

Introduction to CCU

“Patients & Equipment”

CCU

- **CCU** = Coronary Care Unit
- A hospital ward specialized in the care of patients with heart attack, acute coronary syndrome, decompensated heart failure, serious arrhythmia or other cardiac conditions that require continuous monitoring and treatment

CCU

- Acute Coronary Care Units
 - CCU (Coronary Care Unit)
 - ACCU (Acute Coronary Care Unit)
 - CCCU (Critical Coronary Care Unit)
- Intermediate Coronary Care Units
 - ICCU (Intermediate Coronary Care Unit)
 - SCCU (Subacute Coronary Care Unit)
 - PCCU (Progressive care unit)

CCU Vs ICU

(Coronary care unit Vs Intensive care unit)

- Staff
 - Cardiologist Vs Intensivinist/Pulmonologist
 - Specialized medical staffs
- Patients
- Equipment
 - **CCU** : Telemetry, Invasive hemodynamic monitoring, Intraaortic balloon pump, bedside echo, temporary pacemaker, pericardial tapping setetc.
 - **ICU** : Respirator; Advanced respiration monitoring, hemodialysis facility, etc.
- Variation of ICU : Neuro ICU, Trauma ICU, Burn unit, etc.

Patients in CCU

- Coronary disease patients
 - **Acute coronary syndrome (ACS)**
 - ST elevated MI (STEMI)
 - Non-ST elevated MI (NSTEMI)
 - Unstable angina, High risk
 - Sudden Cardiac Death
 - **Chronic CAD with active cardiac problem**
 - Heart failure
 - Arrhythmic problem
 - Etc.
 - **Post PCI/ post CABG**

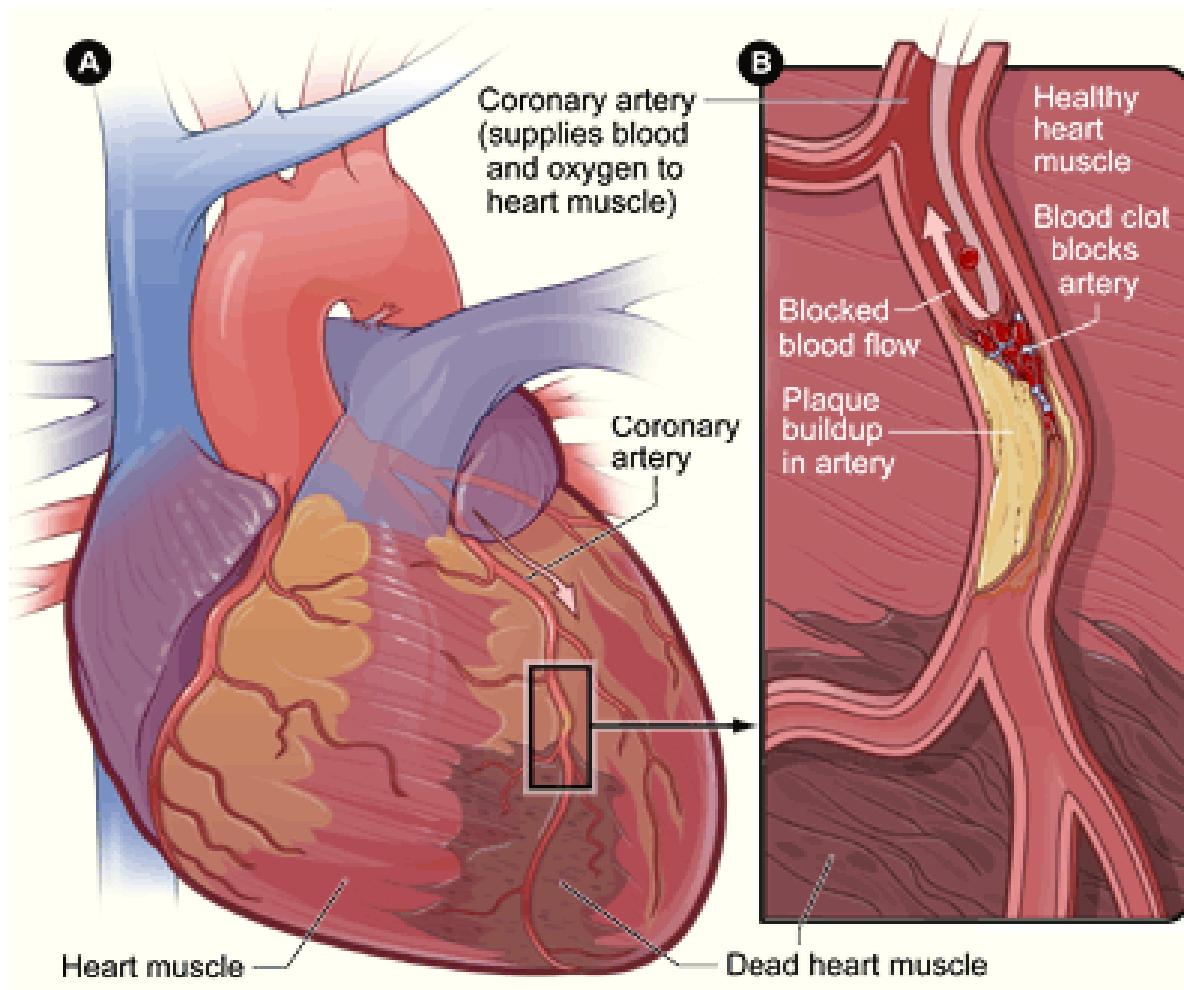
Patients in CCU

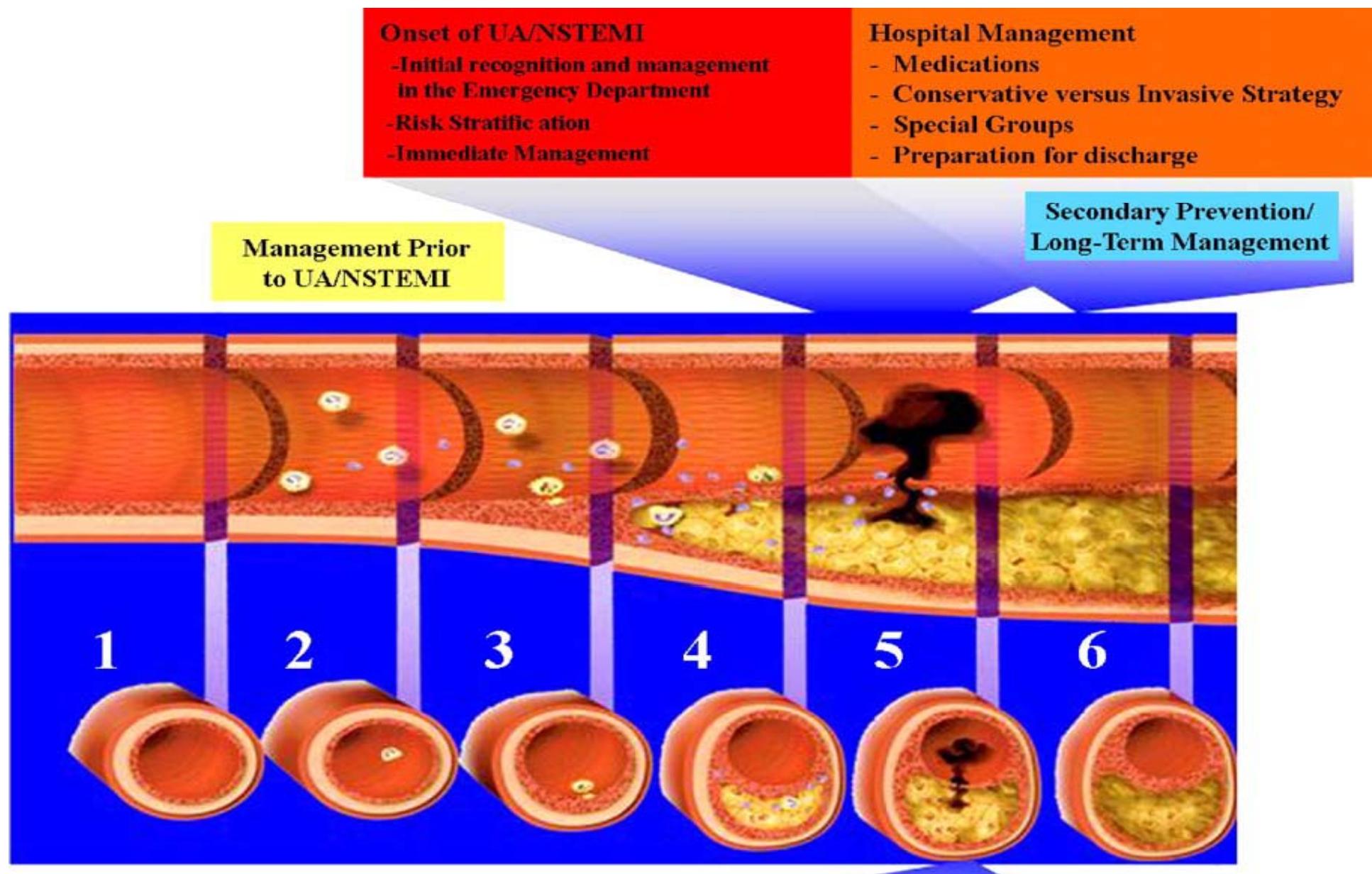
- Non-coronary patients (1)
 - Heart failure
 - Cardiomyopathy : Ischemic & non-ischemic
 - Severe valvular heart disease
 - Diastolic heart failure
 - Cardiogenic shock
 - MI
 - Acute valve regurgitation
 - End stage cardiomyopathy

