Jugular Venous Pressure: Measuring

What is Measuring Jugular Venous Pressure?
Measuring jugular venous pressure (JVP) is a noninvasive physical examination technique used to indirectly measure central venous pressure (i.e., the pressure of the blood in the superior and inferior vena cava close to the right atrium). It is a part of a complete cardiovascular assessment. (For more information on cardiovascular assessment in adults, see Nursing Practice & Skill ... Physical Assessment: Performing a Cardiovascular Assessment in Adults)

- **What**: Measuring JVP is a screening mechanism to identify abnormalities in venous return, blood volume, and right heart hemodynamics
- **How**: JVP is determined by measuring the vertical distance between the sternal angle and the highest point of the visible venous pulsation in the internal jugular vein or the height of the column of blood in the external jugular vein
- **Where**: JVP can be measured in inpatient, outpatient, and residential settings
- **Who**: Nurses, nurse practitioners, physician assistants, and treating clinicians can measure JVP as part of a complete cardiovascular assessment

What is the Desired Outcome of Measuring Jugular Venous Pressure?
- The desired outcome of measuring JVP is to establish the patient’s JVP within the normal range or for abnormal JVP to be identified so that appropriate treatment may be initiated. Patients’ level of activity should not be affected by having had the JVP measured

Why is Measuring Jugular Venous Pressure Important?
- The JVP is a measure of filling pressure into the right side of the heart and reflects changes in blood volume. JVP can reveal when the right side of the heart is pumping blood ineffectively
- JVP is helpful in identifying heart failure and the need for diuresis (Chua Chiaco et al., 2013)

Facts and Figures
- JVP measured by ultrasonography reveals that the top of the internal jugular vein is less than a quarter of the distance from the clavicle to the angle of the jaw in most healthy adults. Using ultrasonography to measure JVP may be more reliable than visualizing the jugular venous pulse and measuring the pressure with a ruler (Socransky et al., 2010)
- Central venous pressure determination via portable ultrasound technology was found to be simple, noninvasive, and accurate in a study of 44 patients from a single tertiary hospital (Siva, 2012)

What You Need to Know Before Measuring Jugular Venous Pressure
- Anatomy of the internal and external jugular veins
  - The internal jugular vein (IJV) is located in the carotid sheath (i.e., fibrous connective tissue on each side of the neck containing the IJV, carotid artery, and vagus nerve).
The IJV courses down the neck within the carotid sheath and joins the subclavian vein behind the sternoclavicular joint to form the brachiocephalic vein.

- The external jugular vein (EJV) runs along the side of the neck superficial to the sternocleidomastoid muscle and empties into the subclavian vein.

- Anatomic location of the sternal angle
  - The sternal angle is the reference point used when measuring the JVP. It is located between the body of the sternum and the manubrium (i.e., the manubriosternal joint, Angle of Louis).

- Mastering the measurement of JVP requires practice
  - The internal jugular vein or the external jugular vein may be used to measure JVP. Typically, the internal jugular vein is preferred because of its straight route to the superior vena cava and right atrium.
  - JVP is estimated by measuring:
    - the vertical distance between the highest point of the visible venous pulsation in the IJV
    - the height of the column of blood in the EJV and the sternal angle
  - The EJV is more superficial and overlies the sternocleidomastoid making it easier to visualize.
  - The pulsation of the IJV can be visualized near the suprasternal notch.
  - When using the internal jugular pulse to measure JVP, distinguish it from the carotid artery pulse by observing for the following characteristics:

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Internal Jugular Pulse</th>
<th>Carotid Artery Pulse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality or appearance</td>
<td>Undulating with 2 waves per cycle</td>
<td>A single, sharp wave</td>
</tr>
<tr>
<td>Palpable</td>
<td>Not typically palpable</td>
<td>Palpable</td>
</tr>
<tr>
<td>Response to respiration</td>
<td>Decreases with inspiration</td>
<td>Remains unchanged during inspiration</td>
</tr>
<tr>
<td>Pressure</td>
<td>Becomes obliterated with pressure</td>
<td>Does not obliterate with pressure</td>
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- A vertical distance of less than 3 cm typically indicates a normal venous pressure.

- To estimate the central venous pressure (CVP; i.e., the pressure of the blood in the superior and inferior vena cava near the right atrium), 5 cm is added to the vertical distance to account for the distance between the right atrium and the sternal angle.

- Alternate methods of estimating the JVP include:
  - observing for collapse of the EJV during deep inspiration (Conn & O’Keefe, 2012)
    - Have the patient lie supine so that the EJV can be visualized.
    - A normal JVP is suggested if the visible EJV collapses during deep inspiration.
    - If the distended EJV does not collapse during deep inspiration, this indicates an elevated JVP.
  - observing the veins on the dorsum of the hand as the arm is passively raised (Walsh et al., 2011)
    - Position the patient in a 30° reclining position.
    - Slowly raise the patient’s hand observing the height of the hand when the veins on the dorsum collapse.
    - If the veins collapse when the hand is at the level of the sternal angle, the CVP is considered normal.
  - Obstruction of the peripheral veins due to the valves can reduce the accuracy of this technique.

