



TRANSITION SERIES  
**TOPICS FOR THE EMT**

TOPIC **24**  
Cardiovascular Emergencies:  
Chest Pain and Acute Coronary  
Syndrome

ALWAYS LEARNING

PEARSON



## Objectives

- Discuss the epidemiological profiles of chest pain and ACS.
- Review the pathophysiologic changes that accompany ACS.
- Discuss assessment and strategies for managing a patient with ACS.
- Review cardiac arrest and appropriate arrest management.

**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

**PEARSON**

Discuss objectives.



## Introduction

- ACS refers to any clinical syndrome that adversely affects myocardial activity.
- ACS may be the reason for the call, or an associated finding.
- Due to the dire nature of cardiac events, proper assessment and management are integral to patient survival.

**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

**PEARSON**

Discuss how ACS is an umbrella term for most anything that adversely affects the heart.

It may be the precipitating cause, or an associated finding due to failure of another body system.

It's better to prevent arrest from occurring, rather than trying to stop a failed heart.



# Epidemiology

- 62 million Americans have cardiovascular disease.
- Chest pain occurs in 7-8 million people annually.
- 1.5 million will suffer a heart attack.
- 500,000 will die from a heart attack, with half of them arresting within one hour of onset.

**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

**PEARSON**

Review statistics.

In a more sobering light:

- About every 25 seconds an American will suffer a coronary event
- Every 34 seconds a heart attack will occur
- About once every minute someone will die from sudden cardiac arrest

These statistics are definite indications of the significance of cardiac-related emergencies and underscore the importance of having a thorough knowledge base regarding cardiac emergencies.

# Pathophysiology

- Atherosclerosis
  - Intimal damage to blood vessel
  - Body attempts to repair damage
  - Fatty streaks develop and smooth muscle proliferates over injury site
  - Fibrous caps that form are not stable and may rupture

**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

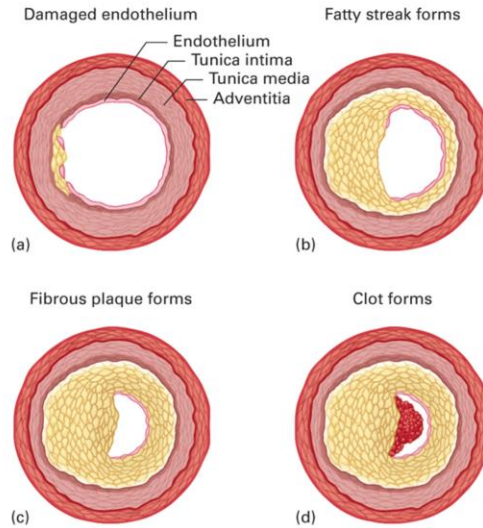
**PEARSON**

Discuss the atherosclerotic changes to a blood vessel that results in lumen deterioration and closing.

Eventually fibrous cap breaks, allowing the clotting mechanism to form a clot there which occludes the blood vessel.

This can happen anywhere in the body, when it occurs to the coronary arteries, it creates an ischemic or infarction of myocardial muscle.

**Figure 24-1** The process of artery occlusion (atherosclerosis): (a) The endothelium (inner wall) of the artery is damaged. (b) Fatty streaks begin to form in the damaged vessel walls. (c) Fibrous plaques form, causing further vessel damage and progressive resistance to blood flow. (d) The plaque deposits begin to ulcerate or rupture; platelets aggregate and adhere to the surface of the ruptured plaque, forming clots that may block the artery.

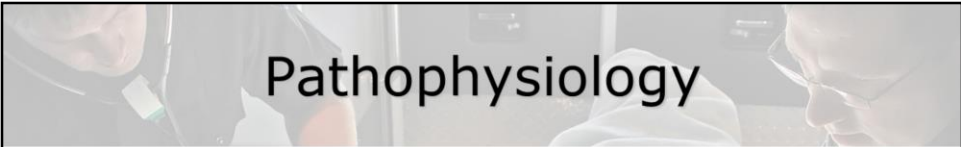


**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

**PEARSON**

Discuss as needed.



