

MASTER

heart disease life cycle

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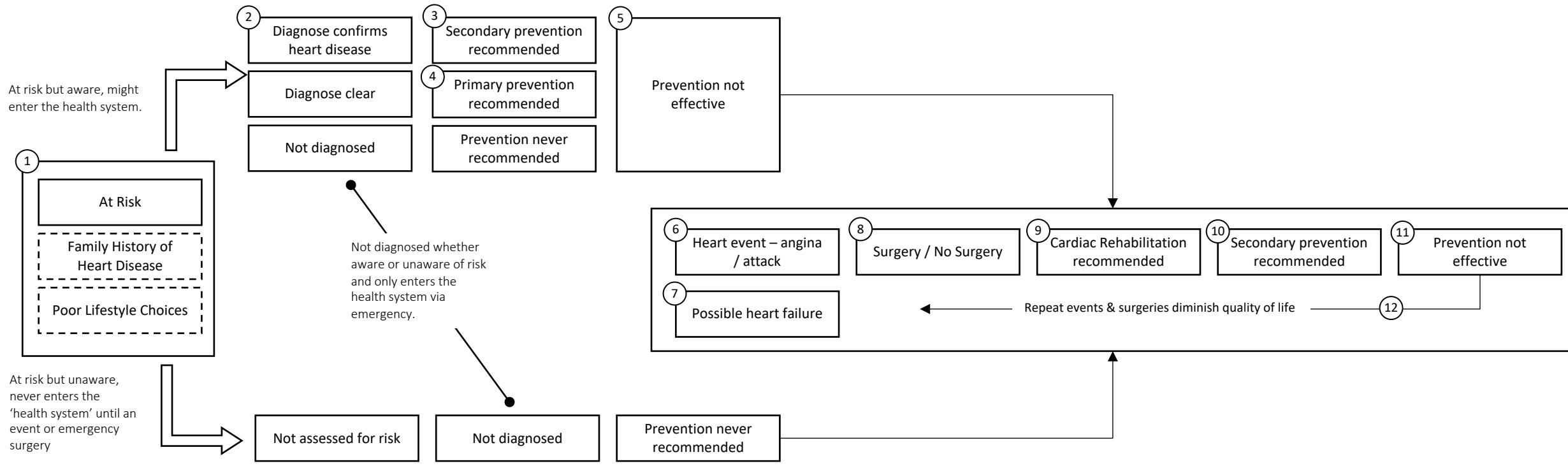
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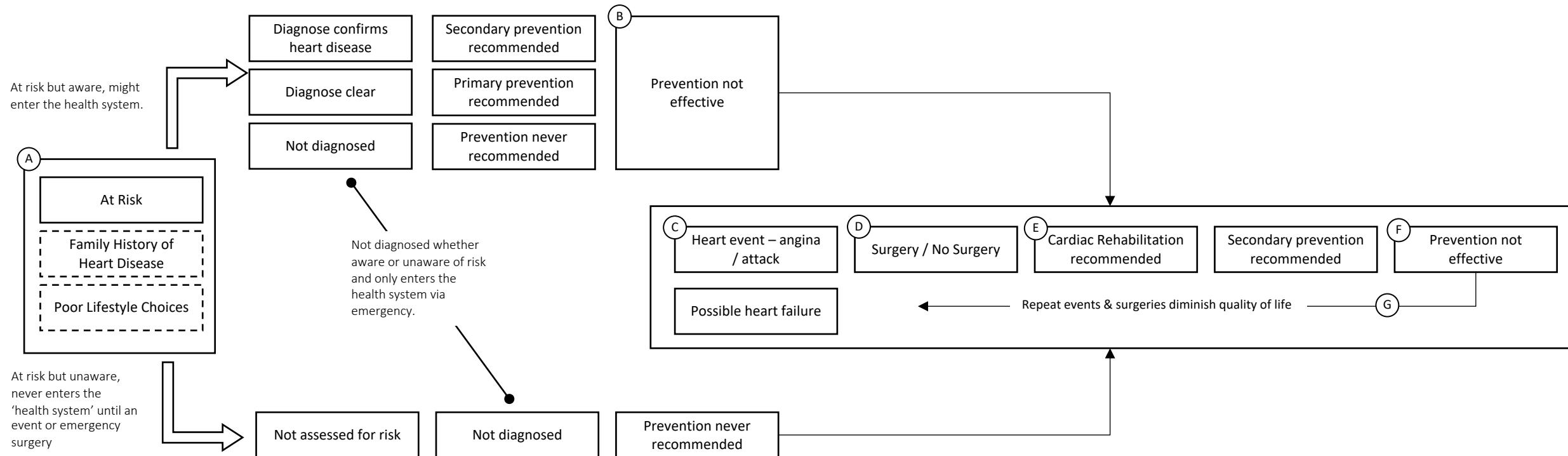
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the heart disease life cycle



