# Rancho Los Amigos National Rehabilitation Center
# DEPARTMENT OF NURSING
# INTENSIVE CARE UNIT
# POLICY AND PROCEDURE

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| **SUBJECT:** | **INVASIVE HEMODYNAMIC** | **Policy No.:** | **ICU07** |
| | **MONITORING GUIDELINES** | **Supersedes:** | **04/2018** |
| | | **Effective Date:** | **07/1999** |
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**Purpose:** To provide guidelines and establish consistency among critical care nurses in ICU, for the safe and effective management of patients with invasive hemodynamic monitoring.

**Background Information:**
When used properly, hemodynamic monitoring aids in the early identification of life threatening conditions, in the evaluation of a patient's immediate response to therapy, and determination of appropriate medical diagnosis and treatment of patients with severe cardiorespiratory compromise.

**Physician's Order Required:** Yes

**Performed By:** ICU nurse, RN who has received training in assisting with the insertion and maintenance of hemodynamic monitoring catheters.

**Policy Statements:**

1. Patients needing invasive hemodynamic monitoring are admitted to ICU.

**Procedural Steps:**

1. A written consent must be obtained per hospital informed consent policy for insertion.

2. The Critical Care Nurse prepares equipment and monitors the patient's status.

3. Special high pressure tubing must be used for hemodynamic monitoring.

4. Pressure bag is maintained at 300 mmHg to maintain an appropriate flush rate.

5. Pressure transducer is leveled and zeroed prior to initial pressure readings (except pulmonary artery catheter which must be zeroed prior to insertion), at the beginning of each shift, when the transducer is disconnected or tubing is changed and when the patient is repositioned.

6. To ensure accuracy, a carpenter's level is used to level transducer with the phlebostatic axis (midway) between the posterior chest and sternum at the fourth intercostal space, mid axillary line).

7. When leveling, zeroing, reading cardiac pressures, and measuring cardiac output, the patient must be supine. If patient is unable to tolerate flat position the head of the bed may be elevated up to 45 degrees.

8. Patient and transducer are positioned on the same level each time the pressures are read and recorded to ensure consistency and accuracy.

9. Hemodynamic pressure values (CVP, PA, PAW, arterial) are documented on the patient's medical record at the time of insertion and at the beginning of each shift.

10. Pressure tubing will be changed every 96 hours. The flush bag will be changed every 24 hours and as needed.

11. Replace dressing every seven (7) days and as needed per Department of Nursing Clinical Policy C122.16 - Guidelines for Care and Maintenance of Intravascular Catheters and Sites.Notify physician of any abnormalities

12. Immediately after blood drawing, the catheter is flushed with 20 mLs of NS until all traces of blood are removed from the catheter.

13. Strict aseptic technique is used during system set-up, insertion, blood withdrawal, tubing changes and site dressing changes.

14. For specific hemodynamic monitoring procedures refer to AACN Procedure Manual For Critical Care 2011 (6th edition).

ARTERIAL LINES

1. Allen's Test is performed by the Provider prior to insertion of radial arterial line.
2. Extremity distal to arterial line is assessed (pulse, sensation, color, temperature) for circulatory insufficiency every two hours.
3. Alarm parameters are set 20 mm Hg above and below the patient's baseline and alarms are maintained at all times so that sudden change in pressure and/or disconnection of the line is immediately noted.
4. Cuff blood pressure is obtained and compared with the monitor readings at the beginning of each shift and when in doubt about intra-arterial pressure range.
5. Arterial line is not used for infusing solutions or medications except flush solution.
6. Arterial lines may be removed by a critical care nurse with physician's order.
7. Pressure is applied on insertion site for five (5) minutes or until hemostasis is achieved after arterial catheter removal.
8. Apply pressure dressing and reassess the site for continued bleeding.

