The pulse of a healthy adult has a relatively constant rhythm; that is, the intervals between beats are regular. Irregularities in heart rhythm are discussed fully in Chapter 17 of this text.

The nurse assesses the force of a pulse, or its stroke volume, by noting the pressure that must be exerted before the pulse is felt. A “full, bounding” pulse is difficult to obliterate. It may be caused by fear, anxiety, exercise, or a variety of alterations in health. A “weak, thready pulse” is easy to obliterate. It also may indicate alterations in health such as hemorrhage. The nurse palpates along the radial artery in a proximal-to-distal direction to assess the elasticity of the artery. A normal artery feels smooth, straight, and resilient.

**MEASURING RESPIRATORY RATE**

The human body continuously exchanges oxygen and carbon dioxide through the act of respiration. Normal respiratory rates are dependent upon age.

**Assessment of Respiratory Rate**

Counting the number of respirations per minute assesses respiratory rate. The nurse observes the full respiratory cycle (one inspiration and one expiration) for rate and pattern of breathing. The client’s respiratory rate is assessed by counting the number of breaths for 30 seconds and then multiplying by 2. If the nurse detects irregularities or difficulty breathing, the respirations are counted for one full minute.

**Factors That Influence Respiratory Rate**

The respiratory rate in some clients may increase if they become aware that their breaths are being counted. For this reason, the nurse should maintain the posture of counting the radial pulse while counting breaths per minute. Other factors that may increase respiratory rate include exercise, stress, increased temperature, and increased altitude. Some medications may either increase or decrease respiratory rate. Table 7.2 lists normal respiratory rates for newborns through older adults. See Chapter 15 for a more detailed discussion of respiration.

**Oxygen Saturation**

Oxygen saturation of the hemoglobin is measured using a pulse oximeter. The pulse oximeter uses a sensor and a photodetector to determine the light sent and absorbed by the hemoglobin. The reported percentage represents the light absorbed by oxygenated and deoxygenated hemoglobin. A value of 95% to 100% is considered normal, while a value of 70% is considered to be life threatening. This noninvasive procedure allows oxygen saturation values to be easily obtained and rapidly updated. Pulse oximetry can detect hypoxemia before symptoms such as cyanosis (blue color) of the skin appear.

**MEASURING BLOOD PRESSURE**

Blood ebbs and flows within the systemic arteries in waves, causing two types of pressure. The **systolic pressure** is the pressure of the blood at the height of the wave, when the left ventricle contracts. This is the first number recorded in a blood pressure measurement. The **diastolic pressure** is the pressure between the ventricular contractions, when the heart is at rest. This is the second number recorded in a blood pressure measurement.

**Circulatory Factors That Influence Blood Pressure**

Factors that influence blood pressure include but are not limited to the following:

- **Cardiac output** is the amount of blood ejected from the heart. Cardiac output is equal to the stroke volume, or amount of blood ejected in one heartbeat (measured in milliliters per beat), multiplied by the heart rate (measured in bpm). Cardiac output averages about 5.5 L/min (liters per minute).
- **Blood volume** is the total amount of blood circulating within the entire vascular system. Blood volume averages about 5 L in adults. A sudden drop in blood pressure may signal sudden blood loss, as with internal bleeding.
- **Peripheral vascular resistance** is the resistance the blood encounters as it flows within the vessels. Peripheral resistance is in turn influenced by various factors, such as vessel length and diameter. Two of the most important factors influencing peripheral resistance are blood viscosity and vessel compliance.
- **Blood viscosity** is the ratio between the blood cells (the formed elements) and the blood plasma. When the total amount of formed elements is high, the blood is thicker, or more viscous. The molecules pass one another with greater difficulty, and more pressure is required to move the blood.
- **Vessel compliance** describes the elasticity of the smooth muscle in the arterial walls. Highly elastic arteries respond readily and fully to each heartbeat. Rigid, hardened arteries,