HARVARD MEDICAL SCHOOL
TEACHING HOSPITAL

Management of Common Cardiac Conditions

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Objectives

1. **Recognize and evaluate coronary artery disease.**

2. **Recognize and evaluate heart failure.**

3. **Recognize and evaluate cardiac arrhythmias.**

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Question #1

Which of the following statements regarding the prevalence of ischemic heart disease is correct?

A. Responsible for ~25% of all deaths globally.
B. Responsible for ~50% of all deaths globally.
C. Responsible for ~60% of all deaths globally.
D. Responsible for ~70% of all deaths globally.

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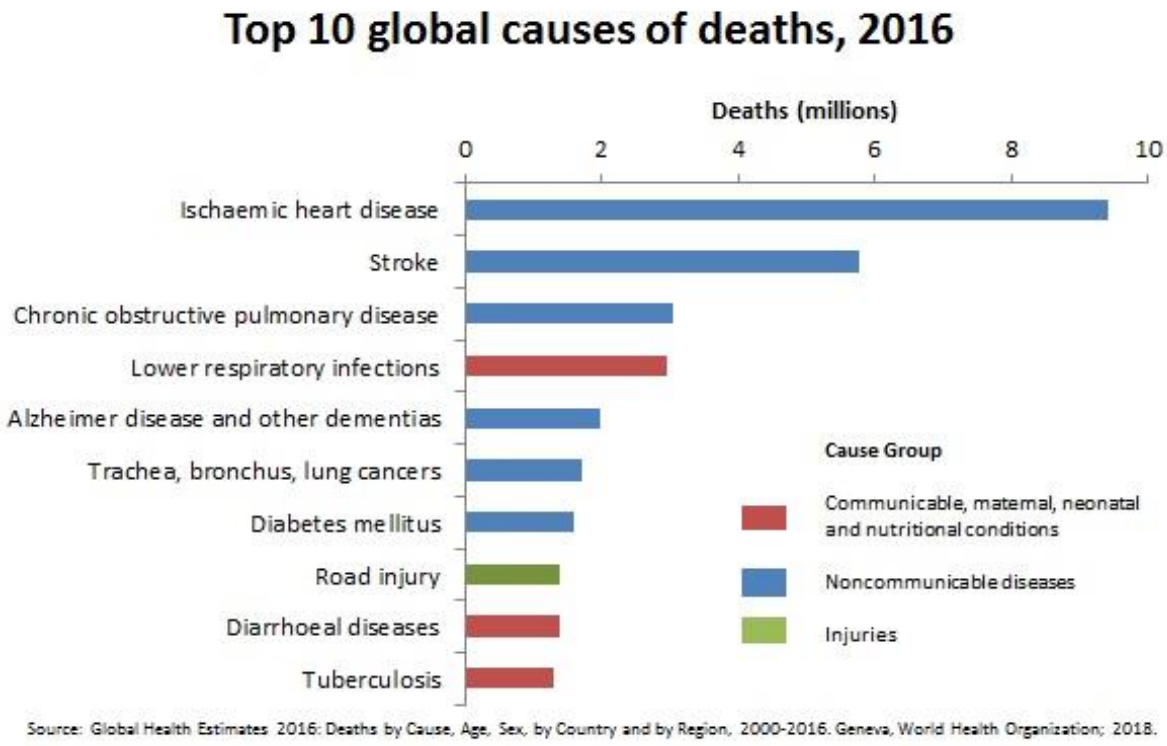
Ischemic Heart Disease: Scope of the Problem



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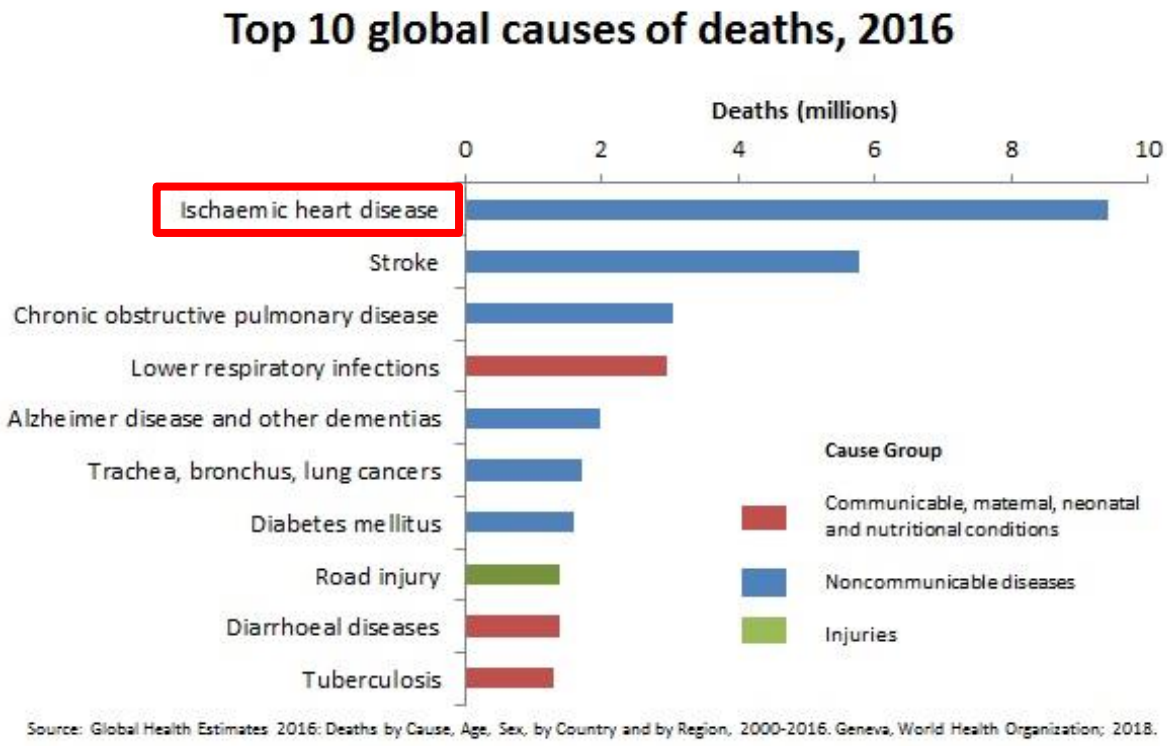
Ischemic Heart Disease: Scope of the Problem



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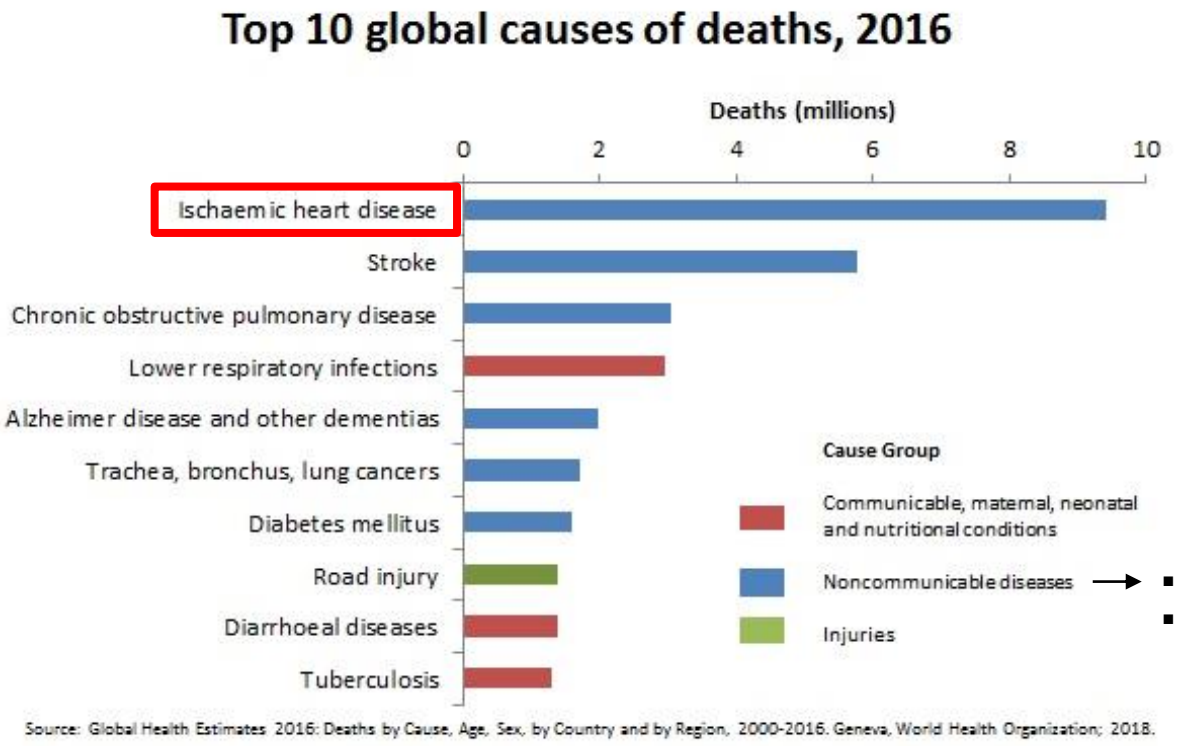
Ischemic Heart Disease: Scope of the Problem



