



# Management of acute coronary syndromes (ACS)

(Based on ACC/AHA Guidelines)

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## MANAGEMENT OF ACUTE CORONARY SYNDROMES QUICK REFERENCE GUIDE

**Chest pain suggestive of ischemia**

- Immediate assessment (<10minutes)**
- Measure vital signs (automatic/standard BP cuff)
  - Measure oxygen saturation
  - Obtain IV access
  - Obtain 12-lead ECG (physician reviews)
  - Perform brief, targeted history and physical exam; focus on eligibility for fibrinolytic therapy
  - Obtain initial serum cardiac markers levels
  - Evaluate initial electrolyte and coagulation studies
  - Request, review portable chest x-ray (<30 minutes)

- Immediate general treatment**
- Oxygen at 4 L/min
  - Aspirin 160 to 325 mg
  - Nitroglycerin SL or spray
  - Morphine IV (if pain not relieved with nitroglycerin)

Memory aid; "MONA" greets all patients (Morphine, Oxygen, Nitroglycerin, Aspirin)

**Assess initial 12-lead ECG**

• ST elevation or new or presumably new LBBB: strongly suspicious for injury

• ST-elevation AMI

• ST depression or dynamic T-wave inversion: strongly suspicious for Ischaemia

• High-risk unstable angina/non-ST-elevation AMI

• Nondiagnostic ECG: absence of change in ST segment or T waves

• Intermediate/low-risk unstable angina

- Start adjunctive treatments (as indicated; no reperfusion delay)
- B-Adrenoceptor blockers IV
  - Nitroglycerin IV
  - Heparin IV
  - ACE Inhibitors (after 6 hours or when stable)

- Start adjunctive treatments (as indicated; no reperfusion delay)
- Heparin(UFH/LMWH)
  - Aspirin 160 to 325 mg
  - Glycoprotein IIb/IIIa receptor inhibitors
  - Nitroglycerin IV
  - B-Adrenergic receptor blockers

Meets criteria for unstable or new-onset angina? or Troponin positive?

Time from onset of symptoms

>12 hours

Access clinical status

- Select a reperfusion strategy based on local resources:
- Angiography
  - PICA (angioplasty + stent)
  - Cardiothoracic surgery backup

• If signs of cardiogenic shock or contraindication to fibrinolytics, PTCA is treatment of choice if available

• If PTCA is not available use fibrinolytics (if no contraindications)

Clinically unstable

- High-risk patient: defined by
- Persistent symptoms
  - Recurrent ischemia
  - Depressed LV function
  - Widespread ECG changes
  - Prior AMI, PICA, CABG

Clinically stable

- Admit
- Serial serum markers (including troponin)
  - Repeat ECG/continuous ST monitoring
  - Consider imaging study (2D echocardiography or radionuclide)

Perform cardiac catheterization: anatomy suitable for revascularization?

- Fibrinolytic therapy selected
- Front-loaded alteplase or Streptokinase
  - Goal: door-to drug <30 minutes

- Primary PTCA selected
- Door-to balloon inflation 90+30 minutes
  - Experienced operators
  - High-volume centre
  - cardiac surgical capability

- Revascularization
- PTCA
  - CABG

- Admit to CCU/monitored bed
- Continue or start adjunctive treatments as indicated
  - Serial serum markers
  - Serial ECG
  - Consider imaging study (2D echocardiography or radionuclide)

