

REVIEW TOPIC OF THE WEEK

# Transatlantic Comparison of ST-Segment Elevation Myocardial Infarction Guidelines



## Insights From the United States and Europe

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### ABSTRACT

ST-segment elevation myocardial infarction (STEMI) remains a significant global public health concern. Practice guidelines in both the United States and Europe have been major contributors to providing evidence-based care. Rapid advances in contemporary therapies mandate regular and timely updates to guideline recommendations. In the fall of 2012, the European Society of Cardiology published their latest guidelines for the management of STEMI. In 2013 (~3 months later), the American College of Cardiology Foundation and the American Heart Association jointly published their most recent STEMI guideline statements. In this review, we compare the transatlantic guidelines, highlighting differences in their recommendations and the interpretation of evidence addressing STEMI care. (J Am Coll Cardiol 2016;67:216-29)  
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Cardiovascular medicine has witnessed remarkable advances in the care of patients with acute coronary syndromes (ACS). This is no more dramatically evident than in the management of myocardial infarction (MI) and is well captured by the evolution of care guidelines first articulated for MI by the American College of Cardiology Foundation (ACCF)/American Heart Association (AHA) in 1990 (1) and by the European Society of Cardiology (ESC) in 1996 (2). Subsequently, specific guidelines aimed at ST-segment elevation myocardial infarction (STEMI) emerged on both sides of the Atlantic, along with regular updates that culminated in recent major revisions occurring within 3 months of each other (3,4). Our purpose here is to highlight particular areas where differences exist in either emphasis or interpretation and how they influence the recommendations that follow. In undertaking this review, we are conscious that the target audience for the ACCF/AHA guidelines is more homogeneous than the more eclectic audience for the ESC, which

spans a greater diversity of social, economic, and political jurisdictions. In context, we also appreciate that this is a rapidly evolving field, where these recommendations may change on the basis of new evidence forthcoming since their publication (5,6).

Some initial general observations are in order. The 2012 ESC cites 346 references in their 2012 document, whereas the ACCF/AHA cite 656 references (almost double) in their full-text 2013 version. Although both documents use the traditional 3 classes of recommendations and levels of evidence (LOEs), the ACCF/AHA have, for the first time, subdivided the Class III category into those assigned as having *no benefit* versus those with the *potential for harm*. Unlike the ESC, the ACCF/AHA guidelines also specifically integrate the classes of recommendation and levels of evidence in an attempt to gauge both the magnitude of expected benefit and the certainty with which it can be anticipated.

As seen in Figure 1, the Europeans provide a larger number of official guideline recommendations

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(ESC 164 vs. ACCF/AHA 122). Although both sets of guidelines share common themes, as evident in the central panel of **Figure 1**, there are unique characteristics for each, as noted in the margins (3,4). When these recommendations are categorized according to their respective LOE (**Figure 2**), the majority from both sets of guidelines are Class I. However, the minority of these Class I recommendations are supported by LOE A (ACCF/AHA 19% vs. ESC 25%). Although this represents a modest improvement over the 10.7% fraction of LOE: A supporting the Class I STEMI recommendations in the 2004 ACCF/AHA STEMI guidelines (7), it also highlights that further evidence is required in areas of clinical need (8).

### ELECTROCARDIOGRAM DIAGNOSIS

Both guideline committees endorse the ESC/ACCF/AHA Universal Definition of Myocardial Infarction for the diagnosis of STEMI (9,10). However, given the timing of publication (i.e., after the ESC guidelines), the ACCF/AHA understandably uses a more contemporary definition (i.e., the Third Universal Definition of Myocardial Infarction [10]). Hence, the ACCF/AHA guidelines include new ST-segment elevation at the J-point in at least 2 contiguous leads  $\geq 2$  mm (0.2 mV) in men,  $\geq 1.5$  mm (0.15 mV) in women in leads  $V_2$  to  $V_3$ , and/or of  $\geq 1$  mm (0.1 mV) in other contiguous chest leads or the limb leads. The ESC defines the STEMI electrocardiogram (ECG) as J-point elevation in 2 contiguous leads with  $\geq 0.25$  mV (0.25 mm) in men below the age of 40 years,  $\geq 0.2$  mV (0.3 mm) in men over the age of 40 years, or  $\geq 0.15$  mV (0.15 mm) in women in leads  $V_2$  to  $V_3$ , and/or  $\geq 0.1$  mV (0.1 mm) in other leads. The Europeans also strongly advocate the use of right precordial leads ( $V_{3R}$  and  $V_{4R}$ ) for inferior MI to identify right ventricular involvement and posterior chest leads ( $V_7$  to  $V_9$   $\geq 0.05$  mV) in patients with suspected posterior (inferobasal) MI (Class IIa, LOE: C).

