CS300 IABP COLOR DISPLAY AND KEYPAD CONTROLS
MANAGING INTRA-AORTIC BALLOON THERAPY

Course Description:
This six hour program is designed for the experienced healthcare professional directly involved with the care of the patient requiring intra-aortic balloon pump therapy. Participants should have experience with hemodynamic monitoring and 6 months critical care experience. Previous experience with intra-aortic balloon pump therapy is preferred.

This program is comprised of 3 modules consisting of theoretical, technical, and clinical considerations for a patient requiring IABP therapy. The theoretical module will briefly review cardiac physiology and the theory of intra-aortic balloon pumping. The technical module will discuss percutaneous insertion and removal of the intra-aortic-balloon catheter followed by a detailed explanation of the MAQUET IABP, highlighting troubleshooting in the clinical setting. Case studies will be utilized to further reinforce troubleshooting techniques. The clinical module provides a discussion of clinical considerations for patients requiring IABP therapy. A skills workshop utilizing the system trainer and Abbreviated Operator’s Guide will be provided.

Behavioral Objectives:
At the conclusion of this program, the participants will be able to:
- Define the two physiological effects achieved by the mechanics of inflation and deflation of the IAB as it relates to the cardiac cycle illustrated by an augmented arterial pressure waveform.
- Identify four indications and three contraindications for IABP therapy.
- Identify the potential complications associated with IABP therapy.
- Demonstrate the set up, operation, and troubleshooting of the MAQUET IABP utilizing the system trainer for practice and the abbreviated operators guide for reference.
COURSE SCHEDULE

8:00-8:10
Introduction
Review Program

8:10-9:30
MODULE I - Theoretical Aspects
Review Cardiac Mechanics
Measurement of Cardiac Performance
Left Ventricular Failure
Theory of IABP
Factors Affecting Diastolic Augmentation/Timing Errors
Indications/Contraindications

9:30-9:40
Break

9:45-10:45
MODULE II IAB -
Catheter and Technical Introduction to IABP
IAB Catheter Insertion
Technical Features of the IABP

10:45 – 11:00
Break

11:00 -12:00
Troubleshooting Alarm and Advisory Messages
Hands On

12:00 – 12:30
Lunch

12:30 – 1:15
Additional Hands on

1:15 – 1:45
MODULE III - Clinical Considerations
Side Effects/Potential Complications
Care Management/Case Studies

1:45 – 2:00
Open Discussion
Program Evaluation
MODULE I
THEORETICAL ASPECTS OF IABP
I. REVIEW PHYSIOLOGY OF CARDIAC MECHANICS

A. CARDIAC CYCLE
1. Atrial Systole
2. Isovolumetric Contraction
3. Ventricular Ejection
   a. Slow Ejection
   b. Rapid Ejection
   c. Slow Ejection
4. Isovolumetric Relaxation
5. Ventricular Filling
   a. Rapid Filling
   b. Slow Filling
B. PRESSURE WAVES

1. Ventricular Waveform
   a. Pressure
   b. Volume

2. Arterial
   a. Radial/Brachial
   b. Aortic
I. REVIEW PHYSIOLOGY OF CARDIAC MECHANICS (continued)

B. PRESSURE WAVES (continued)

NORMAL ARTERIAL WAVEFORM

- **SYSTOLIC PRESSURE**
- **RAPID VENTRICULAR EJECTION PHASE**
  (75% SV Ejected)
- **RUN-OFF PHASE**
  (25% SV Ejected)
- **DICROTIC NOTCH**
  - Aortic Valve Closes
  - Diastole Begins
- **AORTIC VALVE OPENS**
- **AORTIC END DIASTOLIC PRESSURE**
C. MYOCARDIAL OXYGEN SUPPLY AND DEMAND

<table>
<thead>
<tr>
<th>SUPPLY</th>
<th>DEMAND</th>
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<tbody>
<tr>
<td>1. Coronary artery anatomy</td>
<td>1. Heart Rate</td>
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<td>2. Diastolic pressure</td>
<td>2. Afterload</td>
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<tr>
<td>3. Diastolic time</td>
<td>3. Preload</td>
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<td>4. $O_2$ extraction</td>
<td>4. Contractility</td>
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<td>a. Hemoglobin</td>
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<td>b. $PaO_2$</td>
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MVO$_2$

D. FRANK-STARLING LAW OF HEART

Ventricular function curve. As the end-diastolic volume increases, so does the force of ventricular contraction. Thus the stroke volume becomes greater up to a critical point after which stroke volume decreases. [Cardiac failure]
I. REVIEW PHYSIOLOGY OF CARDIAC MECHANICS (continued)

LV FAILURE

- Pumping Efficiency
  - LV Volume & Pressure
- Baroreceptors Activate
  - HR
- Release of Catecholamines
- Afterload (SVR)
- O₂ Demand
- Preload (LVEDP)
- C.O.
- Glomerular Filtration Pressure
- Activation of Renin-Angiotensin-Aldosterone-ADH
- Na⁺ & H₂O Reabsorption
- Preload (LVEDP)
- Afterload (SVR)
- O₂ Supply
- Pulmonary Artery Pressure
- Pulmonary Edema
- Oxygenation
- Contractility
- C.O.
- BP
- Anaerobic Metabolism
- Lactic Acid Production
- Tissue Acidosis
- Tissue Anoxia
- DEATH
II. THEORY OF IABP THERAPY

A. COUNTERPULSATION

1. Balloon Structure and Position

2. Increased Coronary Perfusion
   a. Inflation
   b. Augmentation of Diastolic Pressure

3. Decreased Left Ventricular Workload
   a. Deflation
   b. Afterload Reduction

4. Physiological Pressure Wave Changes
   a. Dicrotic Notch
   b. Diastole: Augmentation
   c. Decreased End-Diastolic Pressure
   d. Systole: Decreased Assisted Systolic Pressure

Inflate

Deflate
II. THEORY OF IABP THERAPY (continued)

A. COUNTERPULSATION (continued)

A   One Complete Cardiac Cycle
B   Unassisted Aortic End Diastolic Pressure
C   Unassisted Systolic Pressure
D   Diastolic Augmentation
E   Assisted Aortic End Diastolic Pressure
F   Reduced Systolic Pressure

INCORRECTED CORONARY ARTERY PERFUSION

REDUCED MYOCARDIAL O₂ DEMAND
ARTERIAL WAVEFORM VARIATIONS DURING IABP THERAPY

1:1 IABP FREQUENCY

1:2 IABP FREQUENCY

1:3 IABP FREQUENCY
II. THEORY OF IABP THERAPY (continued)