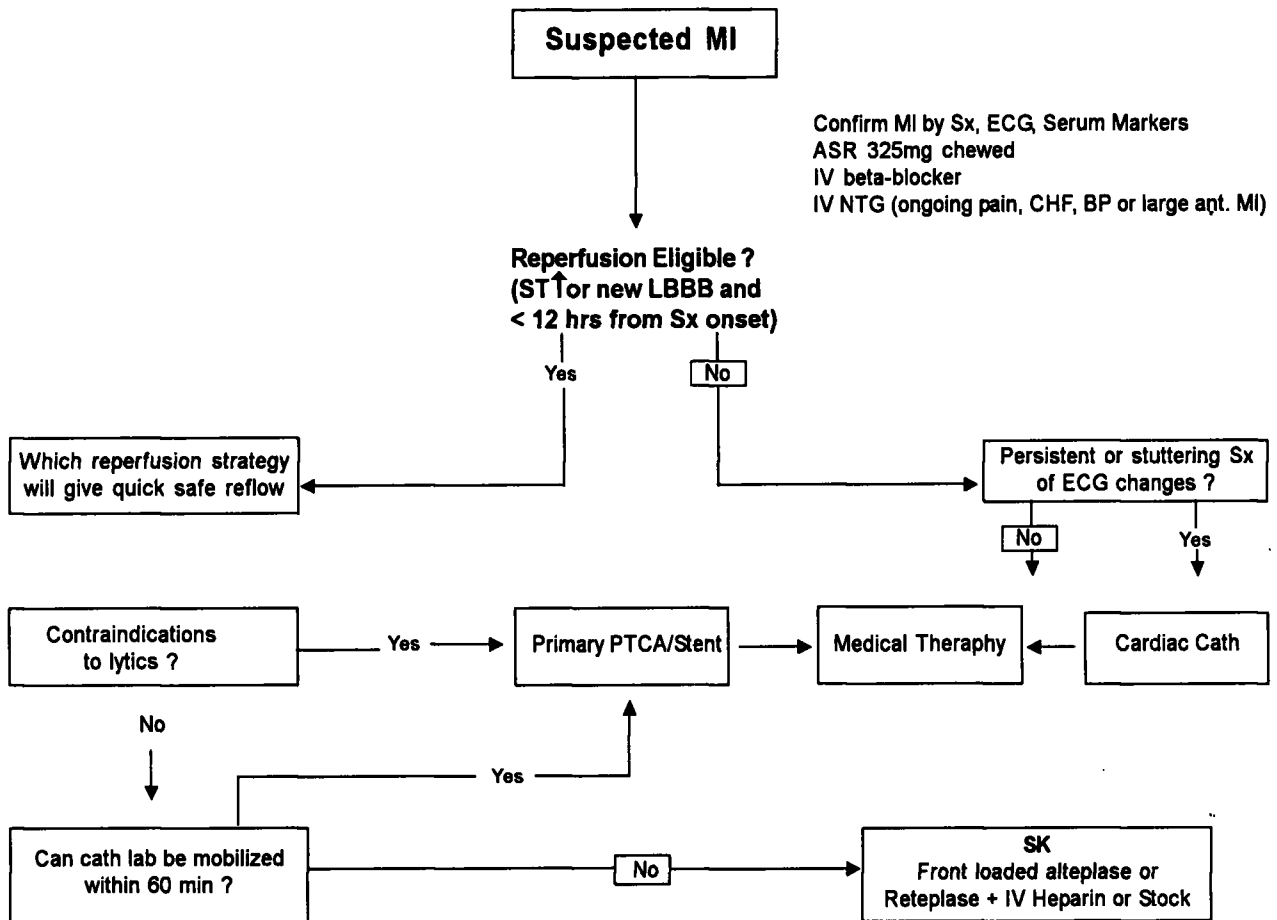
Evidence of ischemia or infraction?

- Discharge acceptable
- Arrange follow-up

This algorithm provides general guidelines that may not apply to all patients. Carefully consider proper indications and contraindications.

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## MANAGEMENT OF ST - ELEVATION MI



### Indications for Cardiac Catheterization

Primary PTCA Rescue for the failed fibrinolysis Clinical Conditions <ul style="list-style-type: none"> <li>- Cardiogenic shock/hemodynamic instability</li> <li>- CHF</li> <li>- Suspected mechanical complications eg. VSD, ruptured papillary muscle</li> <li>- Recurrent symptomatic arrhythmia</li> </ul> Ischemia on pre-discharge ETT
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### Contraindications and Cautions for Fibrinolytic Use in Myocardial Infarction

Absolute Contraindications	Cautions/Relative Contraindications
<ul style="list-style-type: none"> <li>• Previous hemorrhagic stroke at any time: other strokes or cerebrovascular events within 1 yr</li> <li>• Known Intracranial neoplasm</li> <li>• Active internal bleeding (does not include menses)</li> <li>• Suspected aortic dissection</li> </ul>	<ul style="list-style-type: none"> <li>• Severe uncontrolled hypertension on presentation (blood pressure &gt; 180/110 mm Hg)*</li> <li>• History of prior cerebrovascular accident or known intracerebral pathology not covered in Contraindications</li> <li>• Current use of anticoagulants in therapeutic dose (INR &gt; 2-3); known bleeding diathesis</li> <li>• Recent trauma (within 2-4 wks) including head trauma</li> <li>• Noncompressible vascular punctures</li> <li>• Recent (within 2-4 wks) internal bleeding</li> <li>• For streptokinase/anistreplase: prior exposure (especially within 5d-2y) or prior allergic reaction</li> <li>• Pregnancy</li> <li>• Active peptic ulcer</li> <li>• History of chronic hypertension</li> </ul> <p style="font-size: small; margin-top: 10px;">* Could be an absolute contraindication in low-risk patients with myocardial infarction.</p>

#### Fibrinolytic Dosing

**Alteplase**, 15mg bolus IV, followed by 50 mg over next 30 min, followed by 35 mg over next 60 min. **Reteplase**, double bolus 10 IU min apart

