Aortic Dissection
Causes of Death

- Rupture aorta 33.3%
- Unspecified 33.3%
- Neurological deficit 13.9%
- Visceral ischemia/kidney failure 11.5%
- Cardiac tamponade 7.9%

(Circulation 2002;105:200-6)

Medical Management

- Detailed medical Hx and complete physical examination
- Intravenous line, blood sample (CK, TnT(I), myoglobin, WBC, D-dimer, Hct, LDH)
- ECG: documentation of ischemia
- HR and BP monitoring
- Pain relief (morphine)
- ↓ SBP using β–blockers, additional vasodilator in patient with sever HT
- Transfer to intensive care unit

Medical Management

- Pain relief and calming
  - Morphine sulphate
- Decrease shearing force and BP
  - Betablocker: HR ~ 60 bpm
  - Calcium channel blocker in COPD patient
- Decrease BP in severe hypertension
  - Addition of vasodilator: Sodium nitroprusside keep BP as low as possible (100-120 mmHg)

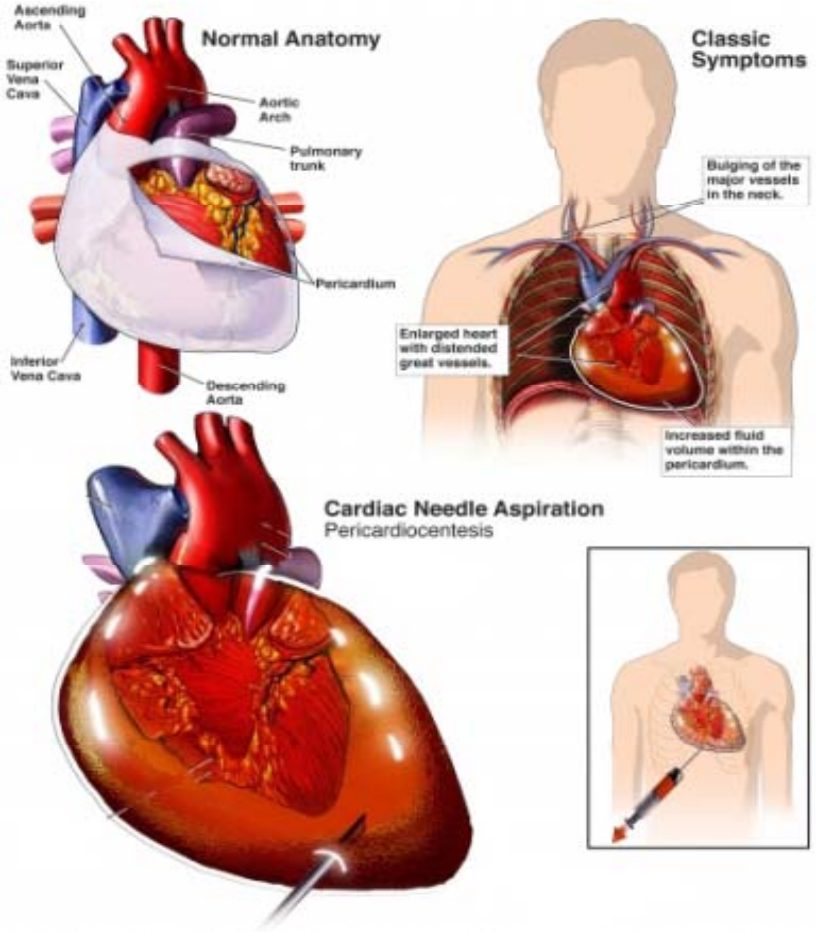
Surgical Therapy of Acute Type A Aortic Dissection

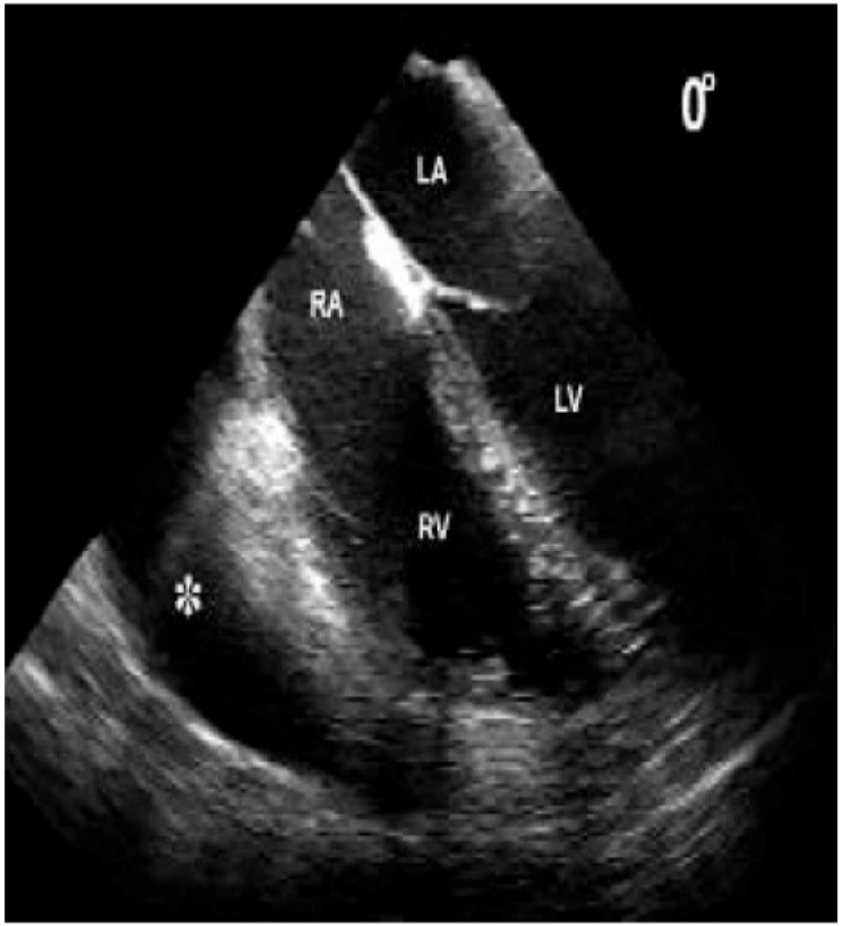
- Emergency surgery to avoid tamponade/ aortic rupture
- Valve-preserve surgery
  - Tubular graft *if* normal sized aortic root and no pathological changes of valve cusps
- Replacement of aorta and aortic valve (composite graft) *if* ectatic proximal aorta and/or pathological changes of valve/aortic wall

Indications for Surgery in Type B Aortic Dissection

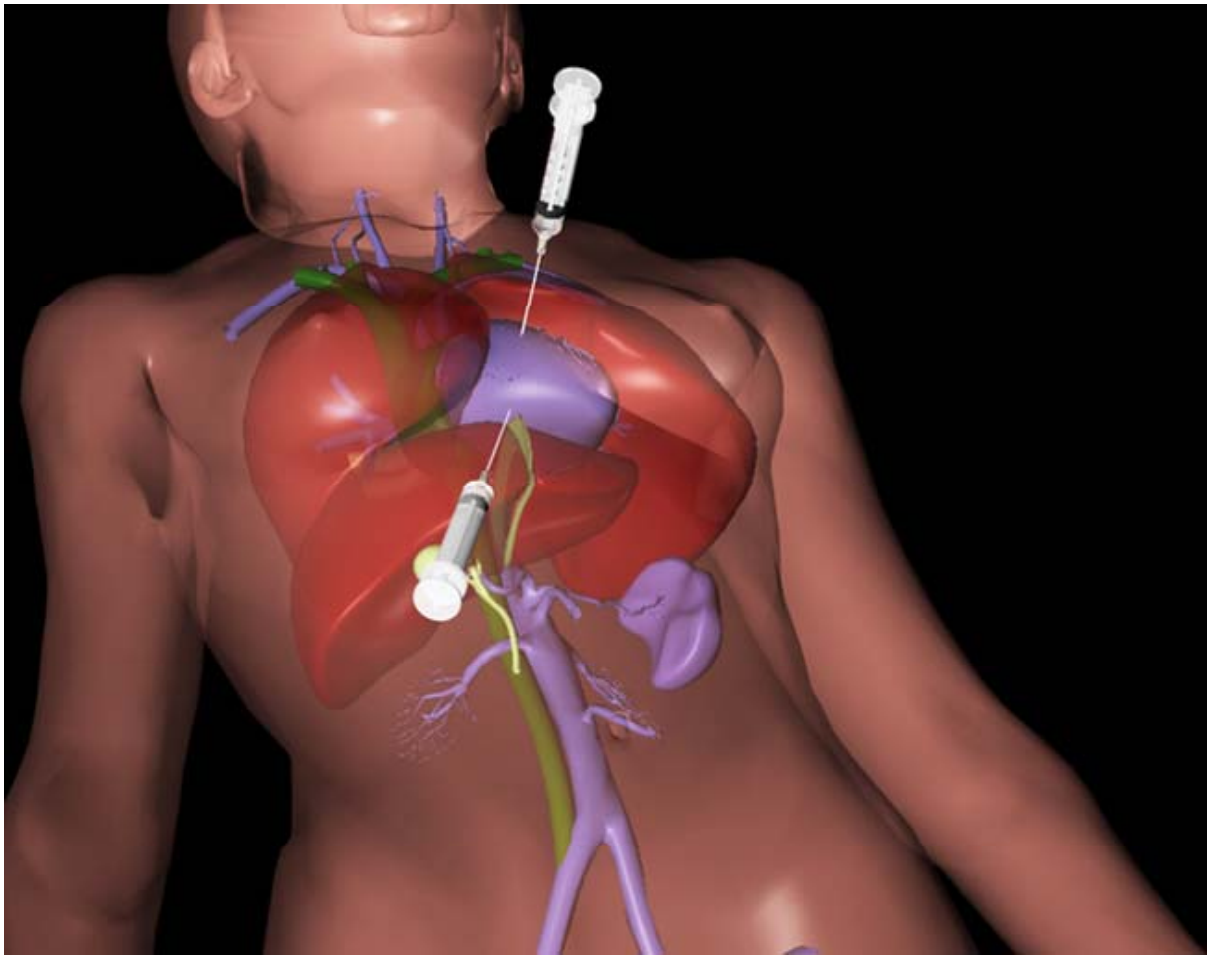
- Persistent, recurrent chest pain
- Early aortic expansion
- Aortic rupture
- Periaortic hematoma
- Mediastinal hematoma
- Peripheral ischemic complications