Patients in CCU

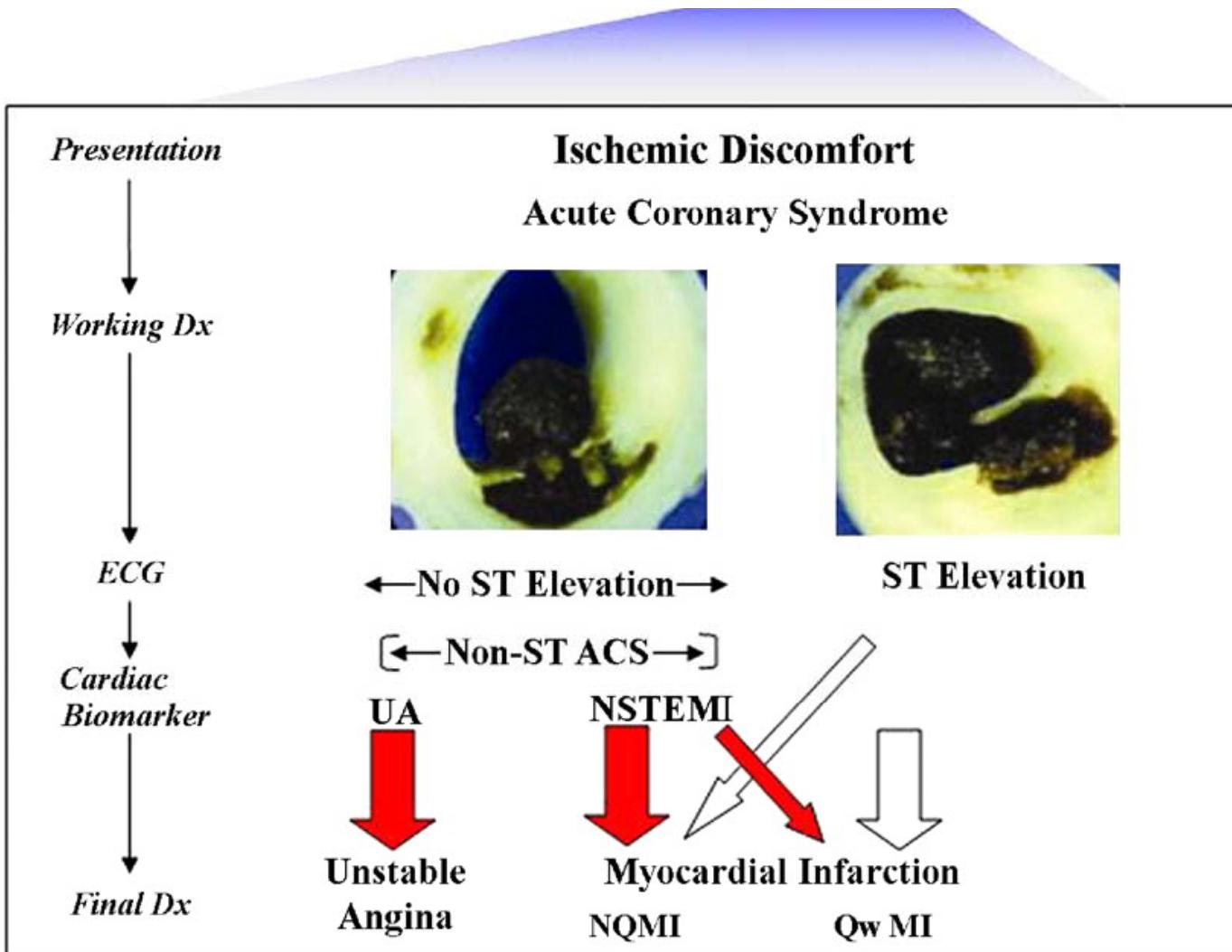
- Non-coronary patients(2)
 - Serious arrhythmia: primary or secondary
 - Tachyarrhythmia : Ventricular arrhythmia, AF with rapid ventricular response, SVT
 - Bradyarrhythmia : high-grade conduction disturbance, sinus pause/arrest
 - Miscellaneous
 - Cardiac tamponade, Infective endocarditis with complication, aortic dissection, etc
 - Post non-coronary intervention / surgery or post-op care for cardiac patients

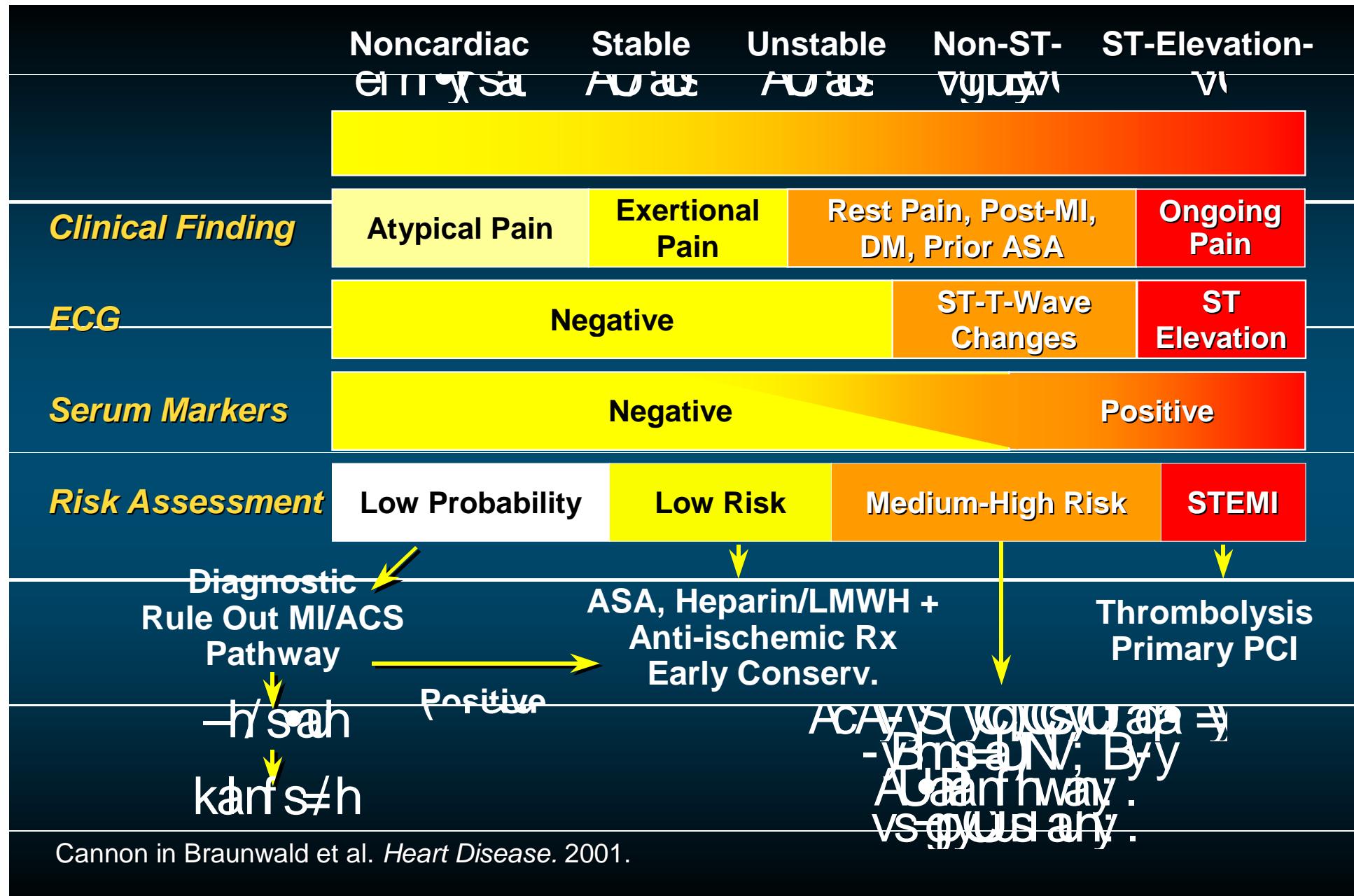
Coronary artery disease (CAD)