1. The risk of heart disease is related to family history and lifestyle factors such as smoking, poor diet, inadequate exercise, excessive drinking and others.
2. Diagnosis in support of risk assessment can include various non-intrusive and intrusive methods such as scans and angiograms. People that are not assessed as 'at risk' because they don't visit a doctor won't be diagnosed.
3. An early confirmed diagnosis will normally result in a recommendation of secondary prevention which consists of lifestyle changes and prescribed medications such as statins (cholesterol lowering medications).
4. A clear diagnosis will still result in a recommendation of primary prevention which is lifestyle changes without medications.
5. Prevention will be ineffective if the recommended lifestyle changes are not implemented or adhered to and/or if the recommended medication are not taken. Many patients have poor health literacy or suffer from socio-economic disadvantage and do not implement effective prevention.
6. Ineffective prevention will often result in angina pain which will send a patient back to a doctor where they will be diagnosed. Patients might also suffer a heart attack.
7. If a heart attack occurs a patient might experience heart failure where part of the heart is damaged – this is extremely serious and can permanently limit working and lifestyle participation.
8. Surgery can include angioplasty to open blockages and open heart surgery to bypass blockages with veins/arteries taken from the leg or arm. A bypass requires months of recovery and rehabilitation.
9. Cardiac rehabilitation involves guided exercise to recover from surgery trauma and lectures on heart conditions and treatment, stress management, smoking cessation, diet, exercise, medications and other topics. It has proven to be effective but many patients do not participate or poor health literacy, socio-economic disadvantage etc limit its effectiveness because lifestyle changes are not permanent.
10. Secondary prevention following rehabilitation will usually include a greater range of medications and stricter lifestyle requirements.
11. As with primary prevention, secondary prevention following an event or surgery is often ineffective because patients stop taking their medications and don't adhere to the recommended lifestyle.
12. Repeat events and surgeries are a major cause of high health costs and degrade quality of life and economic participation for patients.

