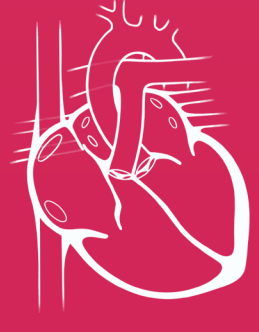
Stollery Children's Hospital

HOW THE HEART WORKS



STOLLERY CHILDREN'S HOSPITAL

Alberta Health Services

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STOLLERY CHILDREN'S HOSPITAL

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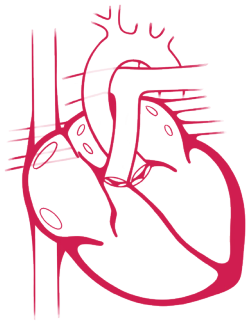

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(Your Name)

Meet Your Heart

All *Meet Your Heart* resources are a result of interdisciplinary design research completed in collaboration with the Stollery Children's Hospital Cardiology Unit and Design Students from the University of Alberta Faculty of Fine Arts, Department of Art and Design.

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Stollery Children's Hospital Foundation

Women & Children's Health Research Institute

DEAR READER,

The heart can be a very complicated organ to understand with many different parts. Each part has a different job and it can be overwhelming to keep all the heart information you are learning straight. We created this booklet to help you better understand how a typical heart works. This is your starting point, and you can refer back to it at any point to refresh your heart knowledge.

Our cardiology team is here to support you and we want to make this journey as easy as possible for you and your family. Our team hopes you find this booklet to be a helpful resource in your journey of learning about and caring for your heart.

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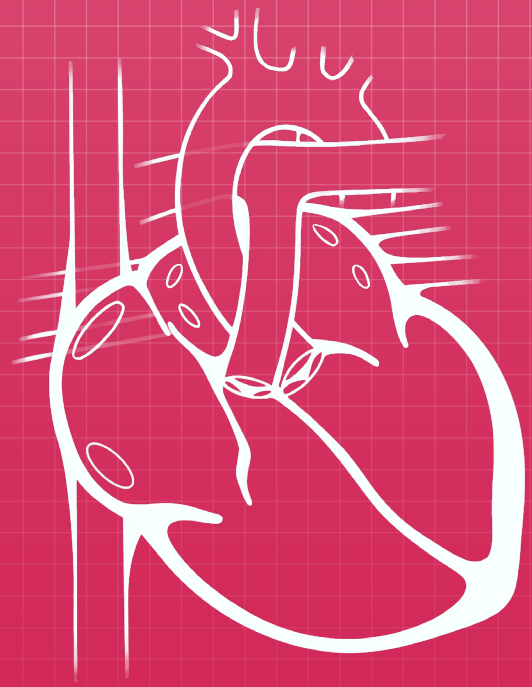
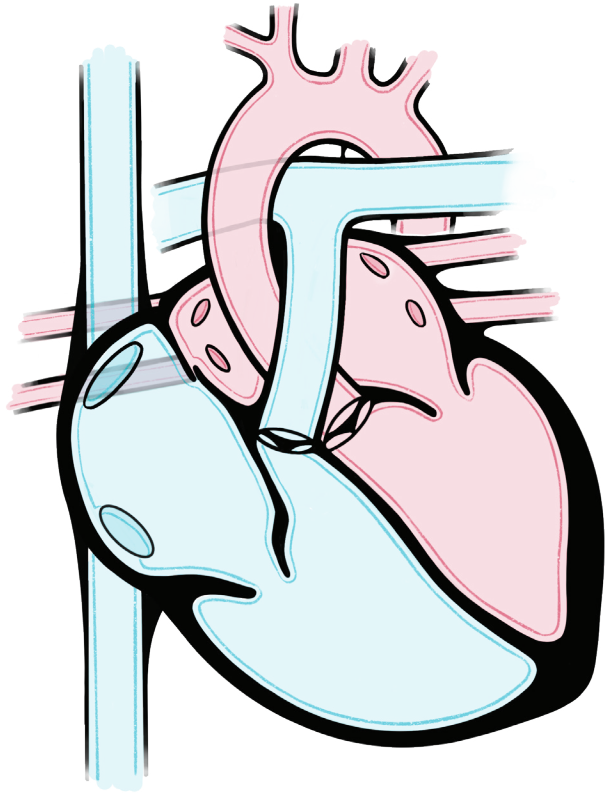
HELLO HEART