B. EFFECTS OF IABP

1. Primary
   a. Supply
   b. Demand

2. Secondary
   a. CO/CI
   b. HR
   c. PAD-PCWP
   d. SVR
   e. B/P-SYSTOLIC
      DIASTOLIC
      MAP
      DIASTOLIC AUGMENTATION

3. Systemic
   a. Neuro
   b. Renal
   c. Vascular
   d. Respiratory
C. FACTORS AFFECTING DIASTOLIC AUGMENTATION

1. Patient Hemodynamics
   a. Heart Rate
   b. Stroke Volume
   c. Mean Arterial Pressure
   d. System Vascular Resistance

2. Intra-Aortic Balloon
   a. IAB in Sheath
   b. IAB Not Unfolded
   c. IAB Position
   d. Kink in IAB Catheter
   e. IAB Leak
   f. Low Helium Concentration

3. IABP
   a. Timing
   b. Position of IAB Augmentation Control
II. THEORY OF IABP THERAPY (continued)

D. TIMING ERRORS

1. Early Inflation
   Inflation of the IAB prior to aortic valve closure
   Waveform Characteristics:
   ■ Inflation of IAB prior to dicrotic notch
   ■ Diastolic augmentation encroaches onto systole (may be unable to distinguish)
   Physiologic Effects:
   ■ Potential premature closure of aortic valve
   ■ Potential increase in LVEDV and LVEDP or PCWP
   ■ Increased left ventricular wall stress or afterload
   ■ Aortic Regurgitation
   ■ Increased MVO₂ demand

2. Late Inflation
   Inflation of the IAB markedly after closure of the aortic valve
   Waveform Characteristics:
   ■ Inflation of the IAB after the dicrotic notch
   ■ Absence of sharp V
   ■ Sub-optimal diastolic augmentation
   Physiologic Effects:
   ■ Sub-optimal coronary artery perfusion
3. Early Deflation

Premature deflation of the IAB during the diastolic phase

Waveform Characteristics:
- Deflation of IAB is seen as a sharp drop following diastolic augmentation
- Sub-optimal diastolic augmentation
- Assisted aortic end-diastolic pressure may be equal to or less than the unassisted aortic end diastolic pressure
- Assisted systolic pressure may rise

Physiologic Effects:
- Sub-optimal coronary perfusion
- Potential for retrograde coronary and carotid blood flow
- Angina may occur as a result of retrograde coronary blood flow
- Sub-optimal afterload reduction
- Increased MVO₂ demand

4. Late Deflation

Waveform Characteristics:
- Assisted aortic end-diastolic pressure may be equal to the unassisted aortic end diastolic pressure
- Rate of rise of assisted systole is prolonged
- Diastolic augmentation may appear widened

Physiologic Effects:
- Afterload reduction is essentially absent
- Increased MVO₂ consumption due to the left ventricle ejecting against a greater resistance and a prolonged isovolumetric contraction phase
- IAB may impede left ventricular ejection and increase the afterload
II. THEORY OF IABP THERAPY (continued)

E. INDICATIONS

1. Refractory Unstable Angina
2. Impending Infarction
3. Acute MI
4. Refractory Ventricular Failure
5. Complications of Acute MI [i.e. acute MR or VSD, or papillary muscle rupture]
6. Cardiogenic Shock
7. Support for diagnostic, percutaneous revascularization, and interventional procedures
8. Ischemia related intractable ventricular arrhythmias
9. Septic Shock
10. Intraoperative pulsatile flow generation
11. Weaning from bypass
12. Cardiac support for non-cardiac surgery
13. Prophylactic support in preparation for cardiac surgery
14. Post surgical myocardial dysfunction/low cardiac output syndrome
15. Myocardial contusion
16. Mechanical bridge to other assist devices
17. Cardiac support following correction of anatomical defects

F. CONTRAINDICATIONS

1. Severe aortic insufficiency
2. Abdominal or aortic aneurysm
3. Severe calcific aorta-iliac disease or peripheral vascular disease
4. Sheathless insertion with severe obesity, scarring of the groin, or other contraindications to percutaneous insertion

Please Refer to the Instructions for Use Prior to Insertion of the IAB
MODULE II
TECHNICAL ASPECTS
I. INTRA-AORTIC BALLOON CATHETER

A. DESIGNED FOR SHEATHLESS OR SHEATHED INSERTION

Fiberoptic IAB Catheter

Conventional IAB Catheter
B. CLINICAL CONSIDERATIONS FOR CENTRAL AORTIC PRESSURE MONITORING

PRECAUTION
- For optimal signal quality, use no more than 8 feet (2.5 meters) maximum of pressure tubing between the transducer and female luer hub of the Y-fitting.

When monitoring pressure through the inner lumen, use a standard arterial pressure monitoring apparatus connected to a three-way stopcock. Connect the three-way stopcock to the female luer hub of the inner lumen. A 3cc/hour continuous flow through the inner lumen is recommended. The anticoagulation dosage should be in accordance with standard hospital practice for arterial pressure lines and may be modified, on physician discretion, for patients receiving anticoagulation therapy. Per hospital policy, a fast forward flush may be performed hourly to help maintain patency of the inner lumen.

PRESSURE MONITORING THROUGH IAB CATHETER PRECAUTIONS
- Use a standard flushing apparatus for arterial pressure monitoring with the inner lumen. Careful technique should be used in the set up and flushing of the arterial pressure monitoring apparatus to minimize the risk of an embolus entering the aorta where it could potentially enter the carotid or coronary arteries.
- Aspirate and discard a 3cc volume of blood from the inner lumen prior to attaching a flushing apparatus to the female luer hub.
- Ensure that all air bubbles are removed from the inner lumen and flushing apparatus. In addition, tap the Y-fitting to remove all air bubbles.
- Prior to fast flushing, stop IAB pumping to reduce the risk of an embolus entering the aortic arch should an embolus be ejected from the inner lumen.
- For optimal signal quality the inner lumen should not be used for blood sampling.
- Always aspirate 3cc initially if the inner lumen aortic pressure signal becomes damped. If you meet resistance during aspiration, consider the inner lumen to be occluded. Discontinue the use of the inner lumen by placing a luer cap on the female luer hub.
- The use of in-line filters or other devices can potentially alter the appearance of the arterial pressure waveform.
- Do not over-tighten connections.
B. CLINICAL CONSIDERATIONS FOR CENTRAL AORTIC PRESSURE MONITORING (continued)

RECOMMENDATIONS FOR ACHIEVING OPTIMAL PRESSURE SIGNAL QUALITY

1. Use no more than 8ft (2.5m) of a low compliance pressure tubing such as that supplied by MAQUET in the IAB Insertion Kit between the transducer and Y-fitting of the catheter.