PULMONARY ARTERY CATHETER (SWAN GANZ CATHETER - WITH/WITHOUT PACEPORT)

1. Chest x-ray must be obtained immediately after line insertion and every time the catheter is repositioned
2. The transducer is zeroed prior to catheter insertion to ensure accuracy of the waveforms and pressure readings as the pulmonary artery catheter is advanced through the right atrium, the right ventricle, and the pulmonary artery.
3. The distal port of the PA catheter is continually attached to a pressure transducer.
4. PA waveform is monitored continuously so that any inadvertent wedging of the catheter or migration of the catheter to the right ventricle can be recognized immediately.
5. Cardiac pressures are read every two hours. Cardiac output with cardiac calculations every four hours, unless otherwise ordered by physician.
6. All pressure readings are obtained at the end of expiration including cardiac output measurement, because at this point the intrathoracic pressure is constant and the pressure waveform is most stable.
7. For patients on a ventilator receiving Positive End Expiratory Pressure (PEEP), the pressure readings are done without removing the ventilator. This will show the effects of PEEP on the patient's hemodynamic status.
8. When PA catheter migrates to RV (right ventricle), a critical care nurse may inflate balloon with 1.5 ml of air to cushion catheter tip and prevent endocardial irritation. If the catheter does not move back immediately into PA position, physician is notified of the need to reposition the catheter.
   **KEYPOINT:** Never flush a PA catheter when in a wedged position. It could result in PA rupture. Notify physician immediately to pull wedged catheter back.
9. A chest x-ray is obtained to confirm catheter placement after each repositioning.

10. When wedging catheter in elderly (over 60-years old) patients or patients with pulmonary hypertension, wedge for no longer than 10-15 seconds to prevent PA ischemia and injury.
11. When deflating PA catheter balloon, disconnect syringe and allow balloon to deflate passively to prevent weakening of the balloon resulting in early leaks.
12. If strong resistance is met during inflation, do not inflate balloon. Notify physician.
13. If air goes in freely and there is no wedge waveform seen, disconnect syringe and lock the port. The gate valve should have a label placed which reads, "DO NOT INJECT AIR". Notify physician.
14. If Pulmonary Artery Diastolic Pressure (PAD) and Pulmonary Artery Wedge Pressure (PAWP) are similar values (less than four (4) mm Hg difference), the PAD pressure can be substituted for PAWP when doing cardiac calculations.
15. Viscous fluids (e.g., whole blood, PRBC, albumin) are not infused via any lumen of the pulmonary artery catheter.
    **KEY POINT:** The largest lumen of a PA catheter is too small for blood administration and will damage RBCs. Flow is too slow and may occlude catheter.
16. Only mixed venous samples are to be drawn from the distal port of the PA catheter. Make sure that the balloon is deflated and sample is drawn slowly.
    **KEY POINT:** This prevents highly oxygenated blood from the pulmonary capillaries to be drawn into the syringe and cause inaccurate high values.

CARDIAC OUTPUT MEASUREMENT

1. A 500 ml D5W IV bag for cardiac output injectate is connected to the proximal port of the PA catheter via a three-way stopcock.
2. If patient is receiving IV fluids through the proximal port, it is turned off while cardiac output measurements are being performed.
   **KEYPOINT:** Avoid infusing cardiotonic or vasoactive drugs via the proximal port of the PA catheter whenever possible due to the risk of bolusing these medications during cardiac output injection (i.e., cardiac arrest, hypotension).
3. Room temperature injectate and closed system technique is used for CO measurements.
4. Documentation includes: Cardiac calculations every four (4) hours; v/s and cardiac pressure readings every two (2) hours (unless otherwise ordered by the physician), any unusual responses, effects of drug therapy and patient's hemodynamic status.

**Patient/Family/Education:**

1. At a minimum education should include:
   - The purpose of the pressure tranducer system.
   - Catheter location and the importance of not touching the line.
   - Signs and symptoms to report to nurse: chest pain, palpitations, new cough, tenderness at insertion site, and chills.

**Documentation:**

1. The date and time of set up.
2. The time the system is zeroed and calibrated.
3. The type and amount of flush solution used.
4. Peripheral vascular assessment.
5. Insertion site condition.
6. Hemodynamic readings
7. The date and time monitoring lines are changed and dressing changed.
8. The date and time hemodynamic catheter is removed, assessments before and after removal and patient’s response to procedure.

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**REFERENCES:**

Wiegand, Debra. Lynn, et al. (2017) *AACN Procedure Manual for Critical Care 6th Edition.* St. Louis MO: Saunders.
Rancho Los Amigos National Rehabilitation Center, Administrative Policy Manual, Consent to medical treatment B504.

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