Cardiac Tamponade

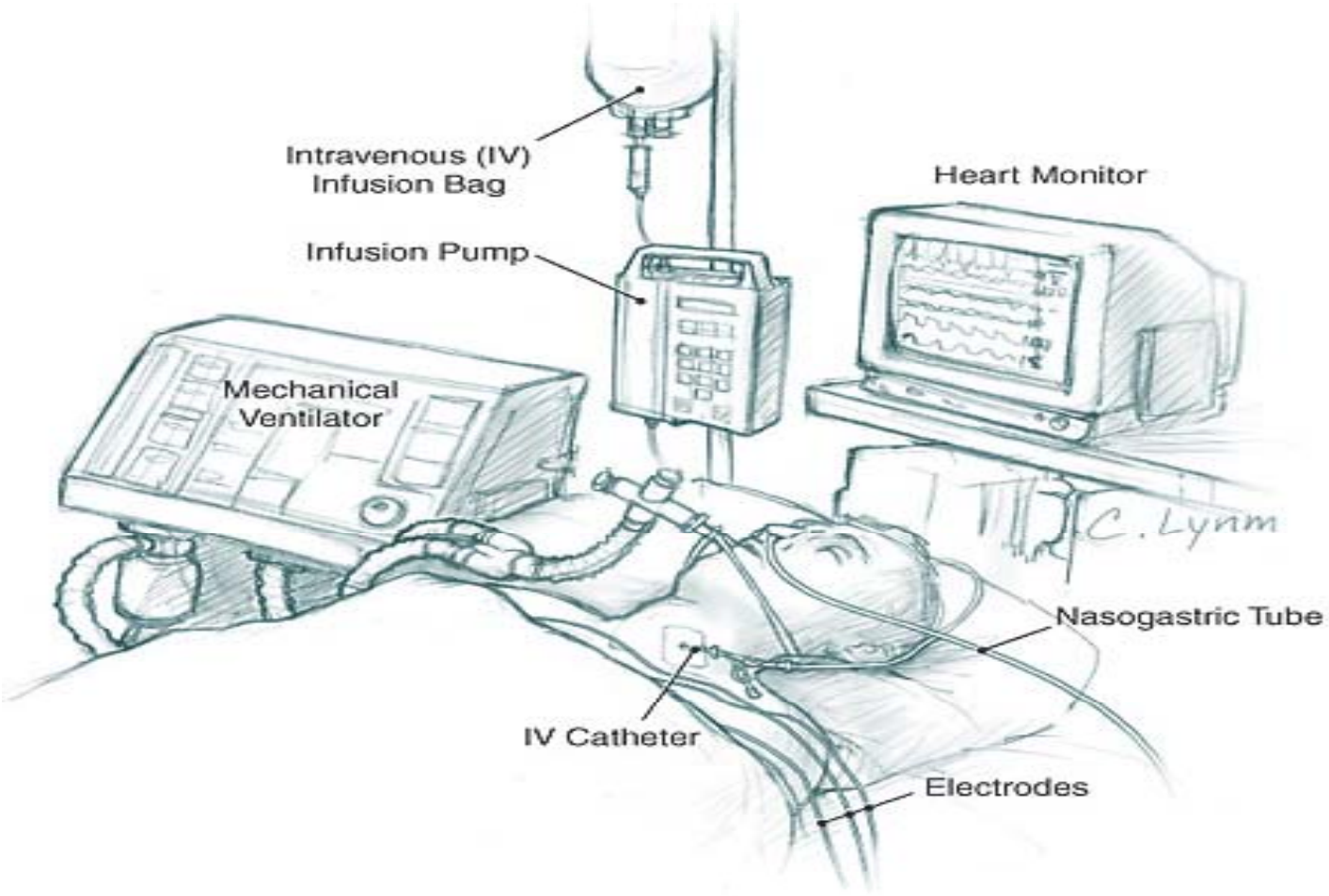




Pericardiocentasis



CCU Equipment



General intensive care unit Equipment

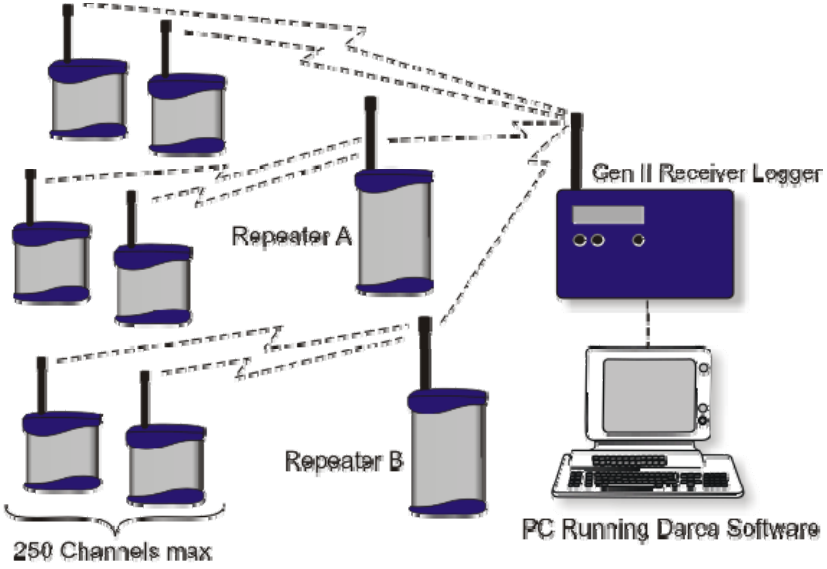
- **Monitoring equipment**
  - **Non-invasive:**
    - Blood pressure, EKG (Telemetry system), Pulse oximetry, Capnometer
  - **Invasive**
    - Arterial BP monitoring
    - CVP via central line
    - PA catheter – PAP, PCWP

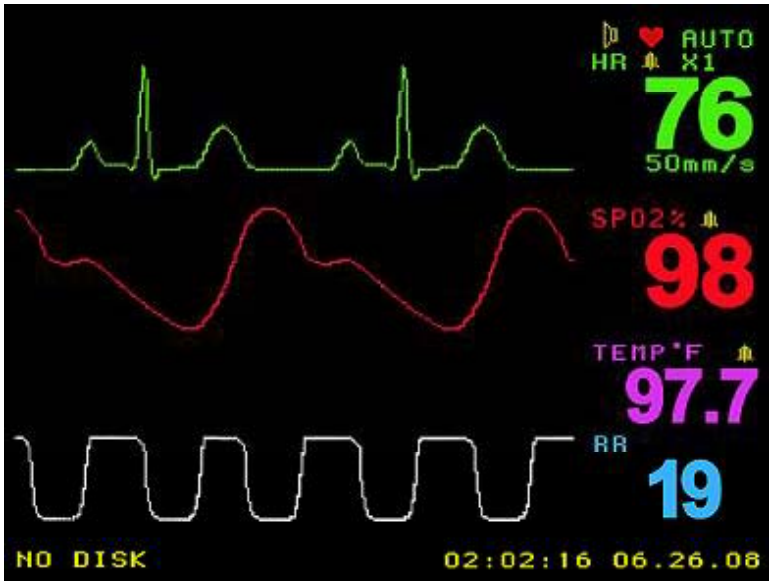
- Life support and emergency resuscitation
  - Ventilator
  - Infusion-pump device
  - Emergency cart containing resusitation equipment inclucing defibrillator, airway intubation devices, bag/mask, medication box
  - Central line

General intensive care unit Equipment

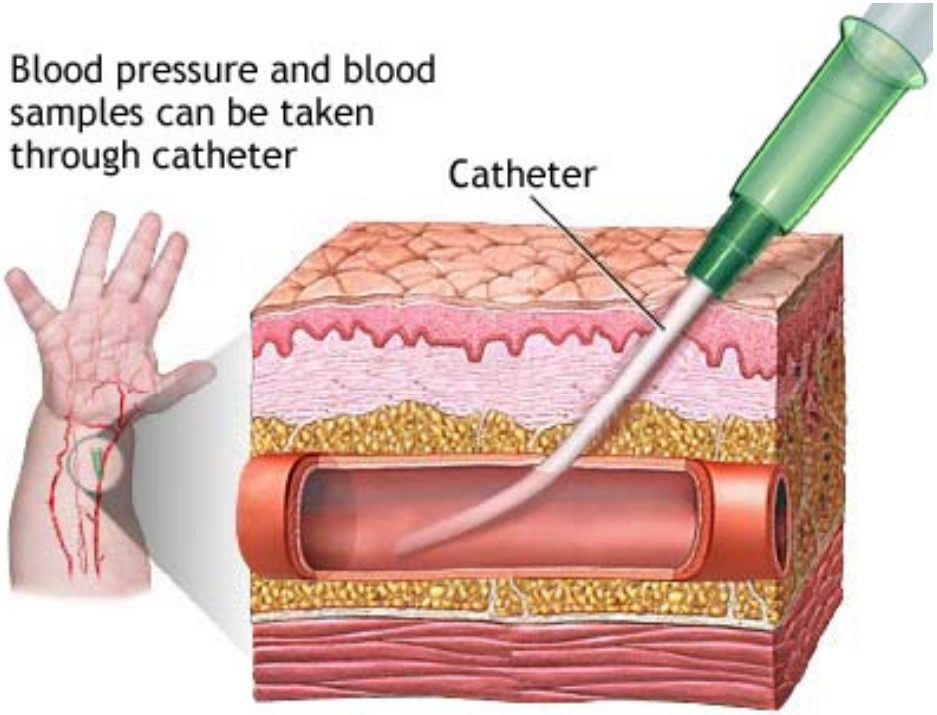
- Diagnostic equipment
  - Mobile X-ray Unit
  - Portable echo
  - Portable clinical lab device
- Disposible equipment
  - Arterial and central venous lines
  - Swan-Ganz (PA) catheters
  - Chest and endotracheal tubes
  - GI an NG tubes
  - Monitoring electrodes

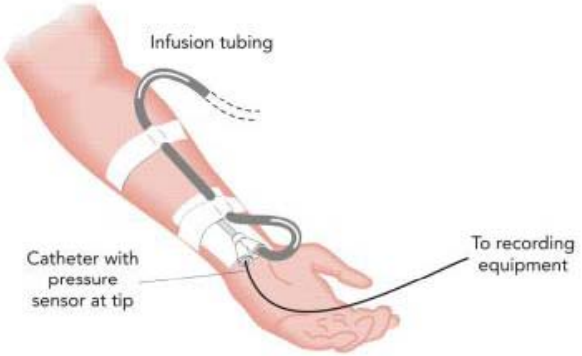
ECG Monitoring (Telemetry)