2. Once the catheter is in place, aspirate and discard 3cc of blood from the inner lumen and then immediately perform a manual flush using a syringe filled with 3cc to 5cc of flush solution. This will minimize the chances of stagnant blood clotting in the inner lumen.

3. Apply only gentle force to the syringe when aspirating the inner lumen.

4. Do not use a R.O.S.E. (Resonance Over Shoot Eliminator) or other damping device.

5. Remove air from flush bag prior to pressurizing.

6. Prime the pressure set-up using gravity flush.

7. Maintain 300 mmHg of pressure on the flush solution and elevate it above the transducer.

8. Whenever the inner lumen of the IAB becomes filled with blood (such as after aspiration), the flush valve should be activated for a minimum of 15 seconds in addition to the time it takes to clear the pressure tubing of blood.

9. Ensure that all air bubbles are removed from the inner lumen and flushing apparatus.

10. Use room temperature flush solution.
II. TECHNICAL COMPONENTS OF THE CS300 IABP
II. TECHNICAL COMPONENTS OF THE CS300 IABP (continued)

A. REAR PANEL
1. Fiberoptic Module
   a. IAB Sensor Input
   b. Vent Key
   c. To bedside monitor
2. Safety Disk/Condensate Removal System
   a. DC Input
   b. IAB Fill Port
   c. Drain Port
3. Helium Supply
   a. Pressure Gauge
   b. Manual Fill Port
4. Patient Connections
   a. ECG
   b. Pressure
   c. Monitor Input
     ■ ECG
     ■ Pressure
   d. ECG/Pressure Output
5. Data Communications Outputs
   a. RS-232
   b. Phone Line
   c. Diagnostic Output
6. Power Cord/Mains
7. System Timer
1. Alarm and Advisory Messages
2. ECG
   a. Lead
   b. Gain
3. Pressure Source
4. IAB Fill Mode
5. Slow Gas Alarm Status
6. Operation Mode
7. IAB Status Indicator
8. Trigger
9. Heart Rate Display
10. Pressure Display
11. Augmentation Alarm
12. Battery Indicator
13. Helium Indicator
II. TECHNICAL COMPONENTS OF THE CS300 IABP (continued)

C. CS300 IABP KEY PAD CONTROLS

1. Operation Mode Keys
   a. AUTO
   b. Semi-Auto
   c. Manual
2. Zero Pressure Key
3. START key and Indicator
4. STANDBY Key and Indicator
5. Trigger Source Key
   a. ECG
   b. Pressure
   c. Pacer V/AV
   d. Pacer A
   e. Internal
6. IAB Frequency
7. IAB Augmentation
8. IAB Inflation Controls
9. IAB Deflation Controls
D. CS300 KEY PAD CONTROL PANEL

1. Alarm Mute Key
2. IAB Fill Key
3. Help Key Indicator
4. Menu Guide
   a. Ref Line
   b. Aug. Alarm
   c. ECG/AP Sources
   d. Pump Options
   e. User Preferences
5. Inflation Interval Key
6. Freeze Display Key
7. Print Strip Key
II. TECHNICAL COMPONENTS OF THE CS300 IABP (continued)

E. RECORDER

1. ECG

2. Pressure

3. Balloon Pressure Waveform
F. SYSTEM BATTERY
   1. Charge Status
   2. Portable Operation

G. DOPPLER STORAGE
II. TECHNICAL COMPONENTS OF THE CS300 IABP (continued)

INFLATION MARKERS

The inflation marker shows the period of inflation. Vertical timing marks located below the arterial waveform are also available to aid with initial timing.

A unique automatic timing algorithm allows effective balloon pumping even during atrial fibrillation. Press the Inflation Interval key to observe the period of inflation while pumping. Vertical markers located below the arterial waveform and the highlighted portion indicate the period of balloon inflation.
III. TROUBLESHOOTING

A. HIGH PRIORITY ALARMS

All Modes
Augmentation Below Limit Set*
No Trigger
IAB Disconnected
Check IAB Catheter
Leak in IAB Circuit
Rapid Gas Loss
Blood Detected
Autofill Failure
Autofill Failure – No Helium
High Pressure Drive
Low Vacuum
AUTO Operation Mode
Poor Signals Persist
Semi Auto or Manual Mode
ECG Detected*
No Pressure Trigger
Trigger Interference
Check Pacer Timing
Autofill Required
Other:
Safety Disk Test Fails

B. MEDIUM PRIORITY ALARMS

All Modes
IAB Optical Sensor Failure
Low Battery
AUTO Operation Mode
Poor Signal Quality
No Pressure Source Available

C. LOW PRIORITY ALARM

AUTO Operation Mode
Unable to Update Timing

D. TECHNICAL ALARMS

Electrical Test Fails Code #
System Failure
No Patient Status Available

E. INFORMATIONAL MESSAGES

All Modes
A.P. Optical Sensing Module Failure
Unable to Calibrate IAB Optical Sensor
IAB Optical Sensor Calibration Expired
No Trigger
Prolonged Time In Standby
Autofilling
Auto Zeroing
Autofilling and Zeroing
Function Not Available
Low Helium
Battery in Use [EXT]
Battery In Use
System Test OK
System Trainer
Maintenance Required Code #
Slow Gas Loss Alarm is OFF
Leak In IAB Circuit – Overridden
Blood Detected – Overridden
AUTO Operation Mode
Function Unavailable in Auto Operation Mode

* Pumping NOT suspended
III. TROUBLESHOOTING (continued)

E. INFORMATIONAL MESSAGES (continued)

AUTO or SemiAuto Operation Mode
Auto R-Wave Deflate
R-Wave Deflate
SemiAuto
Irregular Pressure Trigger
SemiAuto or Manual:
Verify Proper Timing
IAB Not Filled
Manual Fill IAB
Auto Operation Mode is Disabled
Gas Loss and Catheter Alarms Disabled
Manual Mode
Manual Timing Selected – See Help
Other
Install Safety Disk
Unplug Disk Outlet
Plug Disk Outlet
Leak Testing Safety Disk

I. MANUAL FILL

J. MANUAL TIMING

F. PATIENT CONDITIONS

1. Atrial Fibrillation
2. Ectopics
3. Cardiac Arrest
4. Cardioversion/Defibrillation

G. CHANGING HELIUM TANK

H. SAFETY DISK LEAK TEST
IV. NORMAL BALLOON PRESSURE WAVEFORM

- **PEAK INFLATION** (POSITIVE OVERSHOOT)
- **PLATEAU** (FULL INFLATION OF IAB)
- **IAB INFLATION**
- **IAB DEFLATION**
- **ZERO BASELINE**
- **RETURN TO ZERO BASELINE**
- **PEAK DEFLECTION** (NEGATIVE OVERSHOOT)
VARIATIONS IN BALLOON PRESSURE WAVEFORMS