- JVP may be increased due to heart failure, constrictive pericarditis, cardiac tamponade, fluid overload, and obstruction of the superior vena cava.

- Preliminary steps that should be performed before measuring JVP include the following:
  - Review facility protocol for measuring JVP, if available.
  - Verify completion of facility informed consent documents, if needed.
  - Educate the patient about what to expect while the JVP is being measured.
  - Gather supplies which may include the following:
    - Bright light source (e.g., pocket flashlight or a bedside lamp).
How to Measure Jugular Venous Pressure

› Perform hand hygiene
› Identify the patient using two patient identifiers, per facility protocol
› Don PPE as appropriate
› 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) and explain your clinical role
› Assess the patient and family for knowledge deficits and anxiety regarding physical assessment
  • Determine if the patient/family requires special considerations regarding communication (e.g., due to illiteracy, language barriers, or deafness); make arrangements to meet these needs if they are present
  – Follow facility protocols for using a professional certified medical interpreter when a communication barrier exists
• Explain the procedure for measuring JVP and its purpose; answer any questions and provide emotional support as needed
• Raise the examination table or bed to a comfortable height
• Position the patient so that the neck and anterior chest are exposed from the middle of the sternum to the middle of the ears.
  Assist the patient to a supine position at a 30–45° angle
• Move long hair behind the head
• Turn the head to the left
• Instruct the patient to extend the neck to enhance visualization
  – Extension should not be so extreme such that the sternocleidomastoid muscle is tensed
› To improve visualization, shine a light tangentially on the neck to emphasize the pulsations and shadows of the jugular veins
› Instruct the patient to breathe normally
› Differentiate between the carotid pulse and the internal jugular venous pulse
  • To distinguish between the internal jugular venous pulse and the carotid artery pulse, see the unique characteristics of each pulse in What You Need to Know Before Measuring the Jugular Venous Pressure, above
  • Observe the internal jugular venous pulse on the side of the neck near the suprasternal notch or near the origin of the sternocleidomastoid muscle near the clavicle. This pulse is more difficult to visualize because the sternocleidomastoid muscle is anterior to the internal jugular vein
  • Observe the external jugular vein which can be easier to visualize because the vein courses across the sternocleidomastoid muscle
› If the internal jugular venous pulse can be visualized, measure the JVP by
  • placing the centimeter ruler perpendicular to the sternal angle
  • horizontally aligning a straightedge with the highest visible level of the oscillating venous pulsation
  • noting where the straightedge intersects with the vertical centimeter ruler
› If using the external jugular vein, measure the JVP by
  • placing the centimeter ruler perpendicular to the sternal angle
  • horizontally aligning a straightedge with the height of the column of blood in the EJV (e.g., the point at which the EJV is no longer visible or appears collapsed)
  • noting where the straightedge intersects with the vertical centimeter ruler
› A vertical distance of less than 3 cm typically indicates a normal venous pressure
  • To estimate the CVP, add 5 cm to the vertical distance to account for the distance of the right atrium positioned 5 cm below the sternal angle
› Discard PPE, if used, and perform hand hygiene
› Update the patient’s plan of care, if appropriate, and document the following in the patient’s medical record:
  • Date and time of JVP measurement
  • Assessment observations
    – Indicate JVP measurement and whether the IJV or EJV was used to measure JVP
    – If unable to visualize either the IJV or EJV, document that the veins were not visualized
  • Notification of treating clinician of any abnormalities observed
  • Patient/family teaching and response to teaching
Other Tests, Treatments, or Procedures That May Be Necessary Before or After Measuring Jugular Venous Pressure

› Measuring JVP is typically one component of a complete cardiovascular assessment. Portions of the cardiovascular assessment will take place prior to and after measuring JVP
› The abdominojugular test (i.e., hepatojugular reflux) can be performed if the JVP is elevated and right ventricular heart failure is suspected by applying firm, sustained pressure over the upper abdomen for 10–20 seconds. A normal response is a transient increase in JVP with a quick return to baseline in under 10 seconds. An abnormal response would be a continuously elevated JVP of 3 cm or more throughout the period of sustained pressure

What to Expect After Measuring Jugular Venous Pressure

› After a cardiovascular assessment it is expected that the patient will return to a normal level of functioning

Red Flags

› If palpating the carotid artery, use care to palpate gently to prevent stimulating the carotid sinus and slowing down the patient’s heart rate

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

› Educate the patient/patient’s family that measuring JVP is a noninvasive component of a cardiovascular assessment and an abnormal pressure may indicate additional diagnostic testing is needed
› Educate the patient/patient’s family that the patient should return to his/her normal level of activity after having the JVP measured

References