ECG Monitoring
Continuous intraarterial blood pressure

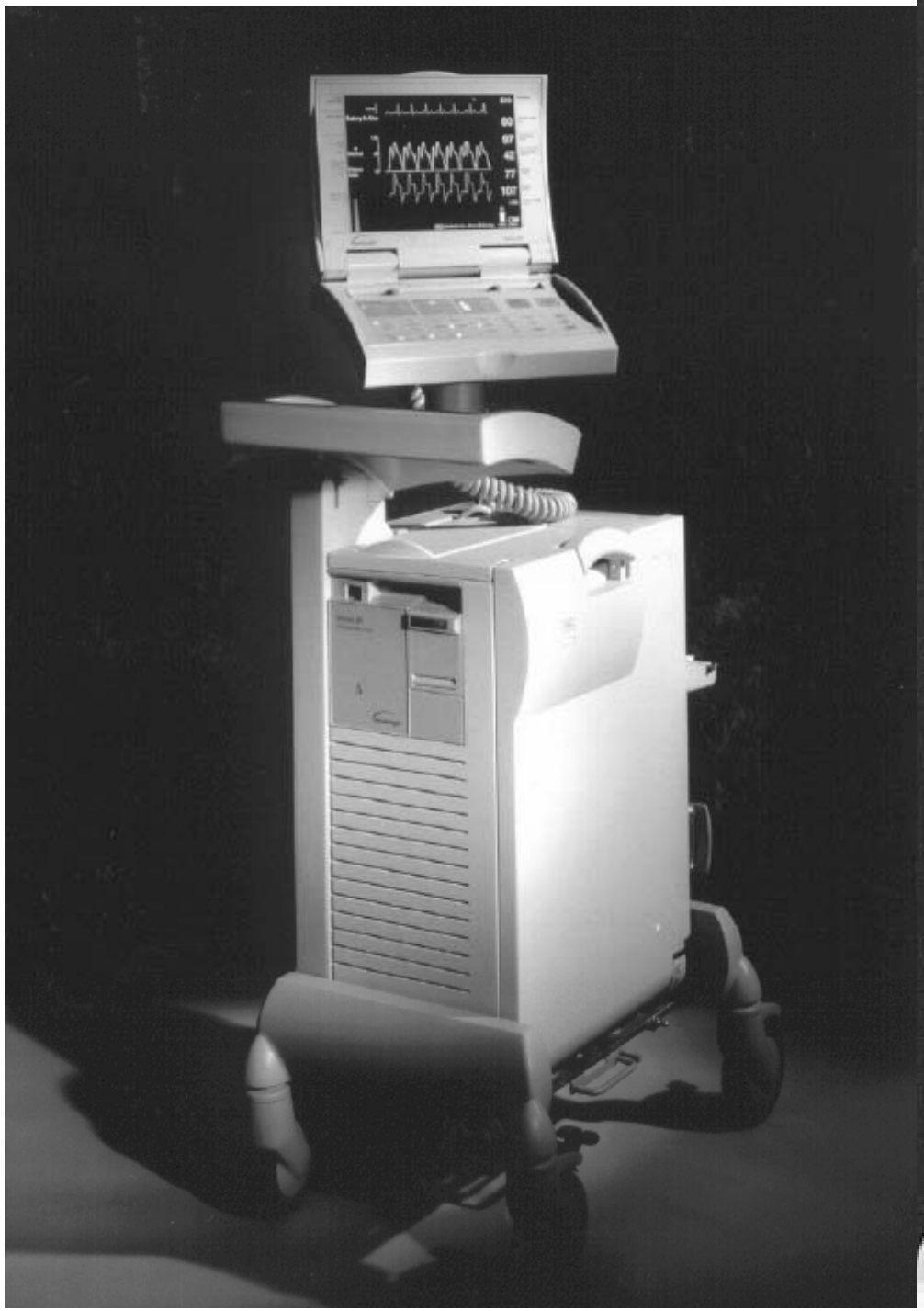




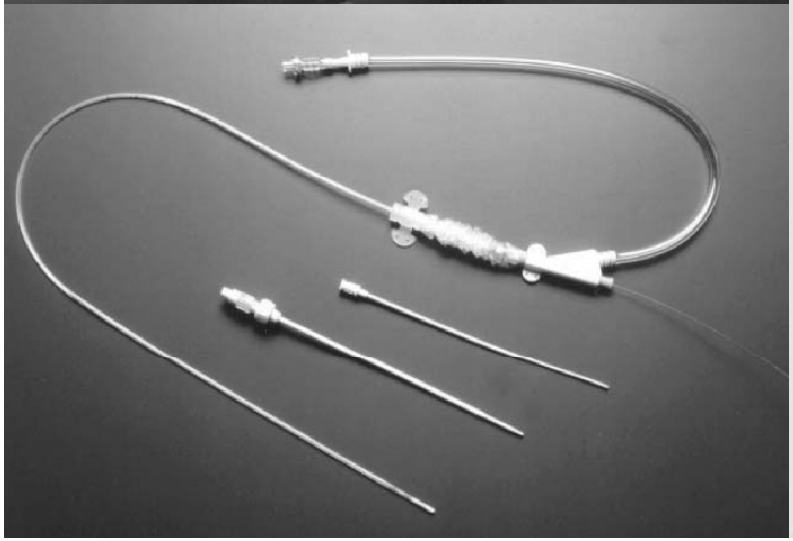
CCU equipment

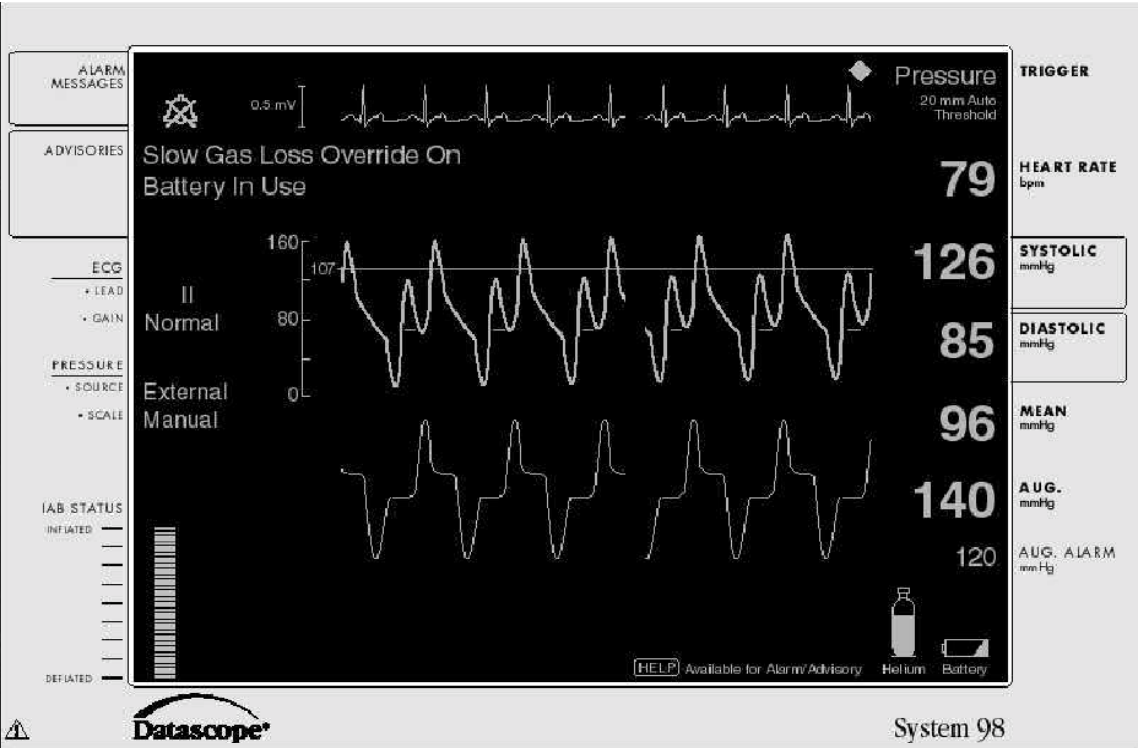
- IABP (Intra-aortic balloon punp)
- Swan-Ganz (PA) catheter
- Defibrillator
- Temporary pacemaker
- Echocardiography (portable)

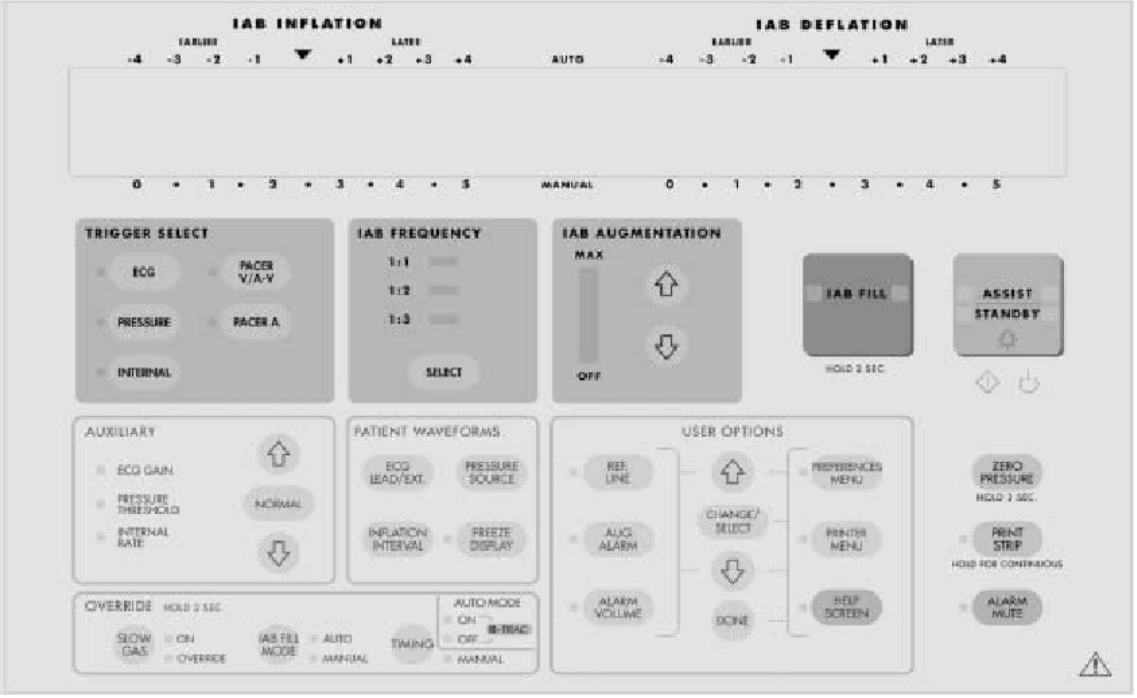
IABP (Intra-aortic Balloon Pump)



