

M-Care: Cardiovascular System Fly-through Script

1. This is the human cardiovascular system.
2. It's an incredibly sophisticated network made up of different types of vessels called arteries, veins and capillaries.
3. Its three main functions are:
 - to transport oxygen, carbon dioxide and nutrients around the body;
 - to regulate body temperature;
 - and to facilitate the clotting of open wounds.
4. At the centre of this system is the heart, a muscular pump which pushes blood around the body.
5. It delivers oxygen and nutrients to organs, tissues and cells, while simultaneously removing waste products like carbon dioxide.
6. Today we focus on the transportation of oxygen around the body so strap in, and get ready to go!
7. We enter the nasal cavity through the right left nostril.

Slide 1 – how air is diverted into the trachea

8. As you breathe in, air enters your body through either the nasal cavity or the oral cavity – otherwise known as the nose and mouth.
9. Air travels into the pharynx – or throat – where it is diverted into the trachea otherwise known as the windpipe.
10. The diagram shows where the vocal cords sit across the top of the larynx and vibrate in the airstream to produce the voice. If you place your fingers on your throat and hum, you will feel your vocal cords vibrating.
11. The pharynx *also* forms part of the digestive system as it carries food as well as air.
12. A flap in the throat called the epiglottis directs the air that you breathe into the trachea. It also prevents food and drink from entering the windpipe, diverting them instead into the oesophagus and the digestive system.
13. You will follow this journey in our digestive system fly-through.
14. The walls of the trachea are strengthened by stiff rings of cartilage which keep it open.
15. The trachea is lined with cilia – microscopic hair-like structures – which sweep fluids and foreign particles out of the airway and away from the lungs.
16. As we travel down the trachea you will see it split into two distinct passages called bronchi.
17. Bronchi are the tubes which lead to the lungs
18. Each bronchus subdivides into smaller tubes called bronchioles inside the lungs.

Slide 2 - Bronchial tree

19. This network of bronchi and bronchioles is called the bronchial tree. As you can see on the diagram it looks like the branches of a tree.
20. Lungs contain elastic tissues allowing them to inflate and deflate without losing shape.
21. They are covered in a thin membrane lining called the pleura.
22. The chest cavity – or thorax – is airtight and houses the bronchial tree, the lungs and heart.
23. The chest walls act as a protective cage around these organs and other structures.
24. The top and sides of the thorax are formed by the ribs and attached muscles and the bottom is formed by a large muscle called the diaphragm.

Slide 3 - Diaphragm and lungs animated

25. When you inhale, the diaphragm moves down towards the abdomen. At the same time muscles pull the ribs up and out.
26. This increases the capacity of the chest cavity and causes air to rush into the lungs through the nose and mouth.
27. When you exhale the diaphragm moves upwards and the muscles in the chest wall relax.
28. The chest cavity reduces in size and pushes air out of the respiratory system through the nose and mouth.

29. Bronchioles inside the lungs end in tiny sacs called alveoli where the exchange of oxygen and carbon dioxide takes place.

Slide 4 - Alveoli

30. There are hundreds of millions of alveoli in the lungs which fill with air every time you breathe.
31. Oxygen from the air transfers to the blood through capillaries which line the walls of the alveoli – a process called diffusion.
32. Capillaries are tiny blood vessels, each of them thinner than a human hair.
33. Some are so small that only one blood cell can move through them at a time!
34. Oxygen is captured in the blood by haemoglobin in the red blood cells.

35. We now enter the bloodstream.
36. The doughnut shaped objects are red blood cells carrying oxygen to the heart.
37. The heart beats between sixty and a hundred times every minute, without stopping, throughout your entire life.
38. With each beat the heart pumps oxygen rich blood to every part of the body.
39. When oxygen has been delivered to the cells the blood is sent back to the lungs to collect more.
40. This cycle repeats constantly, and the heart *never* takes a break.
41. Every day 2,000 gallons, or 16,000 pints, of blood are pumped around the human body. This is the equivalent of more than a hundred bathtubs.

42. We enter the left atrium – one of four chambers in the heart – through the left pulmonary vein.
43. Blood is pumped through the mitral valve into the next chamber of the heart – the left ventricle.
44. Next it travels through the aortic valve on to the aorta where it leaves the heart and takes its oxygen rich cells to the rest of the body.

45. Blood flows around the body by either pulmonary circulation or systemic circulation.
46. Pulmonary circulation takes *deoxygenated* blood to the lungs where it absorbs oxygen and releases carbon dioxide, before returning newly oxygenated blood back to the heart.
47. Systemic circulation transports *oxygenated* blood around the body, and takes deoxygenated blood back to the heart.

Slide 5 – Blood flow through the heart (left side)

48. On this diagram you can see the path that the oxygenated blood takes through the left side of the heart. The arrows show the direction of the blood flow.

49. Oxygenated blood flows from the lungs, into the heart, through pulmonary veins on either side.
50. It travels into the left atrium, then empties into the left ventricle before being pumped out through the aorta to deliver oxygen to the body.
51. You are now flying along with the red blood cells as they travel through the complex network of arteries, arterioles, and capillaries, carrying oxygen to every part of the body.
52. There are twenty major arteries which make a path through the tissues of the body.
53. As they do, they branch into smaller vessels called arterioles, which in turn branch into capillaries.

Slide 6 - Capillaries

54. This diagram shows the tiny capillaries inside the body's tissues. This is where the haemoglobin in red blood cells releases oxygen which passes into the cells of the tissue.
55. Carbon dioxide, a waste product of cells, moves into the capillaries, where most of it dissolves into the blood-plasma and is carried away through the wider vessels called venules.
56. Venules join to form veins which ultimately feed blood back to the heart.
57. It is then transferred into the alveoli in the lungs and is finally exhaled as you breathe out.
58. If the entire network of human veins and arteries were laid end to end, they would measure sixty thousand miles! That's long enough to wrap around the Earth more than twice!
59. The red blood cells are now flowing back into the heart through the vena-cava, into the third chamber called the right atrium.
60. Blood pumps through the tricuspid valve into the fourth chamber of the heart – the right ventricle.
61. From here it travels through the pulmonary valve and via the left and right pulmonary arteries, back to the lungs to be oxygenated.

Slide 7 - Blood flow through the heart (right side)

62. This diagram shows the route taken by the deoxygenated blood as it passes back through the right-hand side of the heart, back towards the lungs. The arrows show the direction of the blood flow.
63. So, there you have it, the cardiovascular system – a never ending cycle of oxygen and carbon dioxide travelling around your body via your lungs and heart. Pretty amazing, hey?
64. Why not try one of our other fly-through experiences like the Human Digestive System, or the Musculoskeletal System?