Respiratory Rate Assessment: Performing in Adults

What is Respiratory Rate Assessment in Adults?

› The respiratory rate (i.e., frequency of breathing) assessment provides data on the effectiveness of the breathing cycle, whereby oxygen is brought into the body via inhalation and carbon dioxide is removed via exhalation. As a component of the procedure for assessing vital signs, the respiratory rate assessment can identify bradypnea (i.e., respiratory rate that is slower than the normal range), tachypnea (i.e., respiratory rate that is faster than the normal range), and various other abnormalities marked by irregular respiratory pattern. The focus of this paper is evaluating respiratory rate in adults by inspection and, as needed, touch. For information on how to perform a full respiratory assessment, see Nursing Practice & Skill ... Physical Assessment: Performing a Respiratory Assessment in Adults

• **What:** The respiratory rate is usually measured when the adult is at rest by observing the number of times the chest rises and falls over 60 seconds. An accurate value can be obtained in most adult patients by noting the number of respirations over 30 seconds, and then multiplying that value by 2. Observation over the course of a full minute is necessary if the patient’s respirations are irregular or interrupted by apneic episodes

• **How:** The respiratory rate assessment is performed at least once per shift, whenever the patient assessment is conducted, and as needed for changes in respiratory status. In addition to observation, the clinician can place one hand lightly on the chest and feel the rise of each inspiration, without informing the patient that he or she is counting respirations, which can alter the patient’s breathing pattern or rate. Assessment is noninvasive and requires minimal supplies

• **Where:** Respiratory rate is a vital sign that is measured in most healthcare settings and in home care environments. It is a component of routine patient assessment during outpatient visits for health promotion or acute illness, as well as inpatient acute or extended care stays

• **Who:** Respiratory rate can be measured by various members of the healthcare team, including treating clinicians, respiratory therapists, registered or licensed nurses, assistive healthcare staff members, and caregivers in the home setting. When measurement of respiratory rate is delegated to unlicensed personnel, it remains the responsibility of the nurse or other clinician (e.g., physician) to interpret the measurement and determine whether the respirations are within or outside acceptable limits. It is generally appropriate for family members to be present during the respiratory rate assessment, as desired

What is the Desired Outcome of Respiratory Rate Assessment in Adults?

› The desired outcome of respiratory rate assessment in adults is to obtain accurate information about the effort and effectiveness of the patient’s breathing, against which prior and future measurements can be compared. Changes in respiratory rate from baseline, or a rate that is too high or low for the patient’s age or activity level, can indicate any of a number of underlying infectious and noninfectious disease processes
Why is Respiratory Rate Assessment in Adults Important?

› Assessment of respiratory rate is important in patients of all ages because it provides insight into the possibility of a number of diseases/conditions of varying severity (Figure 1)

• Eupnea, or normal respiration (i.e., regular pattern with occasional sigh, 12–20 breaths per minute), is a sign of cardiopulmonary stability
• Bradypnea (i.e., slow and regular respirations, < 12 breaths per minute) is associated with injury to or insufficient development of the brainstem, brain tumor, opioid overdose, and increased intracranial pressure (ICP)
• Tachypnea (i.e., rapid and shallow respirations, > 20 breaths per minute) can be associated with severe pain, pneumonia, severe chronic obstructive pulmonary disease (COPD), pulmonary edema, septicemia or other cause of fever, agitation, anxiety, use of amphetamines or cocaine, and/or a long-term history of smoking
• Apnea is characterized by the absence of breathing for several seconds (usually defined as > 20 seconds). If persistent, apnea can lead to respiratory arrest
• Cheyne-Stokes respirations are common in patients at the end of life. It can also be associated with toxic encephalopathy, traumatic encephalopathy, heart failure, and stroke. This pattern is characterized by initially slow, shallow breaths followed by abnormally deep, rapid breaths, which become slow and shallow again, before proceeding to apnea
• Kussmaul’s respirations are associated with diabetic ketoacidosis, chronic kidney disease, and other metabolic alterations (e.g., extreme metabolic acidosis). This pattern is characterized by deep, regular, rapid breaths
• Biot’s respirations are characterized with highly irregular or ataxic breathing pattern with random periods of apnea. This pattern is associated with respiratory depression, long-term and chronic opioid use, and brain damage