**SK**. 1.5 million IU in fused over 60 min.

**ST-SEGMENT DEPRESSION, DYNAMIC T-WAVE CHANGE:  
NON-Q-WAVE INFARCTION-UNSTABLE ANGINA**

**Recommendations for Initial Management and Therapy**

- In general, treat these patients with both
  - Antithrombin (heparin) and an
  - Antiplatelet agent (aspirin)

→ **Antithrombin (heparin) plus  
Antiplatelet (aspirin)**

- Modify this treatment if patient meets criteria for high risk

**High-Risk Criteria**

- ST depression >1mm
- Persistent symptoms; recurrent ischemia
- Diffuse or widespread ECG abnormalities
- Depressed LV function
- Congestive heart failure
- Serum marker release: positive troponin or CK-MB+

Patients who meet high-risk criteria benefit

- Aspirin and
- GP IIb/IIIa inhibitors and unfractionated heparin or
- Low-molecular weight heparin (efficacy and safety combined with GP IIb/IIIa inhibitors under review)

→ **Antithrombin (heparin) plus  
Antiplatelet (aspirin)  
plus  
Glycoprotein IIb/IIIa  
inhibitors**

**All patients without contraindications should receive**

→ **β-Blockers**

**Patients who suffer recurrent angina should also receive**

→ **Nitrates**

**As a third agent to use for refractory angina or in patients with a contraindication to β-blockers**

→ **Calcium channel blockers**

**Recommendation for initial management and therapy of ST-segment depression, dynamic T-wave changes, (non-Q-wave infarction, and unstable angina).**

## MANAGEMENT OF ACUTE MYOCARDIAL INFARCTION

### Pharmacological Therapy

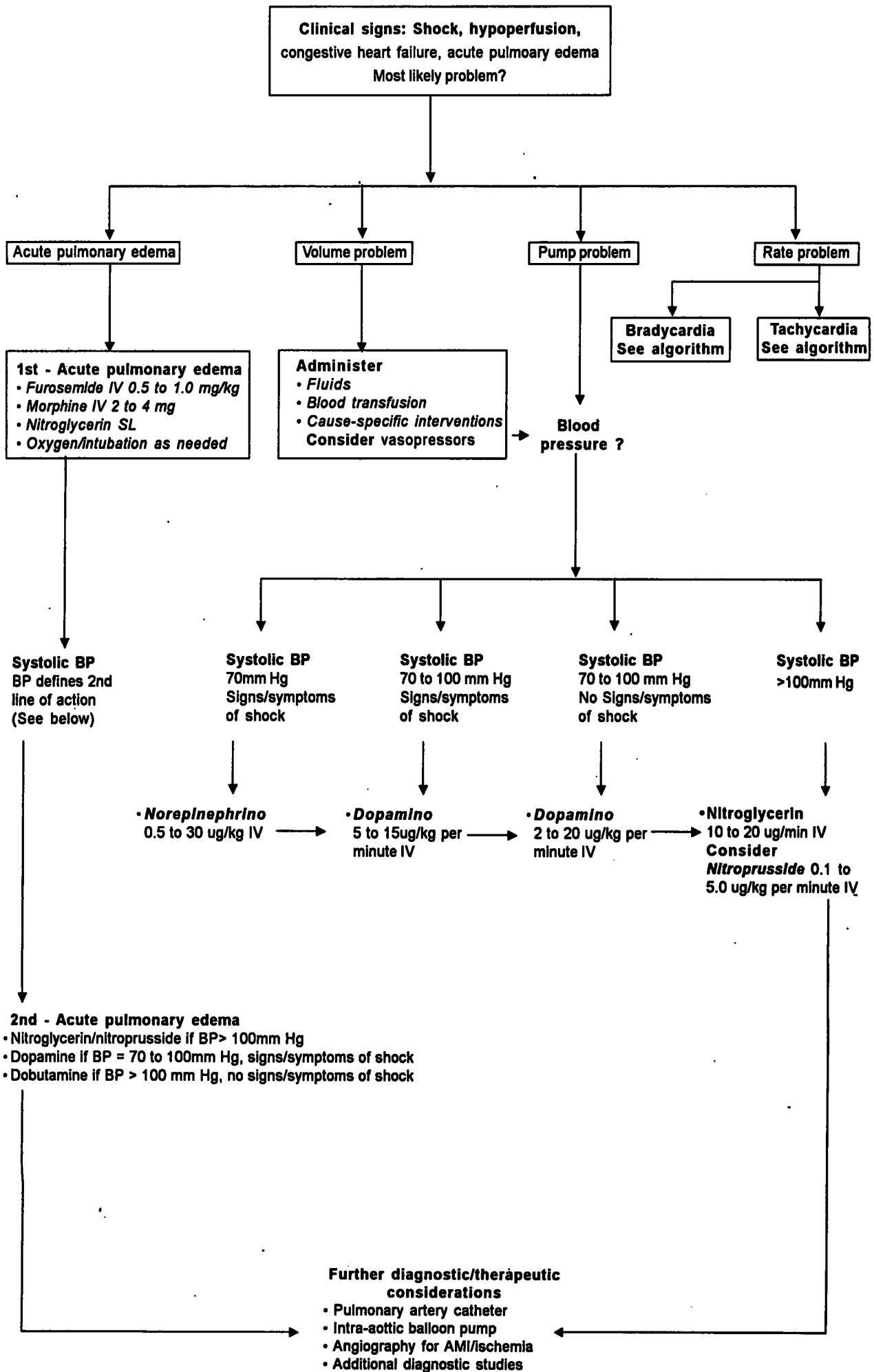
Medication	First 24 Hours	After 24 hours	Discharge
Aspirin	Chewed (in ED) (325mg)	180-325mg qd	81mg qd indefinitely
Reperfusion for ST or new LBBB <12hrs of symptom onset	↑ Front loaded RX treatment fibrinolytics* or Primary PICA	Reperfusion: alteplase/reteplase can be repeated for recurrent occlusion	Coumarin for 3-6 if LV thrombus seen or thromboembolism: chronically for AF