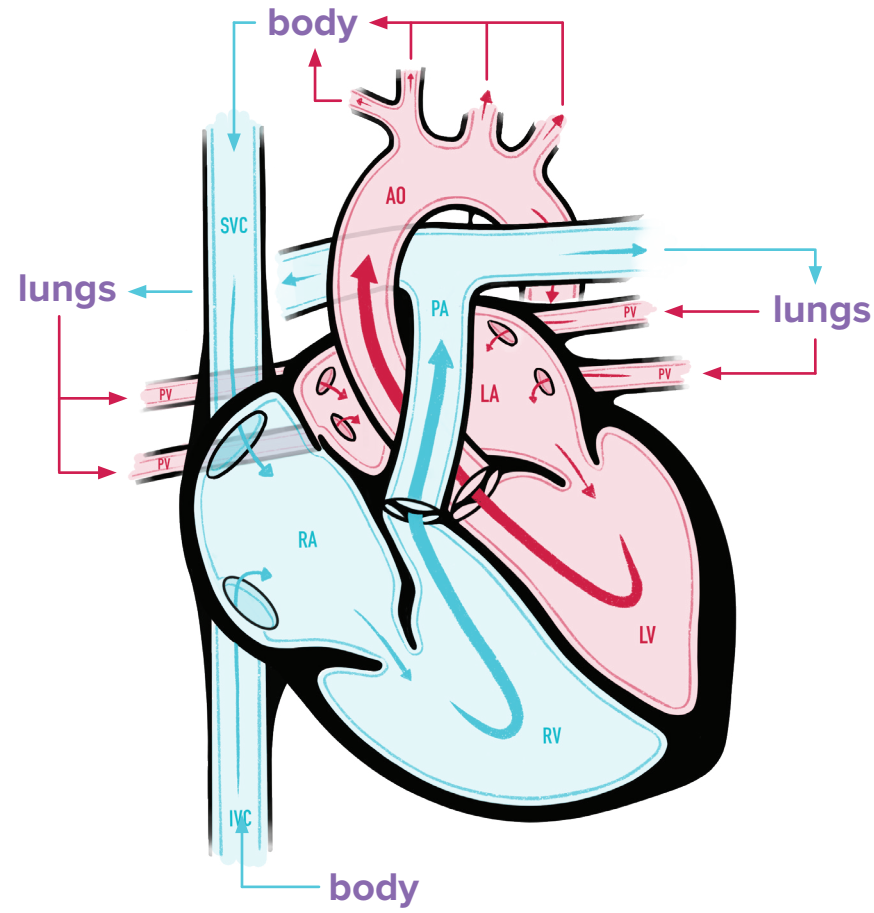
MEET THE TYPICAL HEART



The heart is a powerful pump - the engine of the body and center of the circulatory system. It typically beats about 60 to 100 times per minute. This large range in heart rate can be caused by many different factors including age, gender, fitness level, and overall health to name a few.

Key Takeaway

- The heart is a pump.



With each heartbeat, the heart sends oxygen-rich blood to every cell in the body. After delivering the oxygen, the blood picks up carbon dioxide and returns to the heart. The heart then sends this blood to the lungs to expel the carbon dioxide and pick up more oxygen. This cycle repeats continuously.

Key Takeaway

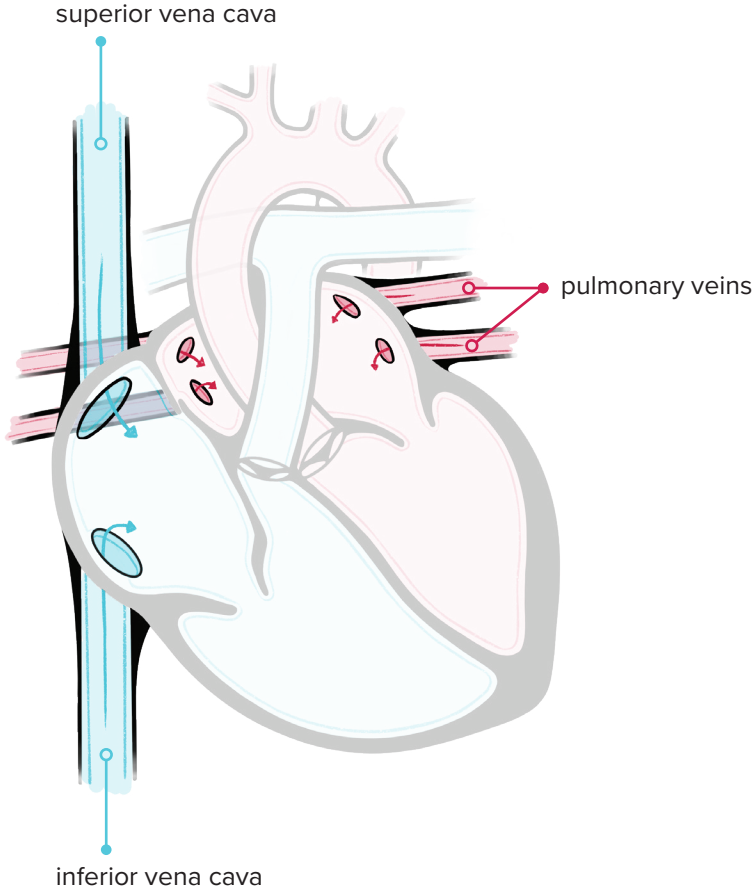
- The circulatory system carries oxygen (O_2) and nutrients to the cells of the body. It also removes wastes, such as carbon dioxide (CO_2).

VEINS AND ARTERIES

The circulatory system is made up of blood vessels that carry blood towards and away from the heart.

Veins:

Veins carry blood *towards* the heart. The main veins connected to the heart are the **superior vena cava**, **inferior vena cava**, and the **pulmonary veins**.