- 71% of all deaths globally
- Low-income countries most affected

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Case Presentation

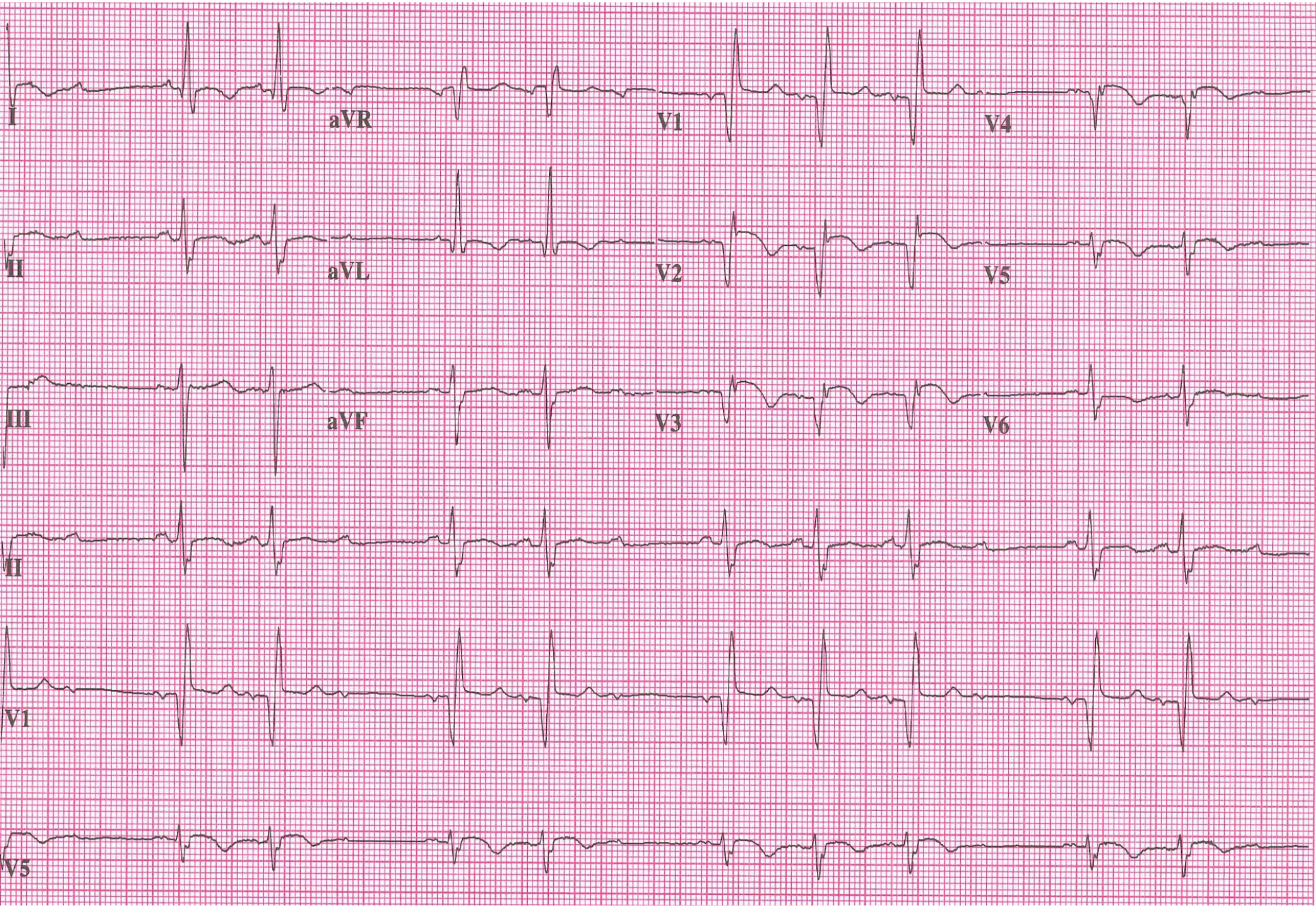
74-year-old man with multiple cardiac risk factors, no documented CAD. Reports SSCP for 6 hours, not clearly exertional. One episode of nausea and vomiting in ED.