1. HEART RATE

<table>
<thead>
<tr>
<th>BRADYCARDIA</th>
<th>TACHYCARDIA</th>
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<tbody>
<tr>
<td>Increased duration of plateau due to longer diastolic phase</td>
<td>Decreased duration of plateau due to shortened diastolic phase</td>
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</table>

2. RHYTHM

Varying R-R intervals result in irregular plateau durations

3. BLOOD PRESSURE

<table>
<thead>
<tr>
<th>HYPERTENSION</th>
<th>HYPOTENSION</th>
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<tbody>
<tr>
<td>Increased height or amplitude of the waveform</td>
<td>Decreased height or amplitude of the waveform</td>
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</tbody>
</table>
4. GAS LOSS

Leak in the closed system causing the balloon pressure waveform to fall below zero baseline. This may be due to a loose connection, a leak in the IAB catheter, H2O condensation in the external tubing, or a patient who is tachycardiac and febrile which causes increased gas diffusion through the IAB membrane.

5. CATHETER KINK

Rounded balloon pressure waveform, loss of plateau resulting from a kink or obstruction of shuttle gas. This may be caused by a kink in the catheter tubing, improper IAB catheter position, sheath not being pulled back to allow inflation of the IAB, the IAB is too large for the aorta, the IAB is not fully unwrapped, or H2O condensation in the external tubing.

6. SUSTAINED INFLATION

Theoretical possibility if the IAB remains inflated longer than 2 seconds. The intra-aortic balloon pump will activate the System Failure alarm and deflate the IAB.
### DIRECTIONS FOR INSTRUCTOR

Place your initials next to the skills the participant is able to perform. Leave blank the skills requiring repeat performance. Clarify learning needs if necessary in the comment section. The “Clinical Setting” column is an optional checklist for use by a preceptor or resource person for reinforcement of skills acquired on system trainer.

<table>
<thead>
<tr>
<th>SKILLS</th>
<th>SYSTEM TRAINER</th>
<th>CLINICAL SETTING</th>
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<tbody>
<tr>
<td>INITIAL SET UP</td>
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<tr>
<td>Establish Power: Main power switch &amp; IABP On/Off switch</td>
<td>ON</td>
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<td>Open helium tank and verify helium pressure</td>
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<tr>
<td>Establish ECG and Pressure connections</td>
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<tr>
<td>If Using a Sensor IAB:</td>
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<tr>
<td>- Ensure the IAB Sensor Cable is connected to the sensor module and clipped to helium extender tubing</td>
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<tr>
<td>If Using a Conventional IAB/Transducer:</td>
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<tr>
<td>- Open transducer to air</td>
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<td>- Press zero pressure key for 2 seconds</td>
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<td>- Close transducer</td>
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<tr>
<td>CONFIRM OPERATION MODE – AUTO</td>
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<td>INITIATE PUMPING</td>
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<tr>
<td>Attach IAB catheter &amp; appropriate extender to safety disk</td>
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<td>Press the Start key</td>
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<tr>
<td>If Using a Sensor IAB:</td>
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<tr>
<td>- Observe the “Autofilling &amp; Zeroing” message</td>
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<tr>
<td>- Verify optimal diastolic augmentation</td>
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<td>If Using a Conventional IAB/Transducer:</td>
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<td>- Verify optimal diastolic augmentation</td>
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<tr>
<td>VERIFY AUG. ALARM</td>
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<td>Verify Aug. Alarm setting is approximately 10mmHg less than the patient’s augmented diastolic pressure</td>
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<tr>
<td>Adjust, if necessary by pressing Aug. Alarm key and using the up and down arrow keys, in the navigation circle, to change value displayed on the screen</td>
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<tr>
<td>ASSESS HEMODYNAMIC BENEFITS</td>
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<tr>
<td>Ensure optimal augmentation</td>
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<tr>
<td>Ensure optimal afterload reduction</td>
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<tr>
<td>If desired, IAB deflation can be fine tuned using the IAB deflation control</td>
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<tr>
<td>RECORD PRESSURES: ASSISTED &amp; UNASSISTED</td>
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<tr>
<td>Press Print Strip key to record waveforms</td>
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<td>Use Printer Menu in User Preferences to change printer settings</td>
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<tr>
<td>AUTO OPERATION MODE</td>
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<tr>
<td>Describe ECG and pressure source selection</td>
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<td>Describe Trigger source selection</td>
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<tr>
<td>Describe automatic timing and Cardiosync 2 with R-Trac</td>
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<td>SEMI-AUTO OPERATION MODE</td>
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<td>Describe ECG and pressure source selection</td>
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<tr>
<td>Describe Trigger source selection</td>
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<tr>
<td>Describe automatic timing and Cardiosync 2 with R-Trac</td>
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<tr>
<td>PRESSURE SOURCE - Describes understanding of how pressure source is originated and calibrated</td>
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<tr>
<td>Fiberoptics</td>
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<td>Conventional IAB/Transducer</td>
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<td><strong>TROUBLESHOOTING</strong></td>
<td><strong>SYSTEM TRAINER</strong></td>
<td><strong>CLINICAL SETTING</strong></td>
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<tr>
<td><strong>DEMONSTRATES ABILITY TO IDENTIFY VARIABLE TRIGGER SELECTION CRITERIA &amp; APPROPRIATE USE OF EACH TRIGGER</strong></td>
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<tr>
<td>Atrial Fibrillation</td>
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<tr>
<td>Demand Ventricular Pacemaker, Rate 60</td>
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<tr>
<td>AV sequential pacemaker, demand mode</td>
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<tr>
<td>Unobtainable ECG signal, regular rhythm, BP 100/50</td>
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<td>Cardiac arrest with good chest compressions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sinus Tachycardia</td>
<td></td>
<td></td>
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<tr>
<td>Sinus Rhythm with frequent PVC’s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed rate AV sequential pacemaker</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atrial pacemaker - 100% paced</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>EVALUATES SITUATIONS THAT MAY CAUSE AN IAB CATHETER ALARM &amp; DESCRIBES APPROPRIATE INTERVENTION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kink in the catheter or tubing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient sitting straight up in bed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IAB has not exited the sheath</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IDENTIFIES &amp; RECOMMENDS APPROPRIATE ACTION FOR POTENTIAL LOSS OF HELIUM (&quot;GAS LOSS&quot;)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blood in the IAB catheter shuttle gas tubing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IAB catheter disconnected from the console</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DISCUSSES THE FOLLOWING ALARM &amp; INFORMATIONAL MESSAGES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor Signal Quality</td>
<td></td>
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<tr>
<td>Poor Signals Persist</td>
<td></td>
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<tr>
<td>No Pressure Source Available</td>
<td></td>
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<tr>
<td>Unable to Update Timing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IAB Optical Sensor Failure</td>
<td></td>
<td></td>
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<tr>
<td>AP Optical Sensing Module Failure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unable to Calibrate IAB Optical Sensor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IAB Optical Sensor Calibration Expired</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SKILLS</strong></td>
<td><strong>SYSTEM TRAINER</strong></td>
<td><strong>CLINICAL SETTING</strong></td>
</tr>
<tr>
<td><strong>DISCUSSES THE HEMODYNAMIC RELATIONSHIP BETWEEN THE PATIENT &amp; IABP THERAPY IN REGARD TO DIASTOLIC AUGMENTATION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increased heart rate</td>
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<tr>
<td>Decrease in patient stroke volume</td>
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<tr>
<td>Ectopy</td>
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<tr>
<td>Increase in patient BP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decreased SVR</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEMONSTRATES APPROPRIATE INTERVENTION FOR THE FOLLOWING ERRORS IN TIMING &amp; VERBALIZES POTENTIAL CLINICAL IMPLICATIONS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early inflation</td>
<td></td>
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<tr>
<td>Late inflation</td>
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<tr>
<td>Early deflation</td>
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<td></td>
</tr>
<tr>
<td>Late deflation</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PORTABLE OPERATION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initiates and terminates portable operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identifies location of battery charge light</td>
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<td></td>
</tr>
<tr>
<td><strong>INTERFACE CABLES (IF APPLICABLE)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identifies location and use of ECG and/or pressure interface cables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Describes proper use of ECG interface cable in the presence of pacemakers</td>
<td></td>
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</tr>
<tr>
<td><strong>LOW LEVEL OUTPUT CABLE (IF APPLICABLE)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identifies location and use of low level output cable</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Instructor Signature ___________________________ Instructor Initials ___________________________

