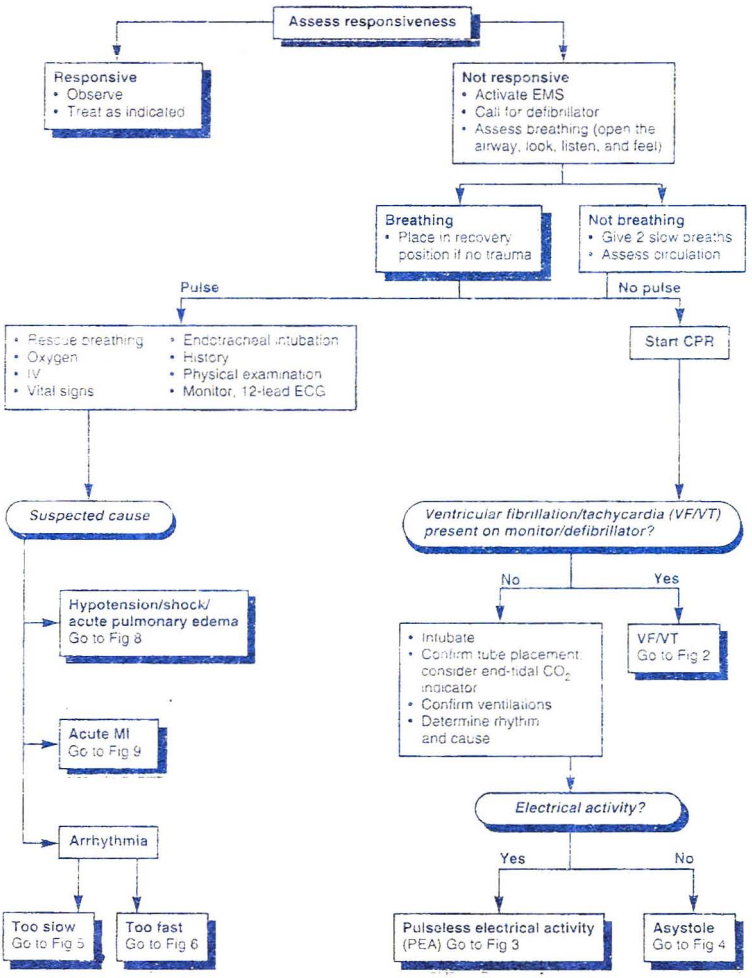
CAPITULO XX
ALGORÍTMOS PARA EL MANEJO DE LAS PRINCIPALES CONDICIONES DE EMERGENCIA

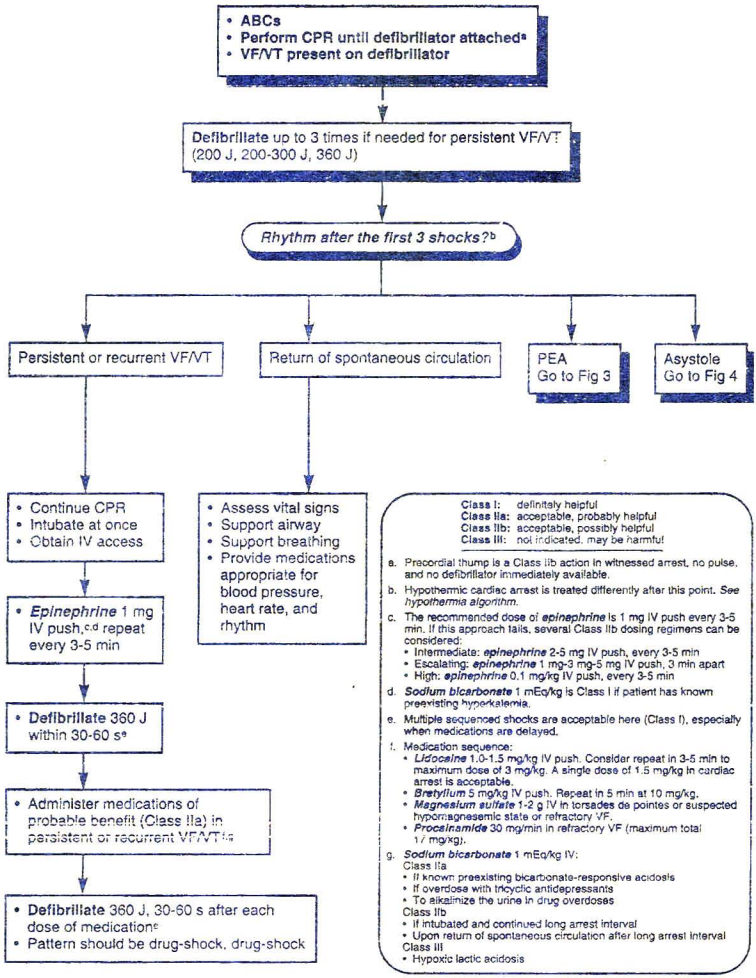
Universal Algorithm for Adult
Emergency Cardiac Care
Figure 1