BP: 90/60 HR: 78 (SR) RR: 14 O2sat: 90% RA

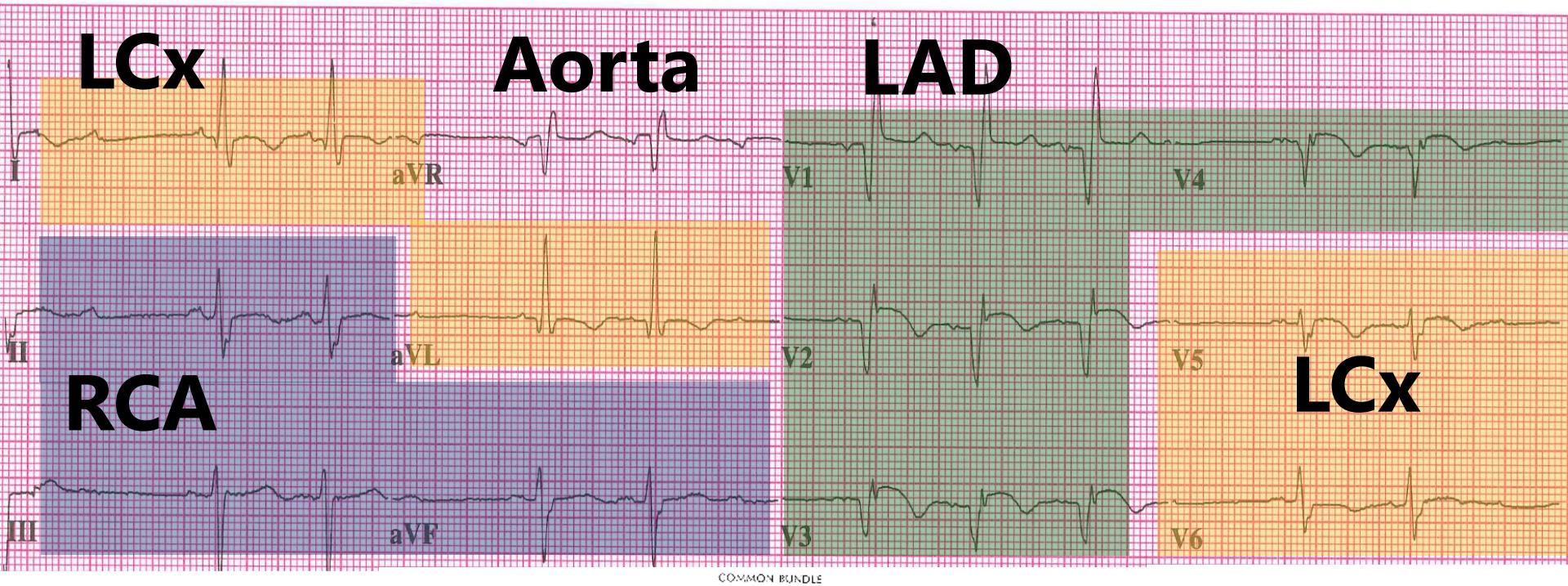
Neck exam: JVP at 9cm

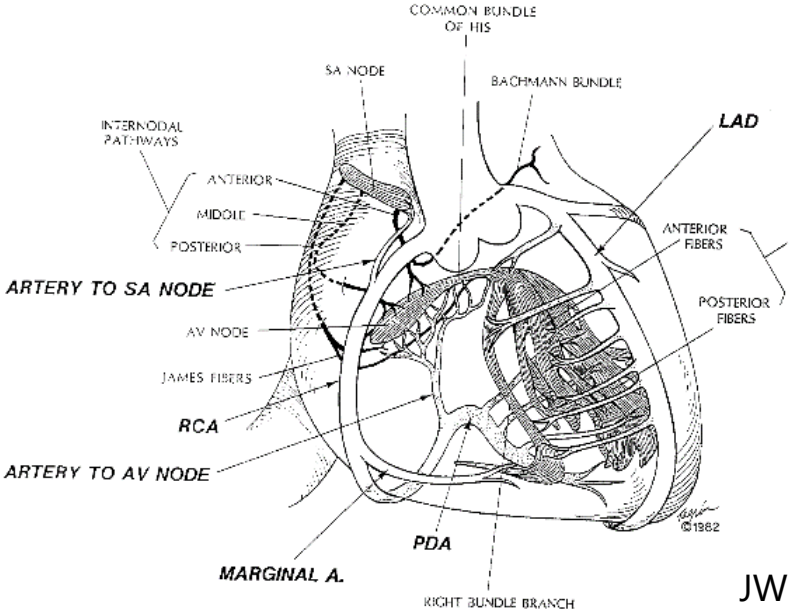
Lung exam: crackles over lower 2/3 of lungs

Cardiac exam: Reg S1S2, +S3


I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
II
V1
V5

Clinical Case: ECG





JW Harthorne

Question #2

What is the most appropriate assessment of myocardial perfusion in a patient presenting with STEMI?

A. CT angiography of the coronary arteries
B. Dobutamine stress echocardiogram
C. Exercise stress test
D. Cardiac catheterization

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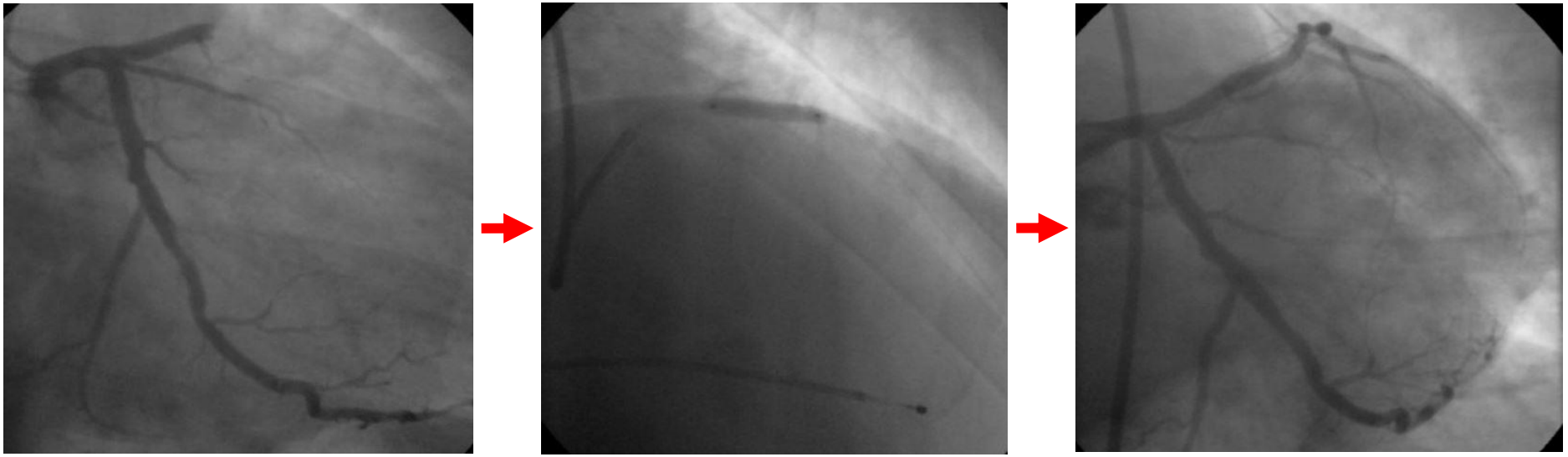
ST Elevation MI: Medical Emergency

Cardiac catheterization was performed:



Single culprit lesion responsible for localized ST elevations.
Treated with Percutaneous Coronary Intervention (PCI)

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STEMI

Cardiac catheterization is indicated in STEMI management:

- Identify culprit lesion, revascularize (PCI, CABG)

After revascularization (if appropriate):

- Initiate medical management
  - Aspirin and possibly other anti-platelet agents
  - Anti-hypertensives
  - Statin

Case Presentation

HPI:

74-year-old man with multiple cardiac risk factors, no documented CAD. Reports to office for routine visit. Reports progressive exertional dyspnea.

PMH:

HTN

DM2

BMI 37

Exam:

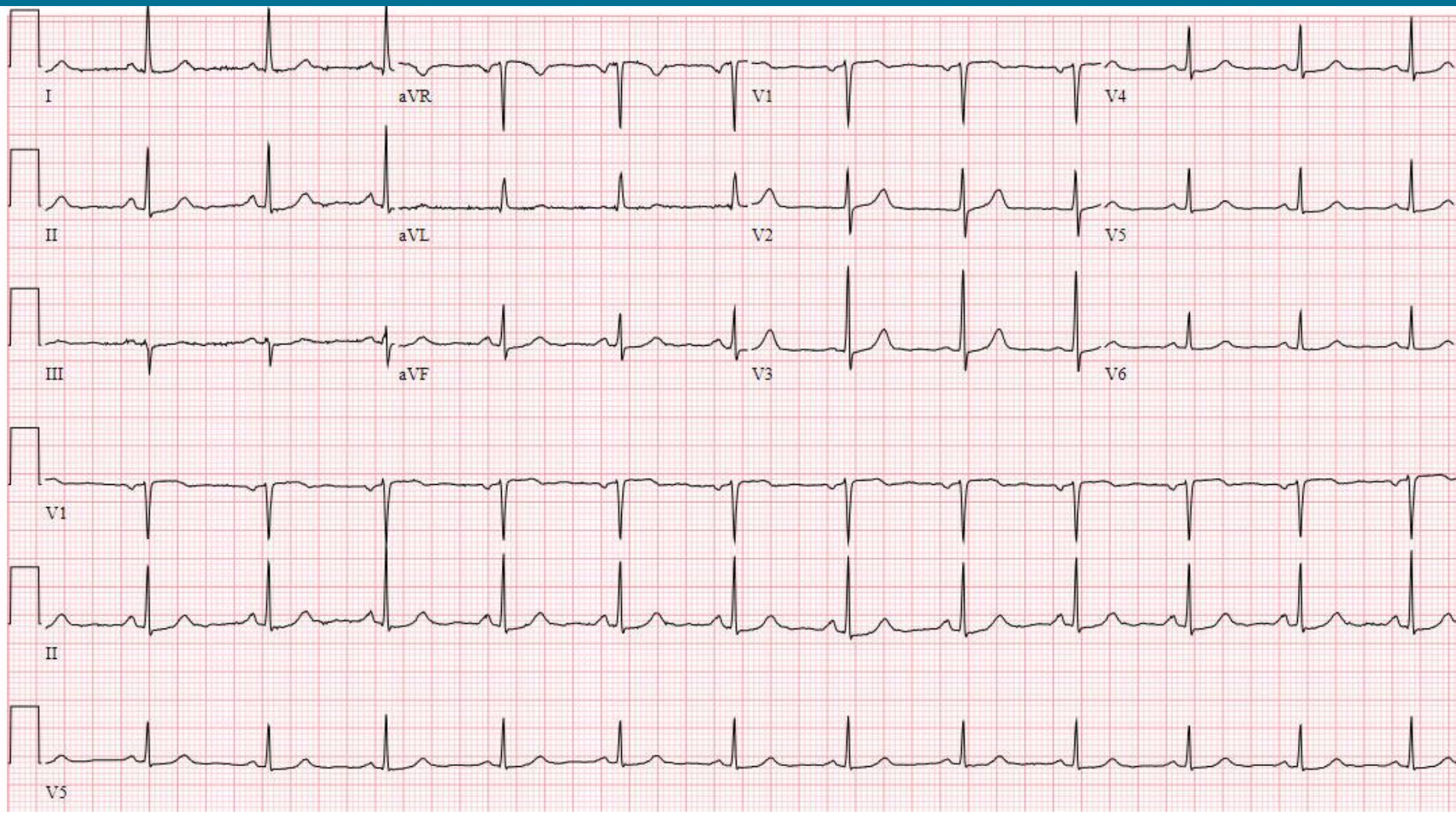
BP: 135/88 HR: 78 (SR) RR: 14 O2sat: 99% RA

