

# Cardiac Diagnostics: Common Symptoms, History Taking, and Medical Imaging

[See online here](#)

**Cardiovascular disease affects the majority of the elderly population and is one of the most common causes of death. Cardiac dysfunction causes both cardiac symptoms as well as pulmonary and other circulatory symptoms and signs. Cardiac diagnostics are important to assess whether cardiac disease may be causing the symptoms. This article will introduce you to the cardinal symptoms of cardiac disease, as well as associated non-invasive examination techniques.**



## Common Cardiac Symptoms

### Chest pain: Oppressive, retrosternal, radiating

[Angina pectoris](#) is most likely the first symptom that comes to a medical student's mind when thinking of cardiac disease. A persistent, oppressive, retrosternal pain that does not respond to nitroglycerin is a concern because this may be a symptom of impaired cardiac circulation.

Typically, anginal pain radiates to the left shoulder and the left arm, but it can also radiate to the jaw, the abdomen, or the back. A cardiac cause should be considered even for patients with toothache or stomach pain, especially in women, in whom atypical pain localization and radiation is more common.

In addition, pain with effort or exercise is highly suggestive of angina, whether the effort is physical or emotional. Anginal pain should stop with rest, usually within 5–10 minutes. Pain may increase with cold temperatures and can be accompanied by anxiety and panic.

The severity of angina can be classified using the program Clinical Classifications Software (CCS) (with stages similar to those of the New York Heart Association (NYHA)), with categories as follows:

CCS0	Silent, asymptomatic
CCS1	Angina during strenuous/prolonged physical activity
CCS2	Angina during moderate physical activity
CCS3	Angina during low physical activity
CCS4	Angina at rest

## Cyanosis



**Image:** Cyanosis of the right foot distal to an occlusion caused by acute arterial thrombosis of the right leg. By James Heilman, MD.  
License: [CC BY-SA 3.0](https://creativecommons.org/licenses/by-sa/3.0/).

A livid discoloration of the hands, feet, or lips is a sign of an insufficient oxygen supply in the peripheral circulation. For central cyanosis, blue coloration of mucous membranes may also be present, in addition to signs of impairment in peripheral circulation. When central cyanosis is present, consider a right-to-left shunt, in which the blood returning to the right heart bypasses the lungs and mixes with oxygenated blood returning from the lungs that is ready to enter the aorta.

In these situations, deoxygenated blood mixes with oxygen-rich blood, causing a reduction in the peripheral oxygen concentration. Peripheral, generalized cyanosis is evidence of cardiac insufficiency and increased oxygen extraction by the tissues, which may be caused by valvular heart diseases, [arrhythmia](#), a cardiac tamponade, or [cardiomyopathy](#). In peripheral cyanosis, the tissues farthest from the heart suffer the most from the lack of oxygen.

## Dyspnea

In left ventricular insufficiency, the left ventricle does not eject an adequate amount of blood, thereby causing blood to back up into the pulmonary circulation. This leads to an increase in pressure and [pulmonary edema](#), which is why, in addition to cardiac causes,

dyspnea can have pulmonary causes, especially chronic dyspnea.

Left ventricular dysfunction can be caused by myocardial or valvular disease, such as [myocardial infarction](#), [myocarditis](#), [cardiomyopathy](#), or mitral or [aortic valve disease](#). Other less common reasons include patent ductus arteriosus or a defect between ventricles or in the interatrial septum.

## Edema

Edema is a pathologic accumulation of fluid in the interstitial space. Typically, left ventricular insufficiency causes [pulmonary edema](#), whereas right ventricular insufficiency causes peripheral edema; usually, the legs are affected first. On inspection, the skin may be taut, and with pressure on palpation, there may be pitting of the subcutaneous tissue.

**Note:** Check both legs. Edema in only one leg is often due to noncardiac causes, most often [phlebothrombosis](#).

Generalized edema, ascites, or congestive hepatopathy may lead to hepatic dysfunction and [splenomegaly](#). Men may also experience scrotal edema.

## Syncope

*Syncope* is defined as a sudden, brief, and self-limited episode of loss of consciousness that is accompanied by a loss of tone of the skeletal muscles. There are many causes of syncope, but one cause is cerebral hypoperfusion due to a cardiac arrhythmia.

## History Taking

### Important questions to ask:

Do you have chest pain? Is the pain sharp? Or is the pain oppressive and dull? When does it arise? Is it associated with preceding physical activity? Do the symptoms improve when you breathe deeply? How long does it last? Does it stop spontaneously? How often do you feel the pain (per month or per year)?

