuing education, increasing patient acuity, and organisational barriers frequently compromise the implementation of evidence-based AMI triage practices. Furthermore, atypical clinical presentations among women, older adults, and patients with diabetes mellitus increase the risk of delayed diagnosis and inappropriate triage categorisation.

This systematic review synthesises the available evidence regarding barriers and facilitators influencing emergency department nurses' competency and adherence to triage protocols for acute myocardial infarction. The review demonstrates that simulation-based education, structured competency assessment, multidisciplinary collaboration, clinical decision support systems, protocol standardisation, mentorship programmes, and continuous quality improvement initiatives significantly improve nursing performance and protocol compliance. These interventions contribute to earlier ECG acquisition, timely activation of reperfusion pathways, and improved patient outcomes.

Overall, strengthening emergency nursing competency requires a comprehensive systems-based approach combining professional education, evidence-based clinical protocols, technological support, organisational commitment, and continuous performance evaluation. Improving emergency nurses' adherence to standardised AMI triage protocols has the potential to minimise treatment delays, enhance patient safety, reduce mortality, and improve the overall quality of emergency cardiovascular care.

Keywords:

Acute Myocardial Infarction; Emergency Department; Triage; Nursing Competency; Protocol Adherence; Systematic Review.

1. Introduction:

Emergency departments represent one of the most dynamic and time-sensitive areas within modern healthcare systems. Nurses working in these settings are continuously required to make rapid clinical decisions while managing unpredictable patient presentations, high patient volumes, and significant environmental pressures. Among all medical emergencies encountered in emergency departments, Acute Myocardial Infarction (AMI) remains one of the most critical conditions because successful treatment depends largely upon the speed with which the condition is recognised and managed. The well-established principle that "time is muscle" reflects the direct relationship between treatment delay and irreversible myocardial damage, making early recognition and immediate intervention essential components of patient survival (Ibanez et al., 2018).

The emergency department triage nurse serves as the primary clinical gatekeeper responsible for identifying patients requiring immediate medical attention. Unlike other healthcare professionals who evaluate patients after diagnostic investigations have commenced, triage nurses must rapidly determine clinical urgency using limited initial information obtained during the first few minutes of patient contact. This responsibility requires advanced knowledge of cardiovascular disease, sound clinical judgement, rapid assessment skills, and the ability to recognise both classical and atypical manifestations of acute myocardial infarction. Effective triage enables prompt electrocardiographic assessment, early activation of institutional chest pain pathways, and timely referral for definitive reperfusion therapy, thereby significantly improving clinical outcomes (Chapman et al., 2017).

International cardiovascular organisations, including the American Heart Association, the American College of Cardiology, and the European Society of Cardiology, have established evidence-based recommendations to standardise emergency care for patients with suspected acute coronary syndromes. These guidelines emphasise that every patient presenting with symptoms suggestive of myocardial ischaemia should undergo a 12-lead electrocardiogram within ten minutes of arrival in the emergency department. Achieving this benchmark depends primarily upon the competency and clinical performance of emergency department nurses during the initial triage assessment (Ibanez et al., 2018).

Although structured triage systems such as the Emergency Severity Index (ESI), Manchester Triage System (MTS), and Canadian Triage and Acuity Scale (CTAS) have been developed to improve consistency in emergency care, considerable variability continues to exist in nursing practice. Emergency nurses differ in their ability to recognise high-risk presentations, interpret clinical findings, identify atypical symptoms, and implement evidence-based triage protocols. Such variations frequently result in delayed electrocardiogram acquisition, prolonged door-to-balloon times, delayed reperfusion therapy, and poorer patient outcomes.

Several factors contribute to these inconsistencies in clinical performance. Individual characteristics such as educational preparation, years of emergency nursing experience, clinical confidence, and knowledge of cardiovascular assessment influence competency. Simultaneously, organisational factors including emergency department overcrowding, workforce shortages, high patient acuity, inadequate staffing levels, limited access to continuing professional development, and insufficient institutional support further affect adherence to recommended triage protocols. These barriers create challenging working environments where emergency nurses must make rapid clinical decisions despite increasing cognitive workload and resource limitations (Body et al., 2011).