Neck exam: JVP at 9cm

Lung exam: clear throughout both lung fields, good air movement

Cardiac exam: Reg S1S2, no S3S4, no rubs or murmurs.

ECG



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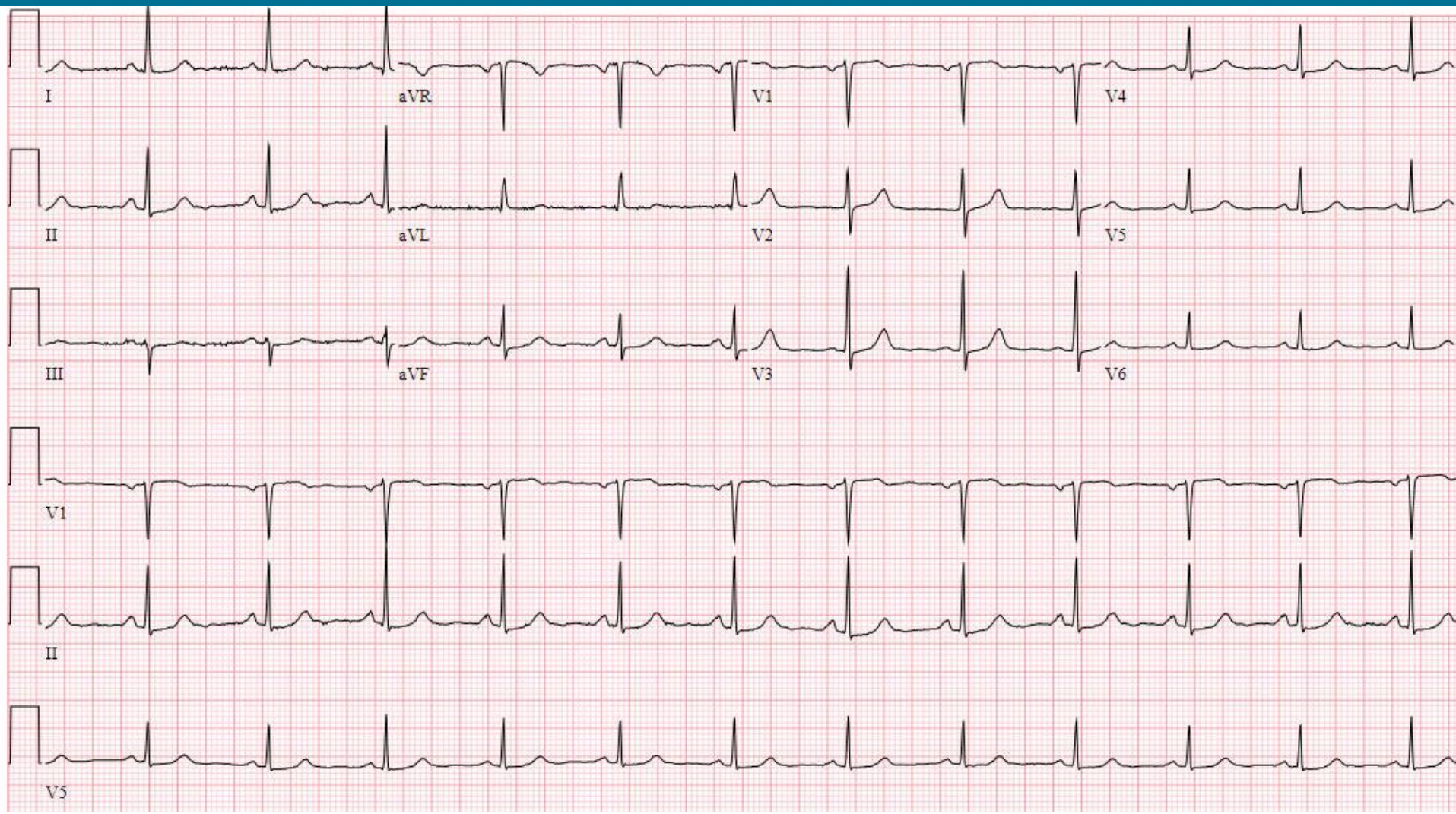
Non-Specific ST Segment / T Wave Abnormalities



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Question #3

What is the most appropriate type of stress test to perform in an ambulatory patient with typical angina symptoms and non-specific ST segment and/or T wave abnormalities on ECG?

A. Exercise stress test, ECG only.
B. Exercise stress test with imaging.
C. Pharmacologic stress test (e.g., adenosine) with imaging.
D. Cardiac CT angiogram.

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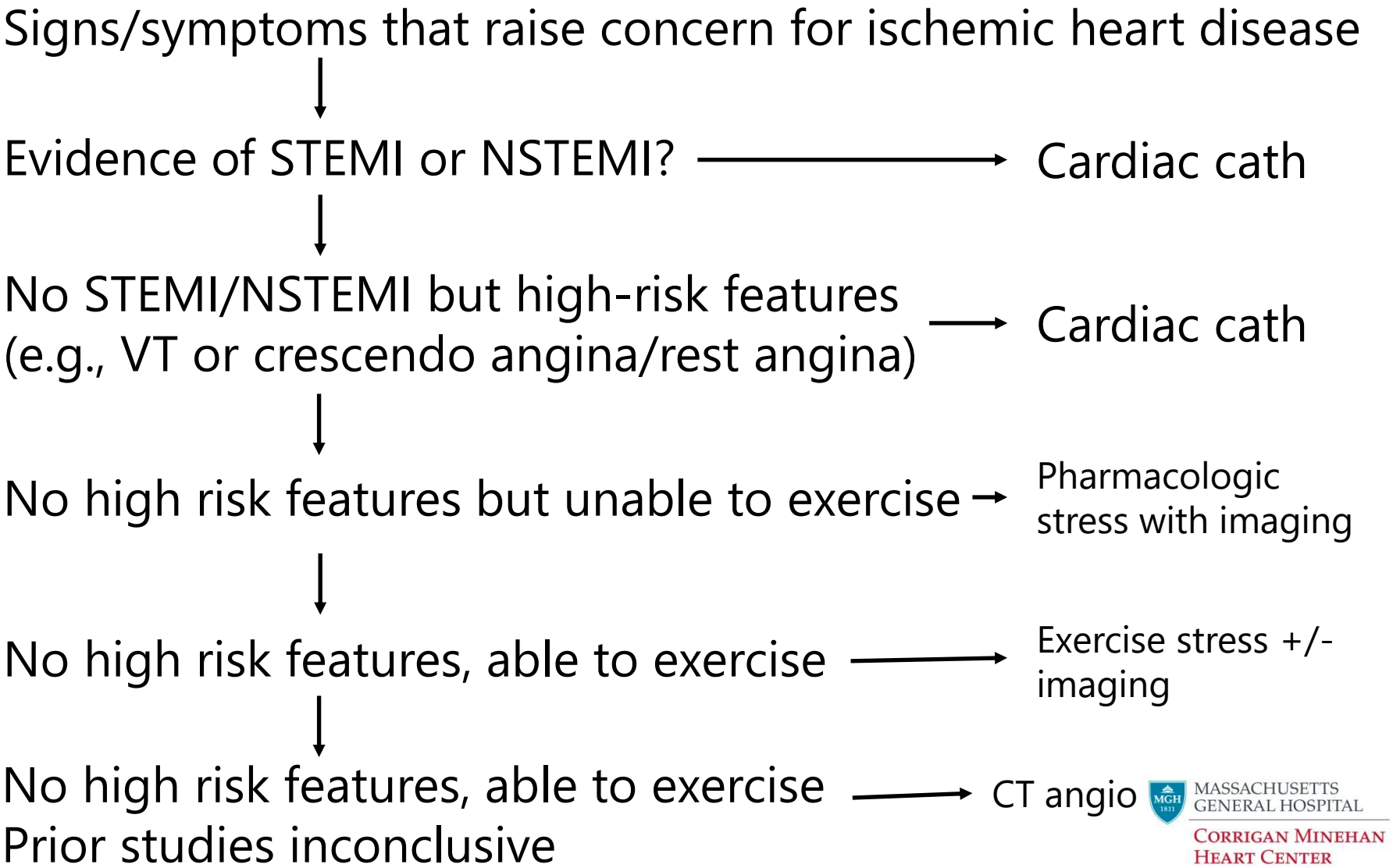
Noninvasive Testing for Cardiac Ischemia



