NCLEX Tip: Hemodynamic Monitoring 💓📊

Hemodynamic monitoring is essential for assessing **cardiac output, blood pressure regulation, and tissue perfusion.** The NCLEX often tests **normal vs. abnormal values, nursing interventions, and recognizing complications.**

1️⃣ Key Hemodynamic Parameters & Normal Values

✅ **Heart Rate (HR): 60-100 bpm** (Tachycardia = Poor perfusion or compensatory response)
✅ **Blood Pressure (BP): Systolic 90-120 mmHg, Diastolic 60-80 mmHg**
✅ **Mean Arterial Pressure (MAP): 70-105 mmHg (≥65 mmHg required for organ perfusion!)**
✅ **Central Venous Pressure (CVP): 2-8 mmHg (High = Fluid overload, Low = Hypovolemia)**
✅ **Pulmonary Artery Wedge Pressure (PAWP): 6-12 mmHg (High = Left-sided heart failure)**
✅ **Cardiac Output (CO): 4-8 L/min (Low = Shock, Heart Failure)**
✅ **Cardiac Index (CI): 2.5-4.0 L/min/m² (Accounts for body surface area)**
✅ **Systemic Vascular Resistance (SVR): 800-1200 dynes/sec/cm⁵ (High = Vasoconstriction, Low = Vasodilation/Shock)**

⚠️ **NCLEX KEY POINT: A MAP <65 mmHg = inadequate organ perfusion → Requires immediate intervention!** 🚨

2️⃣ Types of Hemodynamic Monitoring

✅ **Non-Invasive Monitoring**

- **BP Cuff & Pulse Oximetry** → Provides indirect assessment of circulation.
- **Echocardiography (ECHO)** → Evaluates **EF (Ejection Fraction)**, wall motion, valve function.
- **Doppler Ultrasound** → Measures blood flow velocity.

✅ **Invasive Monitoring (ICU-Level Care)**

- **Arterial Line (A-Line) → Continuous BP Monitoring & ABG Access**
  - Inserted into **radial or femoral artery**.
  - **Monitor for bleeding, infection, and thrombosis.**
  - **Do NOT give medications through an A-line!**
  - **Perform Allen's Test before inserting a radial A-line** (Checks ulnar artery circulation).
- **Central Venous Catheter (CVC) → Measures CVP (Fluid Volume Status)**
  - **Inserted into subclavian, internal jugular, or femoral vein.**
  - **High CVP (>8 mmHg) = Fluid Overload/Heart Failure.**
  - **Low CVP (<2 mmHg) = Hypovolemia/Shock.**
  - **Monitor for pneumothorax & air embolism after insertion!**
- **Pulmonary Artery Catheter (Swan-Ganz) → Measures PAWP (Left Ventricular Function)**
  - **Inserted into pulmonary artery** via a central line.
  - **High PAWP (>12 mmHg) = Left-sided heart failure, pulmonary edema.**
  - **Low PAWP (<6 mmHg) = Hypovolemia.**
  - **Risk of pulmonary artery rupture if overinflated!**

⚠️ **NCLEX KEY POINT: If an arterial line becomes dislodged, apply direct pressure immediately and notify the provider!** 🚨

3️⃣ Nursing Considerations for Hemodynamic Monitoring

✅ **Arterial Line Care**

- **Keep transducer at the phlebostatic axis (4th intercostal space, mid-axillary line).**
- **Zero & calibrate the system before use.**
- **Assess for distal circulation (color, temperature, capillary refill).**
- **Monitor for bleeding and infection.**

✅ **Central Venous Catheter (CVC) Care**

- **Use sterile technique for dressing changes.**
- **Flush with heparin/saline to prevent clot formation.**
- **Monitor for pneumothorax after insertion (absent breath sounds, dyspnea).**
- **If an air embolism occurs: Turn patient to left-side Trendelenburg position and administer oxygen.**

✅ **Pulmonary Artery Catheter (Swan-Ganz) Care**

- **Only inflate the balloon briefly when measuring PAWP!**
- **If resistance is felt during inflation, STOP immediately to prevent rupture.**
- **Monitor for arrhythmias during insertion (can irritate the heart).**

⚠️ **NCLEX KEY POINT: For ALL invasive hemodynamic monitoring, keep the transducer at the phlebostatic axis for accurate readings!** 🚨

4️⃣ Recognizing Hemodynamic Instability & Interventions

✅ **Hypovolemia (Low CVP, Low BP, Low CO, High HR)**

- **Causes:** Bleeding, dehydration, shock.
- **Intervention:** IV fluids (NS, LR), blood products, vasopressors if needed.

✅ **Cardiogenic Shock (High CVP, High PAWP, Low CO, Low BP, High HR)**

- **Causes:** Heart failure, MI, valve dysfunction.
- **Intervention: Diuretics, Inotropes (Dobutamine), Oxygen, Vasodilators.**

✅ **Septic Shock (Low BP, Low SVR, High CO Initially, High HR)**

- **Causes:** Infection, endotoxins causing vasodilation.
- **Intervention: IV fluids, broad-spectrum antibiotics, vasopressors (Norepinephrine).**

✅ **Pulmonary Hypertension (High PAWP, High SVR, High CVP)**

- **Causes:** COPD, pulmonary embolism, left heart failure.
- **Intervention: Diuretics, Oxygen, Vasodilators.**

⚠️ **NCLEX KEY POINT: If a patient with an arterial line or central line suddenly becomes hypotensive, assess for bleeding, infection, or dislodgement FIRST before increasing fluids or medications!** 🚨

NCLEX Quick Review:

- **MAP must be ≥65 mmHg for adequate organ perfusion.**
- **CVP (2-8 mmHg) assesses fluid status—Low = Hypovolemia, High = Fluid Overload.**
- **PAWP (6-12 mmHg) reflects left heart function—High = Heart Failure, Low = Shock.**
- **Arterial Lines are used for continuous BP monitoring & ABG access—Never use for medications!**
- **If an air embolism occurs, turn the patient left-side Trendelenburg & give oxygen.**
- **Keep the transducer at the phlebostatic axis for accurate readings.**