NURSING PRACTICE & SKILL

Intra-aortic Balloon Pump: Overview of Patient Management

What is Involved in Management of a Patient with an Intra-Aortic Balloon Pump?

› The intra-aortic balloon pump (IABP) employs a balloon-tipped catheter and a process called *counterpulsation* to temporarily support coronary and systemic perfusion in patients with severe cardiac disease (e.g., cardiogenic shock) or injury (e.g., myocardial infarction [MI]). The catheter is typically inserted into the femoral artery, threaded close to the descending aortic arch, and attached to an external pump which inflates and deflates the intra-aortic balloon (IAB) in synchrony (timed) with the cardiac cycle. IABP therapy provides temporary hemodynamic support by increasing coronary and systemic perfusion until the heart can resume its function/workload or until cardiac transplantation is performed. **The information contained in this *Nursing Practice & Skill* lesson is intended to present a brief overview of caring for the patient receiving IABP therapy and is not intended to replace facility/unit-specific protocols, clinician orders, or the comprehensive coursework and clinical experience necessary to become proficient in caring for the patient IABP** (for information about IAB insertion, timing, pressure wave assessment, weaning, and removal, see the related series of *Nursing Practice & Skill* papers)

- *What*: Management of a patient receiving IABP therapy requires managing the computerized IABP console; assessing, monitoring, and adjusting balloon inflation and deflation (referred to as timing); monitoring patient response to IABP therapy; and performing intervention to prevent complications that can arise as a result of the presence of the IAB catheter (for details, see *What You Need to Know Before Managing a Patient with an Intra-aortic Balloon Pump*, below)
- *How*: In accordance with treating clinician orders and facility protocols, the nurse caring for a patient receiving IABP therapy evaluates
  - the proper functioning of the IABP and balloon inflation/deflation
    - NOTE: In many facilities, an IABP technician or perfusionist is responsible for monitoring the mechanical components of the IABP
  - the accuracy of balloon timing
  - for signs of vascular compromise (for details, see *Red Flags* , below) or other complications of IAB catheter placement (e.g., bleeding at the insertion site)
  - the patient's response to IABP therapy
- *Where*: Management of a patient receiving IABP therapy is performed in the operating room or cardiac catheterization suite where the IAB catheter was placed, and in the ICU after placement
- *Who*: Management of a patient receiving IABP therapy is performed by a specially trained critical care nurse; an IABP technician or perfusionist is typically responsible for monitoring the mechanical components of the IABP. Care of the patient with an IABP cannot be delegated to assistive personnel. In the interest of minimizing contaminants, family members are not usually permitted to be present during insertion site dressing changes, although they may be present during routine assessment and management

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What is the Desired Outcome of Managing the Patient with an Intra-Aortic Balloon Pump?

› The patient receiving IABP therapy will experience optimal counterpulsation and hemodynamic support with no complications as a result of IAB catheter placement or IABP therapy.
  • Expected outcomes of IABP therapy include (de Jong et al., 2017)
    – increased coronary artery perfusion
    – decreased left ventricular(LV) workload
    – decreased myocardial oxygen consumption
    – decreased afterload
    – increased renal blood flow
    – increased splanchnic blood flow

Why is Management of the Patient with an Intra-Aortic Balloon Pump Important?

› Because IABP therapy is a highly invasive strategy associated with severe and potentially life-threatening complications (e.g., hemorrhage), intensive management of patients with an IABP is important to ensure optimal counterpulsation and patient outcomes and to prevent complications.

