

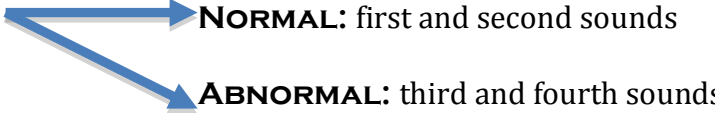
# HEART SOUNDS AND MURMURS

**TWO METHODS:** 1. Auscultation (using stethoscope)  
2. phonocardiography machine

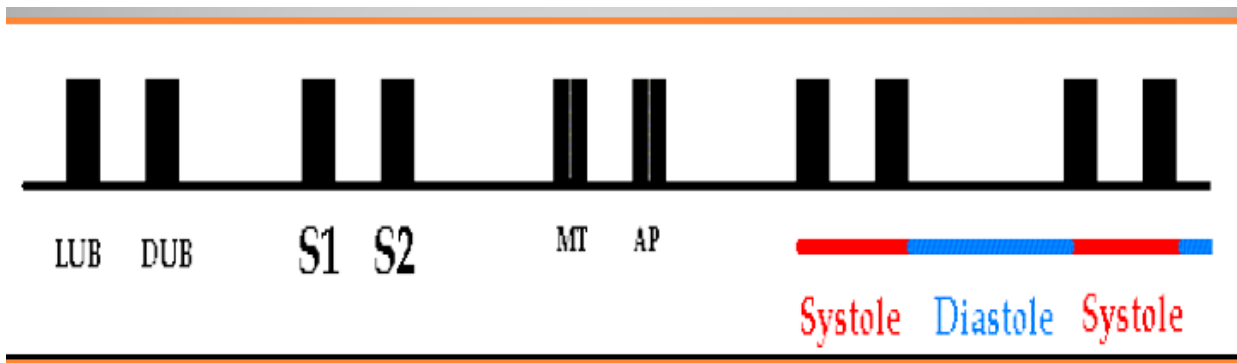
**LOCATION:**

on the anterior chest wall

1. pulmonary area: in the second left intercostal space
  2. aortic area: in the second right intercostal space
  3. mitral area: (apex) in the fifth intercostal space at mid clavicular line (9cm from sternum)
  4. tricuspid area: at the lower part of sternum towards the right side.
- \*\*BEST HEART AT: mitral area or tricuspid area\*\***

**HEART SOUNDS:** 

	<b>S1</b>	<b>S2</b>	<b>S3</b>	<b>S4</b>
<b>Cause</b>	Sudden closure of AV-vs	Sudden closure of semilunar vs	Rush of bl during rapid vent filling → vibration of vent ms.	Vibration produced by cont of atrial ms (attributed to vent filling)
<b>C-cycle</b>	Marks beginning of vent systole (Isovolumetric cont)	Marks beginning of vent diastole (When vent press fall below arterial press)	Max vent filling phase of diastole	Atrial systole (just before 1 <sup>st</sup> HS)
<b>Duration</b>	0.15 sec (Longer)	0.11-0.125 sec (Shorter)	0.05 sec	0.04 sec
<b>Frequency</b>	25-35 Hz	50 Hz		
<b>Character</b>	Low pitch (LUB) (Louder)	High pitch (DUB) (Softer, sharper) Split into 2 sounds during inspiration = Physiological splitting (due to delay closure of pulm v).	Usually not audible	Usually not audible (Rarely heard)
<b>Best heard</b>	M & T	A & P	M	M



notice in the graph the S1 sound is the MITRAL VALVE closure followed directly by the TRICUSPID VALVE CLOSURE.

The S2 sound is the aortic valve closure followed directly by the pulmonary valve closure <<NORMALLY THERE IS NO GAP BETWEEN THEM>>

from s1 → s2 : systole period (contraction of ventricle)

from s2 → s1: diastole period (relaxation of ventricle/filling)

\*\* third sound is after s2\*\* fourth sound is before s1\*\*

### S1 SPLIT:

The mitral valve will shut and the tricuspid will be SHORTLY delayed → split of sound (heart as 2 different sounds) >>> may be confused for S4.

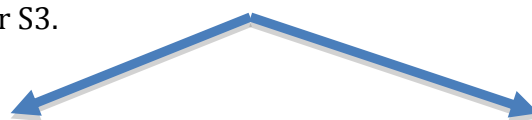
TaLUB DUB

### S2 SPLIT:

The aortic valve will shut and the pulmonary valve will be SHORTLY delayed → split of sound >>> may be confused for S3.

