Belief Revision in Coronary Artery Disease Diagnosis

According to the National Academy of Medicine, the diagnostic process is a "complex, patient-centered, collaborative activity that involves information gathering and clinical reasoning with the goal of determining a patient's health problem". Diagnosis involves a long series of information gathering and tests. Such information is needed for the doctor to form an initial hypothesis (belief) about a patient's disease. This belief constantly changes as more information is received, integrated and interpreted alongside previously formed beliefs. In the context of a coronary artery disease, for instance, the doctor could have initial beliefs based on their age. However, upon knowing eating habits, their beliefs could change significantly. The diagnostic cycle is more clearly shown in the diagram below. [1]

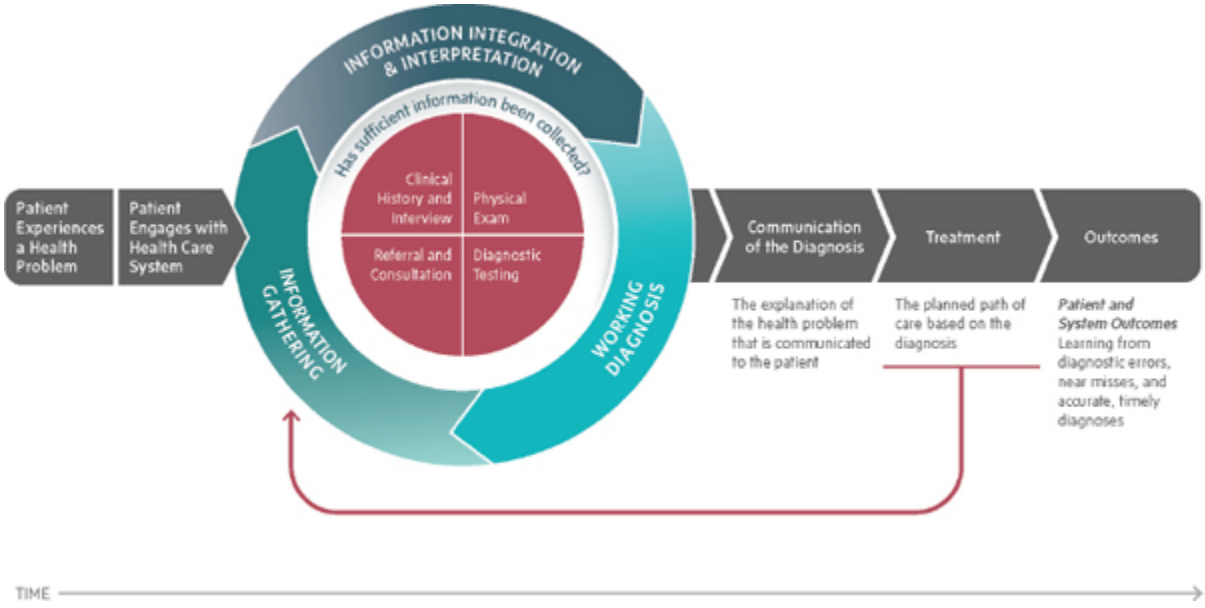

Figure 1: Diagnosis process. [2]

A doctor's diagnosis often starts with an initial perception of their patient. Sensory cues can indicate many things about a person's health. For instance, if the patient looks obese (which could indicate inactivity) or seems to be out of breath (which could indicate smoking/inactivity), then the doctor might be more inclined to believe that they have CAD. Other indicators include age. the older a person is the higher the chance a person is to experience a heart related

[1] National Academies of Sciences, Engineering, and Medicine. 2015. *Improving Diagnosis in Health Care*. Washington, DC: The National Academies Press.https://doi.org/10.17226/21794.
[2] National Academies of Sciences, Engineering, and Medicine. *Improving Diagnosis in Health Care*.

condition. The risk of an organ damage or "narrowed arteries" increases due to age as well.[3] Sex could also alter a doctor's diagnostic process. While the symptoms seem pretty similar, women tend to exhibit more symptoms of upper body discomfort, fatigue and nausea, while men experience more chest pain and heart attacks. Women's risk increases after menopause, while men's risk increases after the age of 45. Race is also another factor. Black, Mexican American, Native American, Native Hawaiian and Asian Americans populations usually have a higher risk of CAD. High blood pressure, obesity and diabetes seems to be more prevalent within these populations.[4]

After such their initial perception, then the information gathering (an integral part of the diagnosis process) begins. The doctor starts off by communicating with the patient and asking them questions about their family history, lifestyle choices, symptoms etc. A typical doctor often bases his diagnosis on a set of categories agreed upon by the larger medical community. Depending on how aware a patient is about their disease, a doctor could have a different diagnostic process. If they come to the doctor with a prediction of what they have, a doctor might treat their symptoms as "checking off a list," since they already have a set of beliefs about what makes up a disease they are trying to diagnose. In the case that a patient is not sure about their disease, then the doctor has to form their own hypothesis based on the initial condition given to them. The latter process of diagnosis is more common and involves more belief revision (and still occurs even if the patient is more aware of their disease, as other diseases should also be considered).

Usually, this gives the doctor a good indication of the likelihood of the patient having CAD. Information about family history is often a great indicator of diseases. A family history of developing CAD earlier than the age of 50 is often an indication of genetic inclination towards the disease. [5] When it comes to lifestyle choices, exercise and eating habits are usually the main variables. For CAD, inactivity, poor eating habits, and smoking/drinking habits often lead to higher risk of CAD.

This diagnosis is usually partnered with more formal clinical testing (such as blood tests, EKG, CT scans etc.).[6] Such testing is important since they also show CAD even with the absence of symptoms. Doctors may order a Cardiac CT scan to detect the levels of calcium in the blood

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[3] "Coronary Artery Disease." *Mayo Clinic*, Mayo Foundation for Medical Education and Research, 5 June 2020, https://www.mayoclinic.org/diseases-conditions/coronary-artery-disease/symptoms-causes/syc-20350613.

[4] "Coronary Artery Disease: Causes, Symptoms, Diagnosis & Treatments." *Cleveland Clinic*, https://my.clevelandclinic.org/health/diseases/16898-coronary-artery-disease.

[5] "Coronary Artery Disease." *Centers for Disease Control and Prevention*, Centers for Disease Control and Prevention, 19 July 2021, https://www.cdc.gov/heartdisease/coronary_ad.htm.

[6] "Diagnosing Coronary Artery Disease." *Patient Care at NYU Langone Health*, https://nyulangone.org/conditions/coronary-artery-disease-in-adults/diagnosis.

because calcium build up results in plaques which is a main cause of CAD. It can also be used to predict the risk of other heart diseases such as a heart attack based on the extent of the calcium build up. An example of what testing is used when there are no obvious symptoms to CAD is EKG. EKG is a non-invasive diagnostic test which records the electrical activity of the heart. It may assist in diagnosing other heart problems as well. It looks at the heart rhythm, size and muscle. It can also be used to make future comparisons to new information on a patient's heart condition.

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