the “wicked problem” affecting the heart disease life cycle

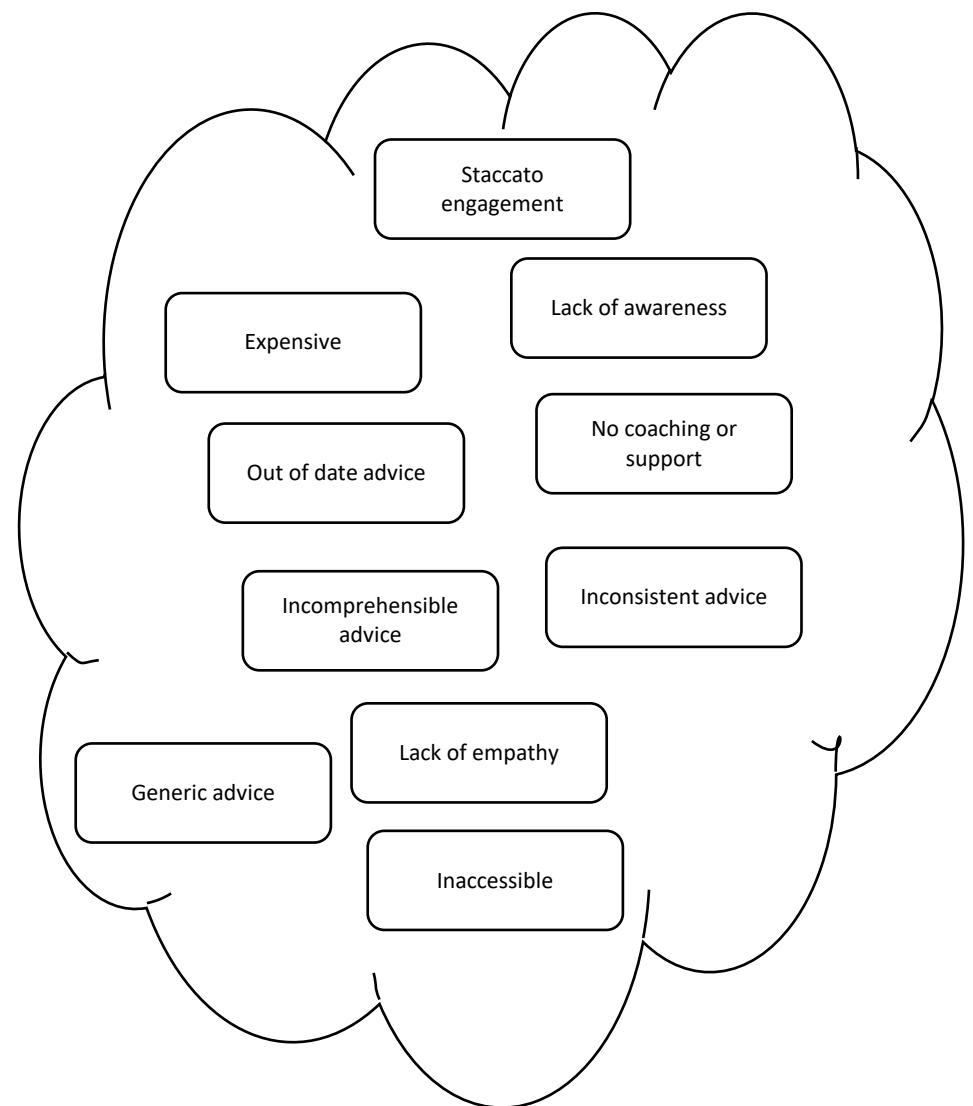


- A. Many people are not aware they are at risk. Visit the websites of heart health advocacy bodies and their front pages are devoted to seeking donations. Trying to dive deeper on these websites requires general and health literacy and the sites are not accessible. Also, most people don't use websites these days – they use apps because they are simple to use and targeted at specific use cases. If people don't suspect they are at risk they won't visit a doctor for diagnosis.
- B. Diagnosis might confirm heart disease but even if it doesn't, being at risk requires people to follow a prevention program to avoid heart disease. Evidence based research confirms that few adhere to prevention programs. They are difficult to understand and pamphlets handed out by a doctor are not the long term lifestyle change program recommended by organisations such as the American College of Cardiology.
- C. Most people only know heart attacks from TV and movies – the classic chest pain. They don't know that pain anywhere from the jaw and down the arm, shortness of breath and even reflux and stomach discomfort can indicate heart problems. As a consequence they don't seek treatment until it becomes an emergency.

- D. Preparing for hospital is confronting and the actual confinement before and after surgery confusing and frightening. Some patients are given booklets by their doctor or admissions staff but these don't address the problem. Just look at the hundreds of patient questions and cries for help on the British Heart Foundation's HealthUnlocked blog. There is no way a human call centre could scale, even if budget was available, to meet this demand.
- E. Cardiac rehabilitation has been found to be effective but in many countries fewer than 30% attend. The best is Britain at around 50% but even there women and ethnic minorities are not well represented and those that do attend from these groups have poor outcomes. Dieticians show patients nutrition labels and tell them to check for saturated fat but many are illiterate and can't read the labels nor understand the numbers. Patients are told to walk for heart health but there is no advice for the many younger patients who want to get back to the gym, cycling etc. Also, these education programs are developed by hundreds of organisations around the world, even in the one country, and not to a standard; patients don't get to see updates once they've left the programs. This duplication costs millions.

- F. After one hour lectures on their condition, smoking cessation, diet, exercise and medications patients are left to their own devices to change their lifestyles. Most don't and also soon stop taking their medications. Most "fall off a cliff" when they finish rehab and the psychological impact on patients and their families is enormous.
- G. In Australia around 30% of heart surgeries are REPEAT surgeries. What is needed is ongoing coaching and the ability for patients to ask questions at anytime with answers they can understand. In Australia doctors can offer patients a few (usually 5) subsidised sessions with an allied health practitioner and some health insurers might partially cover some costs but seeking ongoing support from dieticians, exercise physiologists and psychologists is expensive and out of reach for most. Also, those still in the work force often can't attend rehab let alone make time to attend other practitioners for advice and support. Research has found that many of these practitioners over estimate the literacy of their patients and their advice is not understood nor sustainable.

