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Kevin D. Swenson University of North Dakota

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# **Acute Myocardial Infarction: Are we overlooking NSTEMI?**

Physician Assistant Program, University of North Dakota School of Medicine & Health Sciences Grand Forks, ND 58012-9037 www.med.und.nodak.edu

# Abstract

- Acute myocardial infarction (AMI) is one of the leading causes of death in the United States.
- The purpose of this study was to examine methods of clinical differentiation between ST-segment elevation myocardial infarction (STEMI) and non-STEMI (NSTEMI) and then to compare the various treatment methods and subsequent outcomes in STEMI versus NSTEMI.
- A compilation of systematic reviews, medical journals, practice guidelines, medical texts and meta-analyses were researched for the purpose of this study.
- NSTEMI patients are older, have more comorbidities and present with more atypical symptoms than STEMI patients.
- NSTEMI patients are treated less aggressively than STEMI patients both in-hospital and after discharge.
- Based on current practices, NSTEMI mortality and major adverse cardiac events (MACE) rates are higher than in STEMI patients.
- Recent coronary angiography (CAG) outcome comparisons generally show similar mortality and hazard ratios and suggest better revascularization in NSTEMI than in STEMI.
- Early invasive treatment in NSTEMI has shown more positive results than late invasive treatment and is most effective in intermediate- to high-risk patients.

# Introduction

- AMI is differentiated into ST-segment elevation myocardial infarction (STEMI) or non-STEMI (NSTEMI) based on 12lead ECG findings.
- NSTEMI and STEMI management differs, the latter being more aggressive.

# **Statement of the Problem**

- With a more vigilant effort to rule out STEMI, management of NSTEMI may now be considered a lower priority in an acute care setting.
- Studies are needed to determine if this prioritization is an appropriate approach to AMI management and if NSTEMI patients have less favorable outcomes as a result.

# **Research Questions**

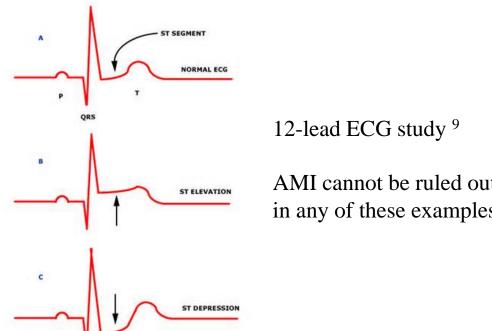
- 1. In patients with acute myocardial infarction, is there a notable difference in approach to treatments and timeliness of care between STEMI and NSTEMI?
- 2. In patients with acute myocardial infarction, is there a notable difference in treatment outcomes of STEMI versus NSTEMI?

Kevin D. Swenson

## Literature Review

## MANAGEMENT OF ACS/MI

- Aggressive management of AMI may include CAG, percutaneous coronary intervention, coronary artery bypass grafting and/or pharmacologic treatment such as anticoagulants, antiplatelets, fibrinolytics and glycoprotein IIb/IIIa antagonists.<sup>4</sup>
- Conservative management of AMI includes medical management of anticoagulation, antiplatelet therapy, symptomatic treatment and ongoing cardiac enzyme testing.<sup>20</sup>
- 12-lead ECG is used to determine location of blockage and to differentiate between STEMI and NSTEMI.<sup>7</sup>
- 12-lead ECG may not clearly differentiate STEMI versus NSTEMI.<sup>14</sup>
- New left bundle branch block and posterior MI considered STEMI equivalents, but do not reveal 12-lead ST elevation.<sup>7,17</sup>



Lead Name & Standard Color			
I Lateral	aVR	V1 Septal	V4 Anterior
II Inferior	aVL Lateral	V2 Septal	V5 Lateral
III Inferior	aVF Inferior	V3 Anterior	V6 Lateral
Basic 12-lead ECD interpretation <sup>6</sup>			

- 43.6% of NSTEMI patients and 27.1% of STEMI patients presented without chest pain and without radiating symptoms to the arm, neck or jaw.  $^2$
- Median delays from initial symptoms to admission shown to be 2.5 hours longer in NSTEMI versus STEMI.<sup>15</sup>