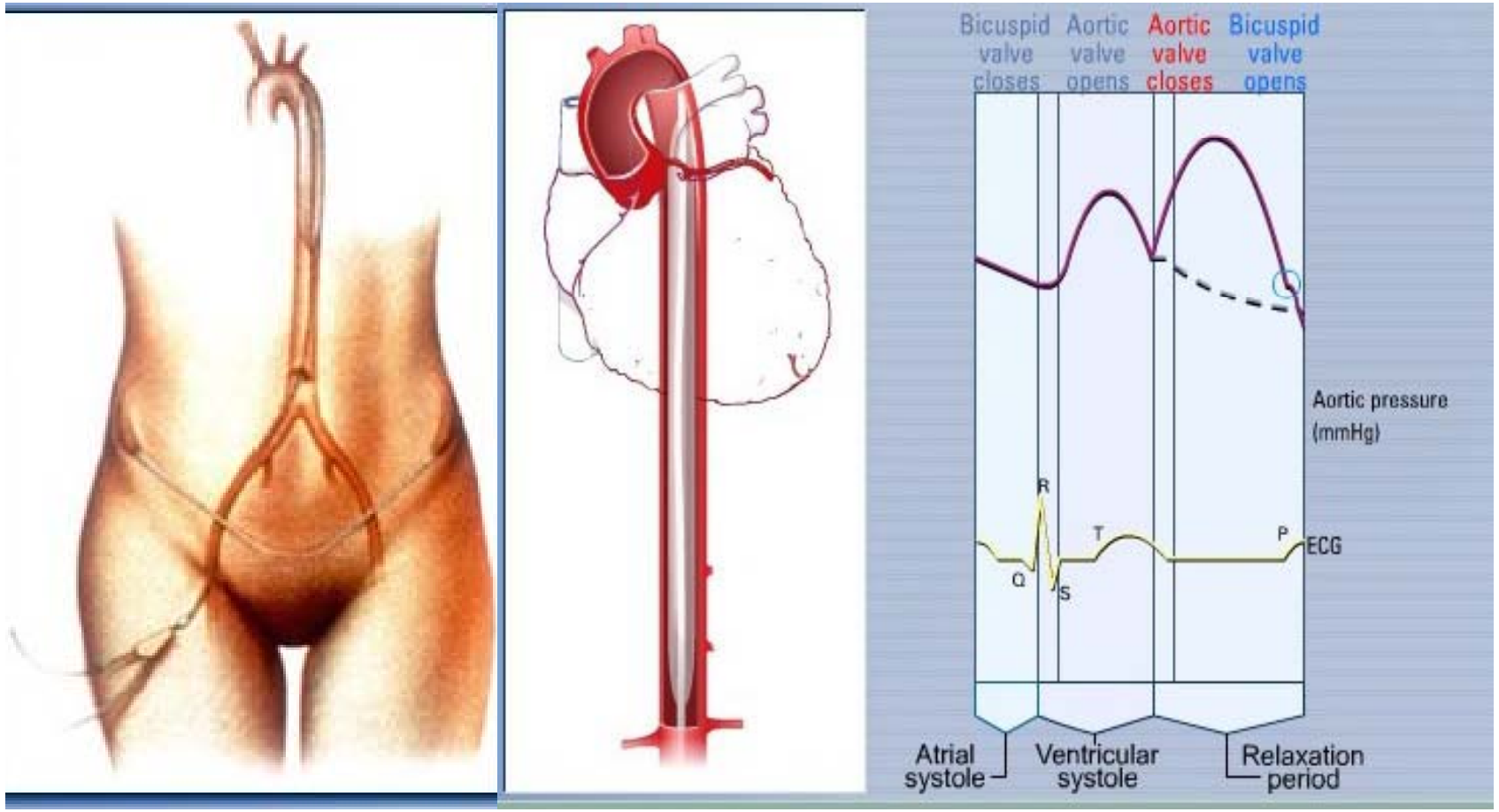

Helium,
99.8%




ALARM MESSAGES
ADVISORIES
ECG
• LEAD
• GAIN
PRESSURE
• SOURCE
• SCALE
IAB STATUS
INFLATED
DEFLATED
0.5 mV
Slow Gas Loss Override On
Battery In Use
II
Normal
External
Manual
160
107
80
0
Pressure
20 mm Auto
Threshold
79
126
85
96
140
120
HELP Available for Alarm/Advisory
Helium
Battery
TRIGGER
HEART RATE
bpm
SYSTOLIC
mmHg
DIASTOLIC
mmHg
MEAN
mmHg
AUG.
mmHg
AUG. ALARM
mmHg
Datascope
System 98

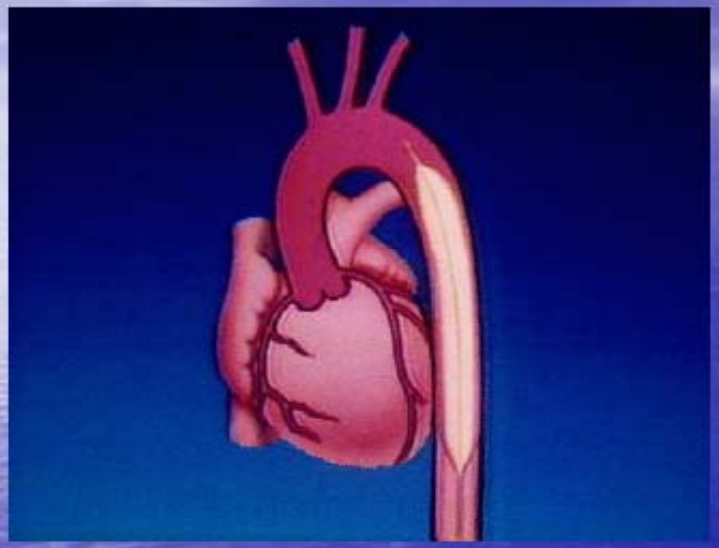

IAB INFLATION
IAB DEFLATION
EARLIER
LATER
-4 -3 -2 -1 +1 +2 +3 +4
AUTO
MANUAL
0 1 2 3 4 5
TRIGGER SELECT
ECG
PACER V/A-V
PRESSURE
PACER A
INTERNAL
IAB FREQUENCY
1:1
1:2
1:3
SELECT
IAB AUGMENTATION
MAX
OFF
IAB FILL
HOLD 2 SEC
ASSIST STANDBY
AUXILIARY
ECG GAIN
PRESSURE THRESHOLD
INTERNAL RATE
NORMAL
PATIENT WAVEFORMS
ECG LEAD/EXT
PRESSURE SOURCE
INFLATION INTERVAL
FREEZE DISPLAY
USER OPTIONS
REF LINE
AUG ALARM
ALARM VOLUME
CHANGE/ SELECT
DONE
PREFERENCES MENU
PRINTER MENU
HELP SCREEN
ZERO PRESSURE
HOLD 2 SEC
PRINT STRIP
HOLD FOR CONTINUOUS
ALARM MUTE
OVERRIDE
HOLD 2 SEC
SLOW GAS
ON
OVERRIDE
IAB FILL MODE
AUTO
MANUAL
TIMING
AUTO MODE
ON
OFF
R-WAVE
MANUAL

