produce a slight blanching. The time it takes for the blanched area to return to its original color is the capillary refill time.

Nursing Alert

Capillary refill should be brisk—less than 2 seconds. Prolonged refill may be associated with poor systemic perfusion or a cool ambient temperature.

Auscultation

Origin of Heart Sounds

The heart sounds are produced by the opening and closing of the valves and the vibration of blood against the walls of the heart and vessels. Normally, two sounds—S_1 and S_2—are heard, which correspond, respectively, to the familiar "lub dub" often used to describe the sounds. S_1 is caused by closure of the **tricuspid** and **mitral valves** (sometimes called the ***atrioventricular valves***). S_2 is the result of closure of the **pulmonic** and **aortic valves** (sometimes called ***semilunar valves***). Normally the split of the two sounds in S_2 is distinguishable and widens during inspiration. **Physiologic splitting** is a significant normal finding.

Nursing Alert

Fixed splitting, in which the split in S_2 does not change during inspiration, is an important diagnostic sign of atrial septal defect.

Two other heart sounds, S_3 and S_4, may be produced. S_3 is normally heard in some children; S_4 is rarely heard as a normal heart sound; it usually indicates the need for further cardiac evaluation.

Differentiating Normal Heart Sounds

Fig. 4-34 illustrates the approximate anatomic position of the valves within the heart chambers. Note that the anatomic location of valves does not correspond to the area where the sounds are heard best. The auscultatory sites are located in the direction of the blood