

TABLE 3-8 CLASSIFICATION OF HEART MURMURS

CLASS	DESCRIPTION	CHARACTERISTIC LESIONS
SYSTOLIC		
Ejection	Begins in early systole; may extend to mid or late systole Crescendo-decrescendo pattern Often harsh in quality Begins after S ₁ and ends before S ₂	Valvular, supra- and subvalvular aortic stenoses Hypertrophic cardiomyopathy Pulmonic stenosis Aortic or pulmonary artery dilation Malformed but nonobstructive aortic valve ↑ Transvalvular flow (e.g., aortic regurgitation, hyperkinetic states, atrial septal defect, physiologic flow murmur)
Holosystolic	Extends throughout systole* Relatively uniform in intensity	Mitral regurgitation Tricuspid regurgitation Ventricular septal defect
Late	Variable onset and duration, often preceded by a nonejection click	Mitral valve prolapse
DIASTOLIC		
Early	Begins with A ₂ or P ₂ Decrescendo pattern with variable duration Often high pitched, blowing	Aortic regurgitation Pulmonic regurgitation
Mid	Begins after S ₂ , often after an opening snap Low-pitched <i>rumble</i> heard best with bell of stethoscope Louder with exercise and left lateral position Loudest in early diastole	Mitral stenosis Tricuspid stenosis ↑ Flow across atrioventricular valves (e.g., mitral regurgitation, tricuspid regurgitation, atrial septal defect)
Late	Presystolic accentuation of mid-diastolic murmur	Mitral stenosis Tricuspid stenosis
CONTINUOUS		
	Systolic and diastolic components “Machinery murmurs”	Patent ductus arteriosus Coronary atrioventricular fistula Ruptured sinus of Valsalva aneurysm into right atrium or ventricle Mammary soufflé Venous hum

A₂, Component of S₂ caused by closure of aortic valve; P₂, component of S₂ caused by closure of pulmonic valve; S₁, first heart sound; S₂, second heart sound.

*Encompasses both S₁ and S₂.

they are of low frequency, they are better auscultated with the bell of the stethoscope. Similar murmurs can be heard with obstructing atrial myxomas. Severe chronic aortic insufficiency can lead to premature closure of the mitral valve, causing a mid-diastolic rumble called an Austin-Flint murmur. Late diastolic murmurs occur immediately before S₁ and reflect presystolic accentuation of the mid-diastolic murmurs resulting from augmented mitral or tricuspid flow after atrial contraction.

Continuous murmurs begin with S₁ and last though part or all of diastole. They are generated by continuous flow from a vessel or chamber with high pressure into a vessel or chamber with lower pressure. They are referred to as *machinery murmurs* and are caused by aortopulmonary connections such as a patent ductus arteriosus, AV malformations, or disturbances of flow in arteries or veins.


Other Cardiac Sounds

Pericardial rubs occur in the setting of pericarditis and are coarse, scratching sounds similar to rubbing leather. They are typically heard best at the left sternal border with the patient leaning forward and holding the breath at end-expiration. A classic pericardial rub has three components: atrial systole, ventricular systole, and ventricular diastole. One might also hear a pleural rub caused by localized irritation of surrounding pleura. Continuous venous murmurs, or *venous hums*, are almost always present in children. They can be heard in adults during pregnancy, in the setting of anemia, or with thyrotoxicosis. They are

heard best at the base of the neck with the patient's head turned to the opposite direction.

Prosthetic Heart Sounds

Prosthetic heart valves produce characteristic findings on auscultation. Bioprosthetic valves produce sounds that are similar to those of native heart valves, but they are typically smaller than the valves that they replace and therefore have an associated murmur. Mechanical valves have crisp, high-pitched sounds related to valve opening and closure. In most modern valves such as the St. Jude valve, which is a bileaflet mechanical valve, the closure sound is louder than the opening sound. An ejection murmur is common. If there is a change in murmur or in the intensity of the mechanical valve closure sound, dysfunction of the valve should be suspected.

 For a deeper discussion of this topic, please see Chapter 51, “Approach to the Patient with Possible Cardiovascular Disease,” in Goldman-Cecil Medicine, 25th Edition.

SUGGESTED READINGS

Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services: Total expenses and percent distribution for selected conditions by type of service: United States, 2008. Medical Expenditure Panel Survey: Household Component Summary Tables. Available at: http://www.meps.ahrq.gov/mepsweb/data_stats/quick_tables_search.jsp?component=1&subcomponent=0. Accessed August 5, 2014.