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Objectives

1. Recognize and evaluate coronary artery disease.

2. Recognize and evaluate heart failure.

3. Recognize and evaluate cardiac arrhythmias.

Case Presentation

62 year old man with CAD and history of AMI 3 years ago (treated with PCI). Now reporting progressive exertional dyspnea over the past 9 months. Associated with 15 pound weight gain (no change in diet) and lower leg swelling. Occasional difficulty in sleeping flat, often sleeps with 1-2 pillows.

Exam:

VS normal

Pulm: fine crackles

Card Reg S1S2 +S3

Extr: +3 edema to knee bilaterally

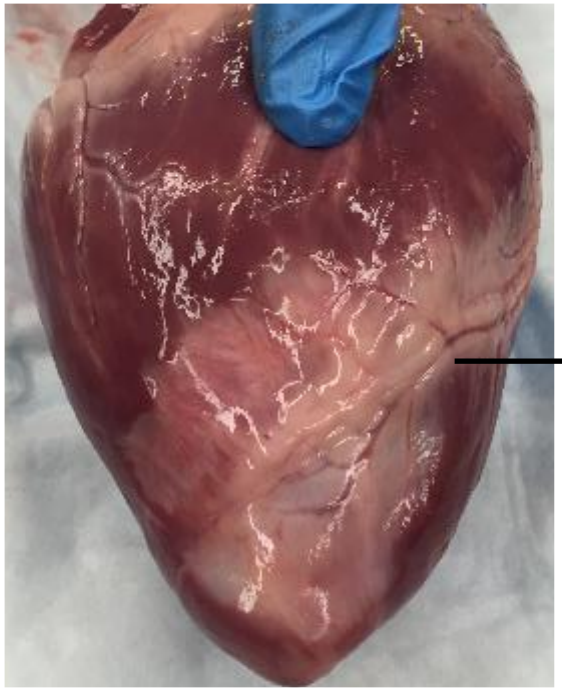
Case Presentation

CXR: patchy infiltrates bilaterally

Lab work: cardiac biomarkers negative

Echocardiogram: LVEF 38%, no valvular disease

Myocardial Infarction Results in Scar Formation



Ruptured atherosclerotic plaque in the coronary artery leads to blockage of blood flow

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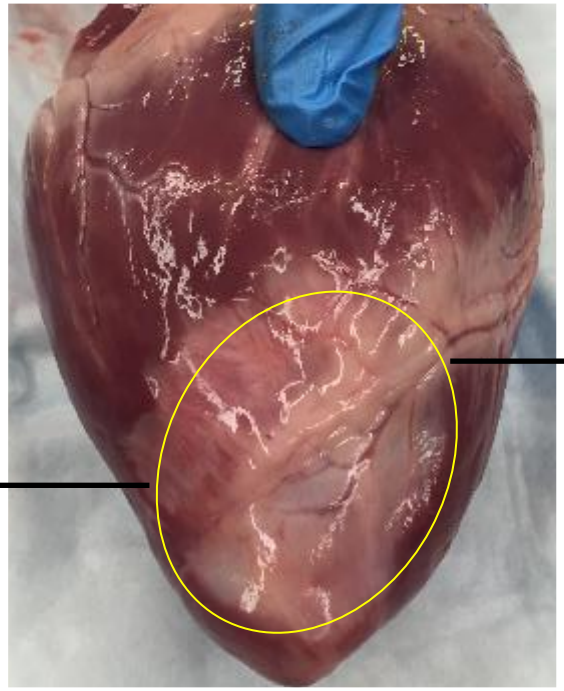
Myocardial Infarction Results in Scar Formation



Ruptured atherosclerotic plaque in the coronary artery leads to blockage of blood flow

Interrupted blood supply leads to scar formation

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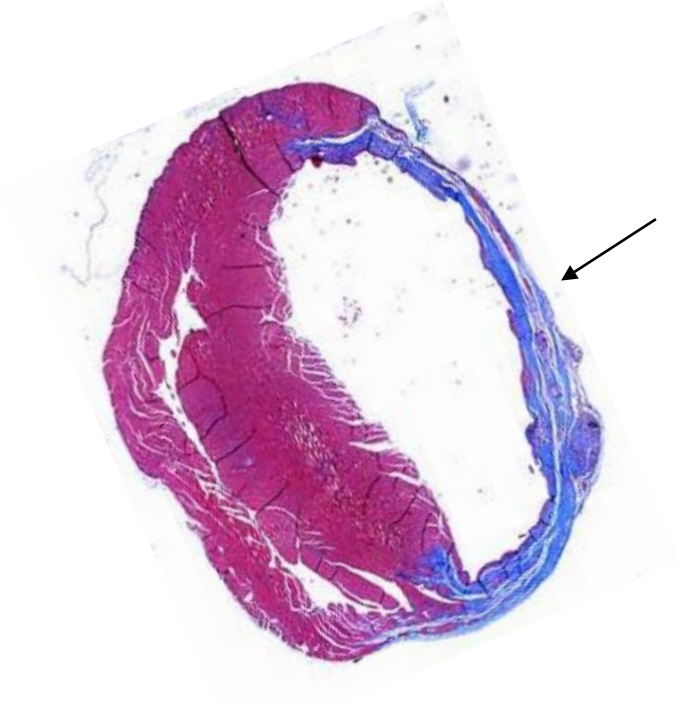
Scar Formation after Myocardial Infarction

Native heart



Post-Infarction

Scar does not contract, leading to decline in cardiac pumping function and heart failure

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Heart Failure

- **Clinical diagnosis**
  - NT proBNP testing
  - Echocardiography
- **Epidemiology**
  - 64 million people affected
  - Incidence increases with age
- **Etiology**
  - Ischemic heart disease
  - Non-ischemic heart disease (toxins, hereditary)