Instructor Signature ___________________________ Instructor Initials ___________________________

Comments ________________________________________________________________
MODULE III
CLINICAL CONSIDERATIONS
# I. SIDE EFFECTS AND COMPLICATIONS

<table>
<thead>
<tr>
<th></th>
<th>ASSESSMENT</th>
<th>PREVENTION</th>
<th>TREATMENT OPTIONS</th>
</tr>
</thead>
</table>
| 1. Limb Ischemia | ▪ Check distal pulses, color, temp. and capillary filling Q30 min. x 2 hrs, then Q2 hrs.  
▪ Monitor differential toe temperatures. | ▪ Use smallest sheath/catheter sizes indicated.  
▪ Risk factors: female, diabetics, peripheral vascular diseases.  
▪ Select limb with best pulse. | ▪ Remove sheath and observe for bleeding.  
▪ Subcutaneous Xylocaine injection for arterial spasm.  
▪ Change insertion site to opposite limb.  
▪ Bypass graft femoral artery. |
| 2. Excessive bleeding from insertion site | ▪ Observation - anteriorly and posteriorly for blood or hematoma. | ▪ Careful insertion technique.  
▪ Monitor anticoagulation therapy.  
▪ Prevent catheter movement at insertion site. | ▪ Apply pressure. Assure distal flow.  
▪ Surgical repair. |
| 4. Immobility of balloon catheter. | ▪ The IAB should not remain inactive (i.e. not inflating and deflating) for more than 30 min. because of potential for thrombus formation.  
▪ Observation of IAB status indicator movement.  
▪ Observation of augmentation. | ▪ Maintain adequate trigger.  
▪ Observe movement of IAB Status indicator.  
▪ If unable to inflate the IAB with the IABP, inflate and deflate the IAB by hand, using a syringe and stopcock once every 3-5 min. | ▪ Notify the physician if the IAB is immobile for > 30 min. |
| 5. Balloon leak | ▪ Observe tubing for blood with or without the presence of a blood detect, low augmentation, and/or gas loss or IAB catheter alarm. | ▪ Do not remove the IAB from its tray until it is ready to be inserted. | ▪ If blood is observed in the pneumatic tubing, disconnect the balloon from the IABP and notify the physician immediately. |
| 6. Infection | ▪ Observation of insertion site.  
▪ Blood cultures for symptoms of infection. | ▪ Sterile technique during insertion and dressing changes as per infection control policy. | ▪ Antibiotics. |
| 7. Aortic Dissection | ▪ Assess for pain between shoulder blades.  
▪ Daily hematocrit.  
▪ If suspected, aortogram may be indicated. | ▪ Insertion of IAB over guide wire with fluoroscopic control. | ▪ Balloon removal.  
▪ Surgical repair. |
| 8. Compartment syndrome may develop after IAB removed. | ▪ Observation of limb for swelling and/or hardness.  
▪ Measure calf girth.  
▪ Monitor interstitial pressure. | ▪ Use the smallest catheter/sheath appropriate.  
▪ Maintain adequate colloid osmotic pressure. | ▪ Fasciotomy if necessary. |
II. WEANING AND REMOVAL

A. FREQUENCY

B. BALLOON AUGMENTATION
III. NURSING CARE KARDEX

Vital Signs:
Monitor Q15" - Q30" until stable
Including hemodynamic parameters
Heart Rate
Mean Arterial Pressure
CVP
Pulmonary Artery Pressure
Pulmonary Capillary Wedge Pressure
Note and record: Cardiac Output/Cardiac Index
  System Vascular Resistance

Notify physician if:
Accepted hemodynamic parameters deviate
Significant change ABG studies or chest film
Low urine output < 30cc/hr
Signs of limb ischemia
IABP non-functioning > 15"
Change Helium tank PRN

IABP:
Refill IAB Q2H/PRN
Maintain optimal augmentation and afterload reduction by adjusting timing PRN
Zero transducer PRN
Note placement IAB on chest X-ray
Change Helium tank PRN

Special Treatment Needs:
Note and record quality of pedal pulses Q30" after insertion x 2H, then Q2H
Change IABP dressing - PRN with sterile technique
Utilize air mattress/heel protectors PRN
Maintain anti-coagulant protocol
Observe for side effects/complications of IABP
Routine care associated with:
  Respiratory and O₂ therapy
  N-G tube
  Hemodynamic monitoring lines
  Chest tube
  IV's
  Foley catheter

