CLINICAL SUPPORT SERVICES
DEVELOPING AN IABP PRECEPTOR STRATEGY
Datascope is now MAQUET Cardiovascular

In early 2009, the purchase agreement between Datascope and Getinge AB was completed. As a result, Datascope’s innovative cardiovascular product portfolio will be integrated into MAQUET Cardiovascular, a global leader representing the Medical Systems Business area of Getinge AB.

Cardiac professionals have always relied on gold-standard Cardiac Assist products from Datascope, helping them to feel confident that they are delivering the highest quality of care to their patients. Now, as a part of MAQUET Cardiovascular, Datascope is even better positioned to focus on the future advancement of Cardiac Assist products and seeks to explore the full potential of this technology through our continued dedication to innovation, service and clinical excellence.

Quality Products:
Expect the same great quality products you have relied on over the years with names you are familiar with like: Fidelity, Linear and Sensation IAB’s, CS300 balloon pumps, SafeGuard and StatLock.

Quality Service:
Rest assured that you will receive the same amazing service and clinical support you have become accustomed to from Datascope. We are still here for you 24/7 with technical support, loaner equipment and clinical help.

Worldwide:
MAQUET ranks among the leading providers of medical products, therapies and services for Surgical Workplaces, Critical Care and Cardiovascular applications. Since its foundation more than 170 years ago, MAQUET has stood for innovation and the advancement of patient care technologies in the field of medicine. The portfolio of MAQUET products is extensive, providing a comprehensive solution that is designed for efficient workflows, safety and the improvement of patient lives and outcomes.

Welcome to MAQUET Cardiovascular:
With a fresh vision of the future, this new, combined organization is committed to providing the highest quality patient care solutions for cardiologists, interventional radiologists, cardiothoracic and vascular surgeons, critical care clinicians and their teams.

For further information please visit www.datascope.com
DEVELOPING AN IABP PRECEPTOR STRATEGY

CONTENT DESCRIPTION

This four-hour presentation is designed for health care professionals involved in precepting staff to IABP therapy. A sound working knowledge of the theoretical and technical aspects of IABP therapy is required. The presentation will include a discussion of the patient’s cardiac performance and patient conditions, which can impact the pump’s performance. Methods for teaching the technical components of the equipment will be demonstrated with hands on time provided. Methods for maintaining clinical proficiency will be discussed.

BEHAVIORAL OBJECTIVES:

1. Discuss the hemodynamic factors that may affect maintaining and or achieving optimal diastolic augmentation pressure and possible corrective action.

2. Discuss the interaction of drug therapy and the mechanical support provided by the IABP on cardiac performance.

3. Demonstrate the set up, operation and troubleshooting of theDatascope IABP utilizing the system trainer for practice and the abbreviated operator’s guide for reference.

4. Describe two teaching strategies for maintaining competency.
COURSE SCHEDULE

8:00 – 8:30  Introduction
Review Program
Assessment of Current Practice

8:30 – 9:30  Theoretical Aspects of IABP
I.  Review Physiology of Cardiac Mechanics
II.  Measurement of Cardiac Performance
III.  Theory of IABP Therapy
IV.  Indications/Contraindications
V.  Side Effects/Complications

9:30 – 9:45  Break

9:45 – 10:45  Teaching Technical and Troubleshooting Components of the IABP
I.  IAB Catheter
II.  Trigger vs. Timing
III.  Review of Control Panel and Monitor
IV.  Troubleshooting

10:45 – 11:15  Hands on Workshop

11:15 – 11:30  Documentation Considerations

11:30 – 11:50  Maintaining Expertise

11:50 – 12:00  Evaluation
ASSESSMENT OF CURRENT PRACTICE

I. What is a Preceptor? Who is a Preceptee?

II. Identify Current Orientation Process for New IABP Operators

THEORETICAL ASPECTS OF IABP THERAPY

I. Review Physiology of Cardiac Mechanics

A. Arterial Pressure Curve
   1. Electrical vs. Mechanical
B. 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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<tr>
<td>4. O₂ extraction</td>
<td>4. Contractility</td>
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<tr>
<td>a. HBG</td>
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<td>b. PaO₂</td>
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II. Measurement of Cardiac Performance
A. Cardiac Output = heart rate x stroke volume
   (Normal-4-6 liters/minute)

B. Cardiac Index = Cardiac Output
   B.S.A.  
   (Normal-2.5-3.5 l/min/m²)

C. Systemic Vascular Resistance = \( \frac{\text{MAP-Mean RA} \times 80}{\text{C.O.}} \)  
   (Normal = 900-1500 dynes/sec/cm⁵)