### **DEFINITIVE MANAGEMENT OF STEMI**

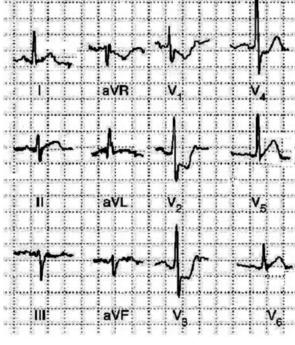
- Early CAG with percutaneous coronary intervention (PCI) remains the gold standard for acute management of STEMI, provided CAG can be performed within 90-120 minutes of initial ED presentation.<sup>8,11</sup>
- CAG indicated even within first 24 hours.<sup>17</sup>

### **DEFINITIVE MANAGEMENT OF NSTEMI**

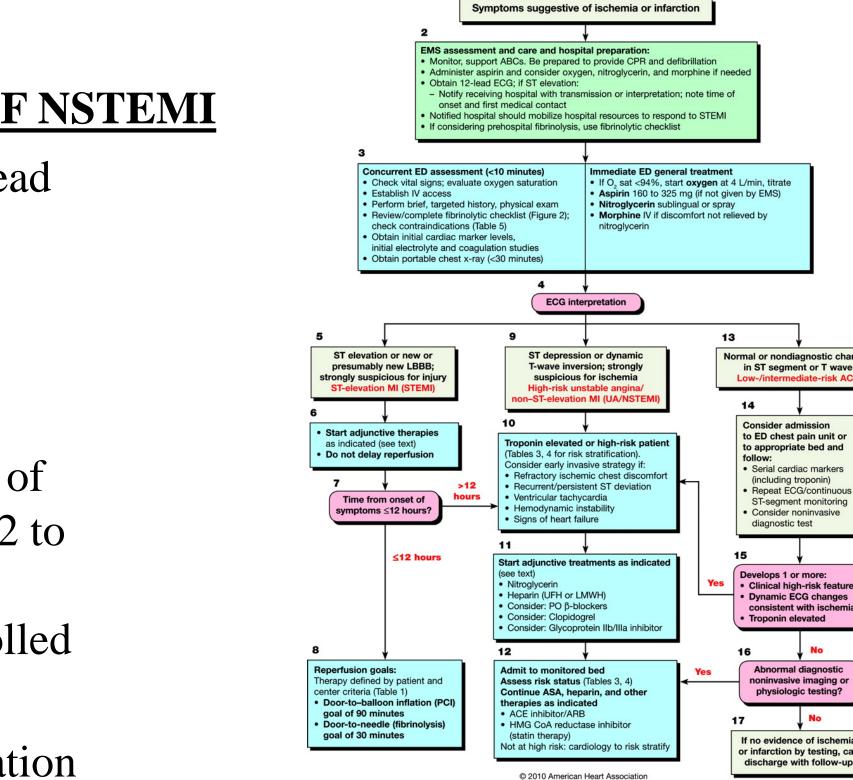
- NSTEMI patients may be monitored by repeating cardiac enzymes, 12-lead ECG's and assessment of symptoms at intervals of four to six hours.<sup>4</sup>
- The Advanced Cardiovascular Life Support® (ACLS) ACS algorithm differentiates patients without ST-segment elevation into high risk and low/intermediate risk.<sup>20</sup>
- Invasive strategy (CAG) shown to be effective in reducing the incidence of myocardial infarction within six to twelve months (RR 0.73, 95% CI 0.62 to 0.86) and three to five years (RR 0.78, 95% CI 0.67 to 0.92). This study included 7,818 chest pain patients from 5 prospective randomized controlled trials.<sup>12</sup>
- Current NSTEMI guidelines require provider discretion for risk stratification and determination of invasive or conservative strategies.<sup>13,16</sup>