# Pathophysiology

- Acute coronary syndrome manifestations
  - Angina (stable and unstable)
  - Myocardial infarction

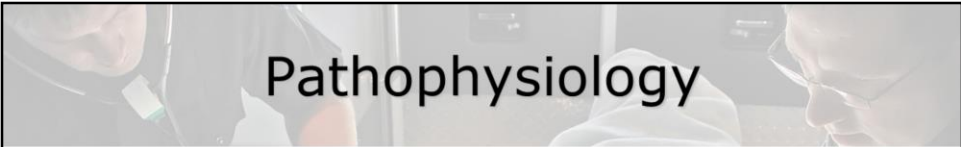
**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

**PEARSON**

Review ACS as it relates to the two common cardiac emergencies:

- Ischemia
- Infarction



# Pathophysiology

- Angina pectoris
  - “Pain in the chest”
  - Increased workload on the heart
  - Insufficient blood flow and oxygen
  - Ischemic cells produce pain

**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

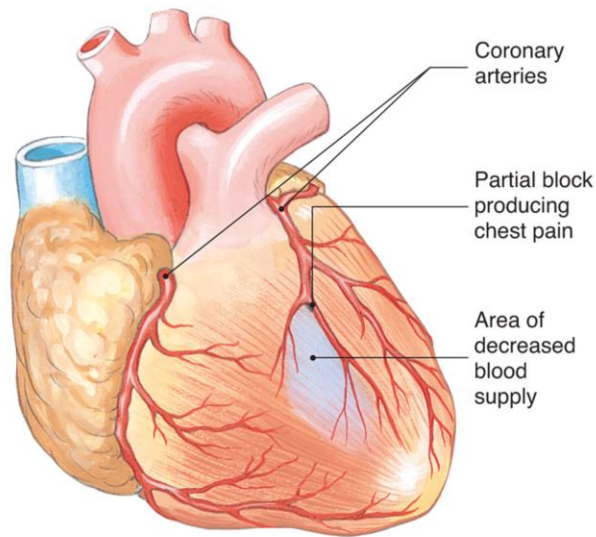
**PEARSON**

Discuss the pathophysiology of oxygen supply and demand mismatch causing chest pain.

If stress on heart is not reduced, or blood flow increased, the ischemic cells may start to die.



**Figure 24-2** Angina pectoris, or chest pain, results when a coronary artery is blocked, depriving an area of the myocardium of oxygen.



**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

**PEARSON**

Discuss the pathophysiology of oxygen supply and demand mismatch causing chest pain.

If stress on heart is not reduced, or blood flow increased, the ischemic cells may start to die.

# Pathophysiology

- Angina pectoris
  - Stable angina
    - Chest pain of a predictable nature
    - Resolution with nitro or rest is also predictable
  - Unstable angina
    - Occurs unexpectedly – not tied to triggers
  - Variant angina (Prinzmetal angina)
    - Coronary artery spasm causes the pain from poor blood flow

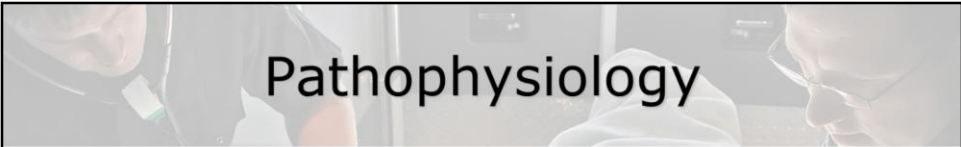
**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

**PEARSON**

Overview and explain as needed the variants of angina:

- Stable—has predictable pattern and resolution
- Unstable—no predictable pattern, harder to resolve
- Variant angina—highly correlated with lethal dysrhythmias, MI, and sudden cardiac death



# Pathophysiology

- Myocardial infarction
  - Commonly from coronary artery occlusion
  - Necrotic core with ischemic borders
  - Weakens heart muscle and can precipitate dysrhythmias

