**Heart Failure**

The heart is a crucial organ that pumps blood through the blood vessels. This throbbing miracle is located in the chest, under the sternum. Contrary to popular belief, the heart is not on the far left in the chest, the organ is approximately in the middle, a little bit Afbeelding met kleding

Automatisch gegenereerde beschrijvingto the left. The heart supplies all organs with blood by means of (stroke) veins and capillas. The blood moves through the veins because the heart pumps, the pumping movements that the heart makes cause pressure in the (stroke) veins, this is the blood pressure. The blood pressure causes the valve to open. Then the blood flows into the right ventricle. Then, again because of the blood pressure, the blood goes through the pulmonary artery to the lungs. Oxygen-rich blood comes back and ends up in the left atrium. Then the valve opens, this allows the blood to enter the left ventricle. Finally, the blood leaves the heart through the aorta and makes its way to the organs and muscles. [(Miranda, 2021)](https://www.news-medical.net/health/Structure-and-Function-of-the-Heart.aspx)

The heart pumps in a certain rhythm, that rhythm depends on how active the person in question is. If a person is at rest, the heart rhythm is quite low, between 60 and 100 beats per minute. With a person in action, this is often higher, about 120 heartbeats per minute or more. This rhythm is maintained by the sinus node. This gives impulses that go through the AV node (the image below)  to the heart muscles. These then contract, causing the blood in the chambers and atria to be pumped further. In all these processes, heart diseases can occur, some can be solved, others cannot. [(Miranda, 2021)](https://www.news-medical.net/health/Structure-and-Function-of-the-Heart.aspx.)

Many studies have been conducted to show which factors affect heart failure. Below is a summary list with the relevant study:

Acute heart failure [(Piotr Ponikowski, 2016)](https://doi.org/10.1093/eurheartj/ehw128)

* Heart attack (artery blockage)

Cardiac arrhythmias

* In cardiac arrhythmias, the electrical impulses in the heart go out of rhythm, due to changes in the heart tissue during cardiac activity. The heart pumps too fast, too slowly or in an irregular rhythm. As a result, organs and muscles receive too little oxygen, this can lead to acute cardiac arrhythmias. [(Piotr Ponikowski, 2016)](https://doi.org/10.1093/eurheartj/ehw128)

Blood pressure and cholesterol

Causes of heart failure

* Artery blockage
  + - Clotting of the blood [(Piotr Ponikowski, 2016)](https://doi.org/10.1093/eurheartj/ehw128)
* No blood supply in coronary artery
* Depolarization and closure of gap junctions in heart muscle allowing no electrical activity [(Piotr Ponikowski, 2016)](https://doi.org/10.1093/eurheartj/ehw128)
* Slow and abnormal conduction impulses
  + - Causes accelerated heart rhythm in which heart chambers close too quickly and too little blood is pumped around (re-entry). [(Piotr Ponikowski, 2016)](https://doi.org/10.1093/eurheartj/ehw128)
* Decrease in MAP causes more re-entries, which ultimately means that no contraction takes place at all. [(Piotr Ponikowski, 2016)](https://doi.org/10.1093/eurheartj/ehw128)

Risk factors that may indirectly cause heart failure:

* Biological risk factors
* Age  [(Parameshwar, J., 1992)](https://pubmed.ncbi.nlm.nih.gov/1419262/)
* Gender [(Sciomer, S., 2020)](https://doi.org/10.1177/2047487320961980)
* Genetics [(Morita, H., Seidman, J., & Seidman, C. E., 2005)](https://doi.org/10.1172/jci24351)
* Expression of disrupted mechanisms
* High blood pressure [(David S.H. Bell, 2003)](https://doi.org/10.2337/diacare.26.8.2433)
* High cholesterol [(David S.H. Bell, 2003)](https://doi.org/10.2337/diacare.26.8.2433)
* Impaired glucose tolerance, diabetes [(David S.H. Bell, 2003)](https://doi.org/10.2337/diacare.26.8.2433)
* Acquired risk factors
* Smoke [(Suskin, N., Sheth, T., Negassa, A., & Yusuf, S., 2001)](https://doi.org/10.1016/s0735-1097(01)01195-0)
* Nicotine
* Carbon monoxide
* Free radicals
* Substances ensure that blood clots faster
* Excessive alcohol consumption [(Laonigro, I., Correale, M., Di Biase, M. and Altomare, E., 2009)](https://doi.org/10.1093/eurjhf/hfp037)
* One-sided diet [(David J. Chess, William C. Stanley, 2008)](https://doi.org/10.1093/cvr/cvn074)
* Overweight [(Sciomer, S., 2020)](https://doi.org/10.1177/2047487320961980)
* LDL cholesterol levels increase and HDL cholesterol levels decrease
* Increase in blood pressure
* Impaired glucose tolerance (diabetes)