IABP Catheter Placement



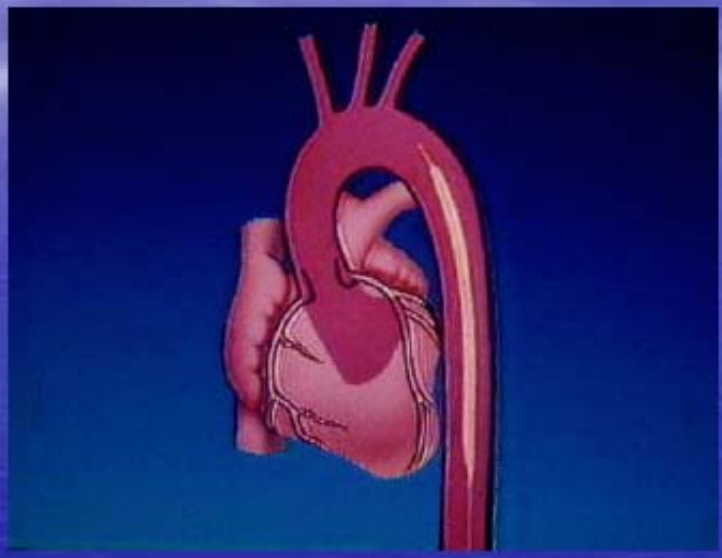
Principles of Counterpulsation

Diastole: IAB Inflation



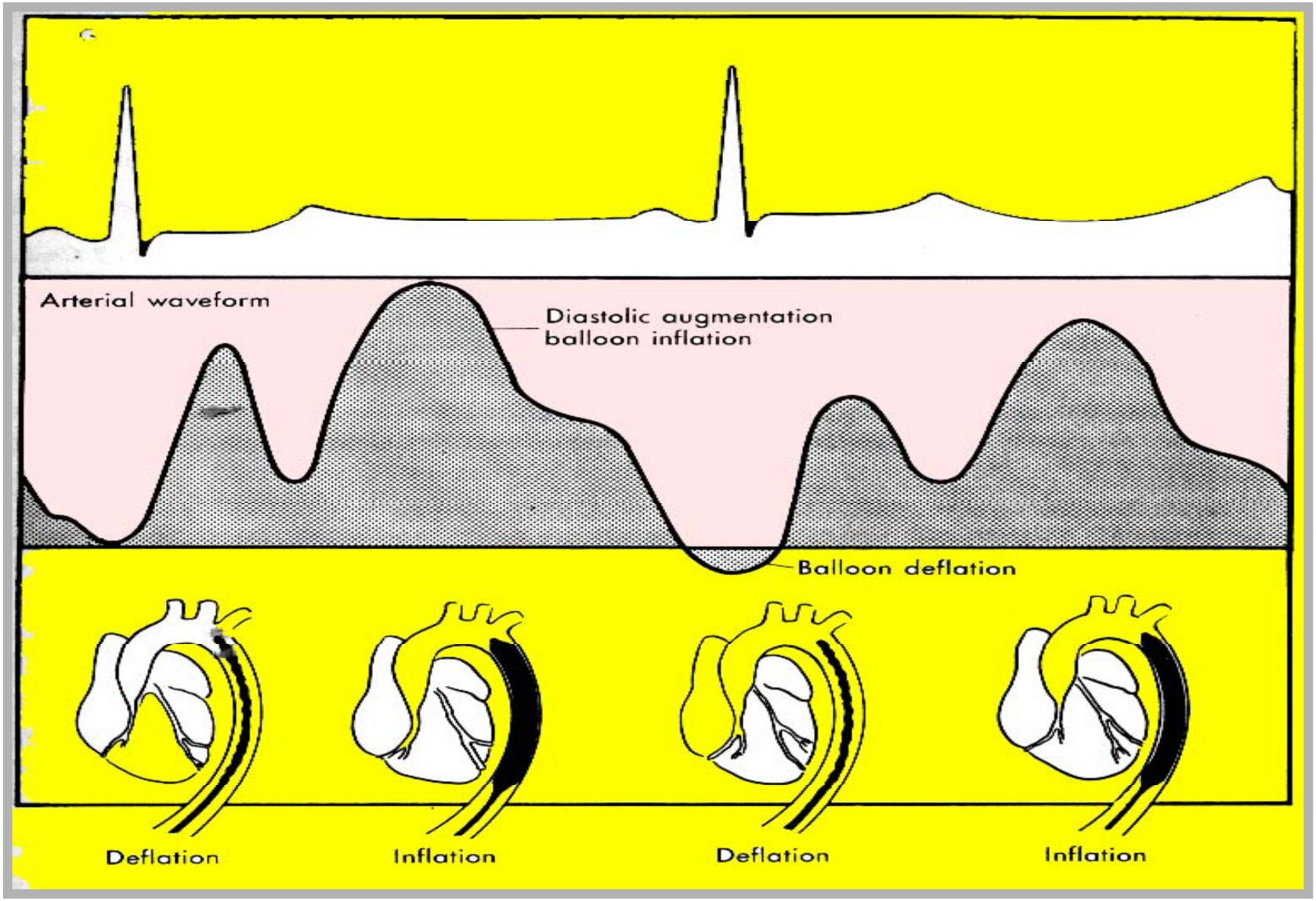
- Increase coronary perfusion
- Enhance pulsatile coronary artery flow

Systole: IAB Deflation



- Decrease cardiac work
- Decrease myocardial oxygen consumption
- Increase cardiac output

Principle of Counterpulsation



Indication for IABP

- Acute myocardial infarction with
  - Cardiogenic shock
  - Refractory angina
  - Mechanical complication e.g.. VSD, acute MR from rupture papillary muscl
- Refractory unstable angina
- Ischemic related intractable ventricular arrhythmias

Indication for IABP(2)

- Bridge to cardiac transplantation
- Prophylaxis or support to intervention in high risk patient
- Cardiac support for high risk patient before cardiac surgery
- Support in severe CAD patients for non-cardiac surgery

Contraindication

- Aortic regurgitation
- Abdominal aortic aneurysm or dissection
- Uncontrolled bleeding
- Severe bilateral peripheral vascular disease
- Bilateral femoral popliteal bypass graft of PVD
- Uncontrolled sepsis

Invasive Hemodynamic Monitoring in CCU

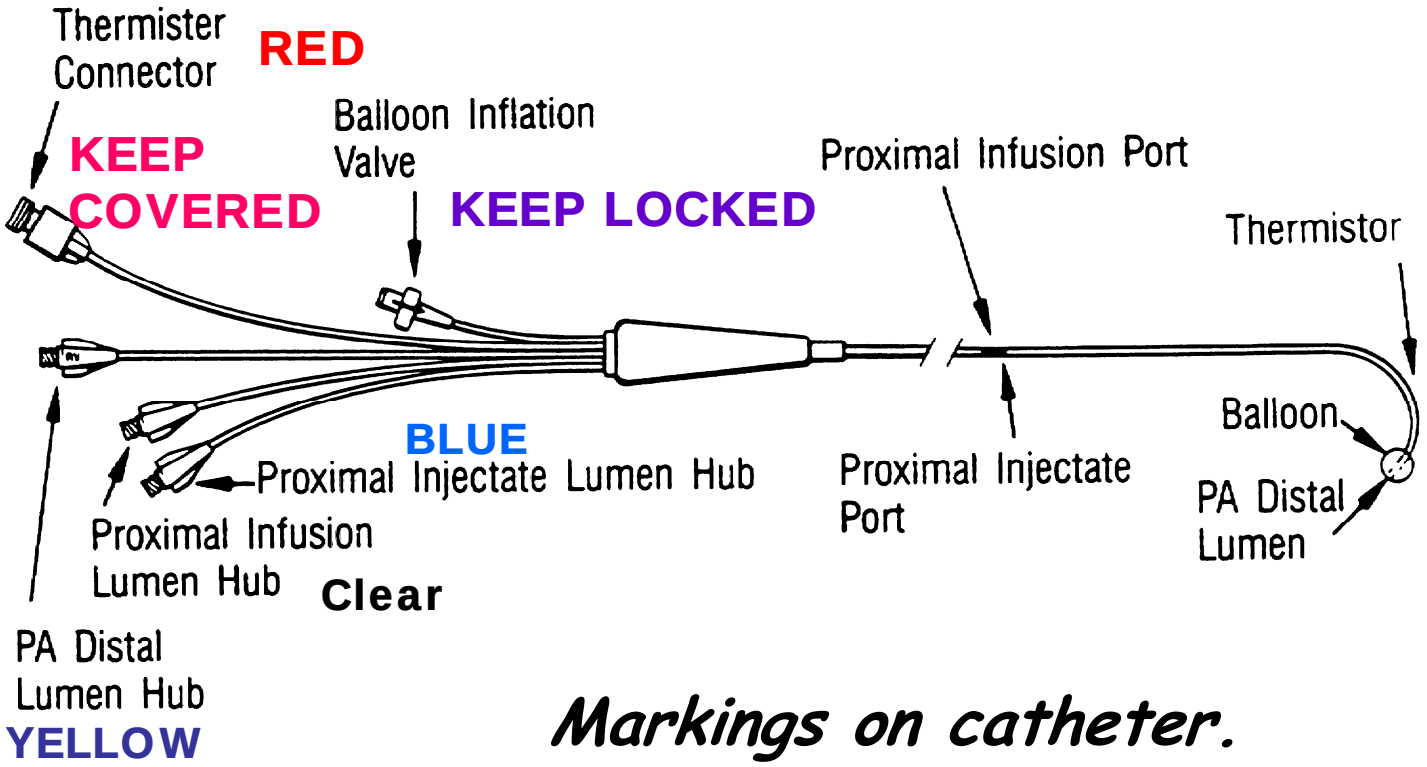
Pulmonary Artery Catheter

(Swan-Ganz Catheter)

Functions of PA Catheter

- Allows for continuous bedside monitoring of the following
  - Vascular tone, myocardial contractility, and fluid balance can be correctly assessed and managed.
  - Measures Pulmonary Artery Pressures, CVP, and allows for hemodynamic calculated values.
  - Measures Cardiac Output. (Thermodilution)
  - SvO2 monitoring (Fiber optic)
  - Fluid administration.

PA Catheter



Markings on catheter.

1. Each **thin** line= **10** cm.
2. Each **thick** line= **50** cm.

Description of PA Catheter

Ports/lumens.

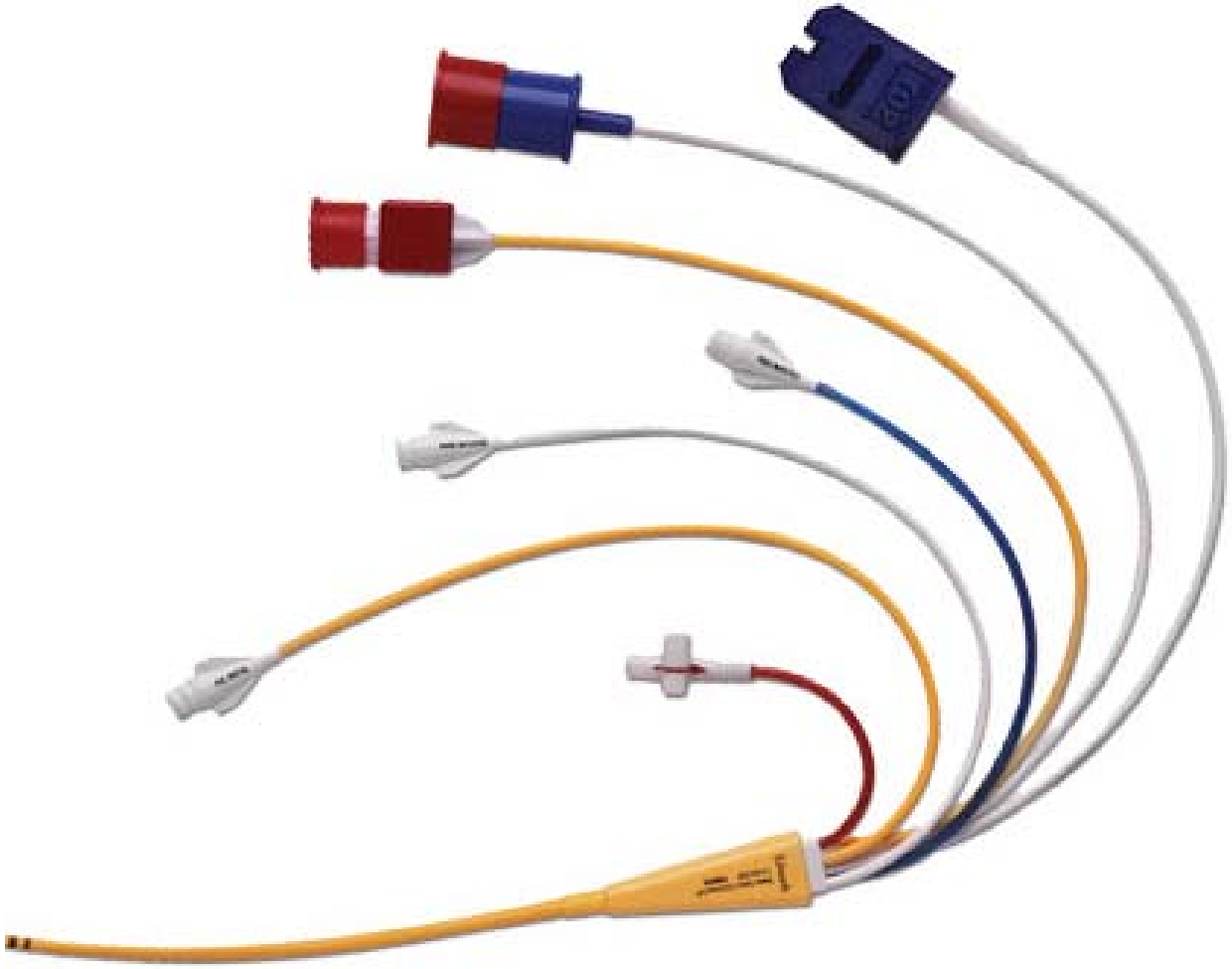
CVP Proximal (pressure line - injectate port for CO)-**BLUE**