Dr. Edgar Miguel López Alvarez
Facultad de Medicina

Ventricular Fibrillation/Pulseless Ventricular Tachycardia (VF/VT) Algorithm

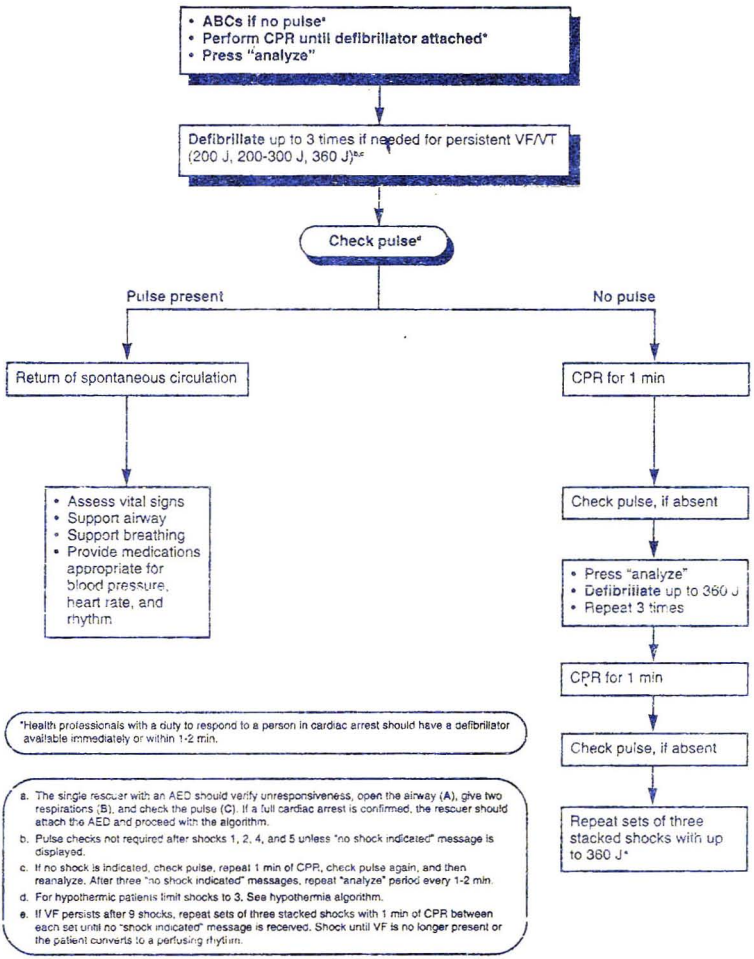
Figure 2



Automated External Defibrillation (AED) Treatment Algorithm

Figure 2A

Emergency cardiac care pending arrival of ACLS personnel



*Health professionals with a duty to respond to a person in cardiac arrest should have a defibrillator available immediately or within 1-2 min.

a. The single rescuer with an AED should verify unresponsiveness, open the airway (A), give two respirations (B), and check the pulse (C). If a full cardiac arrest is confirmed, the rescuer should attach the AED and proceed with the algorithm.

b. Pulse checks not required after shocks 1, 2, 4, and 5 unless "no shock indicated" message is displayed.

c. If no shock is indicated, check pulse, repeat 1 min of CPR, check pulse again, and then reanalyze. After three "no shock indicated" messages, repeat "analyze" period every 1-2 min.

d. For hypothermic patients limit shocks to 3. See hypothermia algorithm.

e. If VF persists after 9 shocks, repeat sets of three stacked shocks with 1 min of CPR between each set until no "shock indicated" message is received. Shock until VF is no longer present or the patient converts to a perfusing rhythm.