Do you have dyspnea at times? Is this associated with physical activity? Do the symptoms improve when you are lying down or sitting?

Have you become unconscious recently? Do you fall more often than you previously did?

When examining the patient, pay attention to edema and cyanosis.

Furthermore, nocturia can be evidence of heart insufficiency. Palpitations or tachycardia may suggest cardiac arrhythmia.

### Cardiovascular risk factors should be determined, including:

- [Arterial hypertension](#)
- [Hyperlipidemia](#)
- [Diabetes mellitus](#)
- [Consumption of alcohol or nicotine](#) (Ask patients not only whether they drink or smoke, but also how much.)
- [Hyperuricemia](#)
- Exercise during daily life
- Family history of cardiac risk factors includes all of the above as well

as [myocardial infarction](#) and [stroke](#).

### **Additional questions should be asked with regard to the autonomic nervous system:**

Have you had a fever, shivering attacks, or night sweats? How is your sleep? Do you sleep well through the night? How are your bowel movements and urination?

## Summary

1. The symptoms described by the patient, along with any history of previous illness in the patient and the family, is 90% of the information needed for the cardiologist to make a diagnosis.
2. The physical exam and various laboratory tests constitute the final 10% of the information needed to make a diagnosis.

### **Purposes of history taking**

- The patient's medical history provides information about potential cardiovascular symptoms and how they developed.
- A complete cardiovascular history gives the examiner indications regarding potential or underlying cardiovascular illnesses or disease states.

### **Taking the history**

- Accurate and useful history taking requires time and interpretation because the patient will often not give their history in a perfectly organized manner; only occasionally is the patient a health care professional who understands how to give a good history.
- The history starts with the chief symptom: Why did you come to see me today?

### **Past health**

It is important to ask questions about the patient's health history, including the presence of any of the following conditions:

- Hypertension
- Elevated blood cholesterol or triglycerides
- Heart murmurs
- Congenital heart disease
- Rheumatic fever
- Unexplained joint pain in childhood

### **Current lifestyle and psychosocial status**

- Nutrition
- Smoking
- Alcohol intake
- Exercise
- Drug history
- Family history

Cardiovascular disease is the leading killer of both men and women among all racial and ethnic groups throughout the world. A thorough cardiovascular assessment will help to identify significant factors that can influence cardiovascular health, such as:

- High blood cholesterol

- Cigarette use
- Diabetes
- Hypertension

## Physical Examination

The following summarizes what to pay attention to when doing a physical examination focused on the cardiac system.

### Inspection

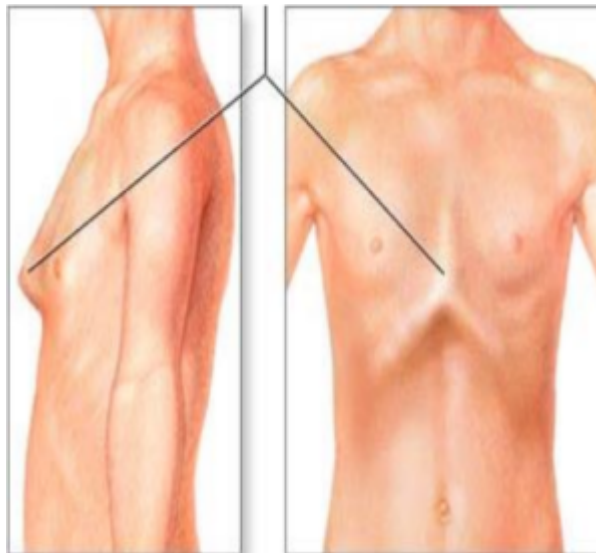
- Clubbing of the fingers/nails (evidence of chronic hypoxia)
- Engorged neck veins (inducible by the hepatojugular reflux test)—measure jugular venous pressure

#### Eyes

The presence of yellowish plaques on the eyelids (xanthelasma) usually indicates hypercholesterolemia, a risk factor for atherosclerosis.

#### Chest

Observe the chest for overall torso contour. Do you see pectus excavatum (a caved-in chest)? Do you see pectus carinatum (a pigeon chest, shown in the image)?



#### Cyanosis

The presence of cyanosis (bluish color) in the hands and feet denotes poor oxygen delivery to the peripheral tissues of those extremities.