Facts and Figures

› While alterations in respiratory rate can indicate serious illness or drug overdose, including opioids (e.g., morphine, heroin, oxycodone), and respiratory rate has been identified as the most sensitive physiologic indicator of declining clinical condition, respiratory rate and other vital signs are often either not recorded or recorded incorrectly by healthcare professionals. Nurses appear to rely on pulse oximetry as a lone measure for ventilation and oxygenation, while overlooking the rate and work of breathing (Cooper et al., 2014; Black et al., 2015)
› Researchers in the United Kingdom surveyed 41 hospital staff members (13 nurses, 20 junior doctors, three student nurses, and five healthcare assistants). They found that study participants lacked confidence in documented respiratory rate measurements and felt that clinical staff frequently estimated respiratory rate due to ‘perceived lack of time’ (Philip et al., 2013)
› In a month-long clinical audit of respiratory assessments performed in children by the London Ambulance Service, researchers noted that respiratory rate was documented twice in the patient’s chart in 85% of patients, auscultation was attempted in 70% of patients, and oxygen saturation measurements were documented twice in the chart in 52% of patients. The primary reason that oxygen saturation was not assessed and documented was lack of equipment. Overall, clinicians were fully compliant with all three assessment techniques in 39% of patients (Clark et al., 2014)
› Investigators in a study involving 82 healthy adult volunteers found that the average respiratory rate was 2.13 breaths/minute lower in participants who were aware that their respiratory rate was being assessed, compared to those who were...
unaware. They also found that monitoring durations of less than 60 seconds led to an underestimation of respiratory rate, with 30-second and 15-second counts underestimating respiratory rates by 0.95 breaths/minute and 2.19 breaths/minute, respectively (Hill et al., 2017)

What You Need to Know Before Assessing Respiratory Rate in an Adult

Prior to assessing respiratory rate in an adult, the nurse clinician should be familiar with the following:

• The basic anatomy and physiology involved in respiration, a complex process that is divided into three components: ventilation, diffusion, and perfusion
  – Respiratory rate assessment, along with assessment of the depth and rhythm of breathing, evaluates ventilation (i.e., the component of respiration that involves the mechanical movement of oxygen \([O_2]\) and carbon dioxide \([CO_2]\) into and out of the lungs)
  – A respiratory cycle involves one full inspiration and one full expiration, during which the chest wall normally rises and falls gently (Figure 2)

Figure 2: Diaphragm and chest wall movement during inspiration and expiration. Copyright© 2014, EBSCO Information Services.

– During inspiration in an adult, the chest wall and lungs expand as the diaphragm contracts and the abdominal organs are slightly displaced downward. During expiration, the diaphragm relaxes and the lungs, abdominal organs, and chest wall return to their resting state

• Normal respiratory rate in adults, usually defined as 12–20 breaths per minute

• Considerations that can improve the accuracy of results of the respiratory rate assessment in adults
  – Assessment at rest is important because it is normal for physiologic changes to occur during exercise (cardiopulmonary system compensation for increased muscle oxygen demand) that increase the respiratory rate
  – Respirations should be evaluated discreetly—this can be accomplished by counting respirations immediately after measuring the pulse rate—because patient awareness of the procedure can cause the patient to alter his or her normal breathing pattern

• Proficiency in physical assessment skills, especially respiratory and pain assessment. See Nursing Practice & Skill ...

  Physical Assessment: Head-to-Toe --Performing
  – While counting respirations, it is important to
    - Note whether the patient exhibits difficulty breathing. Signs include stridor, wheezing, and/or retraction of the soft tissue of the chest wall with each breath
    - Note the patient’s posture (patients with respiratory distress might have to sit upright to breath)
    - Compare the inspiratory and expiratory phases (patients with COPD have a prolonged expiratory phase of respiration)
  – Pain increases both heart rate and respirations in adults. Assessing and medicating for pain can allow the clinician to get a clearer picture of the patient’s normal respiratory rate

Preliminary steps that should be performed before to assessing respiratory rate in an adult include the following:

• Review the facility/unit-specific protocol for assessment of vital signs, or respiratory rate in particular, if one is available

• Review the treating clinician’s order for respiratory rate assessment, if one exists
–Vital signs are part of routine patient care; however, in some circumstances orders from the treating clinician are provided, especially following invasive procedures and when medications are prescribed
–Note the frequency with which vital signs should be taken and prescribed actions for respiratory conditions (e.g., administer bronchodilator, supplemental oxygen, anxiolytic, or analgesic)

- Verify completion of facility informed consent documents
- Typically, the general consent for treatment that is executed by patients at the outset of admission to a healthcare facility includes standard provisions that encompass respiratory rate assessment

- Review the patient’s medical history/medical record for
  - any previous respiratory rate measurements, noting trends
  - use of medications (e.g., opioids) or conditions (e.g., COPD) that can affect the respiratory rate
  - any allergies (e.g., to latex, medications, or other substances); use alternative materials, as appropriate