The recognition of acute myocardial infarction is further complicated by the high prevalence of atypical clinical presentations. While severe central chest pain remains the classical manifestation of myocardial infarction, many patients present with less typical symptoms such as dyspnoea, fatigue, epigastric discomfort, nausea, dizziness, jaw pain, or unexplained weakness. Women, elderly patients, and individuals with diabetes mellitus frequently exhibit these atypical symptoms, increasing the likelihood of under-triage and delayed diagnosis. Consequently, emergency nurses require specialised knowledge and strong clinical reasoning skills to ensure that atypical presentations are recognised promptly and managed appropriately.

Recent developments in emergency healthcare have introduced additional opportunities to improve triage performance. Simulation-based education, structured competency assessment, digital clinical decision support systems, multidisciplinary teamwork, and protocol-driven emergency pathways have demonstrated considerable potential for enhancing emergency nursing competency and improving adherence to evidence-based practice. These interventions aim to reduce clinical variability while supporting nurses in delivering safe, efficient, and standardised emergency cardiovascular care.

The present systematic review seeks to examine the factors influencing emergency department nurses' competency and adherence to triage protocols for acute myocardial infarction. By synthesising evidence from contemporary literature, this review identifies the major educational, organisational, and clinical barriers affecting nursing practice while also exploring the facilitators associated with improved protocol compliance.

Understanding these factors is essential for developing effective educational programmes, strengthening institutional policies, and improving emergency cardiovascular services.

Ultimately, improving emergency nursing competency extends beyond enhancing individual clinical skills. It requires comprehensive organisational support, continuous professional development, evidence-based clinical guidelines, and quality improvement initiatives that collectively ensure rapid recognition, accurate triage, and timely management of patients experiencing acute myocardial infarction. Strengthening these components has the potential to reduce treatment delays, improve survival, preserve myocardial function, and enhance the overall quality of emergency cardiovascular care.

2. Global burden of acute myocardial infarction:

Acute Myocardial Infarction continues to impose a substantial burden on healthcare systems worldwide and remains one of the leading contributors to global mortality and disability. As highlighted throughout this dissertation, ischaemic heart disease accounts for millions of deaths annually and represents one of the most significant causes of premature mortality. Although advances in preventive cardiology, pharmacological therapy, and interventional cardiology have improved survival rates, the overall burden of disease remains considerable because of population ageing and the increasing prevalence of cardiovascular risk factors.

The consequences of AMI extend far beyond mortality alone. Patients who survive myocardial infarction frequently experience long-term physical disability, reduced functional capacity, recurrent cardiovascular events, chronic heart failure, and diminished quality of life. These complications place significant pressure on healthcare systems through repeated hospital admissions, prolonged rehabilitation, lifelong pharmacological treatment, and continuous specialist follow-up. Consequently, acute myocardial infarction generates substantial economic costs affecting patients, families, healthcare organisations, and national economies.

The dissertation emphasises that healthcare expenditure associated with acute myocardial infarction includes emergency department services, advanced cardiac investigations, coronary angiography, percutaneous coronary intervention, intensive care admission, pharmacological management, rehabilitation services, and long-term outpatient care. In addition to direct healthcare expenditure, indirect costs resulting from productivity loss, disability, premature retirement, and premature mortality contribute substantially to the overall societal burden of disease.

Over recent decades, important epidemiological transitions have been observed. High-income countries have reported reductions in age-standardised mortality rates following successful implementation of smoking cessation programmes, hypertension control, lipid-lowering therapy, and evidence-based cardiovascular prevention strategies. However, despite improvements in mortality, the absolute number of patients affected by acute myocardial infarction continues to increase because of longer life expectancy and increasing prevalence of obesity, diabetes mellitus, sedentary lifestyles, and metabolic disorders (Bandstein et al., 2014). In contrast, low- and middle-income countries are experiencing a rapidly increasing burden of acute myocardial infarction. Urbanisation, changing dietary patterns, physical inactivity, tobacco consumption, and limited preventive healthcare services have contributed to rising cardiovascular disease incidence. Simultaneously, fragmented emergency medical systems and limited access to specialised cardiac services increase dependence on emergency department triage for timely diagnosis and treatment. Under such circumstances, the competency of emergency nurses becomes even more critical for ensuring equitable access to life-saving interventions.