LUB TaDUB

Normal (physiological)  
"PAROXYSYMAL"  
during deep inspiration



"FIXED SPLIT"  
abnormal (pathological)

### WHAT IS THE IMPORTANCE OF THE HEART SOUNDS?

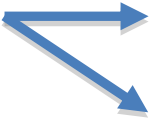
For diagnosing valvular heart diseases and abnormal heart sounds (murmurs)

### WHAT MAKES THESE SOUNDS?

1. closure of valves S1,S2
2. increased blood flow across normal valves in cases like pregnancy, anemia, hyperthyroidism
3. turbulent flow through abnormal valves
4. blood striking left ventricle: S3,S4

## HEART MURMURS:

Abnormal EXTRA heart sounds heard during the cardiac cycle produced by turbulence of blood flow through the heart and its valves.

**CAUSES:**  physiological: increase blood flow across NORMAL valves  
In pregnancy, anemia, children ...etc  
Pathological: turbulent flow through ABNORMAL valves  
Stenosis, or regurgitation

## DESCRIBING A MURMUR:

- Timing:** systolic (during systolic period = between s1 and s2)  
Diastolic (during diastolic period = between s2 and s1)  
Continuous  
(distinguish from normal heart sound by feeling pulse in the wrist "palpation of carotid arterial pulse) \*\*\*note: murmurs are longer in duration than normal sounds  
murmurs are also classified as early, mid and late (systolic or diastolic)
- Shape:** 1. Crescendo: grows louder  
2. Decrescendo: becomes lower  
3. Crescendo-Decrescendo diamond shaped  
4. Plateau: straight
- Location of maximum intensity:** site where murmur originates (listening areas)
- Radiation:** reflects intensity of murmur and direction of blood flow
- Intensity:** from grade 1 → 6 on LEVINE SCALE  
(thrills are associated with grade 4 → 6 <loud>)

<b>I / VI</b>	need quiet room and trained ear to hear. (difficult to hear even by expert listeners)
<b>II / VI</b>	audible to anyone who listens attentively (usually audible by all listeners)
<b>III / VI</b>	loud, but not palpable (easy to hear even by inexperienced listeners, but without a palpable thrill)
<b>IV / VI</b>	loud and palpable: it produces a precordial thrill
<b>V / VI</b>	audible with your stethoscope placed perpendicular to chest wall
<b>VI / VI</b>	audible without a stethoscope

- Pitch:** high, medium, low
- Quality:** blowing, harsh, rumbling & musical
- Other:** 1. Changes with respiration: right sided murmurs change more than left  
2. Variation with patient position (lying down or standing)  
3. Variation with special maneuvers  
ex: valsalva: forced expiration → decreases murmur length and intensity

**COMMON MURMURS AND TIMING:**

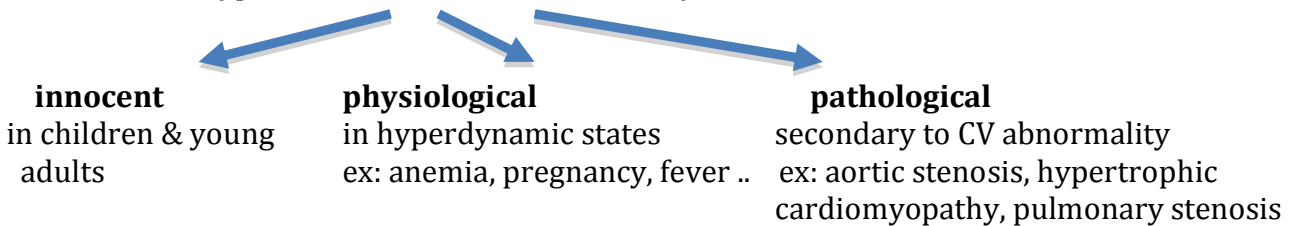
- 1. SYSTOLIC MURMUR:** harsh turbulent flow (from increase in turbulence)
- a. aortic stenosis: ejection murmur because the valves are too tight./don't open completely
  - b. pulmonary stenosis: ejection murmur + S2 splitting
  - c. mitral/tricuspid regurgitation: not properly closed → holosystolic
  - d. mitral valve prolapse (during mid or late systole)
  - e. VSD: ventricular septal defect

**associated with :**

- high flow across normal valve or dilated great vessel
- flow across abnormal valve or narrowed ventricular tract (aortic stenosis)
- flow across incompetent AV valve (regurgitation)
- flow across interventricular septum

**midsystolic:**

most common type of heart murmur and is usually crescendo-decrescendo



**Pansystolic murmur:** begin with s1 → s2

**2. DIASTOLIC MURMUR:**

- softer, blowing, gurgle
- a. aortic regurgitation (during early **systole** → **diastole**)
- b. mitral stenosis (during mid to late diastole)