#### Other elements to look for

- Bulging eyes
- Bounding or very irregular pulse
- Facial flushing
- Swollen limbs or joints
- Rashes or skin bleeding

### Palpation

- Translocated apical impulse (suggests left ventricular hypertrophy)
- Check pulses (heart defects, dysrhythmia)

- Edema
- Quality of the carotid pulse
- Missing pulses
- Swollen abdomen—is the liver enlarged?
- Displaced apical impulse of the heart, i.e. the heart is enlarged
- Extent and severity of body edema

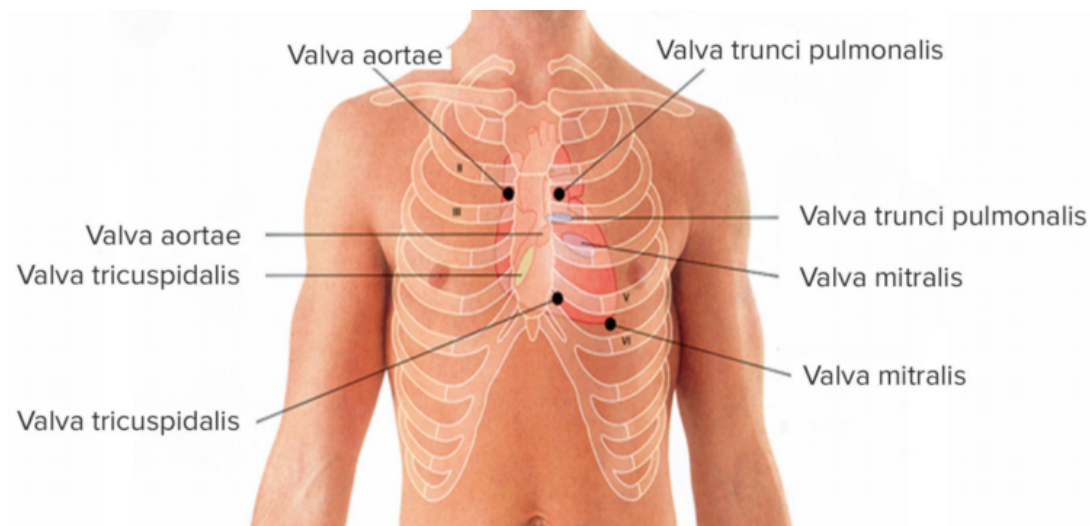
## Percussion

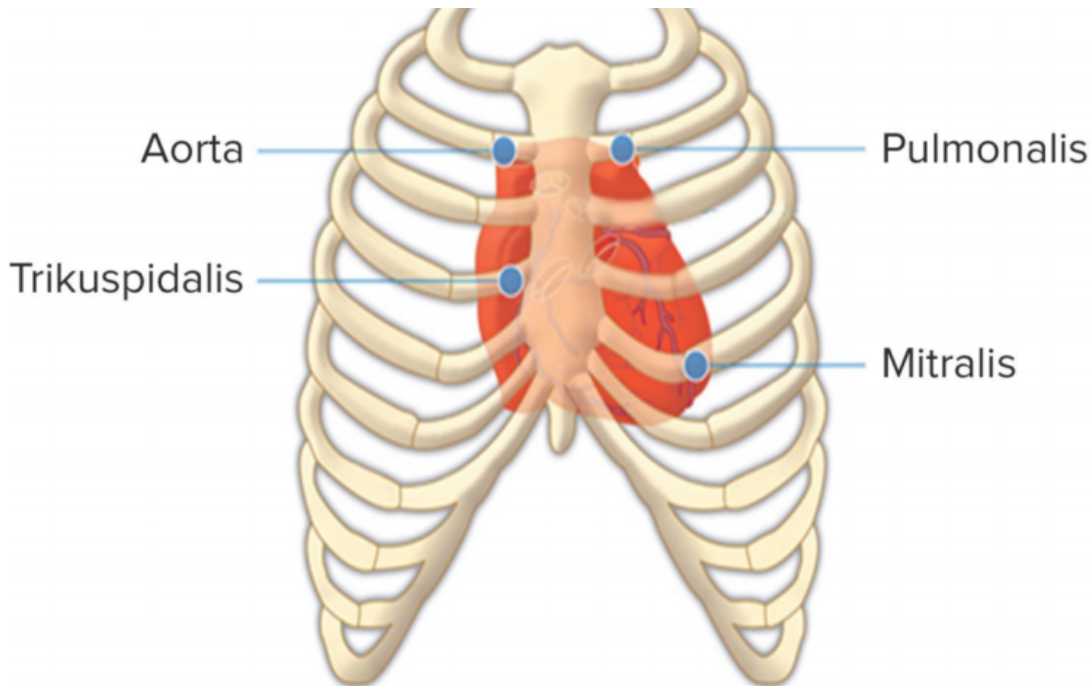
- Pleural effusion
- Hepatomegaly
- Ascites