The burden of acute myocardial infarction is not distributed equally across populations. Women, elderly individuals, patients with diabetes mellitus, and socioeconomically disadvantaged groups often experience delayed diagnosis and poorer clinical outcomes because of atypical symptom presentation, delayed healthcare seeking, and disparities in emergency care. These observations further emphasise the importance of standardised triage protocols and highly competent emergency nursing practice capable of recognising diverse clinical presentations without bias.

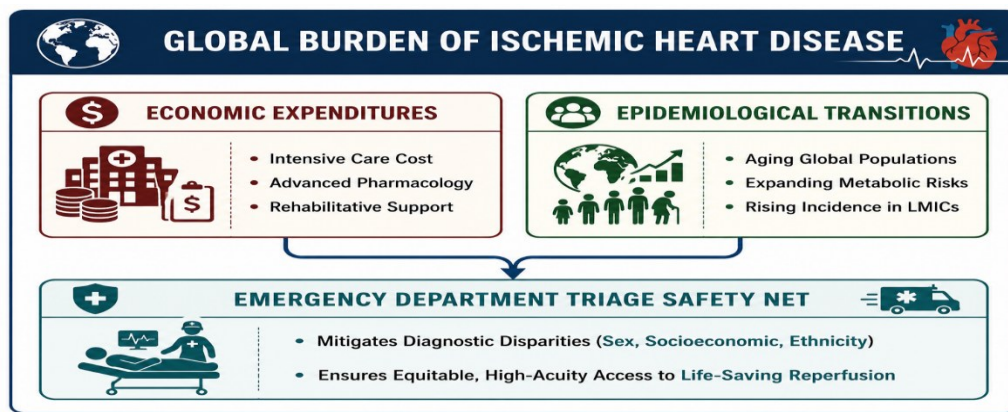


Figure. 1: Global burden of ischaemic heart disease

3. Epidemiology of acute myocardial infarction:

Acute Myocardial Infarction (AMI) remains one of the most prevalent cardiovascular emergencies worldwide and continues to contribute substantially to premature mortality, disability, and healthcare utilisation. According to the evidence presented in this dissertation, cardiovascular diseases collectively account for more than 18 million deaths annually, with ischaemic heart disease and AMI representing the largest proportion of this burden (Mokhtari et al., 2017). Despite remarkable advances in cardiovascular prevention and treatment, AMI continues to challenge emergency healthcare systems because of increasing life expectancy, rising prevalence of cardiovascular risk factors, and significant disparities in access to emergency cardiac services. The epidemiological profile of AMI demonstrates considerable variation across geographical regions, socioeconomic settings, age groups, and sex. These differences are influenced by the prevalence of modifiable cardiovascular risk factors, healthcare infrastructure, emergency medical services, and implementation of preventive public health programmes. Understanding these epidemiological patterns enables emergency department nurses to recognise high-risk populations and improve early identification during triage.

The dissertation highlights that in developed countries, sustained improvements in smoking cessation programmes, hypertension management, lipid-lowering therapy, and evidence-based cardiovascular prevention have contributed to significant reductions in age-adjusted mortality from acute myocardial infarction. However, these encouraging trends have been partially offset by the increasing prevalence of obesity, metabolic syndrome, sedentary lifestyles, and type 2 diabetes mellitus. Consequently, although mortality has declined, the incidence of AMI among younger adults has remained stable or shown a gradual increase in several populations (Roffi et al., 2016).

Conversely, low- and middle-income countries continue to experience an increasing incidence of acute myocardial infarction. Rapid urbanisation, westernisation of dietary habits, reduced physical activity, tobacco consumption, increasing diabetes prevalence, and fragmented emergency healthcare systems have accelerated the cardiovascular disease burden. Limited access to specialised cardiac centres further increases reliance upon emergency department nurses for rapid recognition and appropriate triage of suspected myocardial infarction (Roffi et al., 2016).

These epidemiological changes have important implications for emergency nursing practice. Emergency departments are increasingly required to manage larger numbers of patients presenting with suspected acute coronary syndromes while simultaneously maintaining internationally recommended treatment timelines. As patient numbers increase, the ability of emergency nurses to accurately prioritise patients becomes progressively more important in preventing unnecessary treatment delays.