**BRADY**

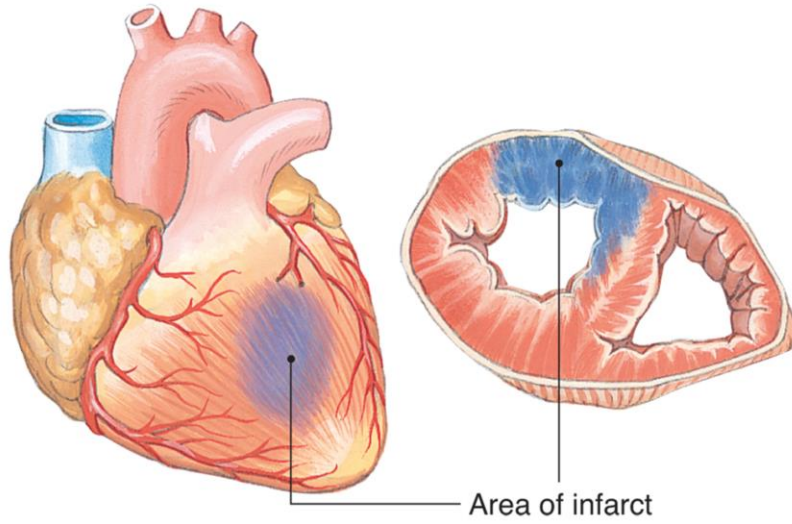
ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

**PEARSON**

Overview and explain as needed the pathophys behind and MI:

- Cellular hypoxia
- Cellular death
- Diminished pumping action of the heart, conduction defects, dysrhythmia formation

**Figure 24-3** (a) Cross section of a myocardial infarction.

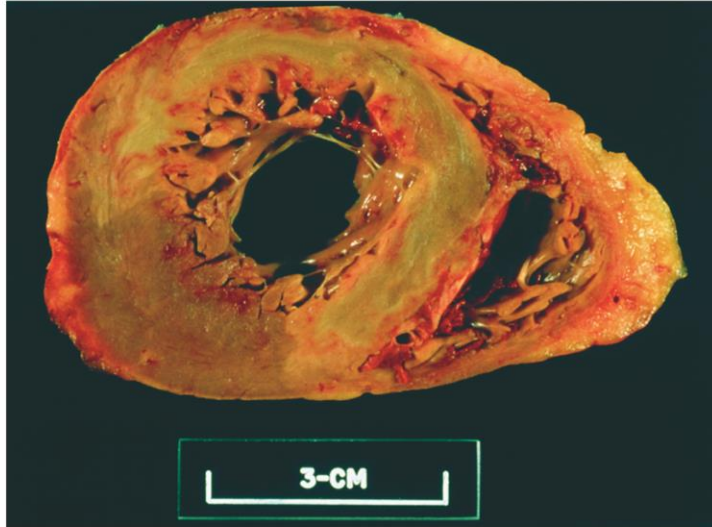


**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

**PEARSON**

**Figure 24-3** (b) A heart with normal and infarcted tissue.



**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

**PEARSON**

# Pathophysiology

- Negative feedback mechanisms
  - Due to pain and drop in cardiac output
  - Rate increases, blood vessels constrict, heart tries to beat harder (sympathetic discharge)

**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

**PEARSON**

These negative feedback mechanisms cause the heart to work harder, thus increasing cardiac output.

The retention of fluid by the kidneys drives up pressure by placing more fluid into the vascular system (explaining the elevated blood pressure and tachycardia seen in many MI patients).

The pain and/or anxiety associated with a myocardial infarction further stimulates the sympathetic nervous system and results in ongoing peripheral systemic vasoconstriction and cardiac stimulation as catecholamines (such as adrenaline, norepinephrine, and dopamine) are released from the adrenal medulla.