Acute coronary syndrome





Acute myocardial infarction (AMI)

- ST elevated MI
- Non-ST elevated MI

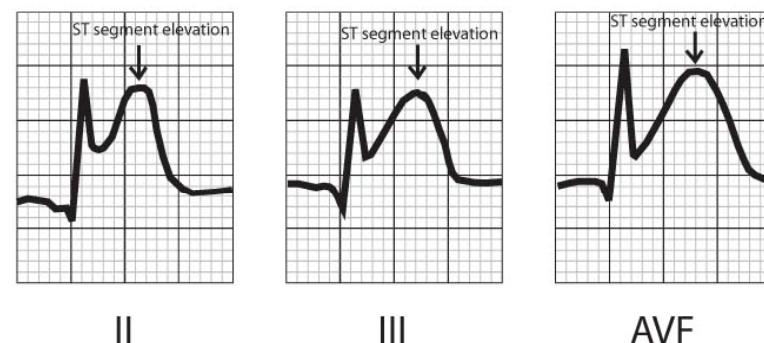
ST Elevated MI (STEMI)

Diagnosis

- Ongoing chest pain
- ECG
- Cardiac enzymes

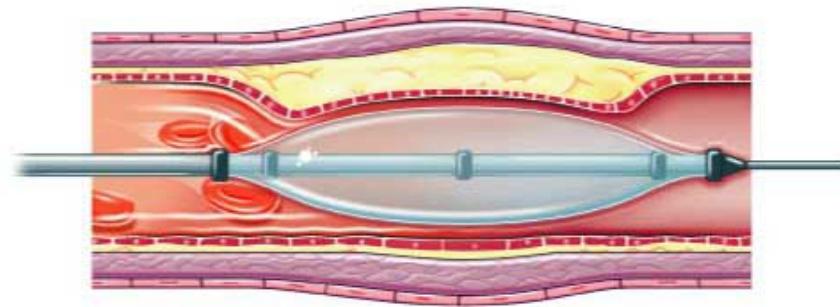


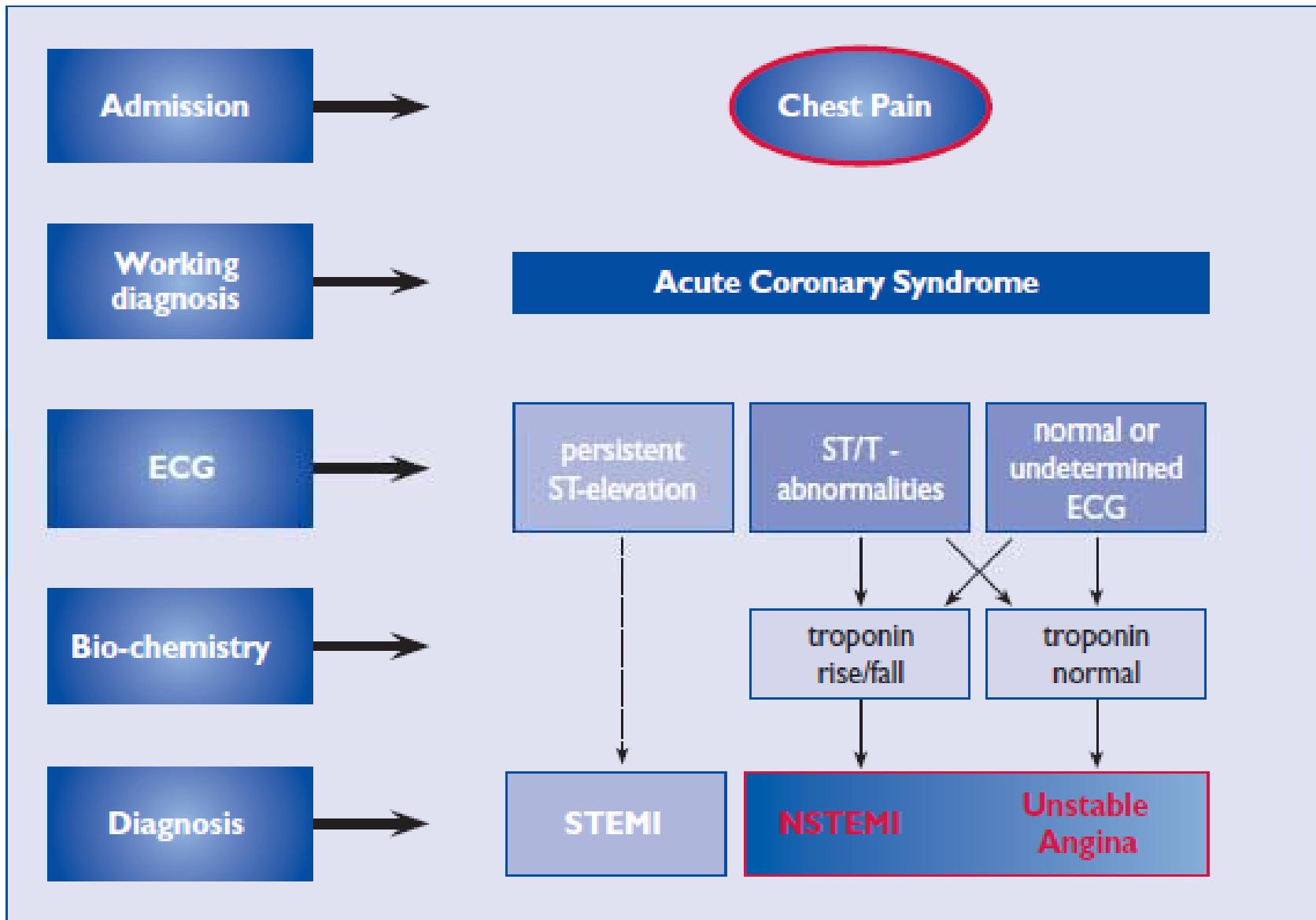
Acute Inferior Myocardial Infarction

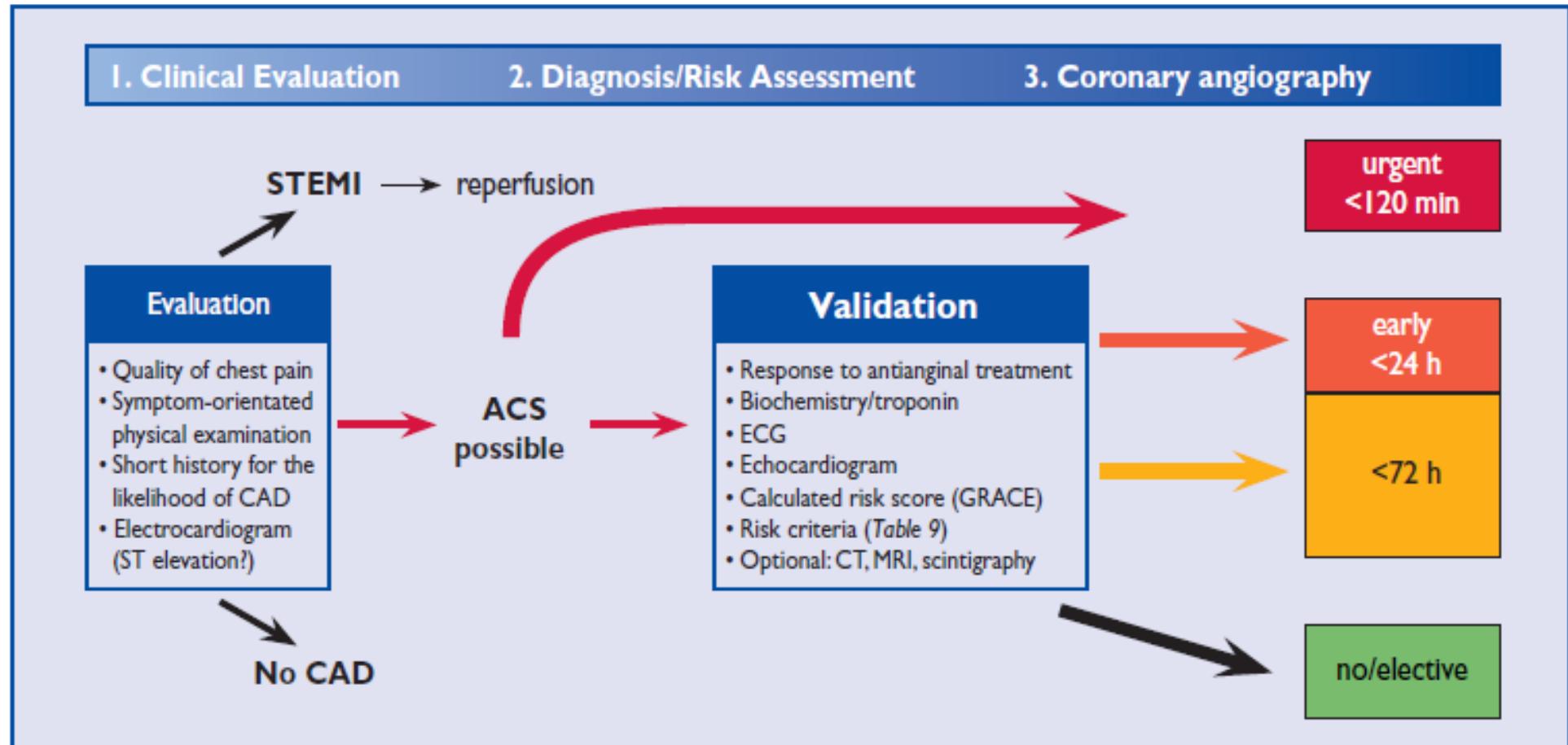


STEMI

- Early reperfusion treatment is important
 - Coronary angioplasty
 - Thrombolytic treatment



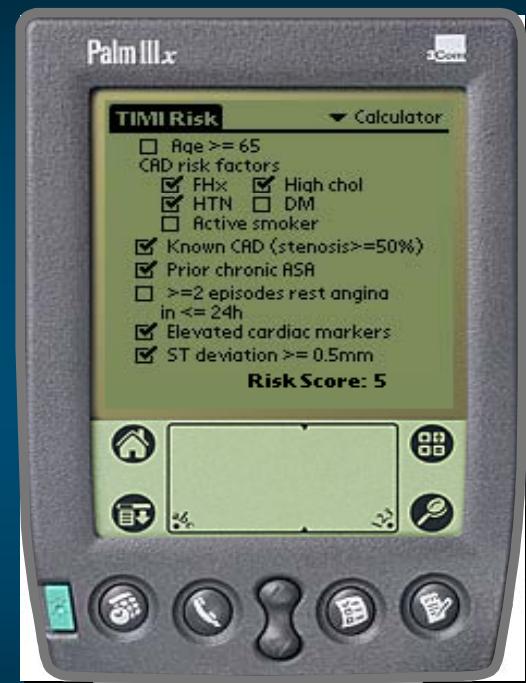




TIMI Risk Score for UA/NSTEMI

7 Independent Predictors

- Age ≥ 65 years
- ≥ 3 CAD risk factors
(↑ chol, FHx, HTN, DM, smoking)
- Prior CAD (cath stenosis $>50\%$)