3.1. Age distribution:

Age remains one of the strongest predictors of acute myocardial infarction. The dissertation indicates that although AMI may occur in younger adults, disease incidence increases progressively with advancing age because of cumulative exposure to cardiovascular risk factors and progressive coronary atherosclerosis.

Older adults frequently present with multiple chronic illnesses including hypertension, diabetes mellitus, chronic kidney disease, and dyslipidaemia, all of which significantly increase cardiovascular risk. Age-related physiological changes further complicate emergency assessment because elderly patients often exhibit diminished physiological reserve and altered symptom perception. Consequently, they are more likely to present with atypical symptoms, increasing the possibility of delayed recognition during emergency department triage (Sandoval et al., 2017).

3.2. Cardiovascular risk factors:

The epidemiology described in this dissertation identifies numerous modifiable and non-modifiable cardiovascular risk factors associated with acute myocardial infarction.

Major non-modifiable factors include:

- Increasing age
- Male sex
- Family history of premature coronary artery disease

Major modifiable factors include:

- Hypertension
- Diabetes mellitus
- Dyslipidaemia
- Cigarette smoking
- Obesity
- Physical inactivity
- Unhealthy dietary habits
- Chronic psychological stress

These risk factors contribute to progressive endothelial dysfunction, chronic vascular inflammation, lipid accumulation, and formation of atherosclerotic plaques within coronary arteries. Progressive plaque instability eventually predisposes individuals to plaque rupture, intracoronary thrombosis, coronary occlusion, and myocardial infarction (Libby et al., 2019).

Emergency nurses should integrate cardiovascular risk factor assessment with symptom evaluation because patients possessing multiple cardiovascular risk factors remain at increased risk despite presenting with relatively mild or atypical symptoms.

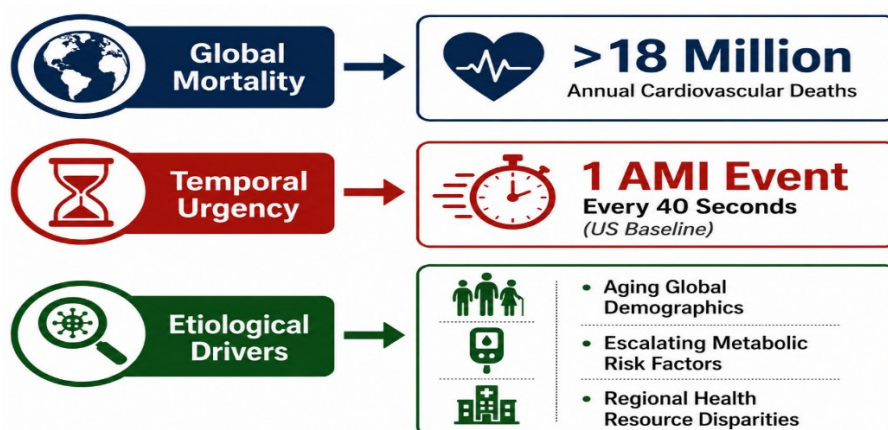


Figure 2: Global epidemiology of ischaemic heart disease

4. Pathophysiology of acute myocardial infarction:

Acute Myocardial Infarction (AMI) is a progressive pathological condition that develops following a sudden interruption of coronary blood flow, resulting in prolonged myocardial ischaemia and irreversible necrosis of cardiac muscle. Under normal physiological conditions, coronary arteries continuously supply oxygen and nutrients to the myocardium according to its metabolic demands. Coronary autoregulation maintains an appropriate balance between myocardial oxygen supply and demand. However, when coronary blood flow is abruptly reduced or completely obstructed, myocardial oxygen delivery becomes insufficient, initiating a cascade of biochemical, cellular, and structural events that culminate in myocardial infarction (Thygesen et al., 2023).

The pathological process begins many years before the acute event through the gradual development of coronary atherosclerosis. Persistent endothelial injury caused by hypertension, diabetes mellitus, dyslipidaemia, cigarette smoking, obesity, oxidative stress, and chronic inflammation increases vascular permeability. This allows low-density lipoprotein (LDL) cholesterol to penetrate the arterial intima, where it undergoes oxidative modification. Oxidised LDL stimulates endothelial cells to express adhesion molecules, promoting recruitment of circulating monocytes and T-lymphocytes into the vessel wall. Monocytes subsequently differentiate into macrophages that engulf oxidised LDL particles, becoming lipid-laden foam cells. Accumulation of foam cells forms the earliest visible atherosclerotic lesion known as the fatty streak (Libby et al., 2019).