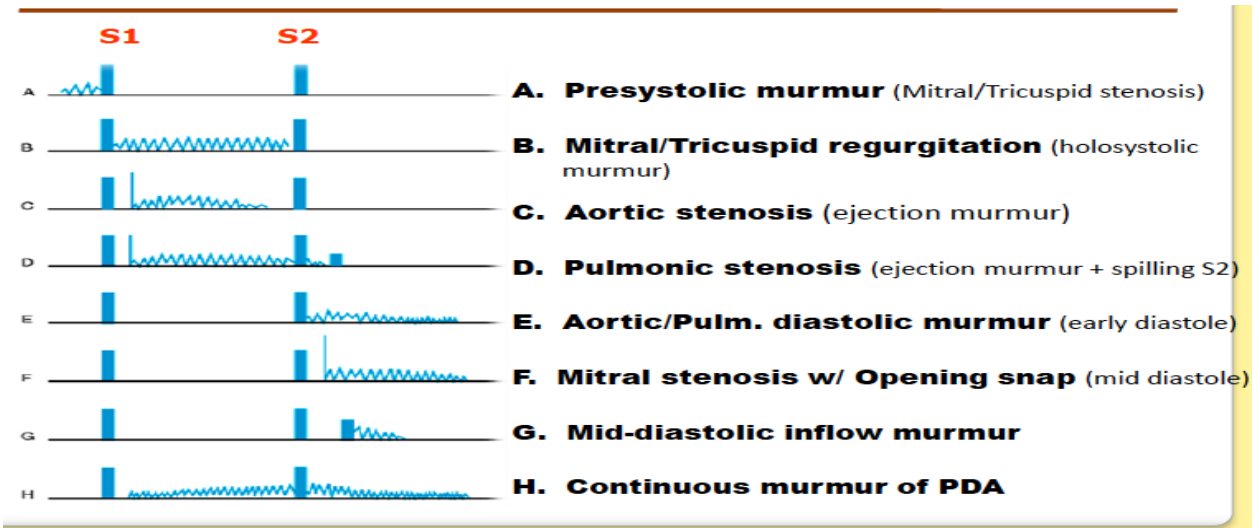
they almost always indicate heart diseases



**3. CONTINUOUS MURMUR:**

- a. patent ductus arteriosus PDA
- b. VSD

begin in systole and peak at s2 then continue throughout the cycle



**AORTIC STENOSIS: (SYSTOLIC MURMUR)**

Causes obstruction in flow from the left ventricle to the ascending aorta

Between s1 and s2

Time: mid-systolic (ejection)

Location: best heard at APEX and radiates to carotid artery

Characteristic: Harsh, Loud + THRILL (you can feel it with your hand)

Associated with: old age, rheumatic fever and congenital bicuspid aortic valve

**MITRAL PROLAPSE: (SYSTOLIC MURMUR)**

Bulging of the leaflet is not the left atrium during left ventricle contraction

Time: mid-late systolic

Location: best heard at apex

Characteristic: Mid-systolic CLICK sound

Associated with: 5% of normal population, usually asymptomatic and may lead to sudden death

**MITRAL REGURGITATION: (SYSTOLIC MURMUR)**

The valve is incompetent so it will leak blood back from the left ventricle to the left atrium

Time: holosystolic murmur

Location: best heard at apex and radiates to left axilla

Characteristic: soft, high pitch, blowing

Associated with: MV prolapse, MV myxomatous degeneration, myocardial infarction, rheumatic heart disease, cardiomyopathy, endocarditis

**AORTIC REGURGITATION: (DIASTOLIC MURMUR)**

The valve is incompetent so the blood will back from the aorta into the left ventricle

Time: early diastolic murmur

Location: best heard at 2<sup>nd</sup> and 4<sup>th</sup> intercostal space (left)

Characteristic: high pitch, blowing, decrescendo

Associated with: aortic root degeneration, rheumatic heart disease, VSD with aortic valve prolapse

**MITRAL STENOSIS: (DIASTOLIC MURMUR)**

Obstruct flow from left atrium to left ventricle

Time: mid diastolic or end diastolic(pre-systolic) with opening snap

Location: best heard at apex

Characteristic: low pitch (heard with bell on the stethoscope)

Associated with: rheumatic fever

The first sound S1: is snapped (opening snap after aortic valve closure)

Low pitch diastolic rumble at apex

Pre-systolic accentuation (with sinus rhythm especially)

**PATENT DUCTUS ARTERIOSIS: (CONTINUOUS MURMUR)**

Failure of the duct between aorta and pulmonary artery to close

Time: continuous

Location: best heard at upper left sternal border

Characteristic: machine-like

Associated with: left to right shunt, cyanosis