Heparin (unfractionated UFH)	IV in alteplase, reteplase, PTCA treated patients and non-ST elevation MI: large or ant MI, AF, prior embolus, LV thrombus 60 U/kg bolus, infusion 12 U/kg/hr (max 4000 U bolus/ 1000 U/hr infusion for pts>70kg) to maintain aPTT 50-70 seconds	48 hrs alteplase, reteplase treated patients: SubQ heparin for all until ambulatory	
Low Molecular Weight Heparin (LMWH)	Subcutaneous (SC) 1mg/kg b.i.d. for patients with non-ST elevation MI if no contraindications; all patients not treated with fibrinolytics, if no contraindications (alternative to UFH)		
Beta-Blockers**	IV Metoprolol (up to 15mg in 3 divided doses) or IV Atenolol (10mg in 2 divided doses)	Oral Metoprolol 50-100mg daily or Atenolol 50-100 qd or other beta-blockers	Oral daily indefinitely
ACE inhibitors	Initial doses 6.25mg captopril followed by 12.5 mg 2 hrs later, 25mg 10-12 hrs later, then 50 mg b.i.d. Or lisinopril 5mg initially, 5mg after 24hrs, 10mg after 48hrs, then 10mg daily	Daily for up to 6 wks	Longer if Sx CHF or LVEF<40%
GP1Ib/IIa Inhibitors	Tirofiban 0.4 ug/kg/min over 30 min. Then infuse 0.1 ug/kg/min for non -ST elevated MI patients at high-risk (elevated serum markers, refractory ischemia)		
Nitroglycerin	IV for 24-48 hrs if no contraindications	Only for ongoing ischemia or uncontrolled hypertension	Oral for residual ischemia
Statins			Indefinitely if LDL-C>100mg/dl
Hormone Replacement Therapy (HRT)		After 1st 24hrs-should not be given de novo to postmenopausal women after acute MI. Women already taking HRT plus progestin at time of AMI can continue. Counsel all postmenopausal women about potential benefits or HRT.	Offer options of HRT