Pulseless Electrical Activity (PEA) Algorithm

(Electromechanical Dissociation [EMD])

Figure 3

Includes
- Electromechanical dissociation (EMD)
- Pseudo-EMD
- Idioventricular rhythms
- Ventricular escape rhythms
- Bradyasystolic rhythms
- Postdefibriliation idioventricular rhythms

- Continue CPR
- Intubate at once
- Obtain IV access
- Assess blood flow using Doppler ultrasound, end-tidal CO_2, echocardiography, or arterial line

Consider possible causes

(Parentheses = possible therapies and treatments)

- Hypovolemia (volume infusion)
- Hypoxia (ventilation)
- Cardiac tamponade (pericardiocentesis)
- Tension pneumothorax (needle decompression)
- Hypothermia (see hypothermia algorithm)
- Massive pulmonary embolism (surgery, ***thrombolytics***)
- Drug overdoses such as tricyclics, digitalis, β-blockers, calcium channel blockers
- Hyperkalemia[a]
- Acidosis[b]
- Massive acute myocardial infarction (go to Fig 9)

- ***Epinephrine*** 1 mg IV push,[a,c] repeat every 3-5 min

- If absolute bradycardia (<60 BPM) or relative bradycardia, give ***atropine*** 1 mg IV
- Repeat every 3-5 min to a total of 0.03-0.04 mg/kg[d]

Class I: definitely helpful
Class IIa: acceptable, probably helpful
Class IIb: acceptable, possibly helpful
Class III: not indicated, may be harmful

a. ***Sodium bicarbonate*** 1 mEq/kg is Class I if patient has known preexisting hyperkalemia.

b. ***Sodium bicarbonate*** 1 mEq/kg:
Class IIa
- If known preexisting bicarbonate-responsive acidosis
- If overdose with tricyclic antidepressants
- To alkalinize the urine in drug overdoses

Class IIb
- If intubated and continued long arrest interval
- Upon return of spontaneous circulation after long arrest interval

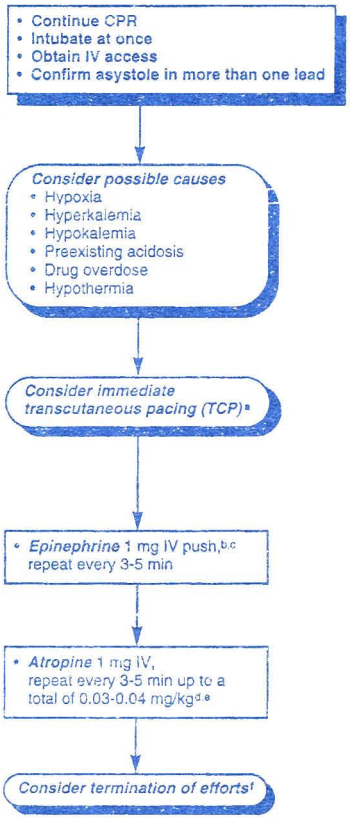
Class III
- Hypoxic lactic acidosis

c. The recommended dose of ***epinephrine*** is 1 mg IV push every 3-5 min. If this approach fails, several Class IIb dosing regimens can be considered:
- Intermediate: ***epinephrine*** 2-5 mg IV push, every 3-5 min
- Escalating: ***epinephrine*** 1 mg-3 mg-5 mg IV push, 3 min apart
- High: ***epinephrine*** 0.1 mg/kg IV push, every 3-5 min

d. The shorter ***atropine*** dosing interval (3 min) is possibly helpful in cardiac arrest (Class IIb).

Asystole Treatment Algorithm

Figure 4



Class I: definitely helpful
Class IIa: acceptable, probably helpful
Class IIb: acceptable, possibly helpful
Class III: not indicated, may be harmful

a. TCP is a Class IIb intervention. Lack of success may be due to delays in pacing. To be effective TCP must be performed early, simultaneously with drugs. Evidence does not support routine use of TCP for asystole.

b. The recommended dose of ***epinephrine*** is 1 mg IV push every 3-5 min. If this approach fails, several Class IIb dosing regimens can be considered:
- Intermediate: ***epinephrine*** 2-5 mg IV push, every 3-5 min
- Escalating: ***epinephrine*** 1 mg-3 mg-5 mg IV push, 3 min apart
- High: ***epinephrine*** 0.1 mg/kg IV push, every 3-5 min

c. ***Sodium bicarbonate*** 1 mEq/kg is Class I if patient has known preexisting hyperkalemia.