IABP:
Refill IAB Q2H/PRN
Maintain optimal augmentation and afterload reduction by adjusting timing PRN
Zero transducer PRN
Note placement IAB on chest X-ray
Change Helium tank PRN

Intake/Output:
Q1H (Strict)
Urine Specific Gravity - Q8H
Sugar/Acetone PRN

Activity:
Bedrest with log rolling
Do not elevate HOB > 30°-45°
Do not flex balloon leg at groin or knee
Utilize fracture bedpan
ROM Q8H to uninvolved extremity
Dorsiflexion of involved foot

Diet:
NPO - clear liquid - soft as tolerated
Supplemental nutritional support
Tube feedings - hyperalimentation

Respiratory Therapy:
Evaluate breath sounds Q4H & PRN
Routine respiratory care of patient with endo tube/trach
Sterile suction technique
Modified respiratory therapy
Coughing and deep breathing, incentive spirometry and nasotrachial suctioning may be utilized

Daily Lab Work/PRN Blood Work:
SMA - 18 QD
Monitor K+, BUN, creatinine closely PRN
Cardiac enzymes CPK, isoenzymes QD
CBC with Diff. QD/PRN
Platelets, PT, PTT, clotting times QD/PRN
ABG - monitor closely QD/PRN
Chest X-ray QD
Urine and serum osmolarity - QD
EKG QD - rhythm strips PRN
Blood, urine and sputum cultures for temperature 102°
# IV. NURSING CARE OF THE PATIENT ON AN IABP

<table>
<thead>
<tr>
<th>SYSTEM</th>
<th>POTENTIAL PROBLEMS</th>
<th>NURSING INTERVENTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac</td>
<td>Left Ventricular Failure</td>
<td>Monitor Vital Signs q15-30” until stable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Blood Pressure MAP, Syst, DA, AOEDP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Heart Rate</td>
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<tr>
<td></td>
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<td>PAP</td>
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<tr>
<td></td>
<td></td>
<td>PCWP/LAP</td>
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<tr>
<td></td>
<td></td>
<td>Cardiac Output/Cardiac Index</td>
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<tr>
<td></td>
<td></td>
<td>CVP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SVR (Systemic Vascular Resistance)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maintain Optimal Diastolic Augmentation and Afterload Reduction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maintain Clarity of ECG Pattern Serving as Trigger</td>
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<tr>
<td></td>
<td></td>
<td>Rhythm Strips PRN</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12 Lead ECGs QD and PRN</td>
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<tr>
<td></td>
<td></td>
<td>Cardiac Enzymes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check Pacer Function</td>
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<tr>
<td></td>
<td></td>
<td>CAUTION</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In the event of Asystole, assure balloon movement by placing Trigger on ECG, Arterial Pressure or Internal (bear in mind a Mean Arterial Pressure of about 50 mmHg is required to visualize augmentation).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Respiratory</th>
<th>Pulmonary Edema</th>
<th>Monitor ABGs closely PRN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pulmonary Emboli</td>
<td>Observe Chest X-ray QD</td>
</tr>
<tr>
<td></td>
<td>Atelectasis</td>
<td>* Lung fields</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* Balloon position</td>
</tr>
<tr>
<td></td>
<td>Pleural Effusions</td>
<td>Provide appropriate ventilatory support</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Standard respiratory care on intubated patient with sterile suctioning technique</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post-exubation, modified respiratory therapy is utilized</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deep breathing, coughing, chest physiotherapy and naso-tracheal suctioning may be used</td>
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<tr>
<td></td>
<td></td>
<td>Elevate HOB 30°</td>
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<tr>
<td></td>
<td></td>
<td>Turning (if hemodynamically stable) cautiously</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Neurological</th>
<th>Altered Level of Consciousness</th>
<th>Neurological assessment q2h/PRN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psychiatric</td>
<td>(Pupils, LOC, motor function)</td>
<td>(Pupils, LOC, motor function)</td>
</tr>
<tr>
<td></td>
<td>Appropriate sedation</td>
<td>Appropriate sedation</td>
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<tr>
<td></td>
<td>Normalization of environment (TV and radio, if appropriate)</td>
<td>Normalization of environment (TV and radio, if appropriate)</td>
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<tr>
<td></td>
<td>Uninterrupted rest periods are essential to these patients</td>
<td>Uninterrupted rest periods are essential to these patients</td>
</tr>
<tr>
<td></td>
<td>Emotional support regarding fears and anxieties should be provided to patient and family</td>
<td>Emotional support regarding fears and anxieties should be provided to patient and family</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Renal</th>
<th>Prerenal Failure</th>
<th>Observe urine output q1h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Acute Renal Failure</td>
<td>Notify physician if &lt; 30cc or &gt; 200 cc/hr. In absence of diuretics or fluid challenge</td>
</tr>
<tr>
<td></td>
<td>Urinary Tract Infection</td>
<td>Strict Intake and Output</td>
</tr>
<tr>
<td></td>
<td>Occlusion of Renal Artery</td>
<td>Observe patient’s fluid volume status - Intake and Output</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Daily Serum K+, BUN, Creatinine or Blood chemistries qd/PRN</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Daily weight</td>
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<tr>
<td></td>
<td></td>
<td>Urine Specific Gravity q8h</td>
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<tr>
<td></td>
<td></td>
<td>Urine Electrolytes and Osmolarity qd</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Note appearance of urine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Watch for signs of urinary tract infection</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check position of IAB catheter on chest film</td>
</tr>
</tbody>
</table>
### IV. NURSING CARE OF THE PATIENT ON AN IABP (continued)