Recognizing Signs and Symptoms of Heart Failure

- Know who is at risk
- Watch for key symptoms
- Take action

Objectives

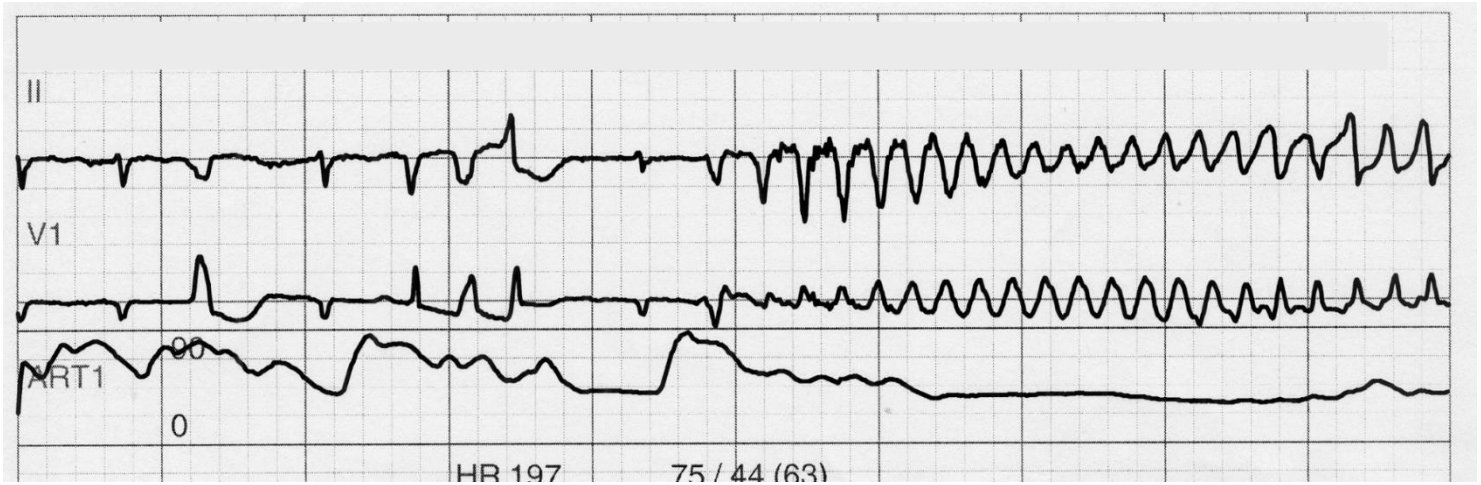
1. **Recognize and evaluate coronary artery disease.**

2. **Recognize and evaluate heart failure.**

3. **Recognize and evaluate cardiac arrhythmias – emphasis on risk factors for sudden cardiac death.**

Sudden Cardiac Arrest (SCA)

Definition: sudden cessation in cardiac activity with hemodynamic collapse, typically due to VT/VF but could also be caused by bradycardia



Question #4

Which of the following statements regarding the frequency of sudden cardiac arrest events is correct:

- 0.5% of total population 7% of all deaths
- 1% of total population, 15% of all deaths
- 2% of total population, 17% of all deaths
- 2.5% of total population, 20% of all deaths

Question #4

Which of the following statements regarding the frequency of sudden cardiac arrest events is correct:

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- 1% of total population, 15% of all deaths
- 2% of total population, 17% of all deaths
- 2.5% of total population, 20% of all deaths

Case Presentation

- 45-year-old man with known CAD, prior MI, is evaluated for dyspnea on exertion (consistent with NYHA Class II). No presyncope or syncope. Stress test reveals a fixed inferior perfusion abnormality that was noted previously, cardiac cath reveals an occluded RCA with left-to-right collaterals (also known). Echocardiogram revealed LVEF 35%, normal chamber size and wall thickness. ECG revealed normal QT interval. No other relevant history or exposures.

Question #5

Which of the following statements regarding the next step in the management of this patient is most correct:

A. Proceed with ICD implantation without further testing.

B. Perform invasive EP study to determine need for ICD.

C. Initiate anti-arrhythmic drug therapy.

D. Neither medical therapy nor ICD implantation are indicated.

Question #5

Which of the following statements regarding the next step in the management of this patient is most correct:

A. Proceed with ICD implantation without further testing.

B. Perform invasive EP study to determine need for ICD.

C. Initiate anti-arrhythmic drug therapy.

D. Neither medical therapy nor ICD implantation are indicated.

Impact of Sudden Cardiac Arrest

- Approximately 1% of the population is affected by a cardiac arrest event each year.
- SCA is responsible for 15% of all deaths.
- Risk factors: heart disease, age, male sex.
- Up to 40% SCA non-arrhythmic in origin (e.g., neuro).
- Up to 10% SCA in patients 18 years or younger.

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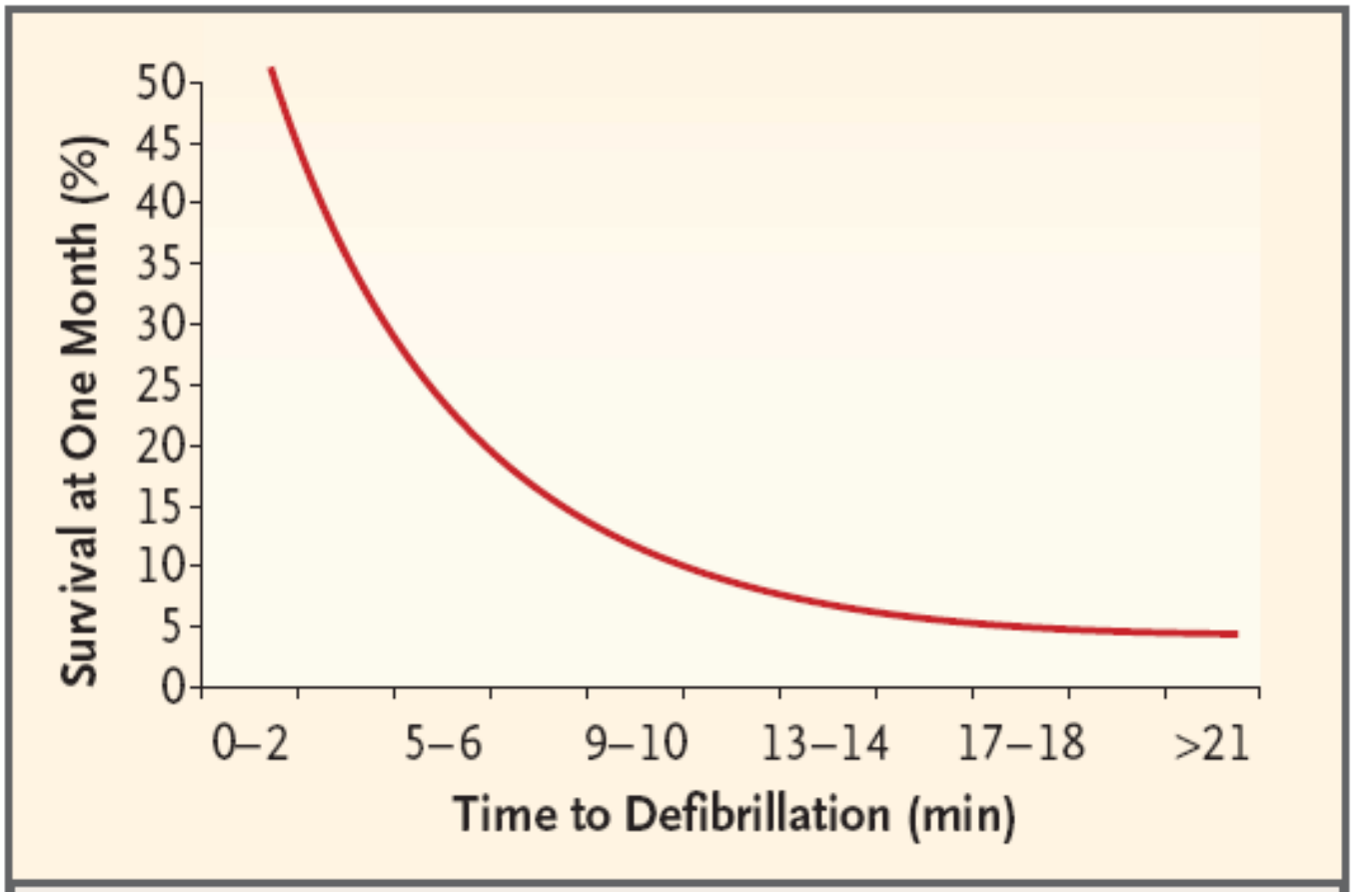
Rapid Treatment of Sudden Cardiac Arrest is Essential for Survival



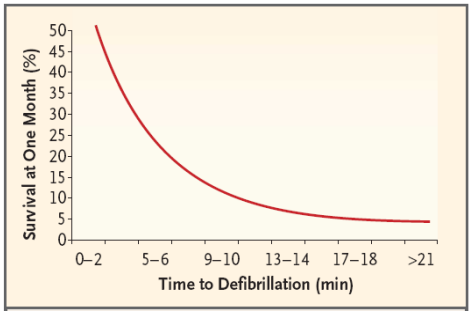
Callans et al., NEJM 2004

1-year recurrence up to 40%

Sudden Cardiac Arrest: Opportunities to Help

Community awareness – regognize/treat SCA

- 7 out of 10 sudden cardiac death events occur in the home.