d. The shorter ***atropine*** dosing interval (3 min) is Class IIb in asystolic arrest.

e. ***Sodium bicarbonate*** 1 mEq/kg:
Class IIa
- If known preexisting bicarbonate-responsive acidosis
- If overdose with tricyclic antidepressants
- To alkalinize the urine in drug overdoses

Class IIb
- If intubated and continued long arrest interval
- Upon return of spontaneous circulation after long arrest interval

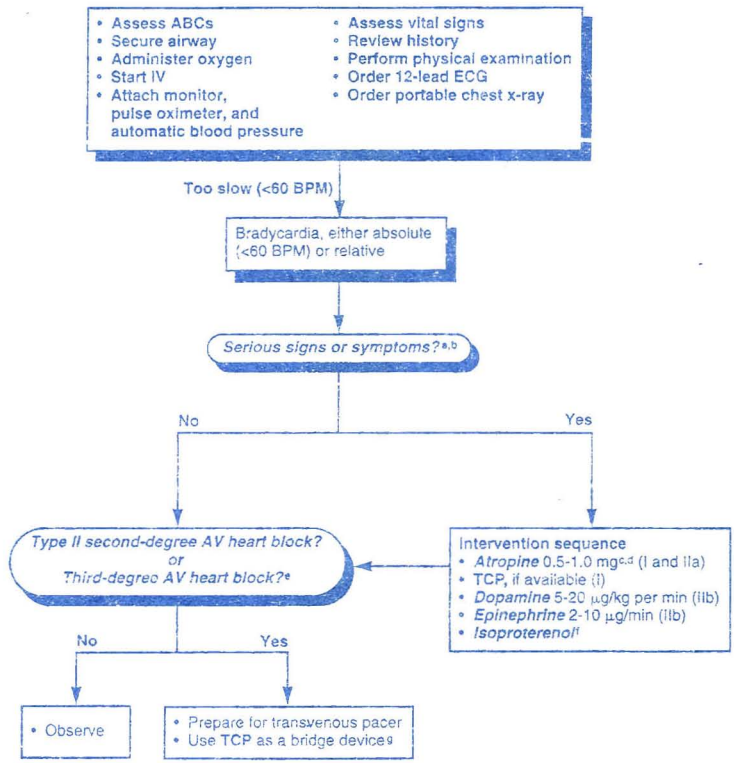
Class III
- Hypoxic lactic acidosis

f. If patient remains in asystole or other agonal rhythm after successful intubation and initial medications and no reversible causes are identified, consider termination of resuscitative efforts by a physician. Consider interval since arrest.

Bradycardia Algorithm

(Patient is not in cardiac arrest)

Figure 5



a. Serious signs or symptoms must be related to the slow rate. Clinical manifestations include
   - Symptoms (chest pain, shortness of breath, decreased level of consciousness)
   - Signs (low BP, shock, pulmonary congestion, CHF, acute MI)

b. Do not delay TCP while awaiting IV access or for *atropine* to take effect if patient is symptomatic.

c. Denervated transplanted hearts will not respond to ***atropine***. Go at once to pacing, ***catecholamine*** infusion, or both.

d. ***Atropine*** should be given in repeat doses every 3-5 min up to total of 0.03-0.04 mg/kg. Use the shorter dosing interval (3 min) in severe clinical conditions. It has been suggested that ***atropine*** should be used with caution in atrioventricular (AV) block at the His-Purkinje level (type II AV block and new third-degree block with wide QRS complexes) (Class IIb).