Facts and Figures

› Investigators who conducted a meta-analysis of 10 international randomized trials reported that use of IABP was not associated with reduced 30-daymortality rates in patients undergoing high-risk reperfusion therapy, but was associated with a 37% reduction in 6-month mortality rates (Chen et al., 2014)
› Authors of a study examining U.S. trends in IABP usage in light of the conflicting evidence of its usefulness found that it is being used much less than before due to better treatment of acute coronary syndrome, including early revascularization and better prevention (Patel et al., 2014)
› Researchers conducting a retrospective chart review to evaluate the effect of IABP therapy on activity tolerance of 45 adult patients awaiting heart transplantation concluded that IABP therapy can allow safely increased physical mobilization among patients awaiting heart transplants, promoting improved preoperative strengthening, decreasing need for assistance with postoperative activity, and significantly shortening length of hospital stay (Green et al., 2015)
› Researchers in a meta-analysis determined that the use of IABP therapy before coronary artery bypass grafting (CABG) was associated with decreased mortality, a shorter ICU length of stay (LOS), and a shorter overall LOS (Poirier et al., 2016)
› Researchers in a systematic review of 20 studies reported an incidence of vascular complications of 0.94-31.1%. Limb ischemia, bleeding, and mesenteric ischemia were the most common vascular complications. Factors that increased risk for IABP complications were diabetes, smoking, peripheral vascular disease, and hypertension (de Jong et al., 2017)
› Roughly 7% of patients utilize IABP therapy following cardiac surgery (Parissis et al., 2016)
› Factors that can preclude the use of IABP therapy in children include small stroke volume, small aortic size, and high aortic elasticity(Parissi s et al., 2016)

What You Need to Know Before Managing a Patient with an Intra-Aortic Balloon Pump

› Managing a patient with an IABP requires specialized training and a strong foundation in critical care skills, including knowledge of and demonstrated competence in the following critical care/nursing skills:
  • anatomy and physiology of the cardiovascular system, including the events of the normal cardiac cycle
  • EKG monitoring (for more information, see the series of *Nursing Practice & Skills* papers on EKG monitoring)
  • arterial pressure monitoring (for more information, see *Nursing Practice & Skill ... Arterial Catheter, Indwelling: Monitoring Arterial Pressure*)
    – The IABP can rely on a traditional arterial line set-up and fluid-filled transducer system to monitor arterial pressure in the aorta, or the IAB catheter can be a fiberoptic catheter with a sensor at the tip for monitoring and transmitting the arterial pressure waveform. If a fluid-filled transducer is to be used, the nurse must know how to set up and manage a pressure transducer system (for more information, see *Nursing Practice & Skill ... Pressure Transducer System, Intravascular/ Intracardiac: Setting Up*)
  • how to analyze an arterial pressure waveform
  • pulmonary artery pressure monitoring (for more information, see *Nursing Practice & Skill ... Pulmonary Artery Catheter: Monitoring Pulmonary Artery Pressure*)

- how to measure cardiac output (for more information, see the related series of *Nursing Practice & Skill* papers on measuring cardiac output)
- cardiovascular assessment (for more information, see *Nursing Practice & Skill ... Physical Assessment: Performing a Cardiovascular Assessment in Adults*)
- advanced cardiac life support (ACLS) protocols
- infection control procedures and aseptic technique (for more information, see the series of related *Nursing Practice & Skill* papers)

› Knowledge of how the IABP functions and provides hemodynamic support is essential

- IABP therapy involves use of a double-lumen catheter with a 25–50cm^3 balloon that lies about 2 cm inferior to the left subclavian artery and proximal to the renal arteries. The balloon inflates and deflates in synchrony with the patient's cardiac cycle; the outer lumen of the catheter allows for movement of helium to and from the IAB, while the inner lumen is typically used for arterial pressure monitoring. The balloon should not occlude > 85-90% of the aorta when inflated
- Balloon inflation is set to start at the beginning of ventricular diastole, which corresponds to the middle of the T-wave on the EKG or at or just prior to the *dicrotic notch* (i.e., aortic valve closure) on the arterial pressure waveform. Balloon deflation is set to occur just prior to the onset of ventricular systole, which corresponds to the peak of the R-wave on the EKG or prior to the arterial upstroke on the arterial pressure waveform (for more information, see *Nursing Practice & Skill ... Intra-aortic Balloon Pump: Timing of*).
  - Inflation during diastole increases retrograde perfusion to the coronary arteries. Deflation at the onset of systole (during the pre-ejection phase) decreases afterload, end-diastolic pressure, the workload of the LV, and myocardial oxygen consumption, and increases cardiac output; this action is referred to as*counterpulsation*
  - Initially, when the patient requires the most support, the IABP can be set to augment each beat (1:1 assist ratio), also known as *maximum augmentation*. As the patient requires less support, the ratio can be adjusted to a minimum of 1:8 to wean the patient from IABP therapy, after which IABP support can usually be discontinued
- Timing errors can result in significant and life-threatening adverse effects. Early inflation is the most dangerous timing error because inflation occurs during systole which results in a significant increase in LV workload as it pumps against the pressure of the inflated balloon
  - Incorrect IABP timing can cause
    - decreased cardiac output (early inflation, early deflation, late deflation)
    - hypotension (early inflation, early deflation, late deflation)
    - increased myocardial oxygen demand and consumption (early inflation, late deflation)
    - myocardial ischemia (late inflation, perhaps early deflation)
- Indications for IABP therapy include
  - LV failure, especially those patients with an ejection fraction < 35% and patients who are awaiting heart transplantation
  - unstable angina
  - cardiogenic shock following myocardial infarction (MI)
  - high-risk percutaneous transluminal cutaneous angioplasty (PTCA) status or failed PTCA
  - the need for hemodynamic support prior to, during, and/or after cardiac surgery
  - inability to be weaned from cardiopulmonary bypass support following cardiac surgery
  - refractory ventricular arrhythmias
  - septic shock