- Several interventions have proven effective:
  - Bystander CPR training (3-fold survival benefit)
  - Utilization of and automated external defibrillator (AED)

CALL·PUSH·SHOCK

www.CallPushShock.org

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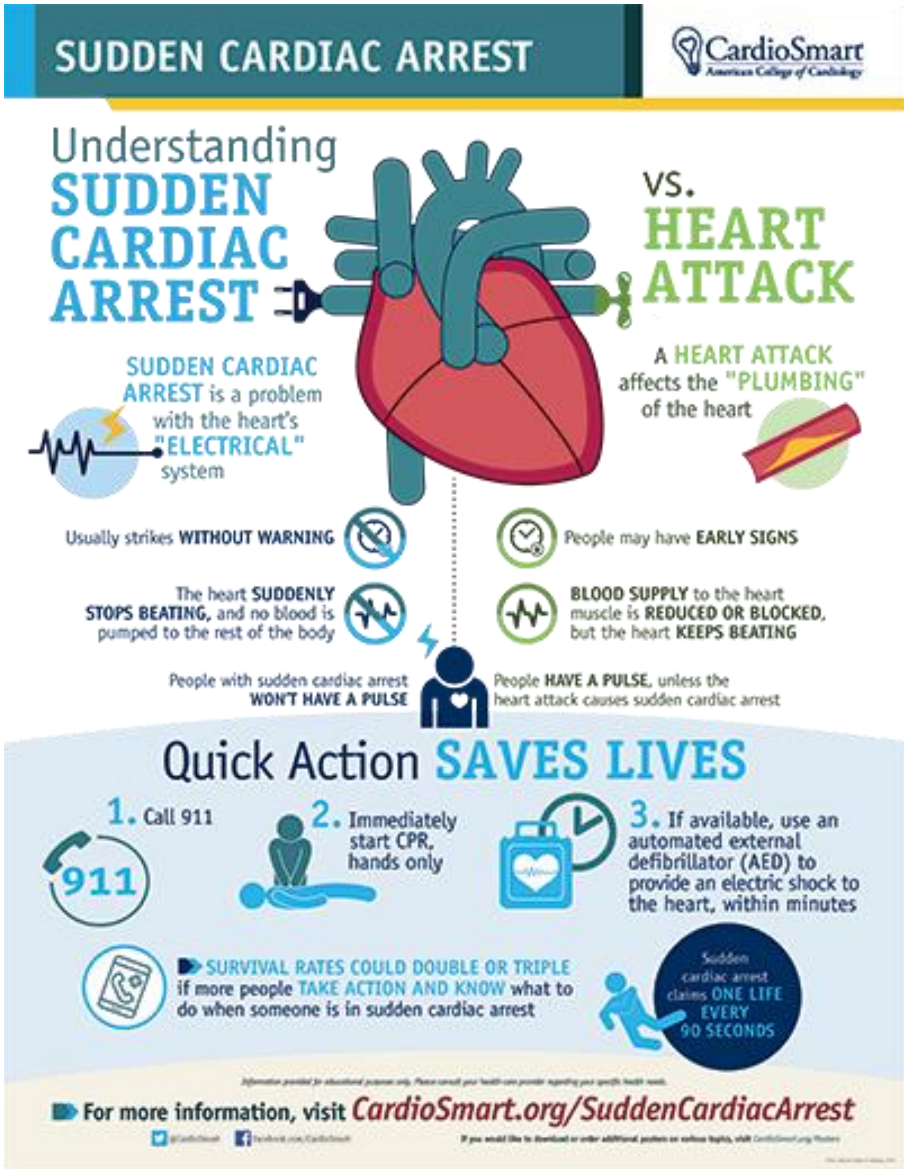
Patient Outreach to Improve Awareness



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Many Lives Saved by Rapid Response to SCA

SCA events at athletic events demonstrate the effectiveness of trained personnel and appropriate equipment (AED)

- Damar Hamlin
- Christian Eriksen

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Impact of Antiarrhythmic Drugs on Sudden Cardiac Arrest

- Class I and Class III antiarrhythmic drugs increase mortality in the absence of an ICD, amiodarone is neutral
  - CAST (flecainide, encainide)
  - SWORD (sotalol)
  - CAMIAT, EMIAT (amiodarone)

- Antiarrhythmics can decrease the frequency of ICD shocks

Assessment of SCA Risk: Who Qualifies for ICD Implant?

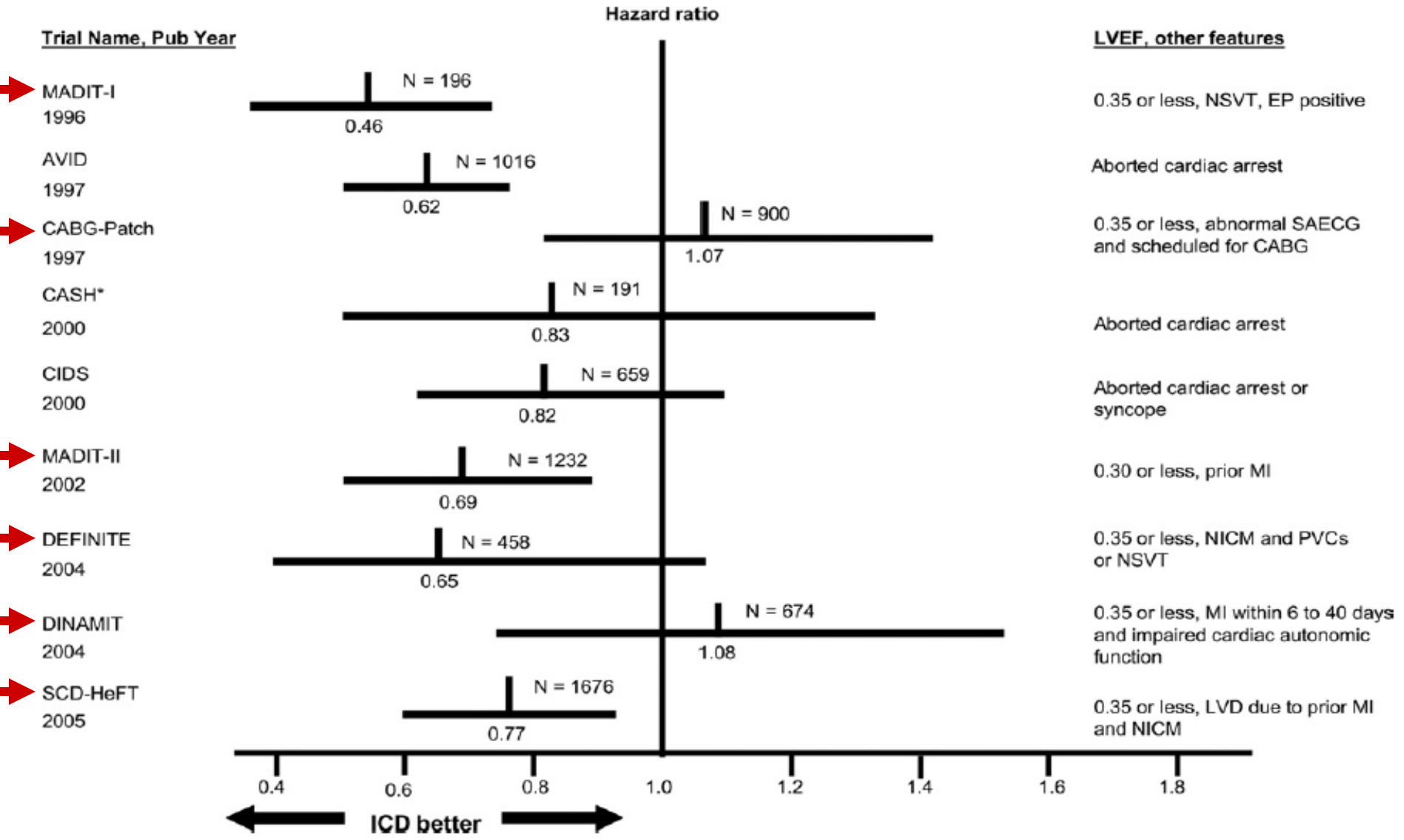
- **Secondary Prevention**
  - Prior cardiac arrest (unless the insult/substrate is *fully* reversible)