**\*\*Cautions/Relative Contraindications:** Heart rate<60 bpm; PR interval>0.24 seconds; severe PVD; SAP<100mm Hg; 2nd or 3rd AV block; IDDM; signs of peripheral hypoperfusion; severe COPD; severe LV failure; Hx of Asthma

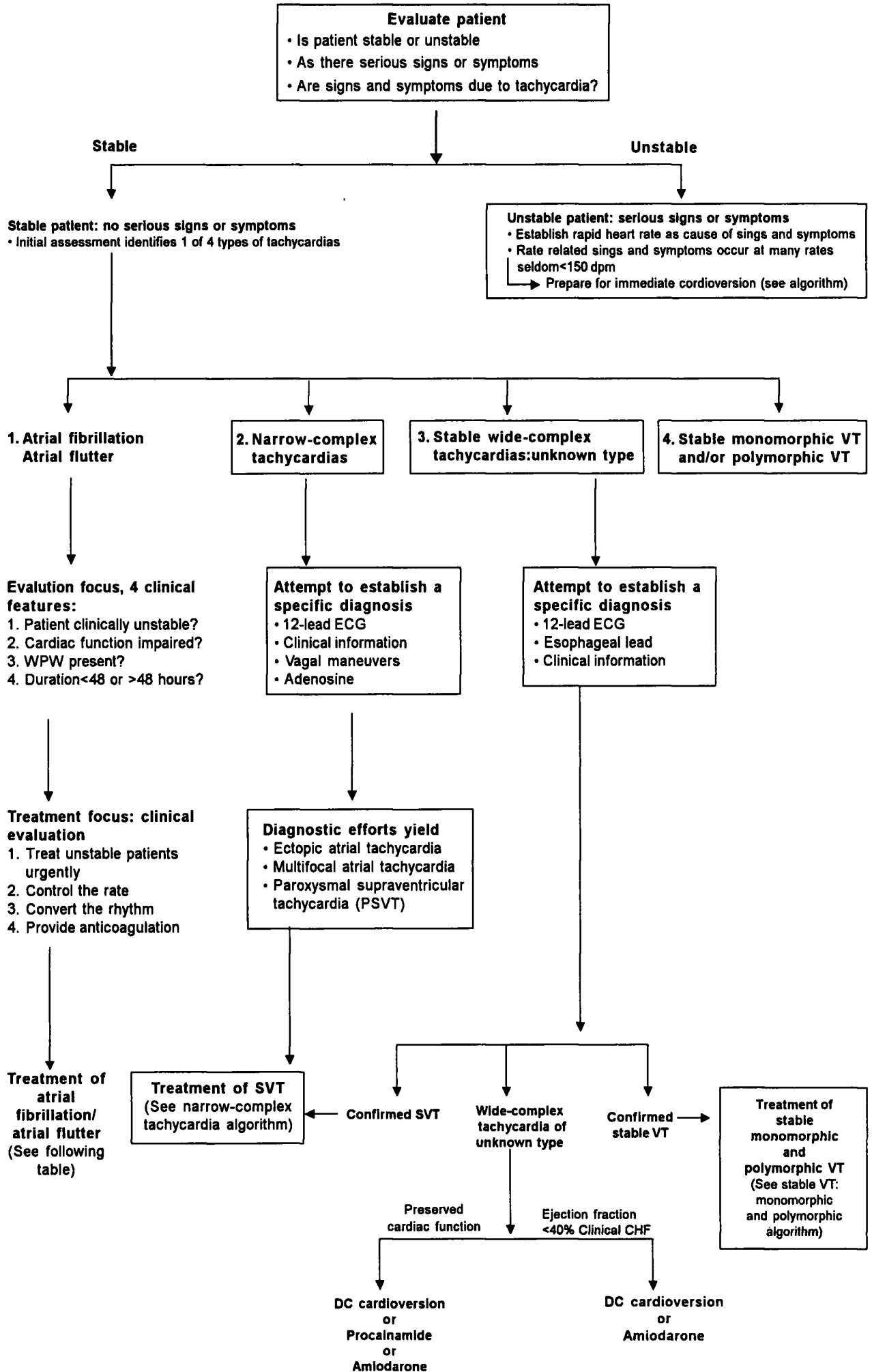
### Non-pharmacological Therapy

Therapy	First 24 Hours	After 24 hours	Discharge
Dietary Advice		Education on low-fat diet	Recommend low-fat diet
Smoking	Reinforce cessation	Reinforce cessation	Referral to smoking cessation classes if desired
Exercise			Recommend regular aerobic exercise
Pre-discharge ETT	For uncomplicated patient in 4-5 days	Perform pre-discharge ETT	Cath patients with significant ischemia
Measure LVEF		ECHO	ACE inhibitors if LVEF<40% or in-hospital CHF
Cardiac Rehabilitation		Start exercise	Refer to rehab program near their home