**Table 24-1** Effects of Myocardial Infarction on Body Systems

<b>Neurohumoral effects</b>	<ul style="list-style-type: none"><li>• Enhanced sympathetic tone</li><li>• Increased circulating catecholamines</li><li>• Higher levels of angiotensin II and aldosterone</li><li>• Increased arginine vasopressin</li></ul>
<b>Cardiopulmonary effects</b>	<ul style="list-style-type: none"><li>• Tachycardia</li><li>• Dysrhythmias</li><li>• Diminished stroke volume</li><li>• Increased oxygen requirements</li><li>• Pulmonary vascular congestion</li></ul>
<b>Peripheral vascular effects</b>	<ul style="list-style-type: none"><li>• Increased vascular resistance (vasoconstriction)</li><li>• Elevations in blood volume</li><li>• Possible systemic edema</li></ul>

**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

**PEARSON**



## Assessment

- Clinical picture of ischemia and infarction almost identical
- Most classic findings
  - Chest pain
  - Radiation to left arm and jaw
  - Nausea and vomiting

**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

**PEARSON**

Gathering a thorough history and physical exam is the foundation of assessment in patients with suspected myocardial ischemia or infarction.

It is also important for the EMT to note that in some patients, in the absence of diagnostic tests performed by ALS providers or in the emergency department, the clinical picture of ischemia versus infarction may be nearly identical.

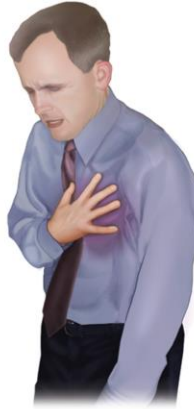
As such, always assume the worst and treat the patient as if the acute coronary event with chest pain is actually an infarction.



**Figure 24-4** Both myocardial infarction and less serious angina can present symptoms of severe chest pain. Treat all cases of chest pain as cardiac emergencies.

**DISTINGUISHING ANGINA PECTORIS FROM MYOCARDIAL INFARCTION**

	<b>Angina Pectoris</b>	<b>Myocardial Infarction</b>
Location of Discomfort	Substernal or across chest	Same
Radiation of Discomfort	Neck, jaw, arms, back, shoulders	Same
Nature of Discomfort	Dull or heavy discomfort with a pressure or squeezing sensation	Same, but maybe more intense
Duration	Usually 2 to 15 minutes, subsides after activity stops	Lasts longer than 10 minutes
Other symptoms	Usually none	Perspiration, pale gray color, nausea, weakness, dizziness, lightheadedness
Precipitating Factors	Extremes in weather, exertion, stress, meals	Often none
Factors Giving Relief	Stopping physical activity, reducing stress, nitroglycerin	Nitroglycerin may give incomplete or no relief



**TABLE 24-2** Symptoms in Women with Cardiac Ischemia or Infarction

- “Classical” findings (not necessarily *common* findings)
  - Dull substernal chest pain or discomfort
  - Dyspnea or respiratory distress
  - Nausea, vomiting
  - Diaphoresis
- “Nonclassical” or “atypical” findings (not necessarily *uncommon* findings)
  - Neck ache
  - Pressure in the chest
  - Pains in the back, breast, or upper abdomen
  - Tingling of the fingers
  - Unexplained fatigue or weight gain (water weight gain)
  - Insomnia