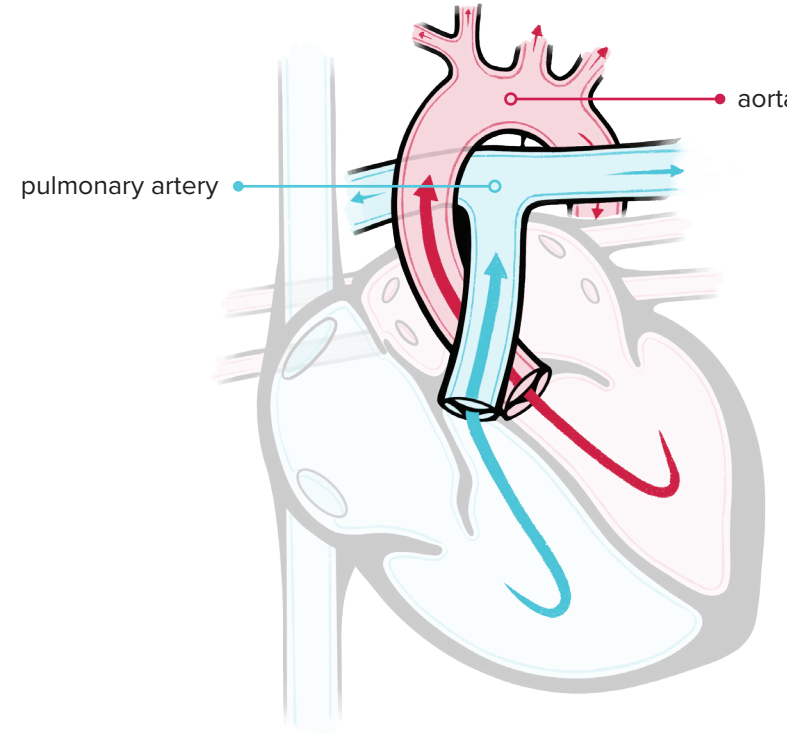


Memory Tip

Arteries = **A**way

Arteries:

Arteries carry blood *away* from the heart. The main arteries connected to the heart are the **pulmonary artery** and the **aorta**.

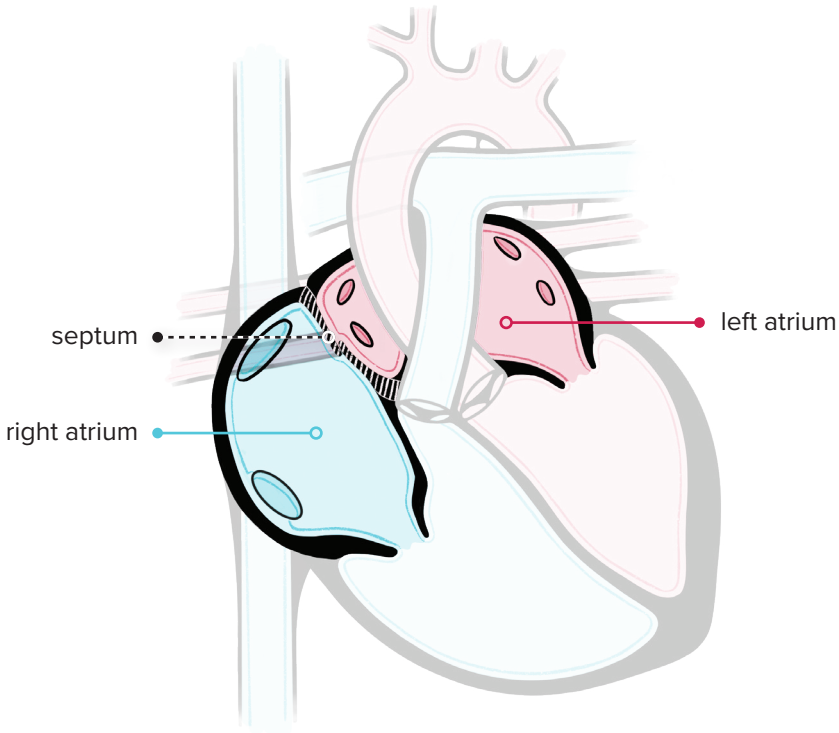


FOUR HEART CHAMBERS

The heart is made up of four chambers that collect and pump blood through the heart to the lungs and body.

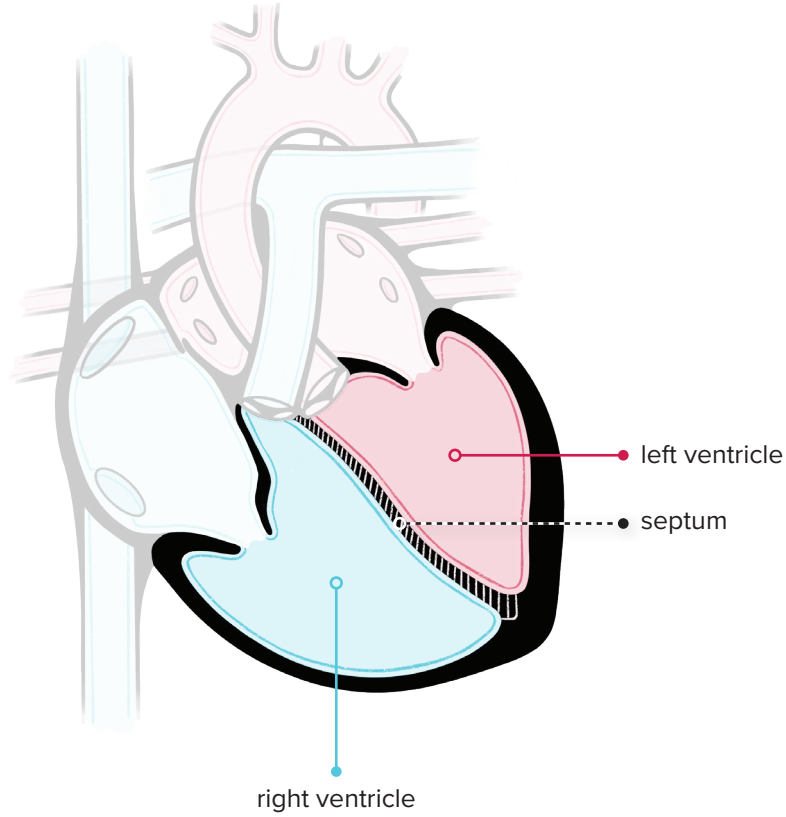
Each Atrium:

The top two chambers of the heart are called the **left** and **right atrium**. They receive the blood entering the heart. They are the collecting chambers and a muscular wall, called the **septum**, separates them.