- ASA in last 7 days
- ≥ 2 Anginal events ≤ 24 hours
- ST deviation
- Elevated cardiac markers (CK-MB or troponin)



AMI Management-Phases

- Acute Evaluation Phase
- CCU Phase
- Hospital Phase
- Pre-discharge Phase
- Convalescence
- Long Term Management
 - Secondary prevention critical to preserve acute mortality benefits

Acute Phase Risk Stratification: Importance of LV dysfunction

Killip Classification	% patients	Mortality (%)
I No CHF	30-50	5
II Rales, S3, Pulmonary venous hypertension	33	15-20
III Pulmonary edema	15	40
IV Cardiogenic shock	10	80-100

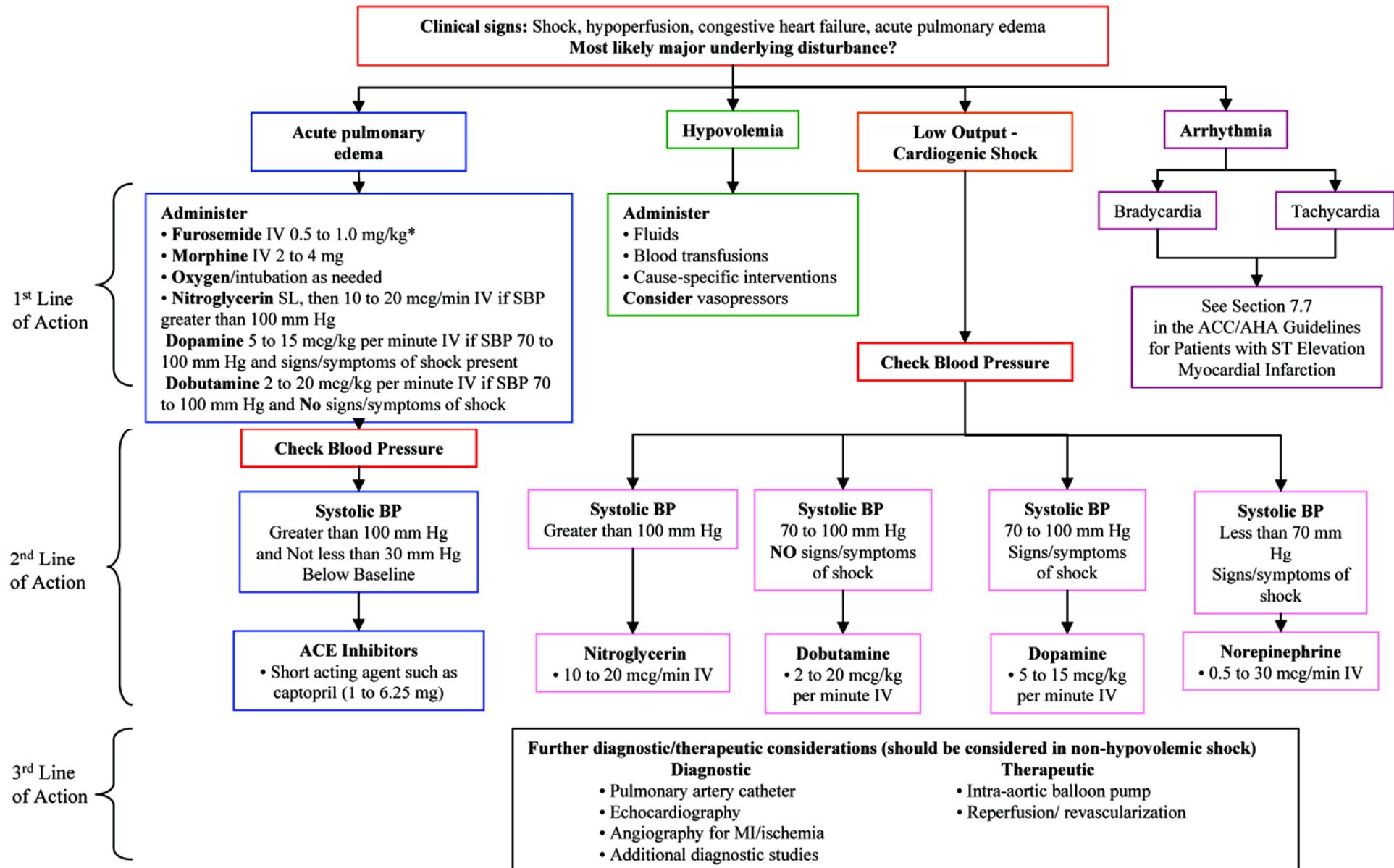
Acute Phase Risk Stratification: Importance of LV dysfunction