**Table 24-3** Special Considerations in Geriatric Cardiac Events

<b>History of diabetes mellitus</b>	A geriatric patient with diabetes has long-term damage to the nerve endings in the body. This causes the typical pain from an MI to be perceived poorly, if at all, by the diabetic patient. Therefore, the diabetic patient experiencing an MI may complain only of respiratory distress or dizziness when standing, or even excessive weakness and dyspnea on exertion. It is important for the EMT to identify the patient with diabetes as potentially having an acute coronary event and to treat him appropriately. Contact ALS early, follow your local protocol, and ascertain whether additional or alternative therapies are desired by medical direction.
<b>History of trauma</b>	If the geriatric patient is a trauma patient, there must be a high index of suspicion for cardiac involvement as well. Geriatric patients who are traumatized can slip quickly into cardiac arrest and do not respond well to typical interventions. Geriatric patients with head trauma, chest trauma, abdominal trauma, or extremity trauma with severe bleeding are especially susceptible to cardiac arrest.
<b>History of asthma</b>	If a patient with a history of asthma goes into cardiac arrest, the cause may be acute bronchoconstriction that led to hypoxemia, acidosis, and cardiac arrest. Until the bronchoconstriction is reversed, the patient will not regain a pulse or start to breathe again. Early intercept or backup by an ALS unit will allow the administration of medications that may help reverse this condition.
<b>History of COPD</b>	Elderly patients commonly have some form of COPD (emphysema or chronic bronchitis). The arrest may have been caused by an exacerbation of the COPD, which led to hypoxemia, acidosis, and then arrest. ALS backup is needed during the resuscitation of this patient. Remember also that COPD disorders can weaken the lung tissue and cause the development of a pneumothorax and collapse of the lung. (This too may precipitate a cardiac arrest.) Be alert for the presence or the development of a pneumothorax during positive pressure ventilation, which may cause a bleb on the lung tissue to rupture.

**BRADY**



## Emergency Medical Care

- Ensure an open airway
- Provide oxygen (high flow)
- Administer 160-325 mg aspirin
- Assist in administration of nitroglycerin
- Position the patient
- Arrange for ALS backup or intercept
- Ensure rapid and smooth transport to ED

**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

**PEARSON**

The treatment for the patient with angina pectoris or MI is geared toward:

- Ensuring patient comfort
- Improving oxygenation to the myocardium
- Diminishing enlargement of the injured area
- Preserving normotension

Remember also that ischemia and infarction may at times be impossible for the EMT to delineate in the field.



## Case Study

You respond to the home of a 64-year-old male patient with chest pain. Upon arrival, you find the patient sitting on a chair, grasping at his chest. He looks scared and keeps saying, “My chest hurts so bad, please, please help.”

**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

**PEARSON**

Discuss presentation.



## Case Study

- Scene Size-Up
  - Standard precautions taken
  - Single white male patient, 150 kg weight
  - NOI is chest pain
  - Entry and egress from home will be straight forward
  - ALS also dual dispatched, still 10 minutes out

**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

**PEARSON**

Discuss presentation.



## Case Study

- What are some concerns you have based on the scene size-up?

**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

**PEARSON**

From the limited information thus far, the patient seems to have an intact airway, and is breathing adequately enough to support speech.

The patient must have a pulse and blood pressure as if they are conscious.

The greatest concern regards what type of event the patient is experiencing that is causing chest pain.

Although it could be an MI or ischemia, it could also be:

- A spontaneous pneumo
- Pleuritis
- A lung pathology
- An aortic dissection
- Even a GI disturbance



## Case Study

- Primary Assessment Findings
  - Scene is secured
  - Pain is “9” on 1-10 scale
  - Airway patent and breathing is adequate
  - Chest excursion normal, inspiratory crackles heard
  - Central and peripheral pulse present
  - Patient states he already took 2 of his nitro pills without relief

**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

PEARSON

Discuss as needed.





## Case Study

- Is this patient a high or low priority? Why?
- What are the life threats to this patient?
- What emergency care should you provide based on the primary assessment findings?

**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

**PEARSON**

Although this patient has an intact airway, breathing, and circulatory components—they should still be categorized as potentially unstable due to the possibility of sudden cardiac arrest.

The life threat to this patient immediately is possible cardiac arrest.

As of right now, the EMT could administer high-flow oxygen and prepare the aspirin for administration after the SAMPLE history is complete (to avoid duplication of meds and to ensure the patient is not allergic to the med).



## Case Study

The patient further adds that the pain started while he was just watching TV. Although he has had angina before, it was never this strong and it always responded to one dose of nitro prescribed by his doctor.

**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

**PEARSON**

Discuss case progression.



## Case Study

- Medical History
  - Hypertension and angina (denies MI)
- Medications
  - Norvasc and nitro
- Allergies
  - Sulfa drugs

**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

**PEARSON**

Discuss case progression.