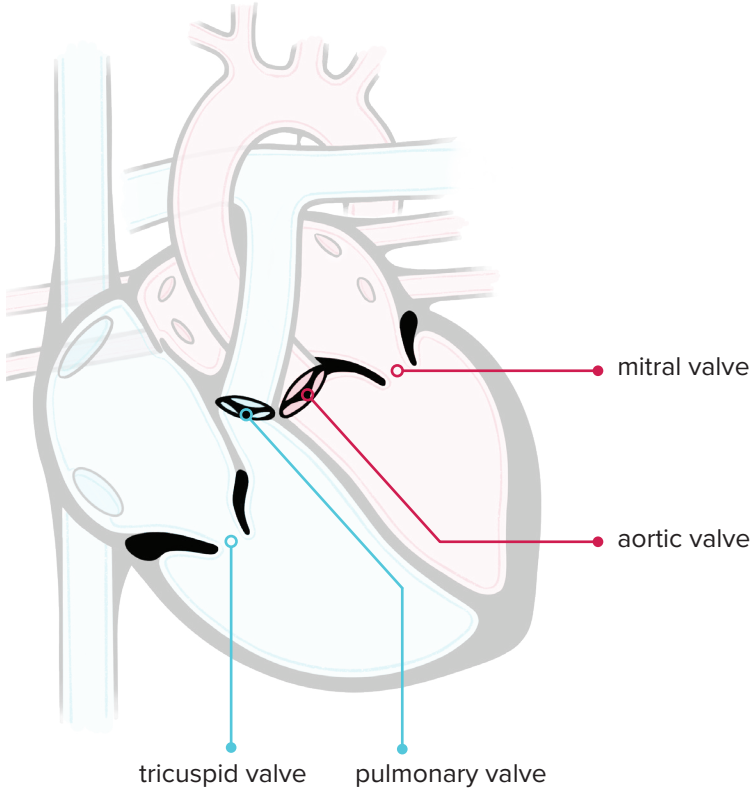
Ventricles:

The bottom two chambers are called the **left** and **right ventricles**. These are the powerhouse of the heart and pump blood out of the heart to the lungs and the body. A muscular wall, called the **septum**, separates them.

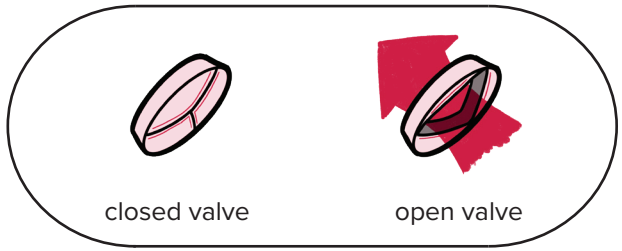


FOUR HEART VALVES

There are four valves in the heart. Their job is to make sure that blood moves freely through the heart in one direction. They also ensure there is no blood leakage (regurgitation) backwards.



Aortic Valve Close Up



Tricuspid Valve:

- One way valve that allows blood to travel from the right atrium to right ventricle.
- When the valve is closed it keeps blood from flowing backward into the right atrium when the right ventricles squeezes (contraction).

Pulmonary Valve:

- One way valve between the right ventricle and the pulmonary artery.
- When the right ventricle squeezes (contracts) the valve is forced open and the blood travels to the lungs through the pulmonary artery.
- When closed it prevents blood from flowing backward.

Mitral Valve:

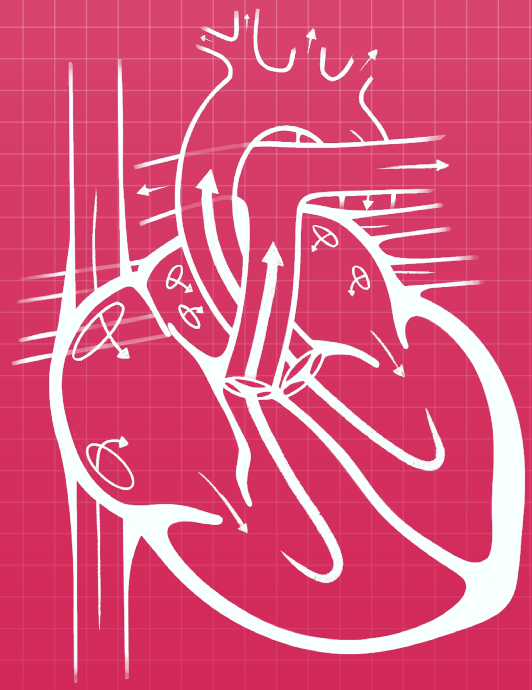
- One way valve that allows blood to travel from the left atrium to left ventricle.
- When the valve is closed it keeps blood from flowing backward into the left atrium when the left ventricle squeezes (contraction).
- This is the **only valve that has two flaps. The other valves have three flaps.**

Aortic Valve:

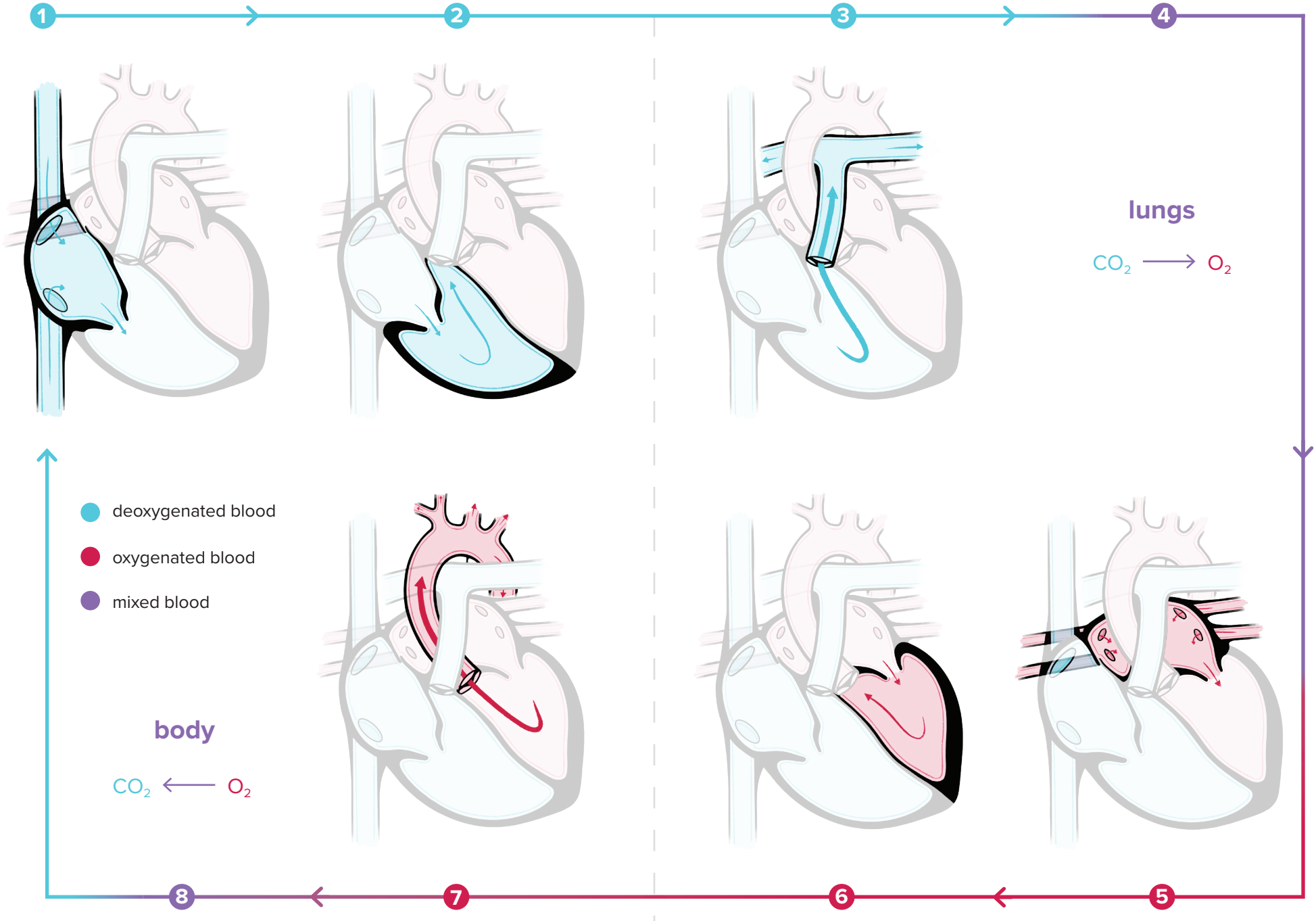
- One way valve between the left ventricle and the aorta.
- When the left ventricle squeezes (contracts) the aortic valve is forced open and the blood travels to the body through the aorta.
- When closed it prevents blood from flowing backward.

NOTES

BLOOD FLOW

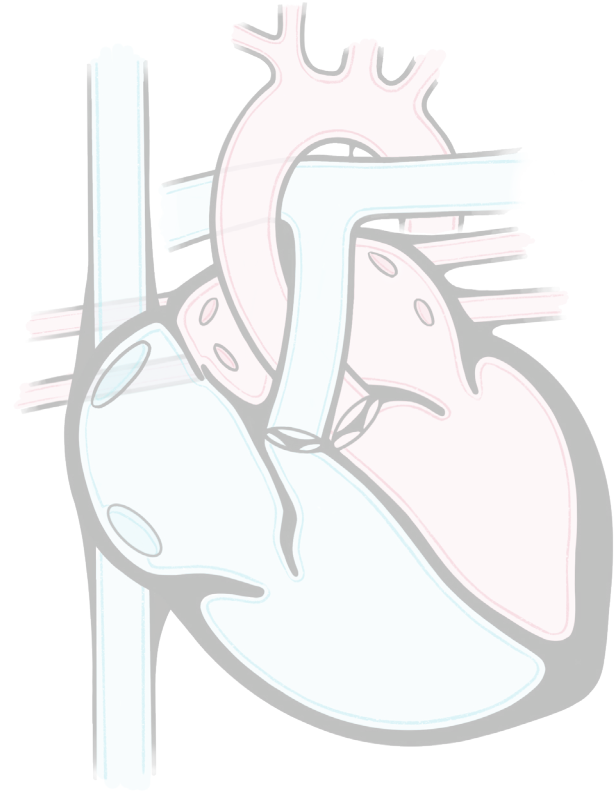


BLOOD CIRCULATION FLOWCHART



STEPS OF BLOOD CIRCULATION

1. In the typical heart, blood from the body enters the **right atrium** through the **Superior Vena Cava (SVC)** and **Inferior Vena Cava (IVC)**. This blood has low oxygen – **Deoxygenated**.
2. From the right atrium blood travels through the **tricuspid valve** (right AV valve) into the **right ventricle**.
3. Blood travels between the right ventricle and **pulmonary artery** through the **pulmonary valve** to end up at the **lungs**.
4. In the lungs, carbon dioxide is exchanged for oxygen.
5. The blood returns to the heart through the **pulmonary veins** and collects in the **left atrium**. This blood is high in oxygen – **Oxygenated**.
6. Blood travels from the left atrium through the **mitral valve** (left AV valve) into the **left ventricle**.
7. Blood travels between the left ventricle and **aorta** through the **aortic valve** to be delivered to the body.
8. In the body, oxygen is exchanged for carbon dioxide, and carried back to the heart to repeat the process.