Forrester Hemodynamic Classification	Mortality % (Clinical Dx)	Mortality % (Hemodynamic Dx)
I PCW < 18 CI > 2.2	1	5
II PCW > 18 CI > 2.2	11	9
III PCW < 18 CI < 2.2	18	23
IV PCW > 18 CI < 2.2	60	51

Post MI Management

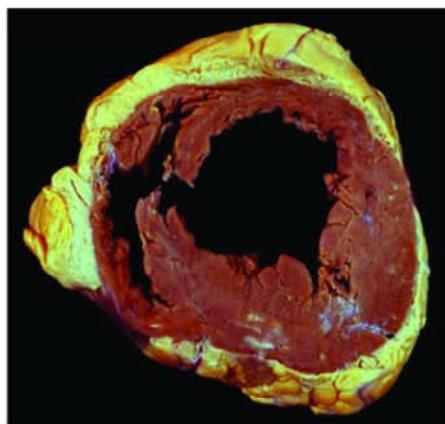
Acute Phases

- **Acute Evaluation and Management**
 - ASA
 - Plavix (NSTEMI/PCI)
 - Glycoprotein IIb/IIIa inhibitors
 - Heparin, LMWH
 - **Thrombolytics** (STEMI,LBBB)
 - **Direct PCI**
 - IV β-blocker
 - IV NTG
- **Complication Surveillance in CCU**
 - CHF
 - Cardiogenic shock
 - Pericarditis
 - Recurrent ischaemia
 - Mechanical complication
 - ventricular septal rupture
 - papillary muscle dysfunction or tear
 - LV thrombus



Mechanical Complication

Ventricular Septal
Rupture



Free Wall
Rupture



Mitral Regurgitation
(Papillary muscle
rupture)



Role of Echocardiography in ACS

- Diagnostic guidance
 - Regional wall motion abnormality
 - Exclude similar condition e.g. aortic dissection
- Risk stratification
 - LV function (LVEF), pulmonary pressure estimation
- Complications of MI
 - Thrombus
 - Aneurysm
 - Papillary muscle rupture/dysfunction → acute MR
 - Septal rupture → acute VSD
 - Free wall rupture → cardiac tamponade

Post MI Management-Phases

Post CCU- Early ambulation

- ASA
- β -blocker
- ACE- inhibitor
- Lipid lowering
 - usually statin
- Anti-coagulation
 - Atrial fib/DVT/CHF/LVT
- Telemetry for arrhythmia
- Echo for LV function/thrombus
- Patient education & counseling
 - dietary
 - risk factors
 - further Ix
- Screening for complications
- Risk stratification

Post MI Management

Convalescence Phases

At time of discharge patient should be on:

- ASA unless contra-indication
- Plavix if PCI/NSTEMI (duration minimum 1 year)
 - Longer duration of Plavix if DES in critical location or complex lesion
- β-blocker unless contra-indication
- Ace inhibitor for CHF or LV dysfunction
 - All for vascular protection?
- Statin for LDL to < 2.0 mmol/L (minimum 50% reduction)

Indications for Angiography

NB: In interventional environment many patients undergo early angiography

- High Risk
 - extensive ECG changes
 - anterior/ infero-posterior/ prior MI
 - Prior MI
- Residual ischaemia
 - post MI angina
 - positive TMT/ perfusion scan
 - non-Q MI
 - ischaemia at a distance
- Complicated MI
 - CHF/ flash pulmonary edema
 - shock
 - heart block
 - RBBB
 - sustained ventricular arrhythmias

Post-PCI Care

- Intermediate CCU or step-down unit
- Observation, early detection & early management for possible complication

Post PCI : potential complications

- Access site complication
 - Arteriovenous (AV) fistula, retroperitoneal bleed, pseudoanerysm
- Cardiac tamponade
- Contrast nephropathy
- Vasovagal reaction
- Acute pulmonary edema or pulmonary hemorrhage
- Cardiogenic shock
- Stroke
- Dissection
- Stent Thrombosis → re-infarct