› Knowledge of how to assess the IABP augmented arterial pressure waveform and the balloon pressure waveform is essential to ensure optimal counterpulsation

- The accuracy of IABP timing is assessed by evaluating the changes in the arterial pressure waveform caused by the IABP when the augmentation ratio is set at 1:2 or 1:3 (for details, see *Nursing Practice & Skill ... Intra-aortic Balloon Pump: Timing of*; CINAHL Topic ID Number T706035). Incorrect timing can result in decreased cardiac output, diminished blood pressure, increased myocardial oxygen demand and consumption, and myocardial ischemia. The augmented arterial pressure waveform should demonstrate
  - a rapid upstroke at the dicrotic notch (indicating a rapid rise in aortic pressure) that results in an augmented **peak diastolic pressure** that is greater than the patient's systolic pressure
  - a **balloon aortic end-diastolic pressure** that is lower than the native patient end-diastolic pressure; the balloon aortic end-diastolic pressure should appear as a distinct "V"
  - the **slopes** of the assisted and unassisted systolic pressure waveforms are equal
  - an **assisted peak systolic pressure** lower than the unassisted peak systolic pressure

- The balloon pressure waveform must be assessed to verify that the inflation/deflation process is occurring correctly, that the catheter is not kinked or leaking, and that optimal counterpulsation is occurring (for details, see *Nursing Practice & Skill ... Intra-aortic Balloon Pump: Assessing the Pressure Waveform*). Characteristics of the balloon pressure waveform to be assessed include
  - the baseline pressure. Normal fill pressure is typically 0–2.5 mmHg
  - a rapid upstroke as the balloon is inflated with helium. A normal upstroke will be sharp and vertical or nearly vertical
  - an inflation artifact as the maximum pressure in the balloon is reached
  - a plateau pressure, which represents duration of inflation. The presence of a plateau indicates the duration of inflation during diastole and confirms that the balloon is fully inflated The height of the plateau indicates the pressure in the aorta while the IAB is inflated and should be within 20–25 mmHg of the augmented peak diastolic pressure
  - a rapid downstroke as the balloon deflates. A normal downstroke will be sharp and nearly vertical
  - a negative deflation artifact below the baseline that occurs as helium returns to the helium supply pump and then stabilizes
    - The deflation artifact may be missing in hypertensive patients
  - a return to baseline

› Knowledge of how the IABP console functions and how to respond to alarms is important
- The IABP console displays the EKG tracing, arterial pressure waveform, and the Balloon pressure waveform, as well as numerical readings of heart rate and arterial pressure
- The IABP console can alarm for a variety of reasons (e.g., occlusion of the IAB, loss of the trigger). Alarms must be responded to promptly as the system may cease counterpulsation when in an alarm state
- The pneumatic system that inflates/deflates the balloon must be assessed periodically, the helium tank pressure monitored, and the helium tank changed as needed; these responsibilities typically fall to the perfusionist
- For details, see the manufacturer's instructions for the specific IABP system in use, as well as the series of *Nursing Practice & Skills* papers regarding IABP management and timing

