Primary PCI with stenting is associated with better outcomes than fibrinolysis. Primary PCI with stenting is associated with a lower rate of composite end point outcomes than PTCA alone. In STENT PAMI, the largest trial, patients assigned to stenting had, at six months, significant reductions in the incidence of angina (11 versus 17 percent), angiographic restenosis (20 versus 34 percent), and the composite end point (13 versus 20 percent) that was primarily due to a reduction in need for target vessel revascularization. [101]. Mortality was not significantly different with stenting (4.2 versus 2.7 percent). There are conflicting data related to the importance of the time from symptom onset to PCI as an important determinant of outcome. At the least, the benefit from primary PCI is less dependent upon the time from symptom onset than is fibrinolysis. Patients seen more than three hours from symptom onset are more likely to do better with primary PCI. The time from hospital arrival to PCI is an important determinant of benefit, with the best outcomes occurring when the time to PCI is ninety minutes or less.

Patients who are transferred to a PCI center may still have better outcomes than those treated with fibrinolysis at the presenting hospital as shown in DANAMI-2 and AIR PAMI. The delay induced by transfer is partially counteracted by the PCI center having time to prepare for the patient’s arrival. Thus, the additional delay should be 60 to 90 minutes although longer delays are common in current practice in the United States. Most of the benefit in these trials was due to a lower rate of reinfarction after PCI, which is unrelated to the time required for transfer.

Primary PCI can be performed in centers without on-site surgical back-up. In the C-PORT trial, patients undergoing primary PCI had a significantly lower incidence of the composite end point (death, recurrent MI, and stroke) at six months (12.4 versus 20 percent for fibrinolysis); the difference in outcome was primarily due to a lower rate of recurrent MI. C-PORT also demonstrated that benefit from primary PCI could be attained in community hospitals that did not offer either on-site surgery or elective PCI.

All hospitals should meet ACC/AHA criteria for primary PCI with or without on-site surgery. The door to balloon time should be less than two hours. In addition to the improvements in patient outcome, there are a number of other advantages to primary PCI:

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Safe treatment of virtually all patients presenting with acute MI, including those with high bleeding risk or cardiogenic shock. The ability to identify patients with severe three vessel coronary disease and/or left main disease for immediate referral for CABG.

Primary PCI should only be performed if emergency CABG is unavailable or the patient is deemed inoperable. However, primary PCI with stenting is an effective therapy for some patients, particularly when associated with cardiogenic shock.

The prevention of unnecessary fibrinolysis in the approximately 5 percent of patients who experience spontaneous reperfusion.

**RECOMMENDATIONS** — In 2004, a task force of the American College of Cardiology/American Heart Association published guidelines for the management of patients with an acute STEMI, including the use of primary PCI. The recommendations that follow are in accord with the ACC/AHA guidelines.

**Candidate evaluation** — Because rapid decision-making is critical in the management of an acute STEMI, the ACC/AHA task force concluded that it is reasonable to initiate the process of evaluation prior to hospital presentation, including:

- Having emergency medical service (EMS) personnel with advanced cardiac life support training perform and evaluate a 12-lead ECG and

  If the ECG shows evidence of an STEMI, having EMS personnel review a “reperfusion checklist” to assess the patient for reperfusion therapy.

The 2004 ACC/AHA task force also recommended to having the decision regarding the choice of initial treatment made by the emergency medicine physician based upon a predetermined, institution-specific, written protocol. It was recommended that immediate cardiology consultation should be available for cases in which the initial diagnosis and treatment plan are unclear or are not covered directly by the agreed-upon protocol. No changes to this approach were made in the 2007 focused update.

**Patient selection for reperfusion** — Patients with chest
pain suggestive of an acute MI and having electrocardiographic evidence of an acute MI manifested by ST elevation (>1 mm in two contiguous leads after nitroglycerin to rule out coronary vasospasm) that are considered to represent ischemia are candidates for primary PCI. Patients with typical and persistent symptoms in the presence of a new or presumably new left bundle branch block or a true posterior MI are also considered eligible.

In patients with a typical history and diagnostic ECG changes, reperfusion therapy should not await the availability of results of cardiac biomarkers. The immediate implementation of reperfusion therapy without awaiting biomarker data was recommended by the ACC/AHA task force and was not changed in the 2007 focused update.