- **Primary Prevention**
  - Identified populations of patients without prior SCD who are at elevated risk for SCD

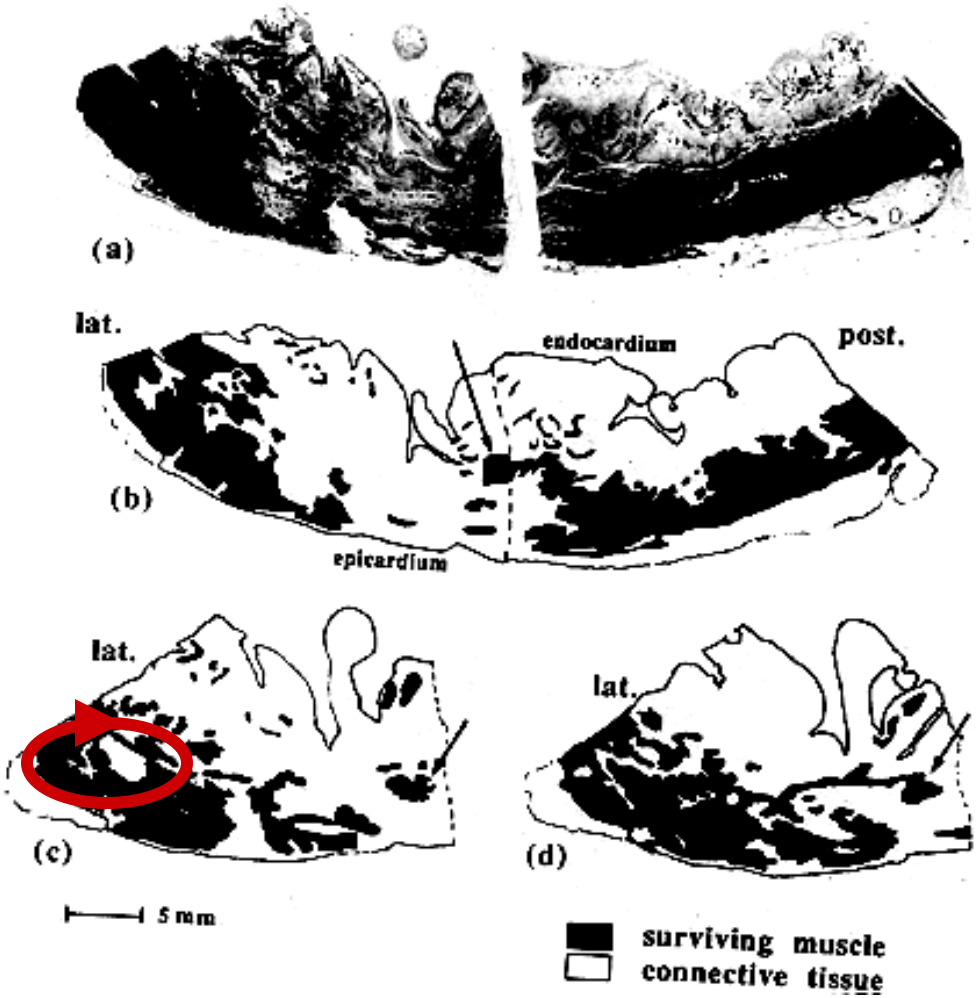
Secondary Prevention of SCA: Impact of ICD Implant

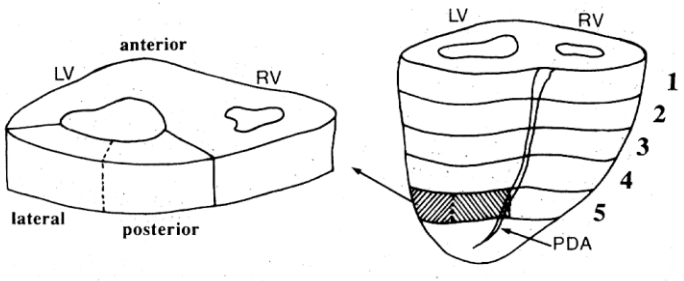
Trial	# Patients	Therapy	Drug event rate	Principal finding
AVID	1,016 (81% CAD)	ICD vs. amiodarone, sotalol	17.7%	Mortality 39% decrease with ICD (P<0.02)
CASH	349 (73% CAD)	ICD vs. amio, propafenone, beta blocker	9.8%	Mortality 30% decrease with ICD (P 0.047)
CIDS	659 (82% CAD)	ICD vs. amiodarone	8.3%	Mortality 19% decrease with ICD (P 0.072)

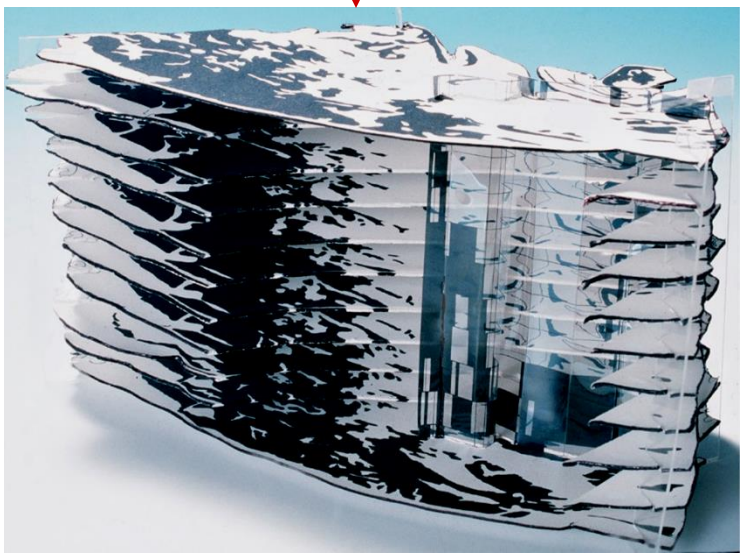
Primary Prevention of SCA: Impact of ICD Implant



Substrate for Ventricular Arrhythmias: Who is at Risk?







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SCD Secondary Prevention: Recommendations for ICD Implant

- Class I
  - Survivors of VF arrest or hemodynamically unstable VT after evaluation to exclude any completely reversible causes (level of evidence A)
  - Structural heart disease and spontaneous, sustained VT (level of evidence B)
  - Syncope of undetermined origin with clinically relevant, hemodynamically significant sustained VT or VF induced at electrophysiological study

    (level of evidence B)

SCD Primary Prevention: Recommendations for ICD Implant

- Class I
  - Ischemic CM with LVEF ≤ 35%, MI > 40 days prior, NYHA Class II or III (level of evidence A)
  - Ischemic CM with LVEF ≤ 40%, nonsustained VT and inducible VF or sustained VT at electrophysiology study (level of evidence B)
  - Non-ischemic CM with LVEF ≤ 35%, NYHA Class II or III (level of evidence A)

Conclusions – Sudden Cardiac Arrest

1. SCA is a common cause of mortality
2. Prevention of SCA (screening for at-risk patients, treating risk factors) is necessary
3. Community awareness regarding SCA and CPR/AED training can improve outcomes
4. Defibrillator implant indications:

    Secondary prevention – SCA no reversible cause

    Primary prevention – LVEF ≤ 35%, NYHA Class II


Thank you
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