As chronic inflammation progresses, vascular smooth muscle cells migrate from the tunica media into the intima and proliferate. These cells synthesise extracellular matrix proteins including collagen, elastin, and proteoglycans, forming a fibrous cap over the lipid-rich core. Progressive lipid accumulation, inflammatory cell infiltration, calcium deposition, and extracellular matrix remodelling gradually enlarge the atherosclerotic plaque and narrow the coronary artery lumen. Despite progressive narrowing, many patients remain asymptomatic because collateral circulation and coronary autoregulation maintain adequate myocardial perfusion during rest.

The likelihood of developing acute myocardial infarction depends primarily on plaque stability rather than plaque size. Stable plaques possess thick fibrous caps, relatively small lipid cores, and limited inflammatory activity. In contrast, vulnerable plaques are characterised by large lipid-rich necrotic cores covered by thin fibrous caps infiltrated with activated macrophages and T-lymphocytes. Activated inflammatory cells release matrix metalloproteinases, collagenases, and elastases that degrade collagen and weaken the fibrous cap. Simultaneously, inflammatory cytokines inhibit collagen synthesis by vascular smooth muscle cells, further reducing plaque stability (Libby et al., 2019).

5. Methodology:

5.1. Study design:

This review was conducted using a systematic review methodology to comprehensively examine the evidence presented in the dissertation regarding emergency department nurses' competency and adherence to Acute Myocardial Infarction (AMI) triage protocols

5.2. Search strategy:

As presented in the dissertation, a comprehensive literature search strategy was implemented using internationally recognised electronic databases

5.3. Data synthesis:

Because included studies demonstrated variation in study design, participant characteristics, healthcare settings, and outcome measures, findings were synthesised using a qualitative narrative approach

5.4. Analysis and interpretation:

The studies included in this systematic review collectively demonstrate that emergency department nurses play a central role in the early recognition and management of Acute Myocardial Infarction (AMI). Since nurses are the first healthcare professionals to assess patients on arrival at the emergency department, their competency directly influences the speed of diagnosis, initiation of electrocardiography (ECG), activation of reperfusion pathways, and ultimately patient survival. The evidence presented throughout the dissertation indicates that nursing competency is influenced by multiple interacting factors rather than a single determinant. These factors include clinical knowledge, assessment skills, professional experience, organisational support, workload, educational preparation, adherence to standardised protocols, and continuous professional development (Levine et al., 2016).

5.5. Knowledge of acute myocardial infarction:

One of the most consistent findings across the reviewed literature was the importance of comprehensive cardiovascular knowledge in achieving accurate emergency triage. The dissertation demonstrates that emergency nurses who possess strong understanding of coronary anatomy, myocardial ischaemia, plaque rupture, thrombus formation, ECG interpretation, and evidence-based management are significantly more likely to recognise suspected myocardial infarction during initial patient assessment (Neumann et al., 2019). Most nurses successfully identified patients presenting with classical symptoms such as severe central chest pain radiating to the left arm, neck, jaw, or shoulder accompanied by diaphoresis, nausea, vomiting, and dyspnoea. They also demonstrated familiarity with immediate priorities including obtaining a 12-lead ECG, initiating cardiac monitoring, establishing intravenous access, and notifying emergency physicians (Levine et al., 2016).

5.6. Recognition of atypical presentations:

The dissertation repeatedly emphasises that one of the greatest challenges encountered during emergency triage involves recognising atypical manifestations of AMI. Unlike classical presentations, atypical symptoms often

mimic gastrointestinal, respiratory, neurological, or musculoskeletal disorders, increasing diagnostic uncertainty.

5.7. Clinical assessment skills:

The review identified clinical assessment as one of the strongest predictors of effective emergency triage. Emergency nurses were required to complete comprehensive assessments within only a few minutes while simultaneously managing competing clinical demands. Successful assessment depended upon systematic patient observation, structured history taking, focused physical examination, cardiovascular risk assessment, and accurate interpretation of presenting symptoms.