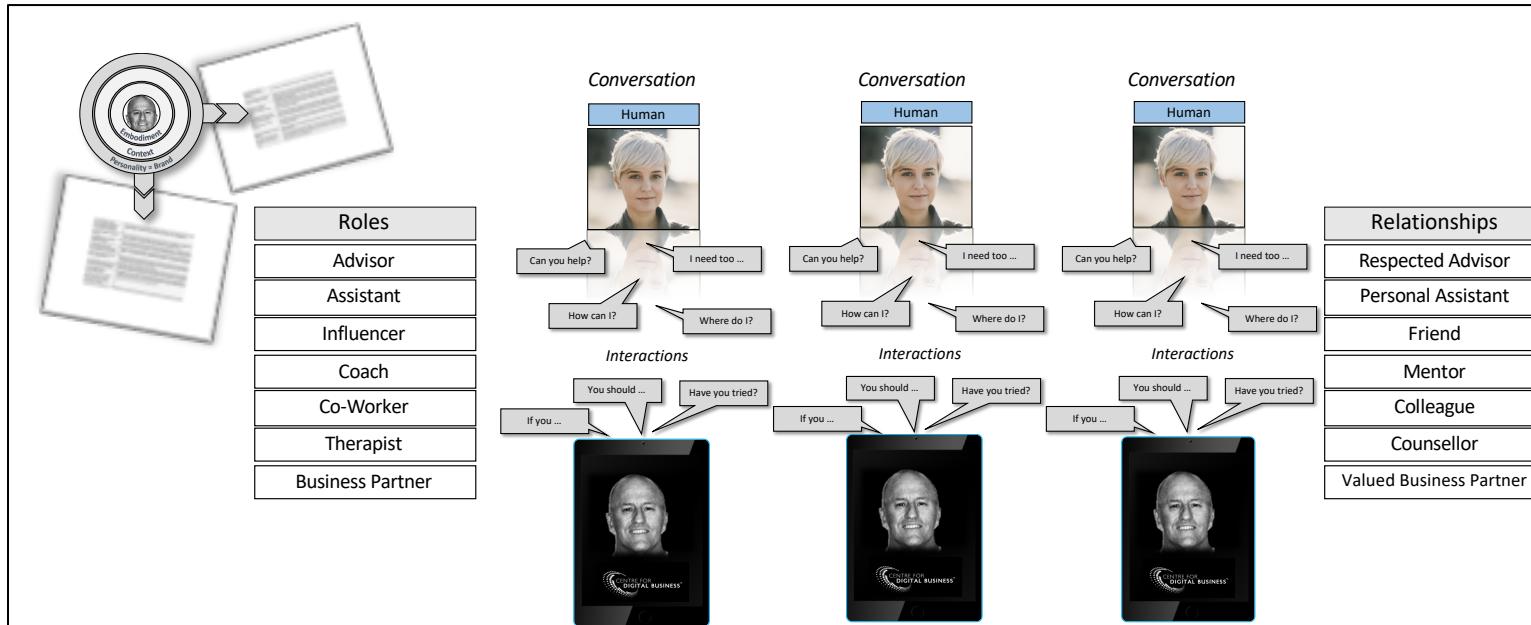
what needs to change?



- Up to date
- Always available
- Accessible
- Empathetic
- Easy to understand advice
- Consistent advice
- Promotes awareness
- Coaching & support provided

- Promotes cardiac disease risk assessment.
- Authoritative information, education & motivation for heart healthy lifestyle provided in accessible, repeatable easy to update format.
- Replaces paper books given by hospitals to heart patients.
- Provides cardiac rehab info and education in accessible, repeatable easy to update format.
- Bridges gap to secondary prevention.
- Provides 'business' lifestyle information (returning to driving, international travel).
- Promotes regular 'progress' assessments such as blood pressure and lipid tests.
- Authoritative info, education & motivation for heart healthy lifestyle provided in accessible, repeatable easy to update format - tailored info for the unique needs of the patient.