Draw the flow:

Now that you know how blood travels through a typical heart, let's practice. Draw the pathway blood takes through the heart starting at the Superior and Inferior Vena Cavas, where blood enters the heart from the body. If you need help follow the steps to the left!

NOTES

HEART ANATOMY

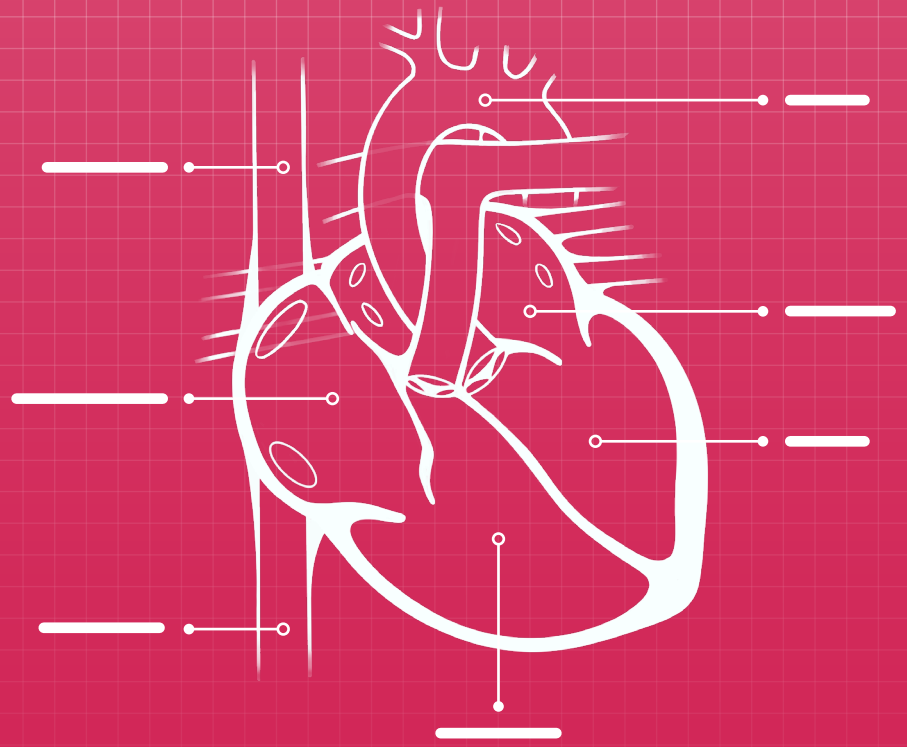
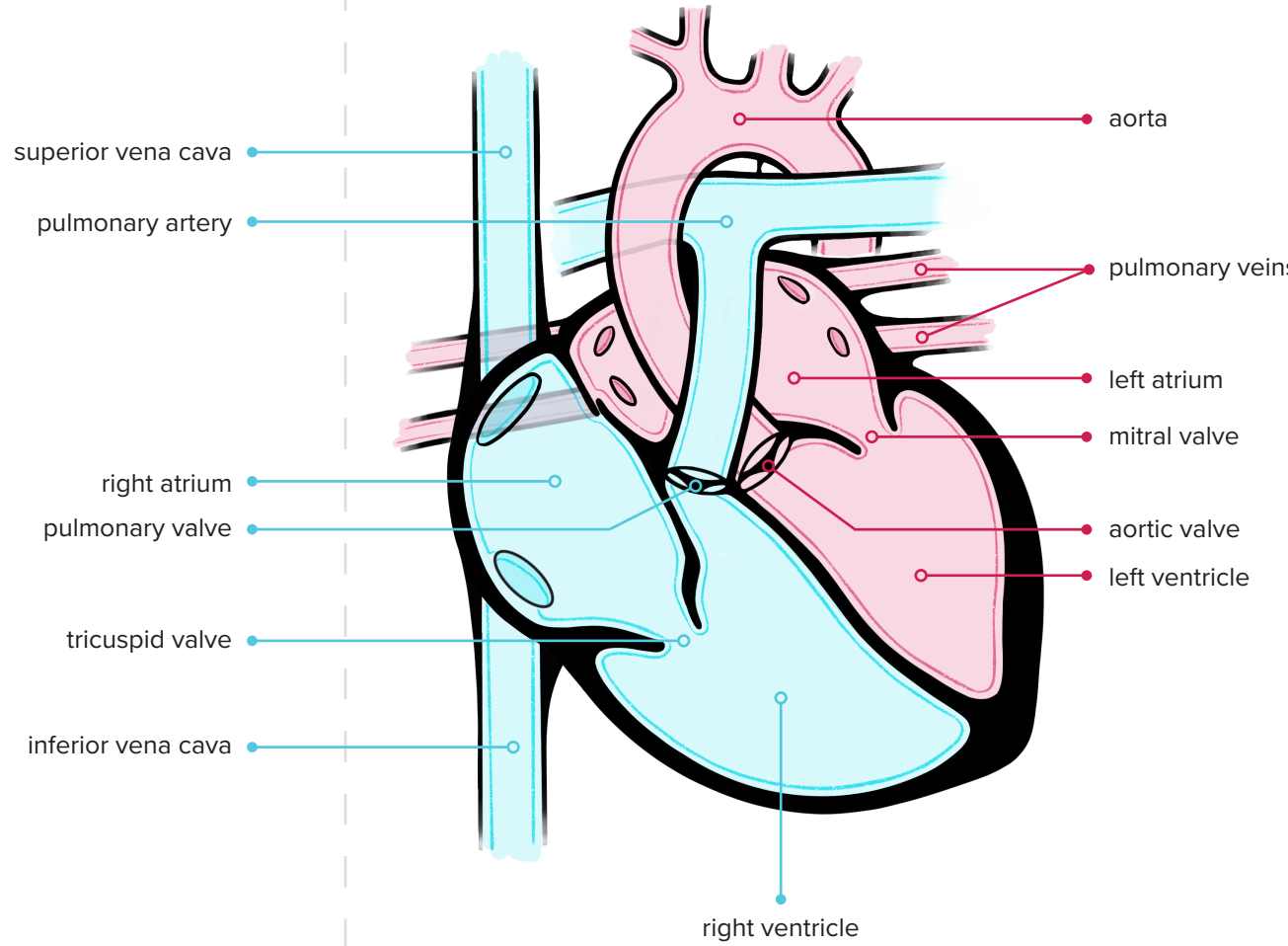