› Knowledge of potential complications of IABP therapy. Limb ischemia is the most common vascular complication of IABP therapy (see *Red Flags* , below). Other complications include
- compartment syndrome (i.e., excessive pressure in muscles that prevents adequate oxygenation and can lead to paralysis, loss of limb, or death)
- vascular injury, including aortic laceration or dissection, dislodging of plaque, and arterial perforation
- left arm ischemia (evidenced by pain and impaired circulation in the left arm) if the balloon is displaced proximally and occludes the left subclavian artery
- hemorrhage due to anticoagulation
  - Heparin-induced thrombocytopenia can occur. In addition, damage to platelets can occur as a result of the balloon inflation and deflation. Patients with a lower initial platelet count are at a substantially higher risk for thrombocytopenia than patients with an initial platelet count that is within normal parameters
- gas embolus secondary to balloon rupture
  - If balloon rupture is suspected, the IAB catheter must be removed **immediately** to reduce risk for air embolus (see *Red Flags* , below)
- balloon entrapment (i.e., an inability to remove the IAB catheter, which can result in the need for surgical removal)
- thromboembolism
- thrombocytopenia
  - Heparin-induced thrombocytopenia can occur. In addition, damage to platelets can occur as a result of the balloon inflation and deflation. Patients with a lower initial platelet count are at a substantially higher risk for thrombocytopenia than patients with an initial platelet count that is within normal parameters
- cardiac tamponade
- peripheral nerve damage if a cutdown was used to insert the catheter
- impaired cerebral circulation (evidenced by neurologic changes including agitation or changes in level of consciousness) if the balloon is displaced proximally and occludes the subclavian artery
- renal ischemia (evidenced by a decrease in urinary output) if the balloon is displaced distally and occludes the renal arteries
- infection and/or sepsis
  - Strict adherence to aseptic technique is necessary. Patient visitors should be instructed in hand hygiene

› Preliminary steps that should be performed before managing a patient with an IABP include the following:
- Review the facility/unit protocol for IABP therapy, if one is available

- Review the treating clinician's orders for IABP therapy, monitoring parameters, laboratory tests, and/or related medication
- Verify completion of facility informed consent documents
- Review the patient's medical history/medical record for
  - indications for IABP therapy
  - patient's response to IABP therapy
  - medications ordered
  - previous waveform tracings
  - any allergies (e.g., to latex, medications, or other substances); use alternative materials, as appropriate
- Review the manufacturer's instructions for all equipment to be used and verify that the equipment is in good working order

› The IABP should already be in use at the patient's bedside. Gather the necessary supplies, which typically include
- Nonsterile gloves; additional personal protective equipment (PPE; e.g., gown, mask, eye protection) may be needed if exposure to body fluids is anticipated
- Equipment for monitoring vital signs
- Facility-approved pain assessment tool
- Doppler for assessing pedal and/or tibial pulses, if needed
- Prescribed sedative and analgesia and means for administering
- 60-cc syringe to manually inflate the balloon in the event of pump malfunction
- Emergency resuscitation equipment (e.g., defibrillator, suction equipment, and medications for advanced cardiac life support [ACLS] protocols) should be readily available
- Written materials to reinforce patient education

› Contact the IABP technician or perfusionist, if available, to assist with the IABP console if difficulties arise

How to Manage a Patient with an Intra-Aortic Balloon Pump

› Perform hand hygiene and don PPE as appropriate

› Identify the patient using two unique identifiers, according to facility protocol

› Establish privacy by closing the door to the patient's room and/or drawing the curtain surrounding the patient's bed

› Introduce yourself to the patient and family member(s), if present; explain your clinical role; assess the coping ability of the patient and family and for knowledge deficits and anxiety regarding IABP therapy
- Determine if the patient/family requires special considerations regarding communication (e.g., due to illiteracy, language barriers, hearing impairment); make arrangements to meet these needs if they are present
  - Use professional certified medical interpreters, either in person or via phone, when language barriers exist
- Reinforce the purpose of IABP therapy and the need to keep the affected extremity immobile; answer any questions and provide emotional support as needed

› Verify that the patient is supine with the head of the bead ≤ 30° and with the affected limb immobilized[6]

› Perform a thorough assessment of the patient's cardiovascular system and hemodynamic status to determine response to IABP therapy as currently timed

› Assess vital signs and level of pain using a facility-approved pain assessment tool. Administer analgesics and sedatives, as ordered