## Auscultation

- Heart sounds, cardiac murmur
- Heart rate
- Heart rhythm
- Respiratory sounds (decreased in pleural effusion, crackles in pulmonary vascular congestion)

### Auscultation points





## Heart sounds: S1 and S2

S1	S2
<ul style="list-style-type: none"> <li>• The 'lub' of the 'lub-dub'</li> <li>• Produced by closure of the tricuspid and mitral valves</li> <li>• Accentuated during exercise and in anemia, hyperthyroidism, and mitral stenosis</li> <li>• Most audible in the tricuspid area ('T-lub-dub')</li> </ul>	<ul style="list-style-type: none"> <li>• The 'dub' of the 'lub-dub'</li> <li>• Produced by closure of the aortic and pulmonic valves</li> <li>• Normal physiologic splitting is best heard at the pulmonic area. It occurs on inspiration.</li> <li>• Persistent wide splitting can indicate an atrial septal defect or a bundle branch block in the conduction system.</li> </ul>

## Additional sounds

- S3 may be an indication of severely abnormal ventricular function, usually in the left ventricle.
- S4 may be an indication that one or both ventricles are stiffer than normal; this is known as 'decreased ventricular compliance.'
- Abnormally thickened valves may cause extra sounds or increased loudness of one of the heart sounds.

## Murmurs

A murmur is an abnormal heart sound caused by turbulent blood flow. The sound may indicate that

- Blood is flowing through a leaking or narrowed heart valve.
- There may be a hole in one of the walls of the heart.
- There may be a narrowing in one of the blood vessels of the heart or the circulatory system.



# Medical Imaging

Obtaining a chest X-ray is an important part of the cardiac exam in order to look for cardiomegaly and to evaluate for pulmonary causes of symptoms.

Frequently repeated and recorded measurements of blood pressure, along with continuous cardiac monitoring (with a Holter monitor) may provide evidence for cardiac diseases, such as [arterial hypertension](#), which is a risk factor for [coronary heart disease](#), [cardiac arrhythmias](#), and [myocardial infarction](#).

Doppler ultrasonography can be used to visualize blood flow, allowing extracardiac diseases such as arterial or [venous stenosis](#) to be identified as the cause of heart stress, cyanosis, or syncope while ruling out other primary cardiac diseases.

Abdominal sonography may reveal signs of a right ventricular insufficiency (e.g., congestive hepatopathy, splenohepatomegaly, or ascites), which may help in the assessment of severity of the disease and may suggest therapeutic options.

Echocardiography can be done via a transthoracic or transesophageal approach. It can identify ejection fraction, cardiac wall motion, and morphology, as well as valvular function (ability to close and open and the rapidity of transvalvular flow). In addition, the pathologic causes of blood flow abnormalities (i.e. reflux) and turbulence can be identified. The ejection fraction can be calculated using echocardiography.

Additional methods are useful in diagnosis. Computed tomography (CT), particularly the newest helical CTs with three-dimensional reconstruction, can help quantify coronary calcification. Cardiac magnetic resonance imaging (MRI) may allow for the detection of malformations of the heart or heart vessels, valvular malformations, tumors, and thrombi. Older infarction scars or myocarditis can be made visible by the use of different contrast agents.

Cardiac catheter examination and pericardiocentesis are invasive techniques used in cardiac diagnostics; the latter is used for the treatment of pericardial effusion to relieve stress on the heart and possibly to perform microbiologic diagnostics (for inflammatory heart disease).

In cardiac catheterization (also known as 'cardiac angiography'), a cardiac catheter can be placed in a right or left ventricular approach. This procedure will allow measurement of pressures, visualization of the coronary vessels, and acquisition of myocardial biopsies and, if necessary, electrophysiologic measurements (rhythm diagnostics).

## References

Lippman, F., Silverman, R., Munuswamy, K., & Smuclovsky, C. M. (2011). *Cardiac Disease and Diagnostics*. Fort Lauderdale, FL: Nova Southeastern University.

Lucey, B. C. (2006). *Cardiac Imaging*. Leesburg, VA: American Roentgen Ray Society.

Ranganathan, N., Sivaciyan, V., & Saksena, F. B. (2006). Pathophysiological Basis of Symptoms and Signs in Cardiac Disease. In *The Art and Science of Cardiac Physical Examination*, 321-359. doi:10.1007/978-1-59745-023-2\_10.

Restrepo, C. S., & Bardo, D. M. (2010). *Cardiac Imaging*. New York: Thieme.

**Legal Note:** Unless otherwise stated, all rights reserved by Lecturio GmbH. For further



legal regulations see our [legal information page](#).

Notes