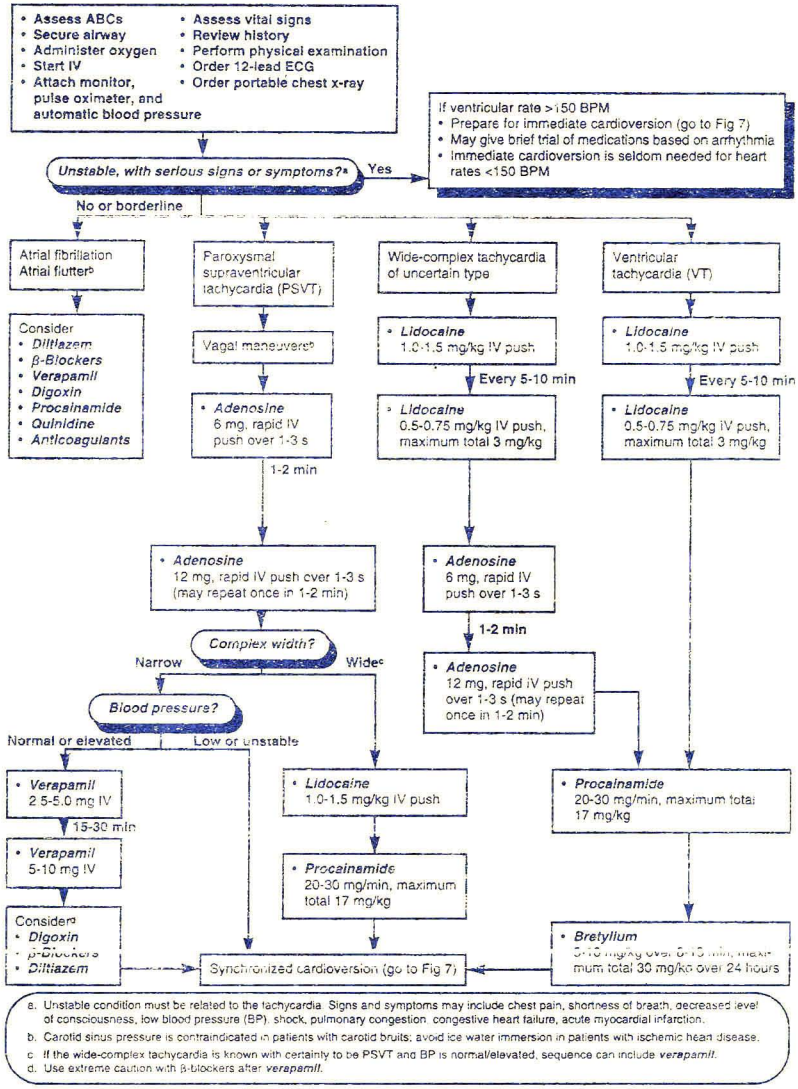
e. Never treat third-degree heart block plus ventricular escape beats with ***lidocaine***.

f. ***Isoproterenol*** should be used, if at all, with extreme caution. At low doses it is Class IIb (possibly helpful); at higher doses it is Class III (harmful).

g. Verify patient tolerance and mechanical capture. Use analgesia and sedation as needed.

Tachycardia Algorithm

Figure 6



a. Unstable condition must be related to the tachycardia. Signs and symptoms may include chest pain, shortness of breath, decreased level of consciousness, low blood pressure (BP), shock, pulmonary congestion, congestive heart failure, acute myocardial infarction.

b. Carotid sinus pressure is contraindicated in patients with carotid bruits; avoid ice water immersion in patients with ischemic heart disease.

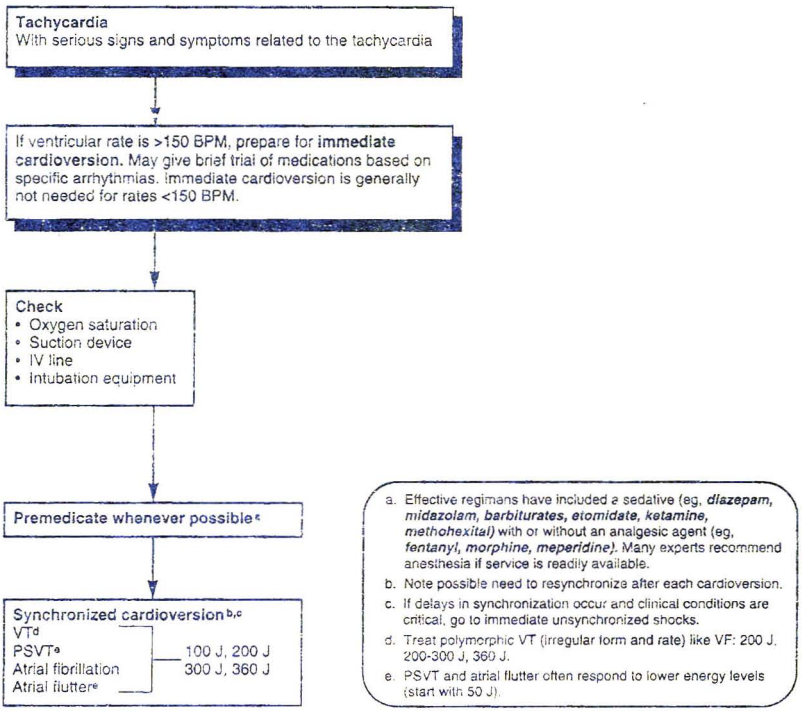
c. If the wide-complex tachycardia is known with certainty to be PSVT and BP is normal/elevated, sequence can include *verapamil*.

d. Use extreme caution with β-blockers after *verapamil*.