<table>
<thead>
<tr>
<th>SYSTEM</th>
<th>POTENTIAL PROBLEMS</th>
<th>NURSING INTERVENTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vascular</td>
<td>Vascular</td>
<td>Check peripheral pulse (q15” x 1 hr, then q2h post-insertion)</td>
</tr>
<tr>
<td></td>
<td>Peripheral Ischemia</td>
<td>Pedal, Posterior Tibial, Popliteal</td>
</tr>
<tr>
<td></td>
<td>Thrombocytopenia</td>
<td>Observe color and temperature of involved leg q2h</td>
</tr>
<tr>
<td></td>
<td>Peripheral Embolism</td>
<td>Maintain anticoagulation protocol:</td>
</tr>
<tr>
<td></td>
<td>Bleeding from Anticoagulation</td>
<td>Heparin</td>
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<tr>
<td></td>
<td></td>
<td>Aspirin</td>
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<tr>
<td></td>
<td></td>
<td>Rheomacrodex</td>
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<tr>
<td></td>
<td></td>
<td>Observe coagulation studies: PT, PTT, Platelets, Hgb and Hct</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Observe for side effects of anticoagulation therapy: petechiae, ecchymosis, excessive bleeding from catheter insertion sites</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Avoid flexing the patient’s hip and knee of involved leg due to IAB catheter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Apply anti-embolism stockings to non-involved leg</td>
</tr>
<tr>
<td>Immunologic</td>
<td>Wound Infection</td>
<td>Monitor temperature</td>
</tr>
<tr>
<td></td>
<td>Systemic Sepsis</td>
<td>Observe WBC</td>
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<tr>
<td></td>
<td></td>
<td>Change IAB dressing qd - strict sterile technique</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maintain “Best Practice” for all hemodynamic lines and observe for drainage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Culture appropriate sites including blood, urine and sputum if specific signs and symptoms of infection process are present.</td>
</tr>
<tr>
<td>Gastro-intestinal</td>
<td>Nutritional</td>
<td>May have diet as tolerated (clear liquid/soft)</td>
</tr>
<tr>
<td></td>
<td>Stress Ulceration</td>
<td>Hyperalimentation or tube feedings may be necessary with prolonged intubation</td>
</tr>
<tr>
<td></td>
<td>Paralytic Ileus</td>
<td>Measure abdominal girth q8h</td>
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<tr>
<td></td>
<td></td>
<td>Assess bowel sounds q8h</td>
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<td></td>
<td></td>
<td>Observe for abdominal distention. Use stool softeners and fracture bedpan as appropriate</td>
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<tr>
<td></td>
<td></td>
<td>Portable KUB X-ray may be required without interrupting IABP</td>
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<tr>
<td></td>
<td></td>
<td>Naso-Gastric tube if appropriate</td>
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<tr>
<td></td>
<td></td>
<td>Naso-Gastric drainage q8h for occult blood</td>
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<tr>
<td></td>
<td></td>
<td>Provide appropriate antacid regimen</td>
</tr>
<tr>
<td>Musculoskeletal</td>
<td>Thrombosis</td>
<td>ROM - Active and Passive to uninvolved leg</td>
</tr>
<tr>
<td></td>
<td>Decubitus Ulcer</td>
<td>Dorsiflexion of foot on involved leg</td>
</tr>
<tr>
<td></td>
<td>Foot Drop</td>
<td>Turn (log roll) q1-2h – cautiously if hemodynamically stable</td>
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<tr>
<td></td>
<td></td>
<td>Apply air mattress and utilize heel and elbow protectors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use footboard or high top tennis shoes to prevent foot drop</td>
</tr>
<tr>
<td>Patient and</td>
<td>Family anxiety</td>
<td>Reinforce simple explanation to patient and family</td>
</tr>
<tr>
<td>Family Teaching</td>
<td>Late Distal Emboli</td>
<td>Discharge planning – communication of progress to nursing floor</td>
</tr>
<tr>
<td></td>
<td>Late Aortic Dissection</td>
<td>Observe for and instruct in manifestations of late peripheral ischemia or emboli</td>
</tr>
<tr>
<td>Cardiac Assist Device</td>
<td>Mechanical Function of IABP</td>
<td>Note and record settings according to hospital policy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Obtain optimal diastolic augmentation and optimal afterload reduction PRN</td>
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<tr>
<td></td>
<td></td>
<td>Notify physician of difficulty</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prevent inflation of IABP during Ventricular Ejection</td>
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<tr>
<td></td>
<td></td>
<td>Maintain adequate ECG and arterial trace</td>
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<tr>
<td></td>
<td></td>
<td>Change Helium tank PRN</td>
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<tr>
<td></td>
<td></td>
<td>Note IAB autofill q2h/refill PRN</td>
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<tr>
<td></td>
<td></td>
<td>Watch for signs of balloon leak: frequent loss of augmentation, blood in extender tubing</td>
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<tr>
<td></td>
<td></td>
<td>If IAB catheter is immobile for greater than 30 minutes, notify physician for appropriate intervention</td>
</tr>
</tbody>
</table>
V. CRITICAL PATHWAY OF THE IABP PATIENT

<table>
<thead>
<tr>
<th>INSERTION</th>
<th>PUMPING</th>
<th>WEANING</th>
<th>REMOVAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood Work</td>
<td>H&amp;H, pt, ptt</td>
<td>Platelet count, WBC</td>
<td>Prior to removal, obtain: H&amp;H, pt, ptt, platelet count</td>
</tr>
<tr>
<td>Diagnostic Procedures</td>
<td>Fluoroscopy, Portable CXR</td>
<td>Routine CXR qd, radiopaque tip at 2nd to 3rd ICS</td>
<td></td>
</tr>
<tr>
<td>Treatments</td>
<td>Shave and prep both potential insertion sites.</td>
<td>Monitor insertion site frequently. Arterial line care per policy. Dressing change per policy.</td>
<td></td>
</tr>
<tr>
<td>Activity</td>
<td>Maintain bed rest: Do not raise HOB &gt; 45°. Do not flex or bend the leg in which the IAB was inserted. Assist the patient with log rolling and positioning.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nutrition</td>
<td>Will depend on the patient’s condition and the indication for IAB insertion.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nursing Interventions</td>
<td>Assess patient and monitor hemodynamic alterations per ICU routine. Administer IV fluids, vasodilator and/or inotropic agents per orders. Assess patient for pain or discomfort and medicate per physician order. Assess vascular status (color, sensation and movement) as well as pulse quality (pedal, posterior tibial, popliteal, femoral, and radial bilaterally). NOTE: diminished left radial pulse may indicate IAB migration. Maintain anticoagulation protocol per physician order and observe for side effects. Encourage deep breathing. Assist the patient with turning and positioning at least q2h. Observe for urine output. NOTE: urine output &lt; 30cc/hr may be an indication that the IAB is occluding the renal arteries. Ensure IAB movement, verify IABP controls in accordance with hospital policies. NOTE: IAB should not remain immobile for &gt; 30 minutes in situ. NOTE: change of pedal pulses in affected leg could be a sign of limb ischemia.</td>
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</tr>
<tr>
<td>Patient Teaching</td>
<td>Educate the patient and family members on IABP therapy utilizing the patient education brochure. Explain each phase of the IABP process. Instruct patient to: * Apply pressure to insertion site if they should cough or sneeze * Report any chest pain or heaviness * Report any pain, numbness or tingling in their arms or legs</td>
<td></td>
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</tr>
<tr>
<td>Expected Outcomes</td>
<td>Patient and family will have adequate knowledge base of IABP therapy. Relief of patient and family anxiety. The patient will experience clinical improvement from the IAB by: * Increasing the supply of myocardial oxygen * Decreasing the demand for myocardial oxygen This will be evidenced by: * Increased cardiac output * Increased MAP * Decreased PAP/PCWP * Decreased chest pain Smooth progression through IABP therapy. Patient hemodynamically stable.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The foregoing is intended to serve as a guideline for the development of a critical pathway. It is not a recommendation from MAQUET.
VI. CLINICAL PROGRESSION - IABP THERAPY