DIAGRAM OF THE HEART



HEART DEFINITIONS

Here are some definitions that explain important parts of the heart. You will hear your cardiology team talk about them often, and it is important you know them too.

Blood States

- **Deoxygenated**
  Blood that has exchanged oxygen for carbon dioxide at the cell level and is flowing back to the heart.

- **Oxygenated**
  Blood rich with oxygen that is traveling to the body to nourish cells with oxygen and pick up carbon dioxide.

- **Mixed Blood**
  Happens when deoxygenated blood and oxygenated blood come in contact and mix together.

Heart Anatomy

- **Aorta (AO)**
  Major vessel carrying oxygenated blood from the heart to the body.

- **Pulmonary Valve (PV)**
  One-way gate from Right Ventricle to Pulmonary Artery that travels to the lungs.

- **Inferior Vena Cava (IVC)**
  Vessel that carries deoxygenated blood from the lower body to the heart.

- **Mitral Valve (MV)**
  One-way “gate” between Left Atrium and Left Ventricle.

- **Left Atrium (LA)**
  Upper left chamber of the heart that collects oxygenated blood from the lungs.

- **Left Ventricle (LV)**
  Left lower chamber of the heart that pumps oxygenated blood from the heart to the body.

- **Pulmonary Arteries (PA)**
  Vessels that travel away from the heart carrying deoxygenated blood to the lungs.

- **Aortic Valve (AV)**
  One-way “gate” between Left Ventricle and Aorta.

- **Pulmonary Veins (PV)**
  Vessels that travel towards the heart from the lungs carrying oxygenated blood.

- **Right Atrium (RA)**
  Upper chamber of the heart that collects deoxygenated blood from the body.

Heart Anatomy Cont.

- **Right Ventricle (RV)**

  Lower right chamber of heart that pumps deoxygenated blood to the lungs to exchange carbon dioxide for oxygen.

- **Superior Vena Cava (SVC)**

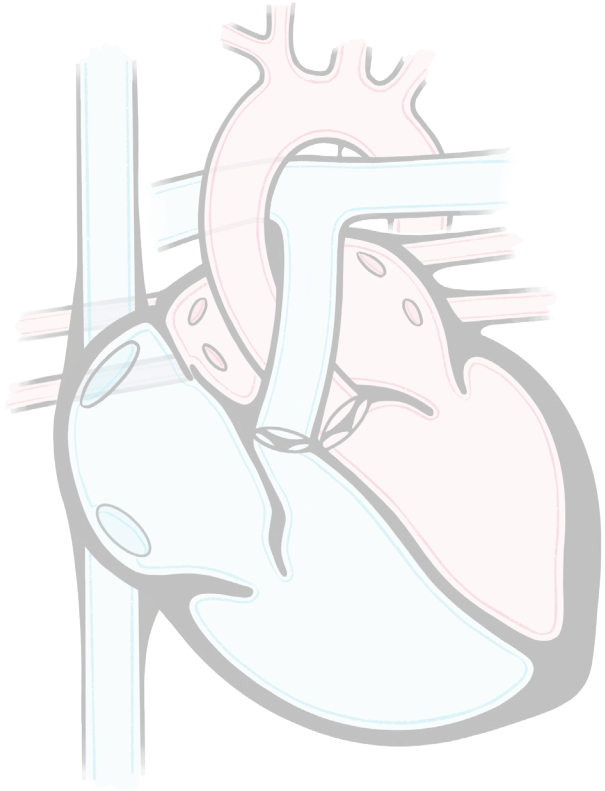
  Vessel that carries deoxygenated blood from the top portion of body to heart.

- **Tricuspid Valve (TV)**

  One-way “gate” between the Right Atrium and the Right Ventricle.

NOTES AND QUESTIONS

HEART NOTES



Here is a space for you to make notes on what you have learned about the heart.

Feel free to **draw on the heart**, and remember to **ask questions.**

FREQUENTLY ASKED QUESTIONS

This booklet was developed to help you learn how a typical heart works so you can **better understand how your own heart works**. Here are some common questions asked by people who have a heart similar to yours.

1. What is a Congenital Heart Defect (CHD)?

Congenital Heart Defect (CHD) is a term used to describe a group of conditions that involve the heart not forming properly during pregnancy. Congenital means that the heart problem is present at birth, even though it may not be detected until later in childhood.

Common examples of congenital heart defects include holes inside the walls of the heart, and narrowed or leaky valves. In more severe forms of CHDs, blood vessels or heart chambers may be missing, poorly formed, and/or in the wrong place.