Gather the supplies necessary for assessing respiratory rate, which are minimal and include the following:
- Nonsterile gloves; additional personal protective equipment (PPE; e.g., gloves, gown, mask) can be necessary, depending on the patient’s known or suspected infectious status and anticipated exposure to body fluids
- Facility-approved pain assessment tool
- Pen and paper or facility-used vital sign documentation form
- Clock or watch with a second hand or digital readout

**How to Perform Respiratory Rate Assessment in an Adult**

- Perform hand hygiene and don PPE as appropriate
- Identify the patient 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/or 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 physical assessment and measurement of vital signs
  - 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
  - Use professional certified medical interpreters, either in person or via phone, when language barriers exist
- Assess the patient’s general health status, including his/her level of pain using a facility-approved pain assessment tool
  - Note that if the patient is experiencing pain, the respiratory rate could be markedly elevated and inaccurate as a baseline value or as a true indication of respiratory function
- Observe standard precautions throughout the procedure
- After taking the patient’s pulse (see _Nursing Practice & Skill ... Arterial (Radial) Pulse: Taking_), keep the fingertips over the radial artery
- Do not inform the patient that respirations will be counted as this could cause him/her to alter his or her normal breathing pattern
- Observe the chest rise and fall with each inspiration and expiration. Count the number of times the chest rises over 30 or 60 seconds
  - Count respirations for 30 seconds and multiply the result by 2, or count respirations for a full minute, depending on the patient’s condition, the treating clinician’s orders, and/or facility/unit specific protocol
  - If respirations are difficult to observe, place one hand gently on the patient’s chest, with consent, such that you can feel the chest wall rise and fall with each respiration (Figure 3)
Note labored breathing, asymmetry of chest expansion, soft tissue retractions, use of accessory muscles, and any adventitious sounds (e.g., stridor, wheezing) that are produced across the breathing cycle.

- These or other signs of respiratory distress or insufficiency, such as cyanosis, edema, pallor, diaphoresis, increased work of breathing (e.g., use of accessory muscles, retractions, grunting, nasal flaring), altered mental status, apnea (i.e., lack of respirations for 20 seconds or more), or presence of a cough should be reported immediately to the treating clinician.

- Observe the patient’s posture while counting respirations, noting that patients with respiratory distress might have to sit upright to breath.

- Compare the inspiratory and expiratory phases.

- Discard used procedure materials and PPE according to facility protocol.

- Perform hand hygiene.

- Update the patient’s plan of care, as appropriate, and document the respiratory rate assessment in the patient’s medical record, including the following information:
  - Date and time the assessment was performed.
  - The patient's respiratory rate and activity level during the assessment (e.g., note if the patient was sleeping).
  - Any circumstances that could impact the patient’s respiratory rate (e.g., pain, current use of opioids).
  - Patient’s response to the procedure.
  - Any unexpected patient events or outcomes (e.g., signs of respiratory distress), interventions performed, and whether the treating clinician was notified.
  - Patient/family education, including topics presented, response to education provided/discussed, plan for follow-up education, and details regarding any barriers to communication and/or techniques that promoted successful communication.

Other Tests, Treatments, or Procedures That May Be Necessary Before or After Respiratory Rate Assessment in an Adult:

- The treating clinician will be notified of any abnormal findings and/or significant changes in previous assessments so that the treatment plan can be established or modified.
  - to evaluate the outcome of interventions (e.g., administration of oxygen or bronchodilators).
  - if the patient’s condition changes (e.g., oxygen saturation decreases).
  - if the patient is medically unstable.

What to Expect After Assessing Respiratory Rate in an Adult:

- The respiratory rate will be accurately assessed and recorded, and be utilized for early identification and assessment of acute disease.

- A patient with a respiratory rate either above or below individual baseline limits or accepted values for adults will receive appropriate evaluation by the nurse and/or the treating clinician. Appropriate changes will be made in the patient’s care plan, if needed.
Red Flags
› Consistent abnormalities of the respiratory rate or signs of increased respiratory effort should be reported promptly to the clinician in charge of the patient’s care, as they can indicate the presence of a serious medical condition such as pneumonia, COPD, or asthma
› Respiratory rate is an independent risk marker for mortality in community-acquired pneumonia. Both decreased and increased respiratory rates on admission are associated with increased hospital mortality rates

What Do I Need to Tell the Patient/Patient’s Family?
› Explain the purpose of measuring the respiratory rate to the patient/family
› If the patient is cared for at home, provide verbal and written information about
  • the correct technique for assessing respiratory rate
  • how to contact a healthcare professional if the patient’s respiratory rate is abnormal, or if questions/concerns arise

References