These factors were used to build an AI that can predict heart failure. Based on datasets, the AI can predict whether is it likely a person will develop heart failure.

**Sources**

Miranda, Gaea Marelle. (2021, February 22). Structure and Function of the Heart. News-Medical. Retrieved on February 04, 2022 from <https://www.news-medical.net/health/Structure-and-Function-of-the-Heart.aspx>.

Parameshwar, J., Shackell, M. M., Richardson, A., Poole-Wilson, P. A., & Sutton, G. C. (1992). Prevalence of heart failure in three general practices in north west London. *The British journal of general practice : the journal of the Royal College of General Practitioners*, *42*(360), 287–289.

Sciomer, S., Moscucci, F., Salvioni, E., Marchese, G., Bussotti, M., Corrà, U., & Piepoli, M. F. (2020). Role of gender, age and BMI in prognosis of heart failure. European Journal of Preventive Cardiology, 27(2\_suppl), 46–51. <https://doi.org/10.1177/2047487320961980>

Morita, H., Seidman, J., & Seidman, C. E. (2005). Genetic causes of human heart failure. *Journal of Clinical Investigation*, *115*(3), 518–526. <https://doi.org/10.1172/jci24351>

Suskin, N., Sheth, T., Negassa, A., & Yusuf, S. (2001). Relationship of current and past smoking to mortality and morbidity in patients with left ventricular dysfunction. *Journal of the American College of Cardiology*, *37*(6), 1677–1682. <https://doi.org/10.1016/s0735-1097(01)01195-0>

Laonigro, I., Correale, M., Di Biase, M. and Altomare, E. (2009), Alcohol abuse and heart failure. European Journal of Heart Failure, 11: 453-462. <https://doi.org/10.1093/eurjhf/hfp037>

David J. Chess, William C. Stanley. (2008), Role of diet and fuel overabundance in the development and progression of heart failure, Cardiovascular Research, Volume 79, Issue 2, 15, Pages 269–278, <https://doi.org/10.1093/cvr/cvn074>

David S.H. Bell, (2003), Heart Failure: The frequent, forgotten, and often fatal complication of diabetes, Diabetes Care, 26 (8): 2433–2441. <https://doi.org/10.2337/diacare.26.8.2433>

European Heart Journal, Volume 37, Issue 27, 14 July 2016, Pages 2129–2200, <https://doi.org/10.1093/eurheartj/ehw128>

Piotr Ponikowski, Adriaan A Voors, Stefan D Anker, Héctor Bueno, John G F Cleland, Andrew J S Coats, Volkmar Falk, José Ramón González-Juanatey, Veli-Pekka Harjola, Ewa A Jankowska, Mariell Jessup, Cecilia Linde, Petros Nihoyannopoulos, John T Parissis, Burkert Pieske, Jillian P Riley, Giuseppe M C Rosano, Luis M Ruilope, Frank Ruschitzka, Frans H Rutten, Peter van der Meer, ESC Scientific Document Group, 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure: The Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC)  
Developed with the special contribution of the Heart Failure Association (HFA) of the ESC, European Heart Journal, Volume 37, Issue 27, 14 July 2016, Pages 2129–2200, <https://doi.org/10.1093/eurheartj/ehw128>