2. What causes Congenital Heart Defects (CHDs)?

Most causes of congenital heart defects are unknown. A combination of genes and other risk factors, such as environmental exposures and maternal conditions account for most congenital heart defects. Genetic conditions make up 15 – 20% of congenital heart defects.

A baby's risk of having a congenital heart defect may be up to three times higher, if the mother, father, or a sibling has a congenital heart defect.

3. What are the symptoms of Congenital Heart Defects (CHDs)?

A child with a congenital heart defect does not always exhibit or show symptoms. A child can look completely healthy and still have a heart defect. In these children, only a detailed examination may discover the heart defect.

Symptoms tend to vary by age.

Most common symptoms in very young children:

- Poor weight gain
- Difficulty feeding
- Excessive sweating
- Fast breathing or breathing that causes the baby to work harder than expected
- *Cyanosis:* blue tinged skin, lips, or fingernails

Common symptoms in older children and adolescents:

- Poor weight gain
- Chest pain
- Unusual heartbeat
- Dizziness and/or fainting
- Decreased ability to tolerate exercise and general fatigue

4. How common are Congenital Heart Defects (CHDs)?

Congenital heart defects are the most common birth defects. They occur in almost 1% of births.

It is now believed that the number of adults living with a CHD is at least equal to, or more than, the number of children living with a CHD. Children who do need a procedure on their heart have an overall survival rate of more than 95%.

5. What is the health impact of Congenital Heart Defects (CHDs)?

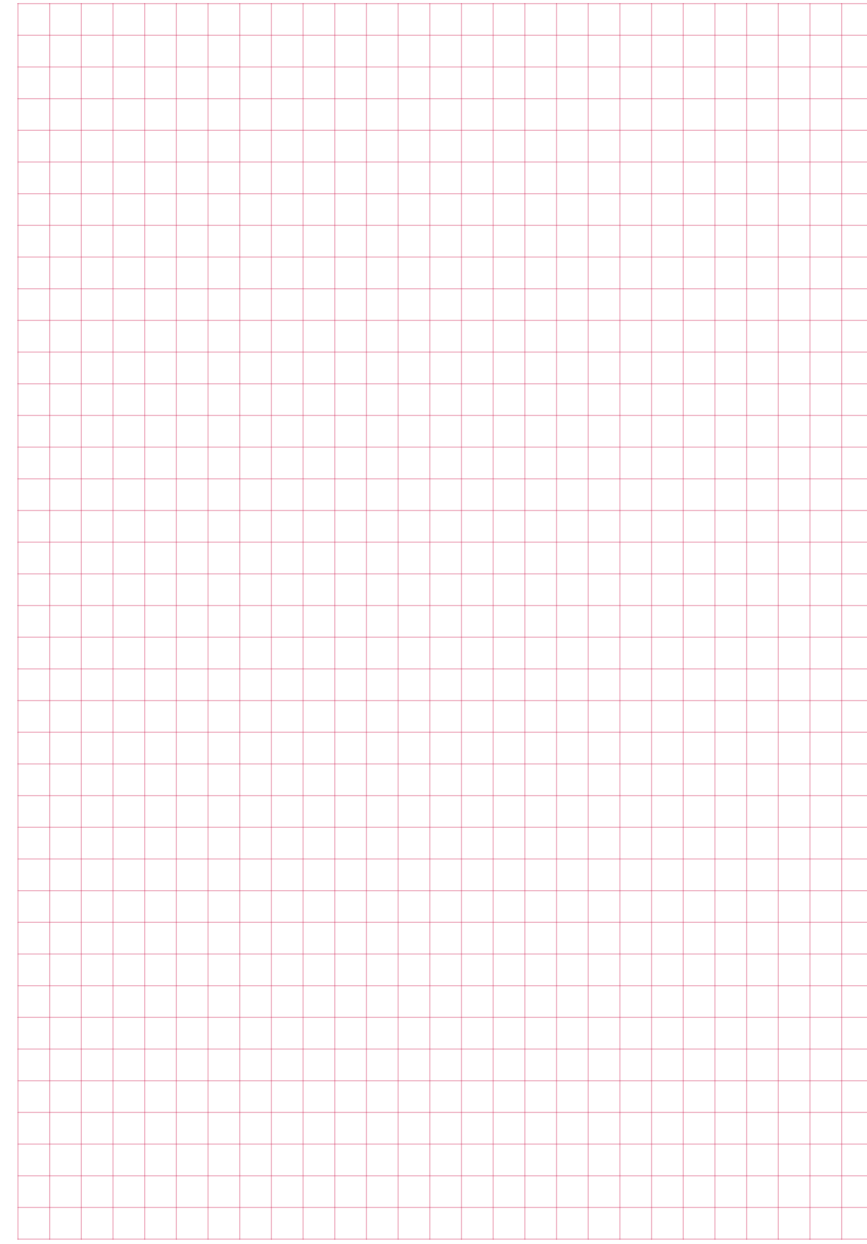
Most forms of CHD are not severe and do not require treatment. Over 85% of babies born with a heart defect live to adulthood.

However, some individuals with a congenital heart defect require several operations, procedures, and/or medications as adults. Therefore, lifelong follow-up by a cardiologist who is knowledgeable about congenital heart defects is very important.

Remember it is very important to live a healthy and active lifestyle. Children born with a congenital heart defect can live long enough to develop illnesses like the rest of the adult population without a CHD. These illnesses can include high blood pressure, obesity, and acquired heart disease.

YOUR HEART QUESTIONS

Write **any heart questions here** and bring them to your next doctor's visit!



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