## Case Study

- Pertinent Secondary Assessment Findings
  - Pupils equal and reactive to light
  - Membranes hydrated
  - Airway patent and breathing adequate
  - Central and peripheral perfusion good
  - Inspiratory crackles still noted
  - Slight nausea, no vomiting

**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

**PEARSON**

Discuss case progression.



## Case Study

- Pertinent Secondary Assessment Findings
  - JVD present at 45-degree angle
  - SpO<sub>2</sub> is 95% on room air, 97% with oxygen
  - Chest pain characteristics still the same
  - Heart rate 113 and irregular, resps 18, B/P 156/90

**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

**PEARSON**

Discuss case progression.



## Case Study

- What is your field impression at this time?
- What would be the next steps in management you would provide to the patient?

**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

**PEARSON**

Given the presentation, the EMT should lean towards a patient having an MI rather than ischemic episode since the pain is worse than what is characteristic, and that the nitro did not have any effect.

The next step for management would include the ongoing administration of oxygen.

The patient should also receive baby aspirin (four 80mg chewable tablets), and after receiving proper medical control, the EMT can help with the administration of the patient's nitro.



## Case Study

- Care provided:
  - Patient placed on the cot in semi-Fowler position
  - Pulse ox maintained (99%-100%)
  - Oxygen administered via NRB mask
  - Patient given 324 mg of aspirin
  - After consulting with the ED, nitroglycerin sublingual (0.4 mg) administered

**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

**PEARSON**

Discuss as needed.



## Case Study

- For each of the following interventions, explain the expected outcome of the intervention:
  - Placing patient in position of comfort
  - Applying high-flow oxygen
  - Administering baby aspirin
  - Administering sublingual nitro

**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

**PEARSON**

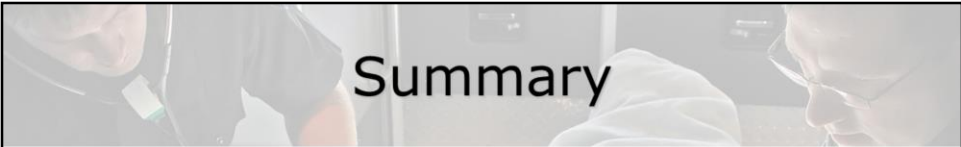
Placing the patient in a position of comfort will at least make them more comfortable, which hopefully will contribute to a drop in the sympathetic discharge. Plus, it makes it easier to breathe.

High-flow oxygen is designed to increase the on loading of RBC with oxygen to help assure the greatest amount of oxygen is reaching the ischemic or infarcting tissues of the myocardium. This will hopefully lessen the size of the injury.

Baby aspirin is used to help thin the blood and prevent it from clotting so readily. This is also hoped to help limit the amount of coronary occlusion and afford better myocardial tissue perfusion.

Nitroglycerin is used for coronary artery vasodilation effects (although it also vasodilates the periphery). With increased blood flow the myocardial, coupled with higher oxygen saturation, the outcome is hoped to be less myocardial damage.





## Summary

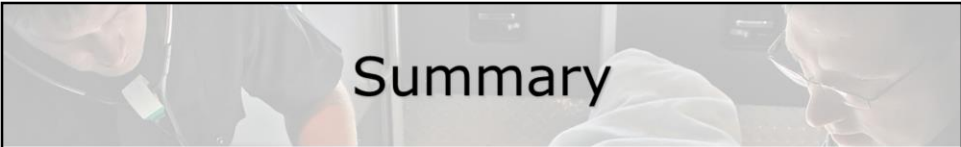
- Acute coronary syndromes (angina or infarction) can become life-threatening emergencies in moments.
- The EMT should remain attentive to the patient's condition and any changes in their complaints.

**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

**PEARSON**

Discuss as needed.



## Summary

- Ongoing deterioration suggests infarction, so summoning ALS on each call is warranted.

**BRADY**

ALWAYS LEARNING *Transition Series: Topics for the EMT*  
Joseph J. Mistovich • Daniel Limmer

**PEARSON**

Discuss as needed.