Non – Acute Coronary Patients in CCU

- Heart Failure
- Serious Arrhythmia

- Aortic dissection
- Cardiac Tamponade
- Post-surgery

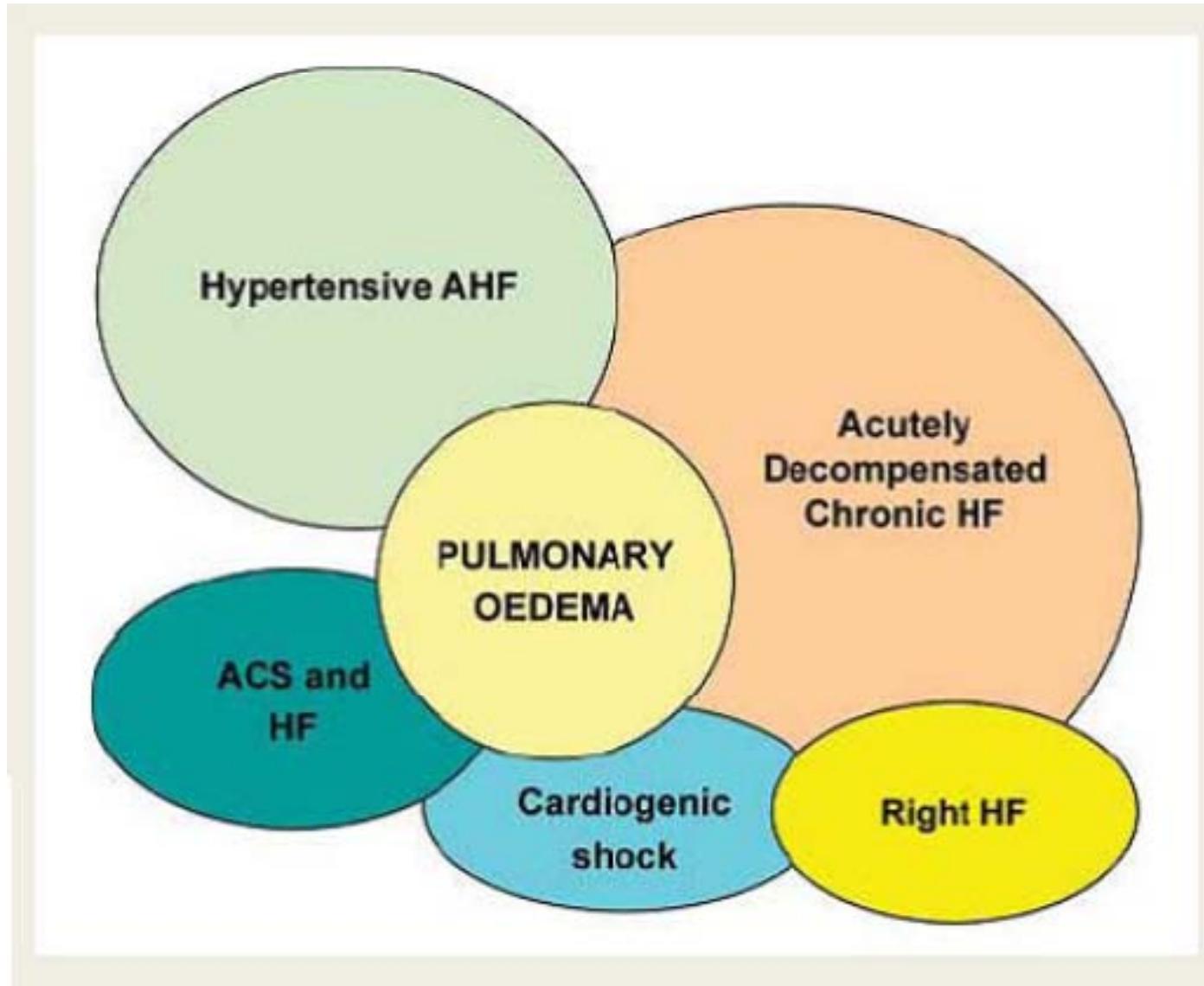
Heart failure patients

- Acute or decompensated chronic heart failure
- Pulmonary congestion/edema → respiratory failure → may need ventilator support
- Unstable hemodynamic status → may need continuous IV medication (Inotropes, Vasodilator) → IABP support

Heart failure: Causes

- Systolic heart failure
 - Ischemic cardiomyopathy
 - Chronic CAD
 - Acute : ACS
 - Non-ischemic cause
 - Myocardial diseases
 - Valvular diseases
 - Arrhythmia
 - Connective tissue disease
 - Idiopathic
- Diastolic heart failure (Normal LVEF)
 - Hypertensive heart disease
 - Aortic/mitral stenosis
 - Pericardial disease

Clinical Classification of AHF



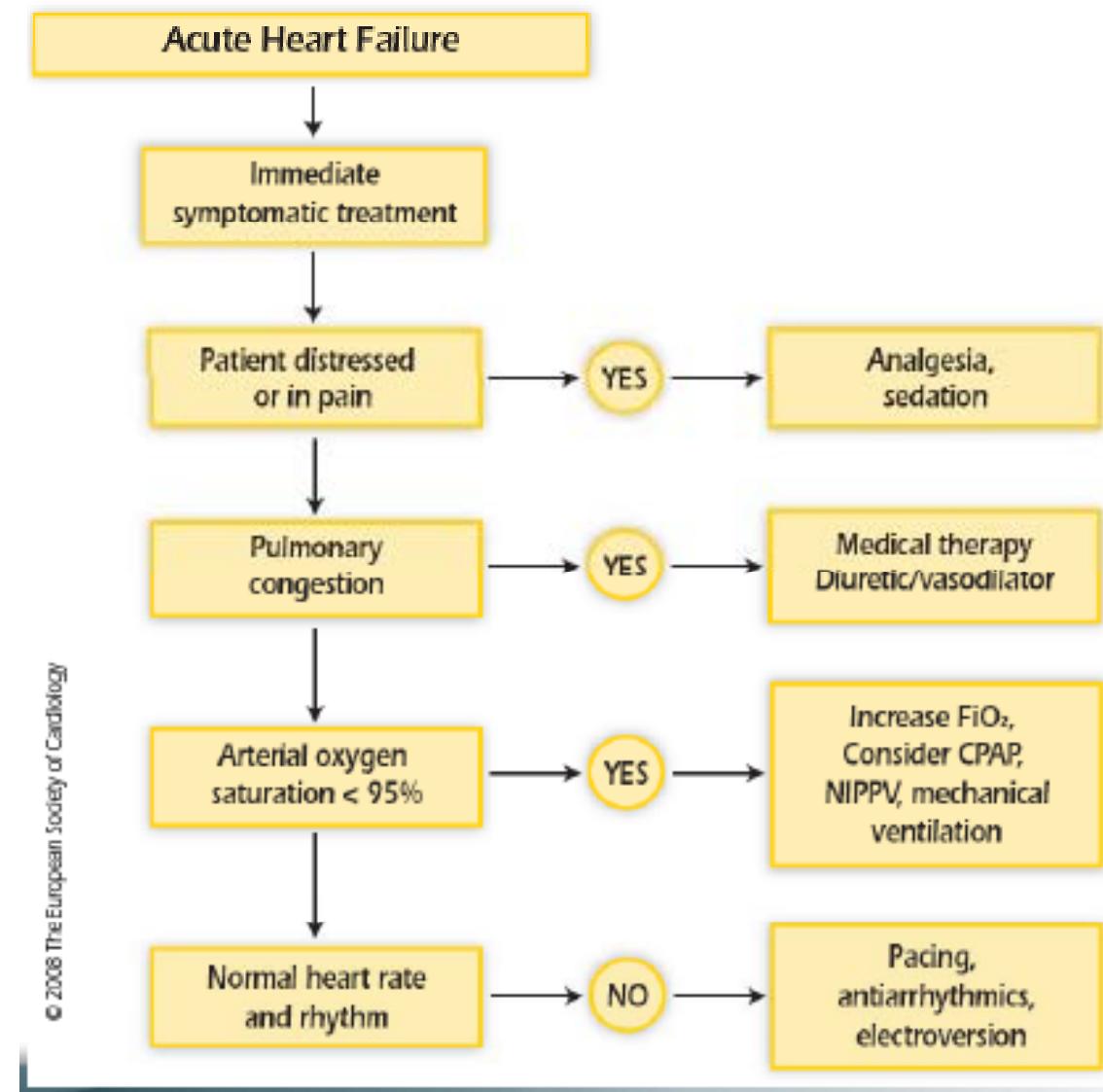
Causes and Precipitating Factors of AHF

Ischaemic heart disease	Circulatory failure
<ul style="list-style-type: none">▪ Acute coronary syndromes▪ Mechanical complications of acute MI▪ Right ventricular Infarction	<ul style="list-style-type: none">▪ Septicaemia▪ Thyrotoxicosis▪ Anaemia▪ Shunts▪ Tamponade▪ Pulmonary embolism
Valvular	Decompensation of preexisting chronic HF
<ul style="list-style-type: none">▪ Valve stenosis▪ Valvular regurgitation▪ Endocarditis▪ Aortic dissection	<ul style="list-style-type: none">▪ Lack of adherence▪ Volume overload▪ Infections, especially pneumonia▪ Cerebrovascular insult▪ Surgery▪ Renal dysfunction▪ Asthma, COPD▪ Drug abuse▪ Alcohol abuse
Myopathies	
<ul style="list-style-type: none">▪ Postpartum cardiomyopathy▪ Acute myocarditis	
Hypertension/arrhythmia	
<ul style="list-style-type: none">▪ Hypertension▪ Acute arrhythmia	

Heart Failure Management

- Specific treatment
 - Find and treat underlying and precipitating causes
- Supportive treatment
 - Re-establish adequate perfusion and oxygen delivery to end organs
 - Medication (Vasodilators, diuretics, Inotropes), Ventilation, Dialysis (UF), IABP
 - Treat aggravating factors : infection, electrolyte imbalance, endocrine problem, bronchospasm, anemia, renal failure, etc