› Zero the transducer, according to manufacturer's instructions, to ensure accuracy of the readings[6]
- If using an IABP that requires a fluid-filled transducer,
  - verify that the transducer set up is intact
  - flush the arterial line to assess patency
  - level the transducer with the patients phlebostatic axis

› Assess and adjust the timing of balloon inflation and deflation every hour, if there is a change in heart rate > 10 bpm, and if there is a change in the patient's heart rhythm[6]
- Select an EKG lead on the IABP console that produces the largest R-wave to allow for optimal triggering
- Set the console to "manual" or "operator mode" if on an automatic timing setting
- Set the assist ratio to 1:2 (50% augmentation)[6]
- Run an arterial pressure waveform strip to use to assess the timing of balloon inflation and deflation
- Identify the dicrotic notch of the augmented waveform. Draw a line that passes through the dicrotic notches of several systolic waveforms recorded on the strip[6]

- Change the inflation point briefly to occur after the dicrotic notch so that the dicrotic notch can be identified instantly, then immediately change to occur at or just prior to the dicrotic notch[6]
- Adjust the inflation point as needed so that it produces a sharp and deep "V" at the dicrotic notch
  - The appearance of a deep, sharp "V" wave serves to confirm that inflation is correctly occurring at the onset of diastole
- Confirm that the augmented peak diastolic pressure is greater than the patient's unassisted systolic pressure
- Identify and compare the augmented end-diastolic pressure and the patient's unassisted end-diastolic pressures[6]
  - The augmented end-diastolic pressure should appear as a sharp and deep "V" and be lower than the patient's unassisted end-diastolic pressure
- Verify that the assisted peak systolic pressure is lower than the patient's native peak systolic pressure[6]
- Slightly adjust deflation earlier or later as needed so that[6]
  - the augmented end-diastolic pressure is lower than the patient end-diastolic pressure and forms a distinct sharp and deep "V"
  - the assisted systolic pressure is less than the unassisted systolic pressure
- Set the IABP back to 1:1 augmentation, or as ordered[6]

› Assess the characteristics of the balloon pressure waveform
- Run a strip of the balloon pressure waveform
- Verify that the baseline uninflated pressure in the balloon is 0–2.5mmHg[6]
- Verify that the upstroke of the waveform is sharp and vertical or nearly vertical[6]
- Assess for the presence of a peak inflation artifact followed by a rapid drop-off[6]
- Assess for the presence of a pressure plateau [6]
- Verify that the downstroke immediately following the pressure plateau is sharp and nearly vertical [6]
- Assess for a negative deflection below the baseline[6]
- Assess the width of the waveform, starting at the beginning of the inflation upstroke and ending when the deflation downstroke crosses the baseline. Verify that it matches the width of the augmented arterial waveform[6]

› Troubleshoot the IABP, if necessary, according to manufacturer instructions or facility protocol, if the normal characteristics of the balloon pressure waveform are not present[6]
- If the balloon is inflating early or late, adjust the inflation point so that the balloon inflates at or just before the dicrotic notch[6]
  - Be aware that early inflation is the most dangerous timing error
  - If the balloon is deflating early or late, adjust the deflation point so that there is a sharp diastolic wave and the greatest increase in the augmented systolic pressure[6]
- If the fill pressure is elevated > 2.5 mmHg
  - assess the catheter or connecting tubing for kinks and straighten, as needed
  - assess for improper balloon positioning; perform a patient assessment (e.g., assess urine output and pulses) and request X-ray to verify placement, as needed
- If the plateau pressure is lower than expected (e.g., > 25 mmHg lower than the augmented peak diastolic pressure), assess the helium supply for leaks or a low supply that could cause a decreased plateau pressure; secure all connections and change the helium tank, as needed
  - Call the IABP technician or perfusionist may need to be called if there are concerns about the helium supply and balloon inflation, according to facility protocol
- If the plateau pressure is higher than expected (e.g., > 25 mmHg higher than the augmented peak diastolic pressure)
  - assess the catheter or connecting tubing for kinks and straighten, as needed
  - decrease the volume of helium used for inflation, according to the treating clinician's order or facility/unit protocol if it is suspected that the balloon is too large for the aorta
- If the waveform is narrow but the patient's heart rate is not rapid, assess the timing for late inflation or early deflation
- If the waveform rhythm is erratic but the patient has a regular rhythm, assess the IABP trigger to verify that the trigger is appropriate and is being sensed; adjust the trigger, as indicated