Interestingly, due to its infrequent occurrence, the ACCF/AHA guidelines have eliminated new left bundle branch block (LBBB) from the diagnosis of STEMI and opine that LBBB “should not be considered diagnostic of acute MI in isolation” (4). However, the ESC still considers atypical electrocardiogram presentations in STEMI, such as LBBB and ventricular paced rhythm, to be worthy potential prospects.

### EMERGENCY SUPPORTIVE CARE

**Table 1** outlines the recommendations for acute supportive care in patients with STEMI. Although both guidelines advocate compassionate therapies, the ESC provides official recommendations (Class,

LOE), whereas the ACCF/AHA guidelines offer advisory statements about these therapies without recommendations.

**MORPHINE.** The ACCF/AHA guidelines suggest morphine as the choice of analgesic agent (opioid) for STEMI to help alleviate anxiety, reduce the work of breathing (particularly in patients with acute pulmonary edema), and help reduce ventricular loading conditions. The ESC is less specific on the choice of analgesic agent, but recommends the general use of intravenous opioids to help relieve pain (Class I, LOE: C).

**OXYGEN.** Inhaled oxygen is promoted by both organizations; however, the ACCF/AHA guidelines are cautious and suggest supplemental oxygen only for arterial saturations  $< 90\%$  due to the 3-fold increased risk of death suggested by a Cochrane review of the data (11) and an observed increase in coronary vascular resistance with oxygen in acute MI (12). The ESC strongly recommends that supplemental oxygen be administered for hypoxia with saturations  $< 95\%$ , breathlessness, or acute heart failure (Class I, LOC: C).

**ASPIRIN LOAD.** Immediate therapy with aspirin has become standard, given the commensurate benefits observed in the ISIS-2 (Second International Study of Infarct Survival) study (13). In keeping with the oral administration in this trial, the ACCF/AHA guidelines endorse oral administration of aspirin (162- to 325-mg load) in acute MI (Class I, LOE: B). However, the ESC recommends either oral (150 to 300 mg) or intravenous formulation (80 to 150 mg) (Class I, LOE: B). Note that intravenous aspirin is only available in Europe, and hence is not included in the ACCF/AHA guidelines.

### CHOICE OF REPERFUSION STRATEGY

Because rapid recanalization of the infarct-related artery is paramount in STEMI, it understandably takes center stage in both task force recommendations. However, this topic also accentuates key transatlantic differences relating to both the modes and timing of reperfusion (**Table 2, Central Illustration**). The ACCF/AHA guidelines focus on primary percutaneous coronary intervention (PCI) as the leading and preferred mode of reperfusion for patients with STEMI. For patients presenting at a PCI-capable hospital, the recommended first medical contact (FMC)-to-device time is within 90 min. For patients presenting to a non-PCI-capable hospital,

### ABBREVIATIONS AND ACRONYMS

- ACCF** = American College of Cardiology Foundation
- ACS** = acute coronary syndromes
- AHA** = American Heart Association
- DAPT** = dual antiplatelet therapy
- ESC** = European Society of Cardiology
- FMC** = first medical contact
- LOE** = level of evidence
- MI** = myocardial infarction
- PCI** = percutaneous coronary intervention
- STEMI** = ST-segment elevation myocardial infarction
- UFH** = unfractionated heparin

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