Electrical Cardioversion Algorithm

(Patient is not in cardiac arrest)

Figure 7



a. 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.

b. Note possible need to resynchronize after each cardioversion.

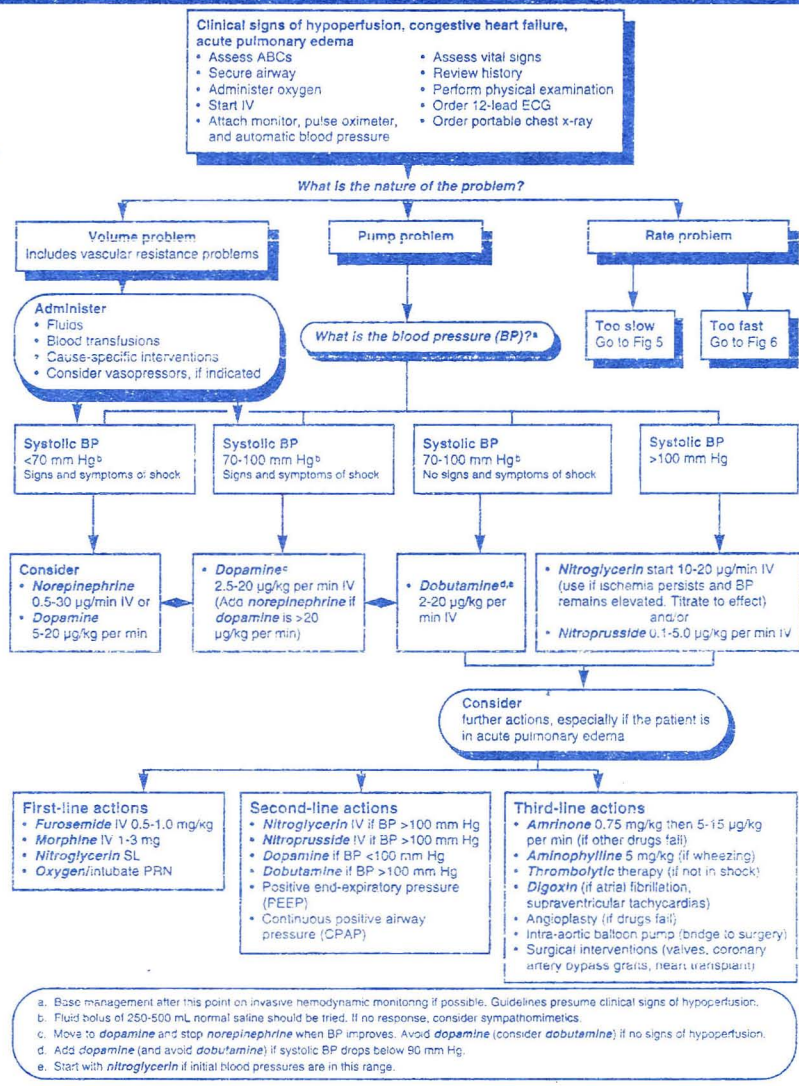
c. If delays in synchronization occur and clinical conditions are critical, go to immediate unsynchronized shocks.

d. Treat polymorphic VT (irregular form and rate) like VF: 200 J, 200-300 J, 360 J.

e. PSVT and atrial flutter often respond to lower energy levels (start with 50 J).

Acute Pulmonary Edema/Hypotension/Shock Algorithm

Figure 8



a. Base management after this point on invasive hemodynamic monitoring if possible. Guidelines presume clinical signs of hypoperfusion.
b. Fluid bolus of 250-500 mL normal saline should be tried. If no response, consider sympathomimetics.
c. Move to ***dopamine*** and stop ***norepinephrine*** when BP improves. Avoid ***dopamine*** (consider ***dobutamine***) if no signs of hypoperfusion.
d. Add ***dopamine*** (and avoid ***dobutamine***) if systolic BP drops below 90 mm Hg.
e. Start with ***nitroglycerin*** if initial blood pressures are in this range.