› Routinely check for the presence of blood in the connecting tubing, which is a hallmark of balloon rupture and is considered a **medical emergency** (for details, see *Red Flags* , below)

- If balloon rupture is suspected (e.g., blood in the helium tubing), **immediately** [6]
  - place the console on standby to prevent pumping helium into the patient
  - clamp the IAB catheter to prevent blood back-flow into the catheter
  - remove the IAB catheter from the console to prevent blood from entering the console
  - notify the treating clinician
  - prepare for immediate removal/replacement of the IAB catheter
  - discontinue anticoagulant therapy if ordered

› Perform a physical assessment of the patient every 15-60 minutes, according to facility protocol
- Assess for hypotension and/or pain in the abdomen, flank or back, which can indicate retroperitoneal bleeding
- Assess for a blood pressure differential between the left and right sides of the body, pallor, dyspnea,syncope, diaphoresis, and pain in the chest, abdomen, or back as these can indicate dissecting aortic aneurysm
- Assess cardiac rate and rhythm; auscultate heart sounds and assess cardiac output, according to facility protocol
  - If the patient is hemodynamically stable, the IABP can be placed on standby briefly so that heart sounds can be more easily auscultated
- Assess respiratory status, including ventilator settings, if applicable, and pulse oximetry. Assess pedal and tibial pulses distal to the IAB catheter insertion site; assess for changes in capillary refill, color, temperature, and sensation of the affected limb. Use a Doppler to assess pulses, as needed
- Assess the radial and ulnar pulses and for changes in capillary refill, color, temperature, and sensation in the left arm
- Assess the patient's urinary output
  - A decrease in urinary output can indicate that the balloon is displaced downward and is occluding the renal arteries
- Assess for neurologic changes, although this may not always be possible because many patients are sedated during IABP therapy
  - Changes in level of consciousness can indicate reduced cerebral blood flow. If the patient is agitated, the risk for catheter displacement is greater
  - Administer sedative, if ordered, to reduce agitation, if present, and reduce risk for catheter displacement
- Auscultate bowel sounds and palpate the abdomen for distention or tenderness, which can indicate thrombus, internal bleeding, or mesenteric ischemia
- Inspect the IAB catheter insertion site
  - Verify that the catheter is secured to the patient's skin, either with sutures or a catheter securement device[6]
  - Assess for signs of infection (e.g., redness, drainage)
  - Change the dressing at the insertion site every 24 hours or according to facility protocol using strict aseptic technique. A transparent occlusive dressing can be used as this allows for better visualization of the insertion site
  - Assess for bleeding at the insertion site or from other sites (e.g., blood in urine or stools, bleeding gums, petechiae) that suggest over anticoagulation
- Assess the skin of the lower limb, especially the heel, for redness or pain, which could indicate pressure injury formation

› Monitor laboratory test results, including
- PT/PTT to assess bleeding risk
- serum electrolytes (e.g., potassium) as abnormalities can increase risk for arrhythmia
- serum creatinine levels to assess risk of compromised renal perfusion

› Verify proper mechanical functioning of the IABP
- Monitor for pump interruption, which may be the result of improper body alignment, loose EKG electrodes or lead wires, outside electrical interference, or kinks in the catheter
- Confirm that the back-up battery for the IABP console is fully charged in case of power failure or if it becomes necessary to transport the patient
- Obtain a new IABP console in the event of pump malfunction; perform manual pumping if a new console not immediately available
  - Use the 60-cc syringe to manually pump the balloon with room air a minimum of once every five minutes to prevent thrombus formation in the catheter. When inflating the balloon manually with room air, the volume of inflation is 10 mL less than the balloon volume marked on the catheter

› Discard used supplies appropriately and perform hand hygiene

› Update the patient's medication administration record (MAR) and plan of care, if appropriate, and document the following information in the patient's medical record and on the IABP flowsheet:
- Date and time of assessments and care provided