# MANAGEMENT OF COMPLICATED AMI THE ACUTE PULMONARY EDEMA, HYPOTENSION, AND SHOCK ALGORITHM



# THE TACHYCARDIA OVERVIEW ALGORITHM



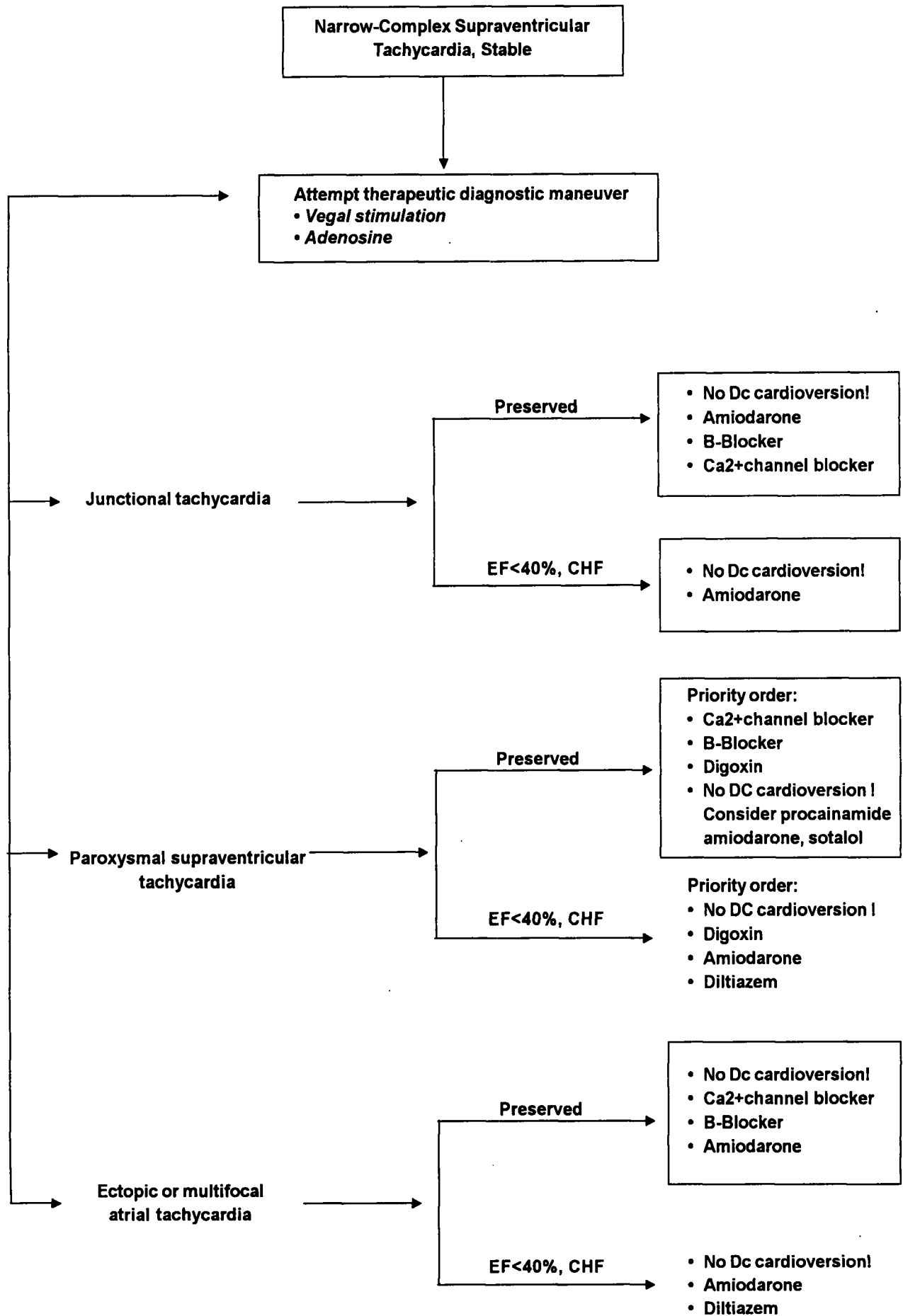
# ATRIL FIBRILLATION / ATRIAL FLUTTER

Atrial fibrillation atrial flutter with	1. Control Rate		2. Convert Rhythm	
	Heart Function Preserved	Impaired Heart EF<40%orCHF	Duration<48Hours	Duration<48Hours or Unknown
<ul style="list-style-type: none"> <li>• Normal heart</li> <li>• Impaired heart</li> <li>• WPW</li> </ul>	<p><i>Note: If AF&gt;48hours . duration, use agents to convert rhythm with extreme caution in patients not receiving adequate anticoagulation because of possible embolic complications.</i></p> <p><i>Use only 1 of the following agents (see note below):</i></p> <ul style="list-style-type: none"> <li>• Calcium channel blockers</li> <li>• B-Blockers</li> </ul>	<p><i>(Does not apply)</i></p> <p><i>Note: If AF&gt;48hours duration, use agents to convert rhythm with extreme caution in patients not receiving adequate anticoagulation because of possible embolic complications.</i></p> <p><i>Use only 1 of the following agents (see note below):</i></p> <ul style="list-style-type: none"> <li>• Digoxin</li> <li>• Diltiazem</li> <li>• Amiodarone</li> </ul>	<p>Consider DC cardioversion</p> <p><i>Use only 1 of the following agents (see note below):</i></p> <ul style="list-style-type: none"> <li>• Amiodarone</li> <li>• Flecainide</li> <li>• Propafenone</li> <li>• Procainamide</li> </ul>	<ul style="list-style-type: none"> <li>• No DC cardioversion!</li> <li>• <i>Note: Conversion of AF to NSR with drugs or shock may cause embolization of atrial thrombi unless patient has adequate anticoagulation</i></li> <li>• Use antiarrhythmic agents with extreme caution if AF &gt;48 hours duration (see note above):</li> <li style="text-align: center;"><i>or</i></li> <li>• <i>Delayed cardioversion</i></li> <li>• <i>Anticoagulation x 3 weeks at proper levels</i></li> <li>• Cardioversion, then</li> <li>• Anticoagulation x 4 weeks more</li> <li style="text-align: center;"><i>or</i></li> <li>• <i>Early cardioversion</i></li> <li>• Begin IV heparin at once</li> <li>• TEE to exclude atrial clot</li> <li style="text-align: center;"><i>then</i></li> <li>• Cardioversion within 24 hours</li> <li style="text-align: center;"><i>then</i></li> <li>• Anticoagulation x 4 more weeks</li> </ul>