Initial treatment algorithm



Goal of treatment in acute HF

▪ Immediate (ED/ICU/CCU)

- Improve symptoms
- Restore oxygenation
- Improve organ perfusion and haemodynamics
- Limit cardiac/renal damage
- Minimize ICU length of stay

▪ Intermediate (in hospital)

- Stabilise patient and optimise treatment strategy
- Initiate appropriate (life-saving) pharmacological therapy
- Consider device therapy in appropriate patients
- Minimise hospital length of stay

▪ Long-term and predischarge management

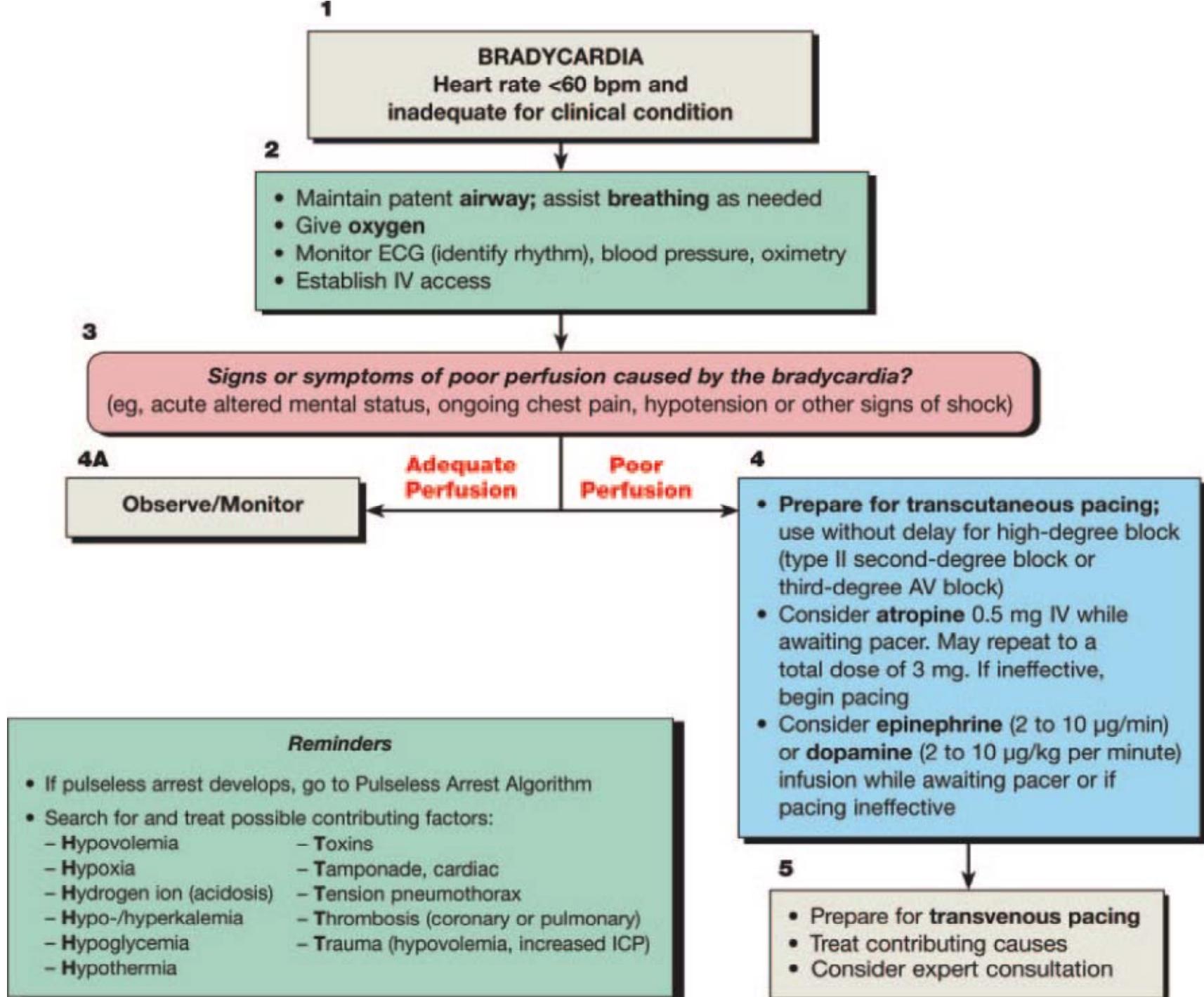
- Plan follow-up strategy
- Educate and initiate appropriate lifestyle adjustments
- Provide adequate secondary prophylaxis
- Prevent early readmission
- Improve quality of life and survival

Serious Arrhythmia

- Arrhythmia with
 - Unstable hemodynamic status
 - Life-threatening conditions
 - Syncope
 - Survivor of cardiac arrest
 - Heart failure
 - Cardiogenic shock
 - High chance of progress to advanced conduction problems
 - Documented lethal arrhythmia : VT/VF