D. Ejection Fraction = \( \frac{\text{end diastolic volume-end systolic volume}}{\text{end diastolic volume}} \)  
   (Normal-60 -75% of end diastolic volume)
III. Theory of Intra-Aortic Balloon Pump 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
B. Effects of Intra-Aortic Balloon Pump Therapy

1. Primary
   a. Increased myocardial oxygen supply
   b. Decreased myocardial oxygen demand

2. Secondary
   a. Cardiac output/cardiac index
   b. Heart rate
   c. Pulmonary artery diastolic/pulmonary capillary wedge pressure
   d. Systemic vascular resistance

3. Systemic
   a. Neurologic
   b. Renal
   c. Vascular
   d. Respiratory

IV. Indications and Contraindications

A. Indications
   1. Refractory unstable angina
   2. Impending infarction
   3. Acute MI
   4. Refractory ventricular failure
   5. Complications of acute MI
   6. Cardiogenic Shock
   7. Support for diagnostic, percutaneous revascularization, and interventional procedures
   8. Ischemia related intractable ventricular arrhythmias
   9. Septic shock
   10. Intra-operative 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

B. Contraindications
   1. Severe aortic insufficiency
   2. Abdominal aortic aneurysm
   3. Severe calcified aortic -iliac disease or peripheral vascular disease
   4. Sheathless insertion with severe obesity, scarring of the groin
V. Side Effects and Complications

A. Limb ischemia
B. Excessive bleeding from the insertion site
C. Thrombocytopenia
D. Immobility of balloon catheter
E. Balloon leak
F. Infection
G. Aortic dissection
H. Compartment syndrome
TEACHING TECHNICAL COMPONENTS AND TROUBLESHOOTING

I. IAB Catheter
   A. Insertion/Removal
   B. Care of the Central Lumen

II. Trigger vs. Timing
   A. Definition of trigger and timing

   **Trigger selection:**
   
   **Timing:**
   
   B. Conventional vs. R-wave deflation timing

III. Review of control panel and monitor
IV. Troubleshooting Clinical Conditions

A. Factors Affecting Diastolic Augmentation
   1. Patient hemodynamics
      a. Heart rate
      b. Stroke volume
      c. Mean arterial pressure
      d. Systemic vascular resistance
   2. Intra-Aortic Balloon
      a. IAB not unfolded
      b. IAB position
      c. IAB size
      d. Kink in IAB catheter
      e. Low Helium concentrate
      f. IAB leak
   3. Intra-Aortic Balloon Pump
      a. Timing
      b. Position of the augmentation dial

B. Rhythm Disturbances
   1. Atrial fibrillation/flutter
   2. Ectopic
   3. Cardiac arrest
   4. Ventricular fibrillation
C. 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 MVO$_2$ 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 MVO$_2$ 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
D. Balloon Pressure Waveform

1. Normal Balloon Pressure Waveform
2. Variations in Balloon Pressure Waveforms

Variations in balloon pressure waveforms may be due to the following conditions:

**Heart Rate**

**Bradycardia**
Increased duration of plateau due to longer diastolic phase.

**Tachycardia**
Decreased duration of plateau due to shortened diastolic phase.

**Rhythm**

Varying R-R intervals result in irregular plateau durations.

**Blood Pressure**

**Hypertension**
Increased height or amplitude of the waveform.

**Hypotension**
Decreased height or amplitude of the waveform.
**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.

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**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.

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**Sustained Inflation**

Theoretical possibility if the IAB remains inflated longer than 2 seconds. System 90 Series intra-aortic balloon pump will activate the System Failure alarm and deflate the IAB.
DOCUMENTATION CONSIDERATIONS

I. Discussion of Documentation Considerations

A. Suggested Documentation
   1. Insertion
   2. During Operation
      a. Pressure changes
      b. Hemodynamic benefits
      c. Pulse checks
   3. Removal

MAINTAINING EXPERTISE

I. Recommendations for Maintaining Expertise

A. Suggested Resources
   1. Videotapes
   2. CD-ROM
   3. Case Studies
   4. Skills Lab – Hands on with performance checklist
BIBLIOGRAPHY

Quaal SJ. Comprehensive Intraaortic Balloon Counterpulsation. 2nd ed. St. Louis, MO: Mosby; 1993


### PROGRAM AND SPEAKER EVALUATION

**Developing an IABP Preceptor Strategy**  
**Program Code 06**

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>
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**Speaker Name:** ________________________________________________________________

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**Comments:**

**Participant Name:** ____________________________________________________________