<table>
<thead>
<tr>
<th>Description of Phases</th>
<th>INSERTION</th>
<th>PUMPING</th>
<th>WEANING</th>
<th>REMOVAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>A balloon is positioned in your aorta after being introduced through an artery.</td>
<td>The IABP shuttles gas from the console to the balloon and is timed with your heart beat.</td>
<td>Decreasing the amount of assistance your heart needs from the IABP.</td>
<td>Removing the balloon from your artery.</td>
<td></td>
</tr>
<tr>
<td>Teaching</td>
<td>Most insertions of the IAB can be completed in approx. 15 minutes. The insertion site will be numbed prior to insertion. During the insertion, you may feel some pressure at the insertion site.</td>
<td>The IABP is helping your heart but not beating for it. Pumping will stop every 2 hours for a short period of time. This is normal.</td>
<td>The amount of time it takes to wean varies for each patient.</td>
<td>Removal is typically done at the bedside and only takes a few minutes to complete.</td>
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<tr>
<td>Activity</td>
<td>Bed Rest</td>
<td></td>
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<tr>
<td></td>
<td>To ensure that the IAB remains in the proper position, you should not sit up or attempt to get out of bed.</td>
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<tr>
<td></td>
<td>The leg in which the IAB is inserted should not be bent or flexed.</td>
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<tr>
<td></td>
<td>Your nurse will assist you with turning and changing your position.</td>
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<tr>
<td></td>
<td>Take deep breaths frequently.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nursing Interventions</td>
<td>Your condition will be monitored according to ICU routine.</td>
<td></td>
<td></td>
<td>Report any wetness at the insertion site.</td>
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<tr>
<td></td>
<td>The nurse will assess your vital signs, which include:</td>
<td></td>
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<tr>
<td></td>
<td>Heart rate and rhythm, blood pressure, respirations, pulse checks and other measurements as your condition warrants.</td>
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<tr>
<td></td>
<td>The insertion site will be checked frequently by your nurse.</td>
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<td></td>
<td>The dressing will be changed on a regular basis.</td>
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<tr>
<td></td>
<td>Your nurse will give you pain medication. Please report any of the following:</td>
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<tr>
<td></td>
<td>Chest pain or heaviness, pain, numbness or tingling in your arms or legs.</td>
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</tr>
<tr>
<td>Diagnostic Procedures</td>
<td>Fluoroscopy (X-ray guidance) may be utilized during insertion. Chest X-ray will be done to verify placement of the IAB.</td>
<td>Routine chest X-rays will be obtained during IABP therapy.</td>
<td></td>
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<tr>
<td>Lab Tests</td>
<td>Blood tests will be obtained prior to the insertion.</td>
<td></td>
<td>Blood tests will be obtained as your condition warrants it.</td>
<td></td>
</tr>
</tbody>
</table>

The foregoing is intended to serve as a guideline for developing a clinical progression for IABP Therapy. It is not a recommendation from MAQUET.

The clinical progression is an outline of what to expect for patients and families who require Intra-Aortic Balloon Pump Therapy. The process will vary for each patient.
VII. CONSIDERATIONS FOR TRANSPORT

A. PURPOSE OF TRANSPORT PROGRAM

B. PLANNING THE TRANSPORT PROGRAM
   1. Retrieval vs. Referral
   2. Coordinator of Transport Team

C. TRANSPORT TEAM
   1. Physician
   2. Nurse, IABP Technician

D. TRANSPORT PROGRAM CONSIDERATIONS
   1. Team Leader
   2. Liabilities
   3. Communication and Response Procedure
   4. Consent Form and Patient Chart
   5. Family Education
   6. Patient Management During Transport

E. VEHICLE USED FOR TRANSPORT
   1. Ambulance
      a. power supply
      b. equipment on board
      c. ramp
      d. response time
   2. Aircraft
      a. power supply
      b. equipment on board

F. EQUIPMENT CONSIDERATIONS
   1. IABP Supplies
   2. Drugs
   3. Infusion Pumps
   4. Respiratory Care

G. POST TRANSPORT CONSIDERATIONS
   1. Equipment Check
   2. Follow-up
CITATIONS

REFERENCE LIST


Benchmark Counterpulsation Outcomes Registry 2005.


REFERENCE LIST (continued)


Ohman EM. Counterpulsation and thrombolysis together improve survival after cardiogenic shock – the TACTICS results. Presented at the 22nd Congress of European Society of Cardiology on August 27, 2000 in Amsterdam, the Netherlands.


BIBLIOGRAPHY

Theory


Indications


Indications (continued)


Indications (continued)


Complications


Insertion


Pediatrics


Pediatrics (continued)


Transport


Nursing Care


Shoulders O. *Managing the challenge of IABP therapy.* Critical Care Nurse 1991 Feb;11(2):60-76.

Weinberg LA. *Buying time with an intra-aortic balloon pump.* Nursing 1988 Sep;18(9):44-49.
**PROGRAM AND SPEAKER EVALUATION**

Managing IABP Therapy
Program Code 05: ____________________________ Date: ____________________________

Please rate the program and speaker items by placing a mark in the appropriate column.

<table>
<thead>
<tr>
<th>PROGRAM EVALUATION</th>
<th>1 POOR</th>
<th>2 FAIR</th>
<th>3 GOOD</th>
<th>4 VERY GOOD</th>
<th>5 EXCELLENT</th>
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<tbody>
<tr>
<td>Program met the stated objectives</td>
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<tr>
<td>Content covered topic adequately</td>
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<td>Overall quality of this program</td>
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<td>Quality of the program objectives</td>
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<tr>
<td>Program met my personal objectives</td>
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<tr>
<td>I can incorporate program content into my practice</td>
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Speaker Name: ____________________________________________

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<td>Objectives- Stated objectives met</td>
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<td>Audiovisual- Contributed to presentation</td>
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<td>Content- Relevance of content to objectives</td>
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<td>Presentation- Speaker qualified and held interest</td>
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<td>Effectiveness- Speaker was organized and effective</td>
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<td>Practice- Validated and/or changed practice</td>
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Comments:..............................................................................................................................

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Participant Name: ............................................................................................................................
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