co-design is about a new way, not automating the old way



1. Attempts are already underway in some countries to automate existing published materials by putting them onto websites. The British NHS has created a Heart Manual that has contributed to their increase in participation and success but it is still not accessible, still doesn't provide coaching and is still pitched at too high a level of literacy for many. It is supported by home visits but this support is simply not scalable in most countries for budget reasons let alone logistics factors such as lack of trained staff. Putting forms and information on websites has proven ineffective for governments putting services online and it will be no more effective for putting heart health online for the same reasons.
2. The answer is in part demonstrated on the British Heart Foundation's HealthUnlocked blog. Patients have questions, hundreds of them, despite being given the usual booklets and brief discussions with a doctor or nurse. This is not about diagnosis and treatment; that is not what a digital human cardiac coach is about. It is things like 'how do I cook kale and quinoa', or 'is there a fitness trainer nearby who understands heart patients', or 'where can I get travel insurance', or 'is there anyone else on this medication?' There are of course questions where the correct response is 'call an ambulance to take you to hospital NOW' or 'see your doctor and ask them' but the majority of questions are about general advice and connection. Some of what they ask is in their booklets but they can't read it or don't understand it.
3. A digital human cardiac coach is about enabling conversations and this is where Co-Design comes in; it works with patients and everyone else involved in their care and support, to understand the intent behind the questions and to answer them as plainly and succinctly as possible. There is no patient question to which the correct answer is 'atherosclerosis' and yet that word appears in many patient publications. Intent is critical; by understanding intent the Q&A repository in the AI corpus is greatly simplified to support its development and updating.
4. Co-Design is not the 'customer consultation' employed by systems integration projects. For example, psychologists work with patients to understand the emotions behind questions, to ensure they are answered empathetically. In this way the digital human cardiac coach evolves through repeated interactions to become a mentor, not just a coach and a trusted advisor, not just a source of information. These connections are the basis of achieving the long term lifestyle changes required for heart health.

what is the heart health ecosystem?

Citizens
At Risk / Not at Risk
Diagnosed / Undiagnosed
Treated / Untreated

- Citizens (including legal and illegal immigrants) might have a risk of heart disease associated with family history (genetics) and lifestyle (smoking, poor diet and exercise, excessive drinking etc).
- Of those at risk, some are diagnosed whilst many aren't diagnosed because they seldom present to a doctor.
- Of those that are diagnosed, treatments can range from non-invasive medications and lifestyle changes to surgery.
- Surgery and medications are not a cure and lifestyle changes are always required to reduce risk. These are called primary prevention (prior to an event or surgery) and secondary prevention (after an event or surgery).
- Most initial and repeat events and surgeries result from non-adherence to the recommended lifestyle changes and medication regime.

Government
Finance & Policy
Licensing & Regulation
Health System (Delivery)

- Governments finance the health system through budget allocations and set broad policy on how the health system will operate.
- Governments also license practitioners and organisations in the health sector and regulate how services are delivered.
- Governments also deliver health services; sometimes exclusively and other times in parallel to commercial organisations.
- Some governments provide 'universal healthcare' but the USA in particular is centred on citizens paying their own way with private health insurance.
- In countries such as Australia the private insurers offer an alternative to universal health care that avoids waiting times in the government system.
- Governments at the Federal, State and Local levels can have a role to play in the health system.
- At the global level the World Health Organisation (WHO) provides information and recommendations for heart disease prevention.

Commercial
Health Insurers
Private Hospitals
Health System Software Providers
Allied Health & Lifestyle Providers
Professional and Industry Bodies

- Health insurers in the USA provide healthcare through their own network of providers.
- In countries such as Australia private insurers have traditionally offered access to non-affiliated service providers (e.g. private hospitals) although this is starting to change with more insurers making commercial arrangements with specific providers.
- Software providers operate in many spaces such as patient administration; patient management; medical applications; supply chain for food/beverage, clinical supplies, pharmaceuticals and engineering; staff rostering and so on.
- Most countries have industry and professional bodies (e.g. Heart Foundations, American College of Cardiology) that support and publish research, and provide information for health care providers and citizens.
- The various Heart Foundations often rely on a mix of government grants, philanthropy and sales of products and services although the latter is usually quite small.
- Commercial advice and programs to assist with lifestyle change sit mainly outside of the government and commercial health care systems and many are non-specific and even unsuited to preventing heart disease. These are usually not licensed although often subject to government regulations aimed at preventing citizens being defrauded or harmed.