- Details of timing, pressure waveform, and pump assessment
- Patient assessment findings, including
  - vital signs
  - level of pain
  - hemodynamic measurements
  - results of cardiovascular, respiratory, neurologic,abdominal,and skin assessment
  - presence and strength of peripheral pulses
  - I & O
  - insertion site and any indications of bleeding or infection
- Details of patient positioning
- Complications or mechanical malfunctions that occurred, interventions performed, whether or not the treating clinician was notified, and patient outcome
- All patient and family education provided, including topics presented, response to education, plan for follow-up education, barriers to communication, and techniques that promoted successful communication and emotional support

Other Tests, Treatments, or Procedures That May be Necessary Before or After Managing a Patient with an IABP

› Chest X-rays may be ordered daily to verify correct placement of the IABP
› ABGs are routinely ordered to evaluate the effectiveness of the IABP and the patient's oxygenation and respiration status
› The patient's hematologic status is closely monitored, especially for infection and bleeding. Laboratory tests include
- CBC with differential and platelets. The platelet count is assessed for the increased risk of thrombocytopenia
- Hct and Hgb values to monitor for hemorrhage
- PTT levels if the patient is receiving heparin therapy in order to monitor that a level 1.5–2 times the normal value is maintained

What to Expect After Management of a Patient with an Intra-Aortic Balloon Pump

› The patient's cardiac workload will be reduced and myocardial perfusion will be increased
› The patient's cardiac function will improve
› The patient will not experience adverse effects from the IABP therapy

Red Flags

› **Limb ischemia** is the most common vascular complication. Patients with a history of peripheral vascular disease are particularly at risk. Routinely palpate pedal and posterior tibial pulses, noting both presence and strength; if pulses are not palpable, a Doppler must be used to monitor neurovascular status and prevent limb ischemia. Pain or changes in the color, sensation, capillary refill, and temperature of the affected limb can also indicate limb ischemia and/or **compartment syndrome** . Provide ongoing documentation, and report changes to the clinician. **If the patient develops ischemia, the IAB catheter will have to be removed**
› **Ischemia of the left arm can also occur if the balloon is displaced proximally and occludes the** left subclavian artery. Loss of pulses,pain, or changes in the color, sensation, and temperature in the left arm may indicate upward balloon displacement. **Renal ischemia** can occur if the balloon is displaced distally and occludes the renal arteries.
› Although less common than limb ischemia, **visceral and mesenteric ischemia** can occur due to incorrect balloon positioning which compromises perfusion to visceral arteries. Patients can develop abdominal pain and distention as a result of ischemia or thrombus formation. Visceral ischemia can lead to fatal organ damage before signs and symptoms are detected. **If the patient develops ischemia, the IAB catheter will have to be removed**
› Patients with an IABP are at increased risk for a **dissecting aortic aneurysm** and should be monitored for a blood pressure differential between the left and right sides of the body; an increase in blood pressure; pallor; dyspnea; pain in the chest, abdomen, or back; syncope;and diaphoresis
› IABP therapy may be placed on hold while troubleshooting the device; however, it is important that the balloon **not remain dormant (i.e., not inflating/deflating) for > 15 minutes** due to an increased risk for clot formation
- If the IABP console malfunctions, a new console must be immediately obtained, attached to the IAB catheter, and pumping continued as ordered

- If unable to locate a new IABP console immediately, the IAB should be manually inflated/deflated every 5 minutes using a 60 cc syringe and a quantity of room air roughly 10 cc less than the maximum inflation volume printed on the catheter. **Never manually inflate the IAB if balloon rupture suspected**

› **Balloon rupture is a life-threateningemergency** . Balloon rupture is suspected if there is blood visible in the helium tubing or if there is a sudden cessation of inflation/deflation. **If balloon rupture is suspected, the IAB catheter must be removed immediately** to reduce the likelihood for fatal gas embolism occurring as a result of helium being pumped directly into the artery and infection with can occur because the gas chamber of the balloon is not sterile (for more information on balloon removal, see *Nursing Practice & Skill ... Intra-aortic Balloon Pump: Weaning from and Removing*)

What Do I Need to Tell the Patient/Patient's Family?

› Explain how IABP therapy helps to support the patient's cardiovascular system and why it has been ordered for the patient
› Reinforce the need to not bend the leg or handle the IAB catheter
› Reassure that sedation and analgesia will be provided either routinely or as needed, according to treating clinician orders
› Provide information regarding the timeline for use of IABP therapy (e.g., until the patient's heart can function adequately or, if appropriate, until post-transplant weaning is successful)

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