Normal heart (EF<40% or CHF)	<i>(Does not apply)</i>	<p><i>Note: If AF&gt;48hours duration, use agents to convert rhythm with extreme caution in patients not receiving adequate anticoagulation because of possible embolic complications.</i></p> <p><i>Use only 1 of the following agents (see note below):</i></p> <ul style="list-style-type: none"> <li>• Digoxin</li> <li>• Diltiazem</li> <li>• Amiodarone</li> </ul>	<p>Consider</p> <ul style="list-style-type: none"> <li>• DC cardioversion</li> <li style="text-align: center;"><i>or</i></li> <li>• Amiodarone</li> </ul>	<ul style="list-style-type: none"> <li>• Anticoagulation as described above, followed by</li> <li>• DC cardioversion</li> </ul>
WPW	<p><i>Note: If AF&gt;48hours duration, use agents to convert rhythm with extreme caution in patients not receiving adequate anticoagulation because of possible embolic complications.</i></p> <ul style="list-style-type: none"> <li>• DC cardioversion</li> </ul> <p style="text-align: center;"><i>or</i></p> <ul style="list-style-type: none"> <li>• Primary antiarrhythmic agents</li> </ul> <p><i>Use only 1 of the following agents (see note below):</i></p> <ul style="list-style-type: none"> <li>• Amiodarone</li> <li>• Procainamide</li> <li>• Flecainide</li> </ul> <p><i>can be harmful</i></p> <ul style="list-style-type: none"> <li>• Adenosine</li> <li>• B-Blockers</li> <li>• Calcium blockers</li> <li>• Digoxin</li> </ul>	<p><i>Note: If AF&gt;48hours duration, use agents to convert rhythm with extreme caution in patients not receiving adequate anticoagulation because of possible embolic complications.</i></p> <ul style="list-style-type: none"> <li>• DC cardioversion</li> <li style="text-align: center;"><i>or</i></li> <li>• Amiodarone</li> </ul>	<ul style="list-style-type: none"> <li>• DC cardioversion</li> <li style="text-align: center;"><i>or</i></li> <li>• Primary antiarrhythmic agents</li> </ul> <p><i>Use only 1 of the following agents (see note below)**</i></p> <ul style="list-style-type: none"> <li>• Amiodarone</li> <li>• Procainamide</li> <li>• Flecainide</li> </ul> <p><i>can be harmful</i></p> <ul style="list-style-type: none"> <li>• Adenosine</li> <li>• B-Blockers</li> <li>• Calcium blockers</li> <li>• Digoxin</li> </ul>	<ul style="list-style-type: none"> <li>• Anticoagulation as described above, followed by</li> <li>• DC cardioversion</li> </ul>