PA Distal (Pressure line hook up)- **Yellow**

Extra port - usually- **Clear**

Thermistor **–** **Red Cap**

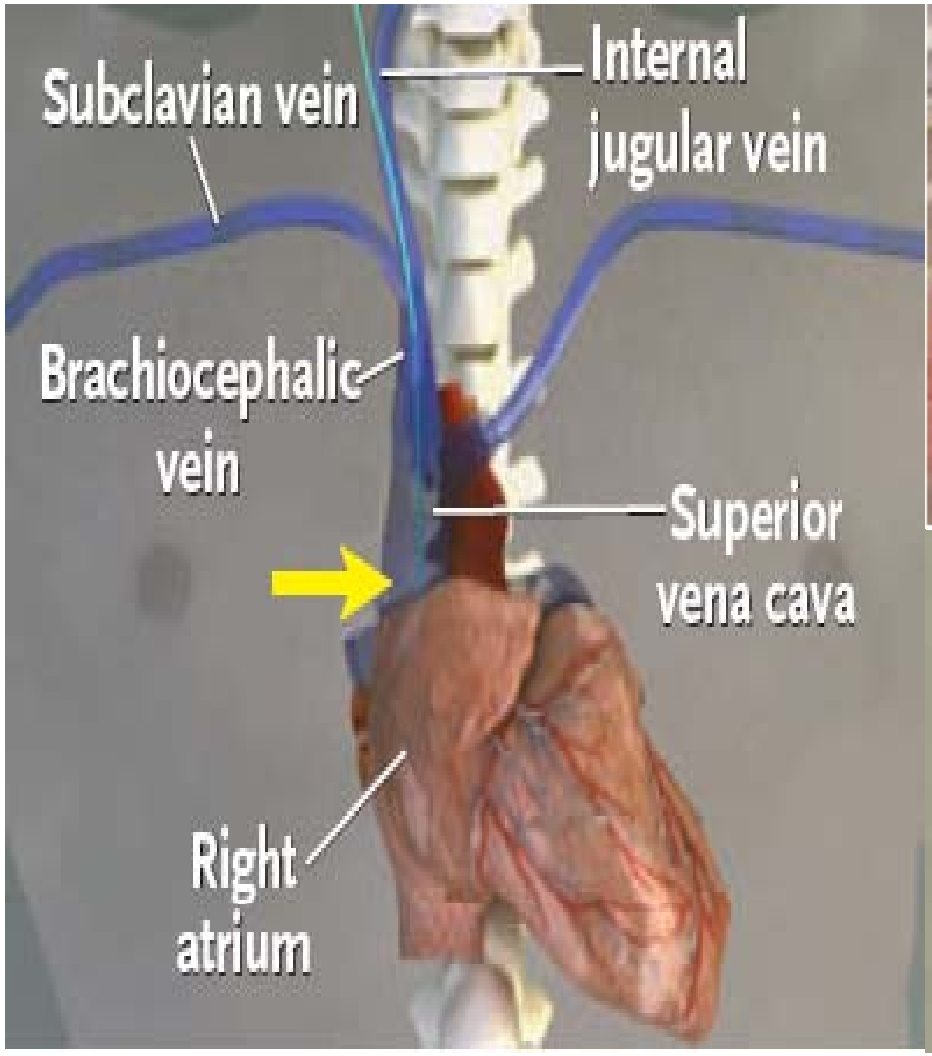
Continuous Cardiac Output and SVO_2 monitoring

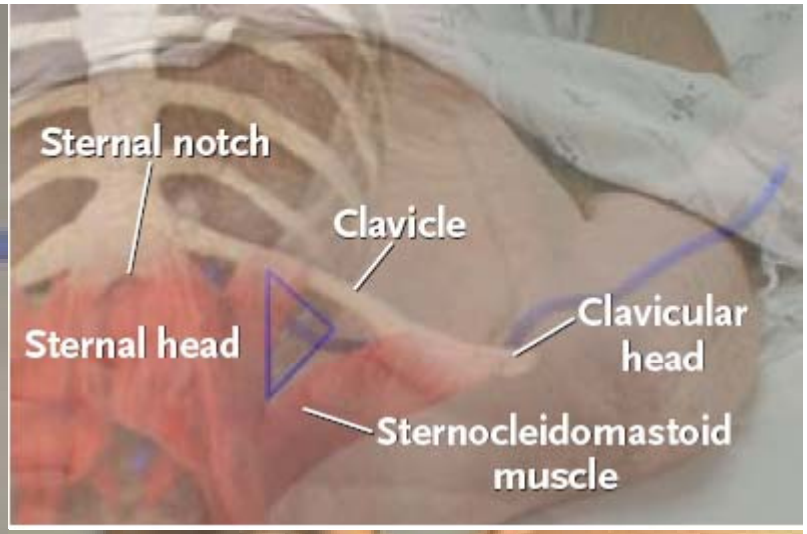


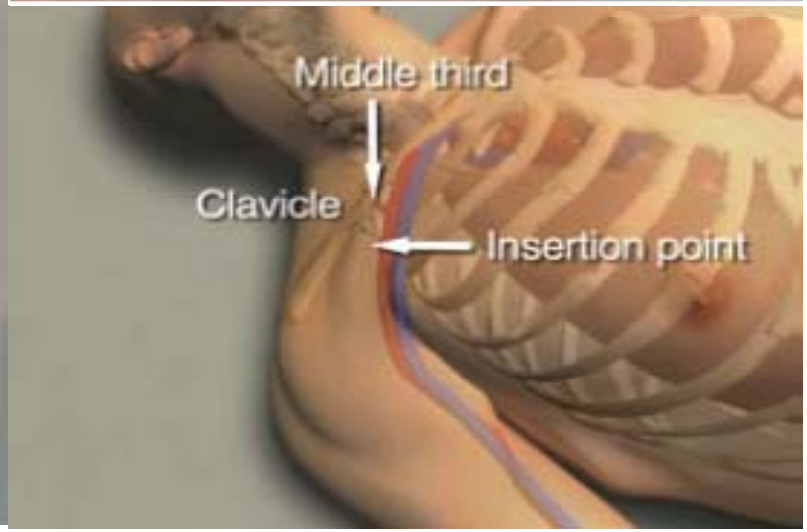
Indications for PA catheter

- The pulmonary artery catheter is indicated in patients whose cardiopulmonary pressures, flows, and circulating volume require precise, intensive management.
  - MI – cardiogenic shock - CHF
  - Shock - all types
  - Valvular dysfunction
  - Preoperative, Intraoperative, and Postoperative Monitoring
  - ARDS, Burns, Trauma, Renal Failure

Access site
Internal jugular or Subclavian vein







Using the Swan-Ganz catheter to diagnose type of shock

Condition	HR	MAP	CO/CI	CVP/RAP	PAP/PAWP	Notes
Left ventricular failure	↑	↓	↓	↑	↑	
Cardiogenic pulmonary edema	↑	N/↓	↓	↑	↑ PAWP > 25mmHg	
Massive pulmonary embolism	↑	↓	↓	↑	↑ PAD>PAWP by >5 mmHg	↑ Pulm Vasc Res
Acute ventricular septal defect	↑	↓	↓	↑	↑ giant 'V' waves on PAWP trace	O_2 step up noted in SvO_2
Acute mitral regurgitation	↑	↓	↓	↑	↑ giant 'V' waves on PAWP trace	
Cardiac tamponade	↑	↓	↓	↑	↑ PAD/PAWP equalised	
Right ventricular failure	↑V	↓V	↓	↑	↑ PAP ↓/N PAWP	↑RVEDV
Hypovolemic shock	↑	↓	↓	↑	↓	↑ O_2 extraction + SVR
Cardiogenic shock	↑	↓	↓	↑	↑	↑ O_2 extraction + SVR
Septic shock	↑	↓	↑↓	↑↓	↑↓	↓ O_2 extraction + SVR

Defibrillators

- Automated External Defibrillators (AED)
- **<u>Manual Defibrillators</u>**
  - New models : may have AED mode

Electrode Placement

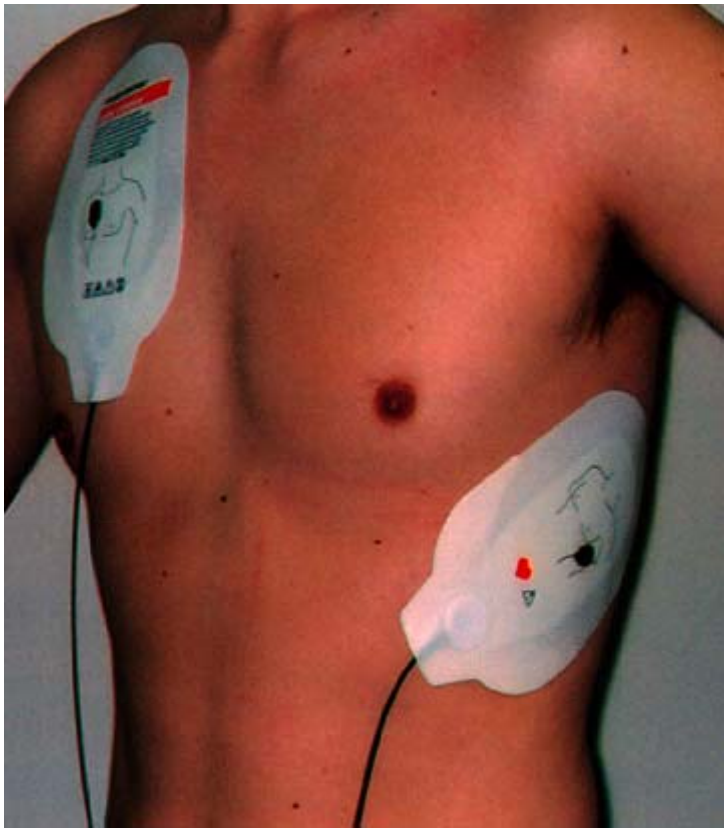
- Paddles or Pads
  - Well-separated paddles/pads
  - Bare chest (may need to remove hair by shaving or briskly removing of an adhesive pad; may need to wipe out water or sweat)