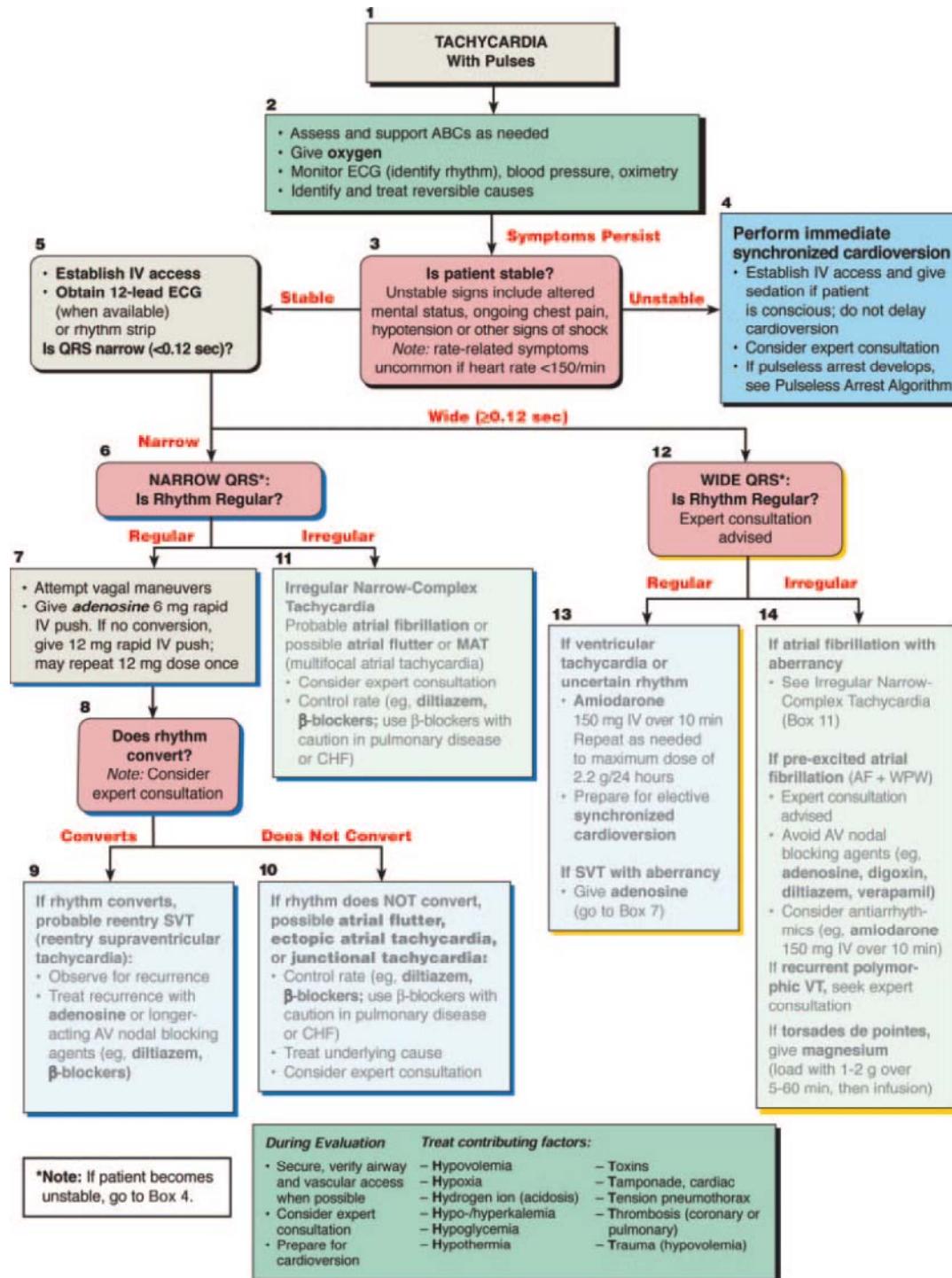
Serious Bradyarrhythmia

- Sinus node dysfunction
 - With long ventricular pause
 - Syncope with serious injury
- Advanced AV Block
 - Complete heart block
 - High grade AVB
 - Mobitz II, second degree AV block
- Bradyarrhythmia with profound hypotension
- Asystole/Ventricular standstill

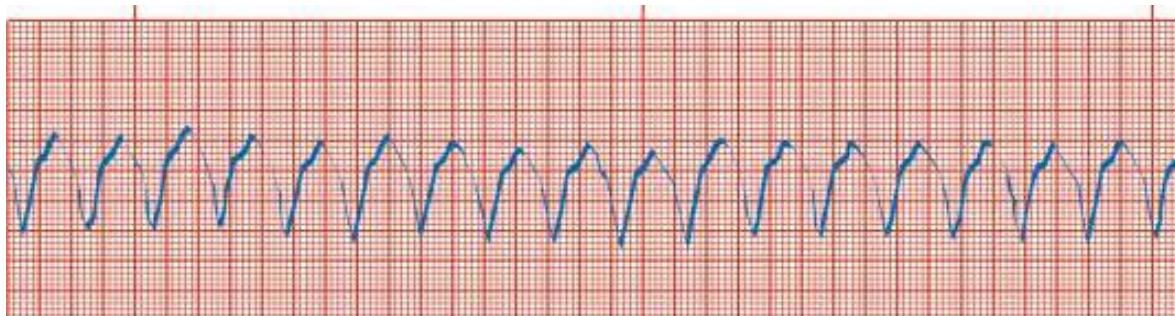


Serious Tachyarrhythmia

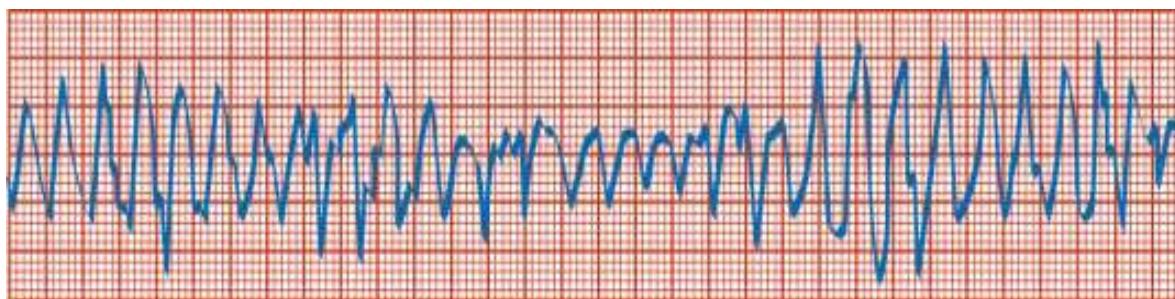
- Pulseless or with pulse
 - Pulseless arrest → VF/VT → CPR
- Serious tachycardia
 - **Ventricular tachyarrhythmia**
 - VT
 - Monomorphic
 - Polymorphic
 - Torsades de pointe
 - VF
 - **AF with rapid ventricular rate**
 - **Incessant SVT**



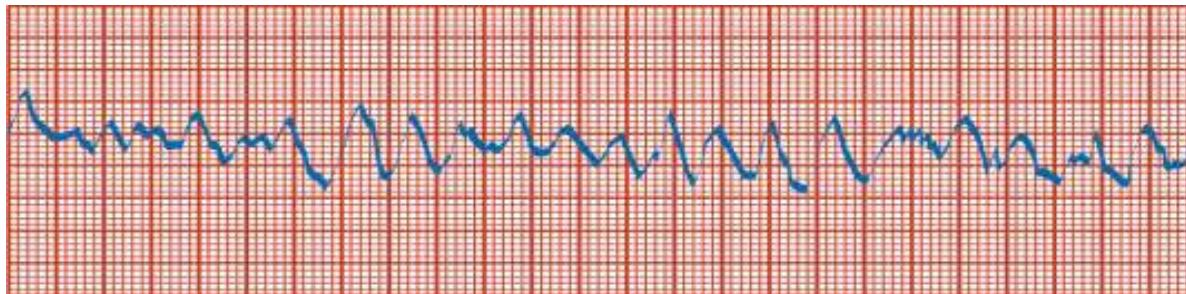
Defibrillation : Shockable Arrhythmia



**VT : Ventricular
Tachycardia
(Monomorphic)**

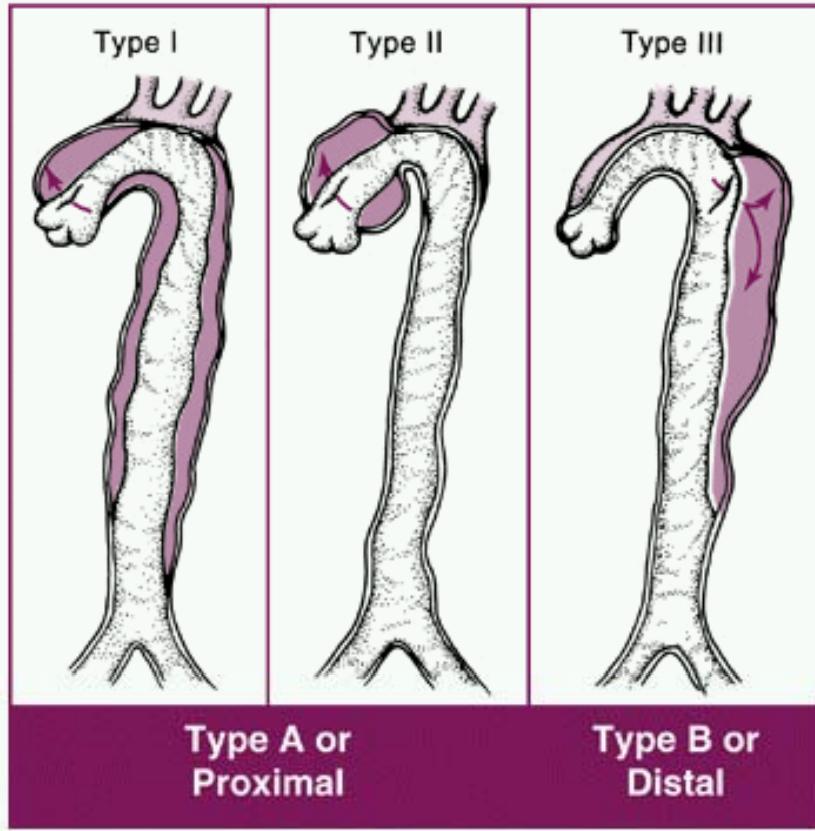


**VT : Ventricular
Tachycardia
(Polymorphic)**



**VF : Ventricular
Fibrillation**

Aortic Dissection



- **Type I:** Originates in the ascending aorta, propagates at least to the aortic arch and often beyond it distally
- **Type II:** Originates in and is confined to the ascending aorta
- **Type III:** Originates in the descending aorta and extends distally down the aorta or, rarely, retrograde into the aortic arch and ascending aorta