## **OUTCOME COMPARISONS OF STEMI AND NSTEMI**

- A 2007 French MI registry study analyzed one-year treatment outcome comparisons of NSTEMI and STEMI patients, where treatment decisions were based on provider discretion. STEMI patients were more likely to receive fibrinolytics (28.9 vs. 0.7%, P<0.0001) and/or PCI (71.0 vs. 51.6%, P<0.0001).<sup>15</sup>
- Demographic statistics from a 2010 Polish observational multicentered registry of 13,441 AMI patients: More comorbid factors in NSTEMI including median age (68 vs. 63), previous MI (23.9 vs. 14.7%), diabetes (27.6 vs. 22.6%), hypertension (70.1 vs. 57.7%) and obesity (20 vs. 17%). Coronary angiography was performed more often in STEMI patients (61.6 vs. 28.7%), fibrinolytics were administered more often to STEMI patients (8.2 vs. 1%) and two-year mortality rates after discharge were lower in STEMI patients (22.9 vs. 26%). Upon discharge, STEMI patients were more likely to receive ACEinhibitors (76.2 vs. 74.5%), aspirin (88.6 vs. 84.8%), thienopyridine (63.5 vs. 33.5%), beta-blockers (80.6 vs. 77.4%) and statins (82.1 vs. 74%). NSTEMI more likely to have two-year MACE (50.6 vs. 46.7%).<sup>18</sup>
- A 2006 study of the CADILLAC trial included 2,082 AMI patients randomized into a 2x2 study where 50% received angioplasty with abciximab and 50% received angioplasty alone. Patients with NSTEMI had higher revascularization rates (21.8 vs. 11.9%) than STEMI patients. One-year mortality rates were similar (3.4% NSTEMI vs. 4.4% STEMI).<sup>5</sup>
- A 2009 retrospective study at the Duke University Medical Center analyzed 4,606 consecutive AMI patients undergoing CAG. Early revascularization was achieved more often in STEMI (74.9 vs. 56%) while adjusted hazard ratios remained similar between STEMI and NSTEMI (0.73 vs. 0.76, 95% CI).<sup>3</sup>
- Long-term outcomes of successful PCI in both STEMI and NSTEMI patients were examined from the PROSPECT (Providing Regional Observations to Study Predictors of Events in the Coronary Tree) study. The international multi-centered registry study followed 697 post-PCI MI patients for 3-4 years to a primary end point of MACE including death, MI or rehospitalization. MACE occurred less frequently in NSTEMI patients than in STEMI patients (19.6 vs. 22.1%).<sup>1</sup>



The 12-lead ECG illustrating potential rior ST-elevation myocardial ominant R-wave in leads V1-V2, in pain, which doctors and paramedics were asked to interpret.<sup>14</sup>



Acute Coronary Syndromes Algorithm - American Heart Association<sup>20</sup>



# patients.

- presentation.
- therapy strategies.

# **Applicability to Clinical Practice**

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## Discussion

Based on the literature reviewed in this study, STEMI patients currently receive more expedient care and more aggressive treatments than NSTEMI

Provider discretion toward risk assessment and necessity of early invasive strategy is required by all of the studied NSTEMI guidelines. The ability of providers to differentiate between STEMI and NSTEMI is necessary for proper application of treatment guidelines, but many discrepancies are common in

• According to the literature reviewed in this study, more favorable outcomes are observed in STEMI patients based on current practices. However, current practices provide more aggressive treatment of STEMI patients than NSTEMI patients. The details involved in comparative PCI outcome studies reveal that NSTEMI patients have similar outcomes to STEMI patients in early invasive

• NSTEMI patients may benefit from the more aggressive STEMI strategy.

Current NSTEMI practices may require ongoing testing which delay definitive treatment from hours to days. This "watchful waiting" approach may be contributing to higher mortality and MACE rates in NSTEMI.

• A more standardized tool may be beneficial to assist in the risk stratification component of treatment determination in NSTEMI.

• Current studies are illustrating statistically that NSTEMI patients are receiving favorable results from invasive treatments such as PCI. Some studies show even more favorable outcomes than in STEMI patients.

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