Aortic area	Second right ICS close to sternum	S_2 heard louder than S_1; aortic closure heard loudest
Pulmonic area	Second left ICS close to sternum	Splitting of S_2 heard best, normally widens on inspiration; pulmonic closure heard best
Erb point	Second and third left ICSs close to sternum	Frequent site of innocent murmurs and those of aortic or pulmonic origin
Tricuspid area	Fifth right and left ICSs close to sternum	S_1 heard as louder sound preceding S_2 (S_1 synchronous with carotid pulse)
Mitral or apical area	Fifth ICS, LMCL (third to fourth ICS and lateral to LMCL in infants)	S_1 heard loudest; splitting of S_1 may be audible because mitral closure is louder than tricuspid closure S_1 heard best at beginning of expiration with child in recumbent or left side-lying position; occurs immediately after S_2; sounds like word S_1 S_2 S_3: "Ken-tuck-y" S_4 heard best during expiration with child in recumbent position (left side-lying position decreases sound); occurs immediately before S_1; sounds like word S_4 S_1 S_2: "Ten-nes-see"

*Use both diaphragm and bell chest pieces when auscultating heart sounds. Bell chest piece is necessary for low-pitched sounds of murmurs, S_3, and S_4.

ICS, **Intercostal space**; *LMCL,* left midclavicular line.

Auscultate the heart with the child in at least two positions: sitting and reclining. If adventitious sounds are detected, further evaluate them with the child standing, sitting and leaning forward, and lying on the left side. For example, atrial sounds (such as, S_4) are heard best with the person in a recumbent position and usually fade if the person sits or stands.

Evaluate heart sounds for (1) quality (they should be clear and distinct, not muffled, diffuse, or distant); (2) intensity, especially in relation to the location or auscultatory site (they should not be weak or pounding); (3) rate (they should have the same rate as the radial pulse); and (4) **rhythm** (they should be regular and even). A particular arrhythmia that occurs normally in many children is **sinus arrhythmia**, in which the heart rate increases with inspiration and decreases with expiration. Differentiate this rhythm from a truly abnormal arrhythmia by having children hold their breath. In sinus arrhythmia, cessation of breathing causes the heart rate to remain steady.

Heart Murmurs

Another important category of the heart sounds is **murmurs**, which are produced by vibrations within the heart chambers or in the major arteries from the back-and-forth flow of blood. (For a more