Choice of PCI versus fibrinolysis — Compared to fibrinolysis, primary PCI achieves a higher rate of TIMI 3 flow (more than 90 percent), does not carry the risk of intracranial hemorrhage, and is associated with improved outcomes.

The 2004 ACC/AHA task force gave a class I recommendation to the use of primary PCI for any patient with an acute STEMI who presents within 12 hours of symptom onset and who can undergo the procedure within 90 minutes of presentation or, in patients who present within three hours of symptom onset (the time when fibrinolytic therapy would be most effective; an expected door-to-balloon time minus an expected door-to-needle time of ≤60 minutes. This approach was not changed in the 2007 focused update.

Primary PCI is also generally preferred in patients who present with a symptom duration greater than three hours. On the other hand, fibrinolysis (unless contraindicated) was recommended in patients with an STEMI who present to a facility without the capability for expert primary PCI within 90 minutes. The task force identified specific considerations for choosing primary PCI, including the experience of the person performing the procedure, the timing of the procedure, and the specific clinical setting.

Primary PCI should not be performed in hospitals without onsite cardiac surgery unless they meet specific criteria, including having a proven plan for rapid transport to a cardiac surgery operating room in a nearby hospital and having appropriate hemodynamic support capability for transfer.

Late primary PCI — Registry data suggest that 9 to 31 percent of patients with an STEMI present more than 12 hours after the onset of symptoms. The 2004 ACC/AHA guidelines concluded that it is reasonable to perform primary PCI for patients with onset of symptoms within the prior 12 to 24 hours who have one or more of the following:

- Severe heart failure
- Hemodynamic or electrical instability
- Persistent ischemic symptoms

In contrast, the task force did not recommend primary PCI in stable, asymptomatic patients presenting more than 12 hours after symptom onset. Randomized trials of routine late PCI have shown an improvement in left ventricular function but not in hard clinical end points. The 2007 focused update of the ACC/AHA did not change the approach described above.

Use of fibrinolysis — The ACC/AHA task force recommended the use of fibrinolytic therapy in preference to primary PCI for any patient without contraindications who presents to a facility without the capability for expert, prompt intervention with primary PCI within 90 minutes of first medical contact. This approach was not changed in the 2007 focused update.

Timing is important with fibrinolysis. The task force recommended fibrinolytic therapy for patients without contraindications presenting within 12 hours of onset of symptoms. Although there is no evidence of benefit with later therapy, the task force concluded that it is reasonable to administer fibrinolytic therapy to patients presenting 12 to 24 hours after the onset of symptoms if they have continuing symptoms and persistent ST segment elevation on the ECG.

Procedure — When performed, primary PCI should be limited to the infarct-related artery. Simultaneous stenting of nonculprit lesions is generally not recommended since this approach may be associated with an increased risk of adverse outcomes. One exception may be a patient with severe multivessel disease and persistent shock after PCI of the infarct-related vessel, in which same-procedure catheter-based revascularization (or bypass surgery) may be contemplated to further reduce the ischemic burden.

All patients should receive aspirin (initial dose 162 to 325 mg followed by 75 to 162 mg once a day; the first tablet should be chewed or crushed), a thienopyridine, and a GP IIb/IIIa inhibitor (eptifibatide or abciximab) as soon as possible after diagnosis, and heparin during the procedure. Beta blockers reduce mortality in patients undergoing primary PCI, and should be administered intravenously before PCI as well as orally after the procedure.

A number of other adjunctive therapies may be used in selected patients:

- Insertion of an IABP should be considered in high-risk patients with hemodynamic instability or cardiogenic shock.
- Pretreatment with fibrinolysis is limited to patients in whom primary PCI is likely to be excessively delayed because of local logistic problems or interhospital transfer. Facilitated PCI in which fibrinolytic therapy is given just before planned primary PCI is not recommended because outcomes may be worse.
- There is no clear evidence favoring routine use of either thrombectomy or embolic protection devices to minimize embolization of fragments of plaque (atherosclerotic debris) in patients undergoing primary PCI in native coronary arteries.