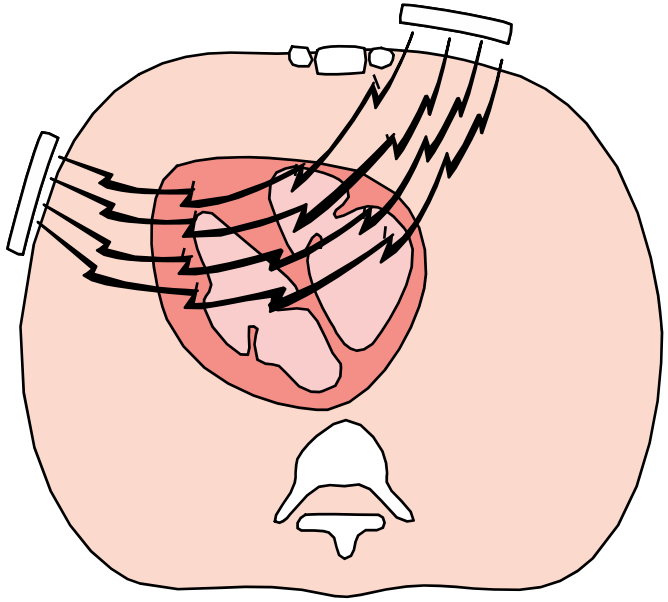
Electrode Placement

- Paddles or Pads
  - No paste or gel smeared on the chest between paddles
  - Not place on top of a transdermal medical patch
  - Not place over or close to device generator (eg. Permanent pacemaker, AICD)

Electrodes Placement

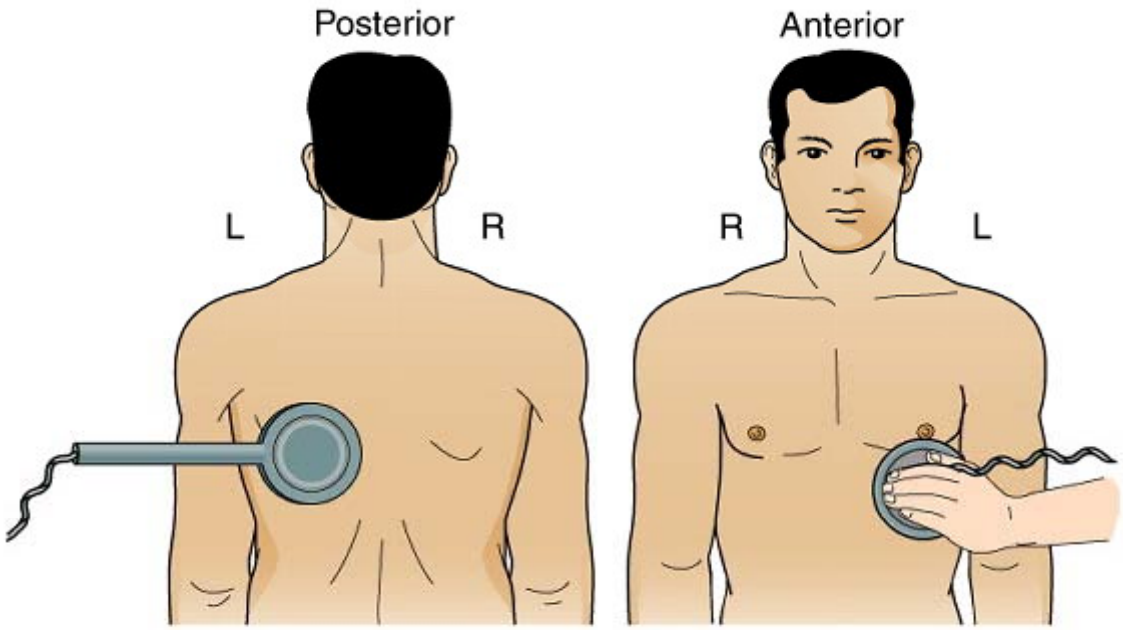
Standard Paddles Placement





Self adhesive pads Placement

A-P Electrode Placement

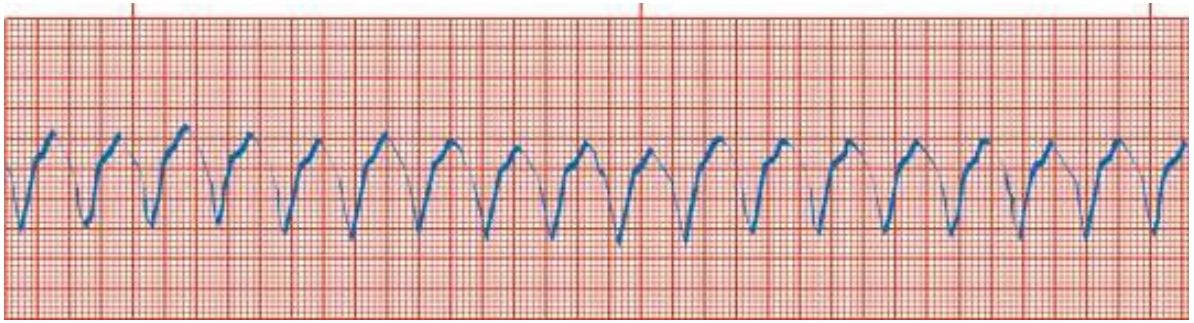


Antero-posterior Placement

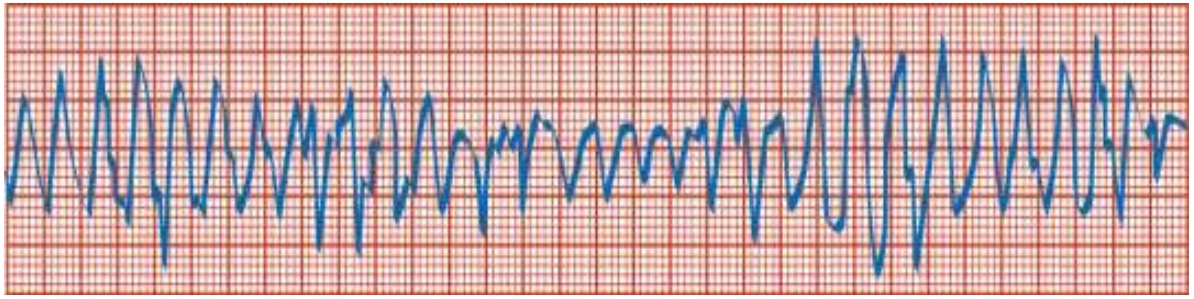
Defibrillator

- Defibrillation (asynchronous)
- Cardioversion (synchronous)
- Transcutaneous pacing
- Bedside monitoring
  - ECG
  - Pulse oxymeter

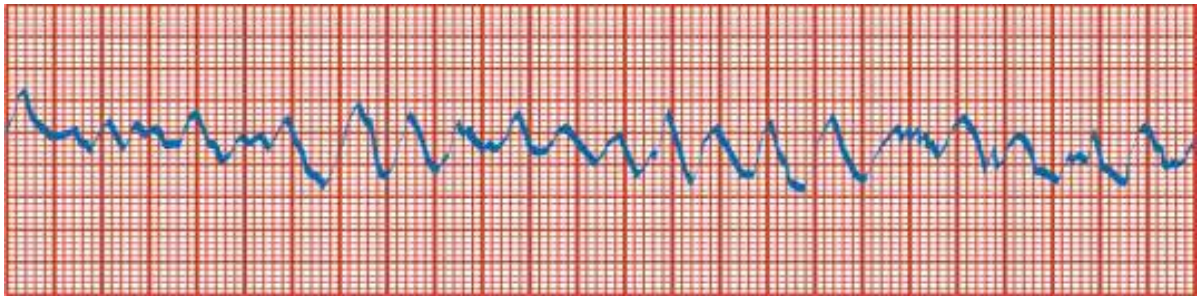
Defibrillation : Shockable Arrhythmia



VT : Ventricular Tachycardia (Monomorphic)



VT : Ventricular Tachycardia (Polymorphic)



VF : Ventricular Fibrillation

Synchronized Cardioversion

- Shock delivery that is timed (synchronized) with the QRS complex
  - Avoid shock during the relative refractory period which can cause VF
- Indicated in Unstable tachyarrhythmia associated with
  - Organized QRS complex **AND** perfusion rhythm (pulse)
- Recommended in Supraventricular tachycardia (SVT), Atrial fibrillation (AF), Atrial flutter, or hemodynamic stable monomorphic VT

Synchronized Cardioversion

- Not used in treatment of
  - VF
  - Pulseless VT
  - Unstable polymorphic VT

  → ***No use in sudden cardiac arrest*** ←
- Not effective in
  - Junctional tachycardia, ectopic or multifocal atrial tachycardia, sinus tachycardia

Pacemaker

- Permanent Pacemaker
  - Single chamber, Dual chamber, Bi-V pacemaker, etc.
- Temporary Pacemaker → usually used in CCU/ ICU/ Emergency room
  - Transcutneous
  - Transvenous

Transcutaneous Temporary Pacing

- Pacer (Defibrillator with pacer mode)
- Adhesive pads (on chest wall)

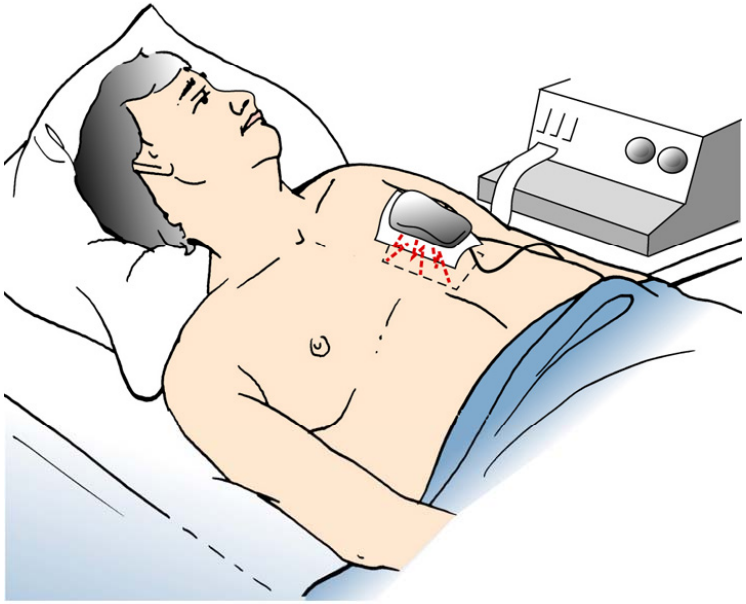
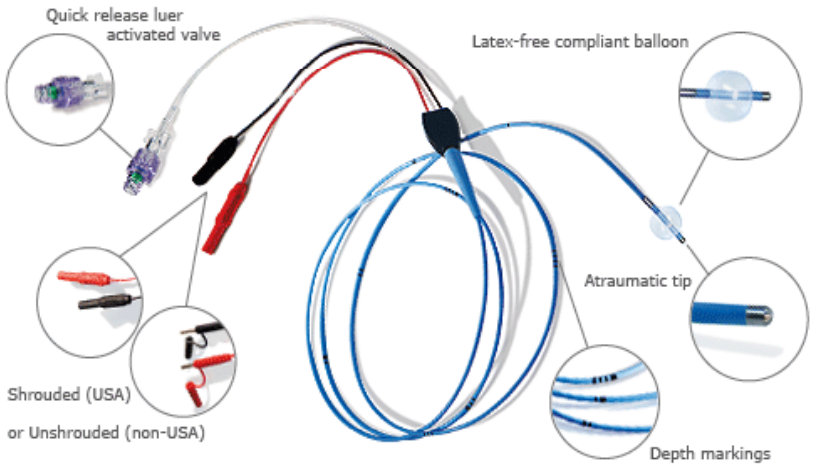