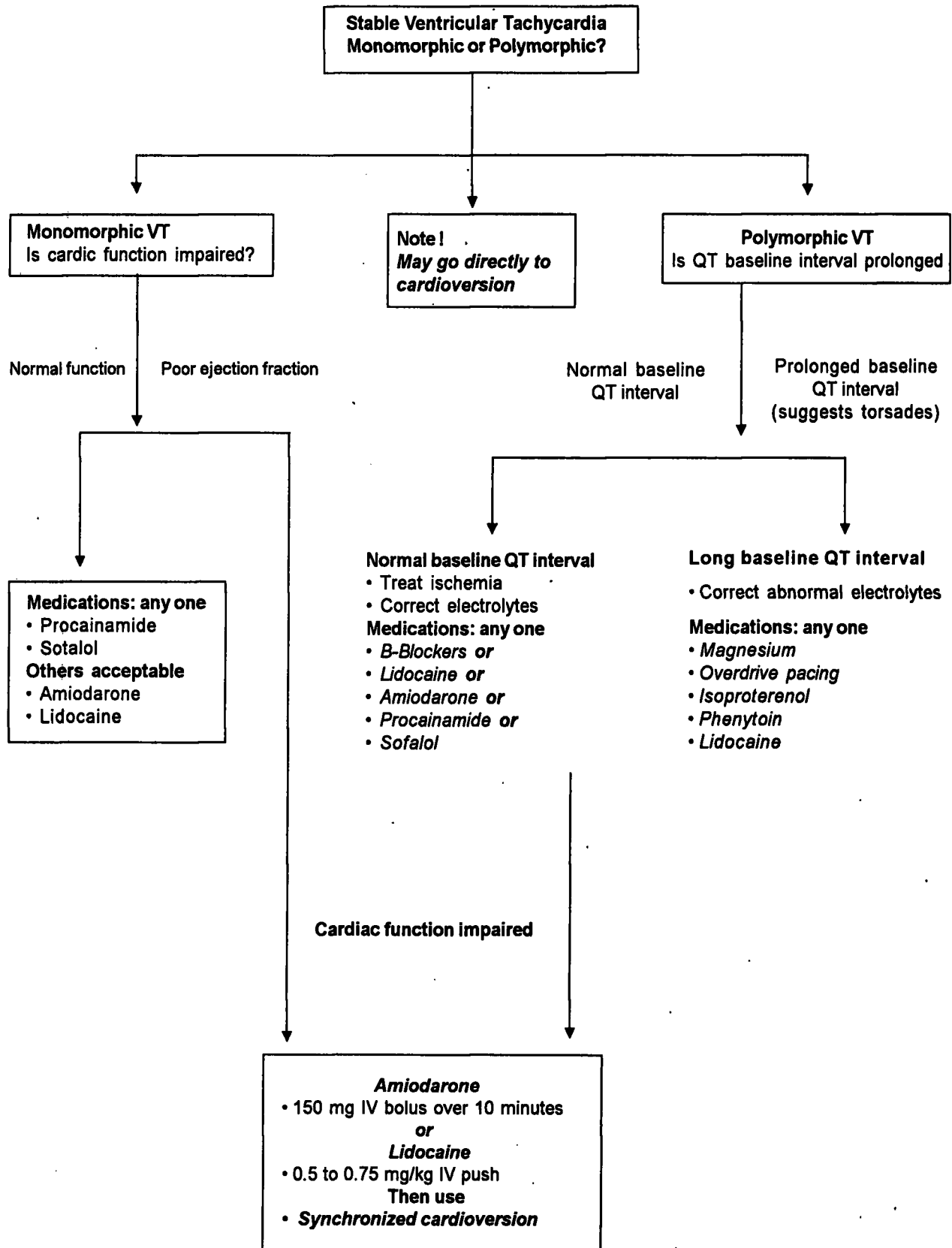
WPW indicates Wolff-Parkinson - White syndrome; AF atrial fibrillation; NSR, normal sinus rhythm; TEE, transesophageal echocardiogram; and EF, ejection fraction

**Note:** Occasionally 2 of the named antiarrhythmic agents may be used, but use of these agents in combination may have proarrhythmic potential.

## NARROW-COMPLEX SUPRAVENTRICULAR TACHYCARDIA ALGORITHM



## STABLE VENTRICULAR TACHYCARDIA (MONOMORPHIC OR POLYMORPHIC) ALGORITHM



## UNSTABLE PATIENT - CARIOVERSION

### Tachycardia:

With serious sign and symptoms related to the tachycardia

If ventricular rate is >150 bpm, prepare for immediate cardioversion. May give brief trial of medications based on specific arrhythmia. Immediate cardioversion is generally not needed if heart rate is <150 bpm.

### Have available at bedside

- Oxygen saturation monitor
- Suction device
- IV line
- Intubation equipment

Premedicate whenever possible

### Synchronized cardioversion

- Ventricular tachycardia
- Paroxysmal supraventricular tachycardia
- Atrial fibrillation
- Atrial flutter

100 J, 200 J  
300 J, 360 J,  
monophasic energy  
dose (or clinically  
equivalent biphasic  
energy dose)

2,3,4,5,6

### Notes:

1. Effective regimens have included a sedative (eg, diazepam, midazolam, barbiturates, etomidate, ketamine, methohexital) with or without an analgesic agent (eg, fentanyl, morphine, meperidine). Many experts recommend anesthesia if service is readily available.
2. Both monophasic and biphasic waveforms are acceptable if documented as clinically equivalent to reports of monophasic shock success.
3. Note possible need to resynchronize after each cardioversion.
4. If delays in synchronization occur and clinical condition is critical, go immediately to unsynchronized shocks.
5. Treat polymorphic ventricular tachycardia (irregular form and rate) like ventricular fibrillation: see ventricular fibrillation/pulseless ventricular tachycardia algorithm.
6. Paroxysmal supraventricular tachycardia and atrial flutter often respond to lower energy levels (start with 50 J).

## BRADYCARDIA ALGORITHM

### Bardycardia

- **Slow** (absolute bradycardia = rate <60 bpm)  
*or*
- Relative slow (rate less than expected relative to underlying condition or cause)

Serious signs or symptoms?  
Due to the bradycardia?

No

Yes

Type II second-degree AV block  
Third-degree AV block?

#### Intervention sequence

- Atropine 0.5 to 1.0 mg
- Transcutaneous pacing if available
- Dopamine 5 to 20 ug/kg per minute
- Epinephrine 2 to 10ug/min

No

Yes

Observe

- Prepare for transvenous pacer
- If symptoms develop, use transcutaneous pacemaker until transvenous pacer placed