6. Conclusion:

Acute Myocardial Infarction (AMI) continues to represent one of the most time-critical cardiovascular emergencies encountered in emergency departments. The evidence synthesised in this systematic review demonstrates that emergency department nurses occupy a pivotal position in ensuring early recognition, accurate triage, and timely initiation of evidence-based management pathways. Since emergency nurses are usually the first healthcare professionals to assess patients, their clinical competency directly influences door-to-electrocardiogram (ECG) time, activation of reperfusion protocols, treatment delays, and ultimately patient survival.

The findings presented throughout this review indicate that emergency nurses generally possess satisfactory knowledge regarding the classical manifestations of acute myocardial infarction. Recognition of severe central chest pain, radiation to the upper limbs or jaw, diaphoresis, nausea, and shortness of breath was consistently reported across the reviewed literature. Likewise, nurses demonstrated awareness of the importance of immediate ECG acquisition, rapid physician notification, cardiac monitoring, and adherence to emergency cardiovascular protocols. These competencies remain fundamental components of effective emergency cardiovascular care and contribute significantly to improving patient outcomes.

However, the review also identified several important knowledge gaps that continue to compromise emergency nursing performance. Recognition of atypical clinical presentations remains inconsistent, particularly among women, older adults, and patients with diabetes mellitus. Symptoms such as isolated dyspnoea, fatigue, nausea, epigastric discomfort, dizziness, shoulder pain, neck pain, and unexplained weakness were frequently under-recognised during triage. Consequently, these patients were more likely to experience delayed ECG acquisition, inappropriate triage categorisation, prolonged waiting times, and delayed reperfusion therapy.

The review further demonstrates that clinical assessment skills constitute one of the strongest determinants of triage accuracy. Nurses who employed structured assessment approaches, including systematic history taking, cardiovascular risk assessment, PQRST pain assessment, focused physical examination, and comprehensive clinical reasoning, consistently demonstrated greater ability to identify high-risk patients. Conversely, incomplete assessment frequently resulted in missed opportunities for early diagnosis. These findings reinforce the importance of maintaining structured clinical assessment despite increasing emergency department workload.

Organisational factors emerged as equally important determinants of emergency nursing competency. Emergency department overcrowding, inadequate staffing levels, increasing patient acuity, workforce shortages, frequent interruptions, and excessive cognitive workload consistently reduced adherence to recommended triage protocols. Under these demanding conditions, nurses frequently encountered difficulties performing comprehensive patient assessment while simultaneously managing competing clinical priorities. The review therefore indicates that improving emergency cardiovascular care requires organisational investment alongside individual professional development.

Educational interventions were consistently identified as major facilitators of improved nursing performance. Simulation-based learning, structured competency assessment, ECG interpretation workshops, case-based education, multidisciplinary training programmes, and continuing professional development significantly enhanced nurses' knowledge, confidence, and clinical decision-making. These interventions improved recognition of atypical presentations, strengthened adherence to evidence-based guidelines, and reduced treatment delays. Continuous education therefore remains essential for maintaining emergency nursing competency within rapidly evolving cardiovascular practice.

The review also highlights the growing value of structured emergency triage systems and digital clinical decision support technologies. Standardised protocols reduced variation in clinical practice, improved consistency of patient assessment, strengthened adherence to international guidelines, and facilitated earlier activation of institutional STEMI pathways. These systems were particularly valuable for supporting less experienced nurses working within high-pressure emergency environments.

Overall, the evidence presented throughout this dissertation demonstrates that emergency nursing competency results from the interaction of individual knowledge, clinical assessment skills, professional experience, organisational support, educational preparation, and institutional commitment to quality improvement. No single intervention alone is sufficient to optimise emergency cardiovascular care. Instead, successful implementation of evidence-based triage requires coordinated investment in nursing education, workforce development, protocol standardisation, digital support systems, and continuous quality assurance.

Strengthening these domains has the potential to improve triage accuracy, reduce diagnostic delay, minimise under-triage, improve adherence to international cardiovascular guidelines, preserve myocardial function, reduce mortality, and ultimately enhance the quality and safety of emergency cardiovascular services.

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