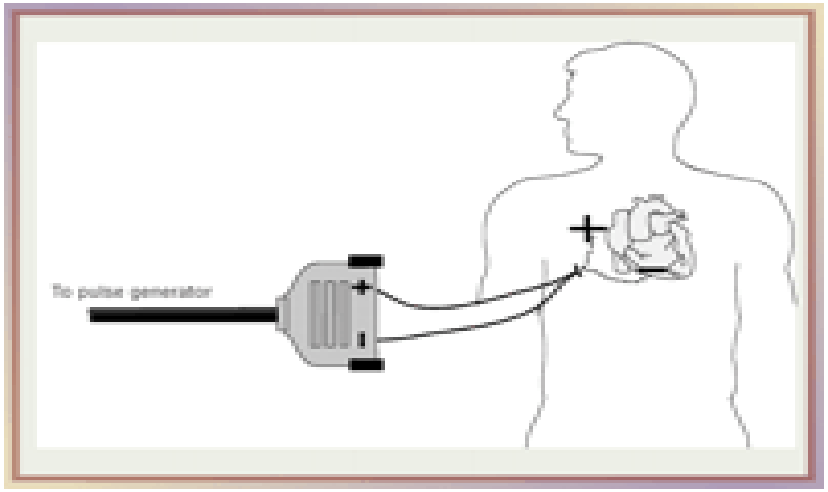
Figure 18-32 Transcutaneous pacing. Electrodes are placed on anterior and posterior chest walls and attached to the external pacing unit.

Transvenous Pacing

- External Pacer

- Transvenous pacing wire

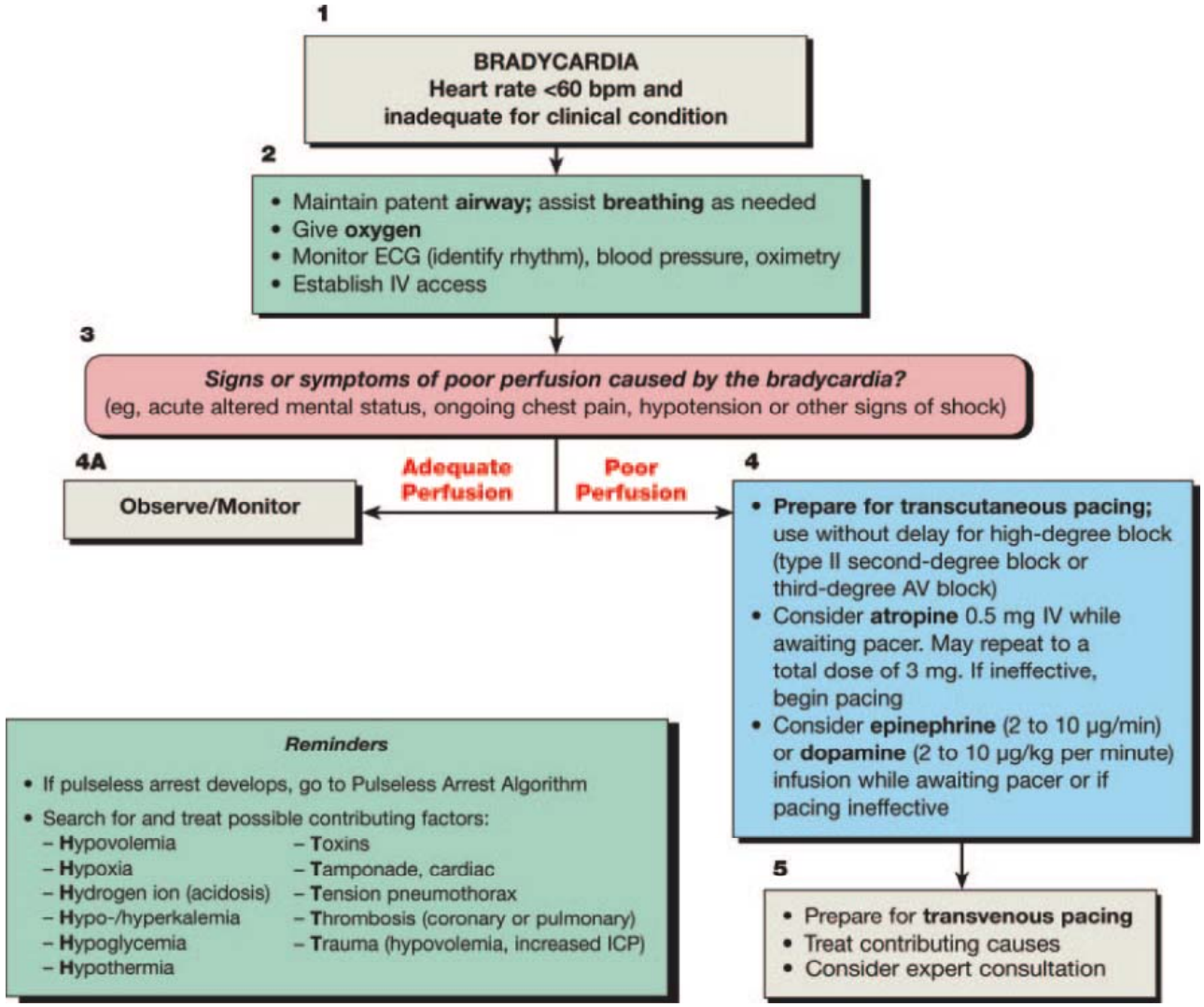




Common Access Sites

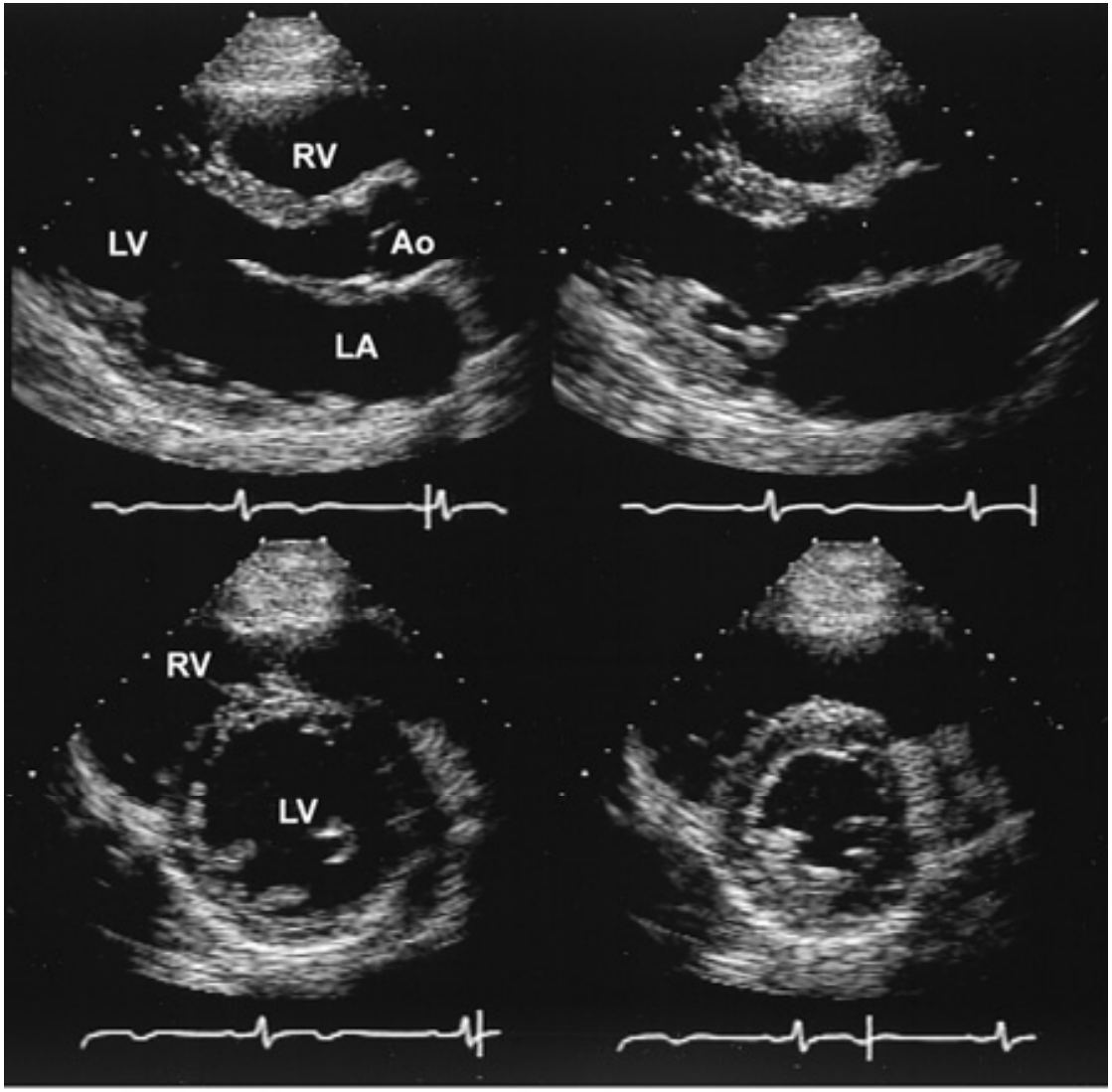
- Transvenous lead
  - Internal Jugular vein
  - Subclavian/Axillary vein
  - Femoral vein
- Epicardial lead (usually for post open heart surgery)
- Emegency pacing - transcutaneous

Indication for transvenous temporary pacemaker



Portable Echocardiography

Echocardiogram



Echocardiogram