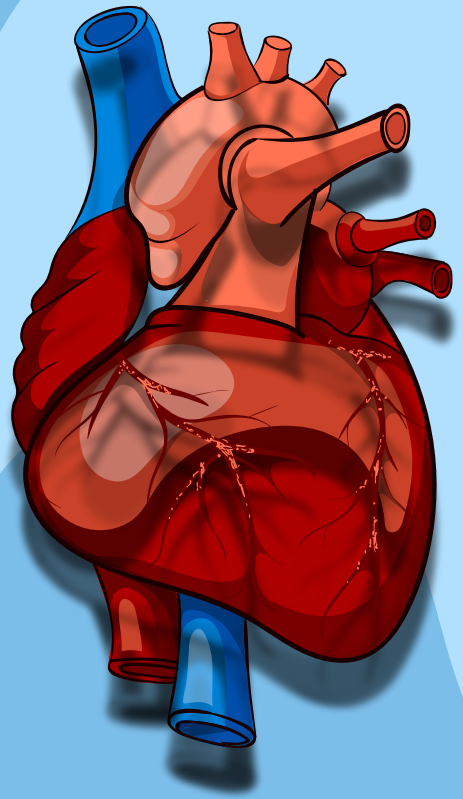

Population Health and Digital Health Promotion : Heart Guard - a wearable device

Component 3 – Group Project Presentation

Model Code : LCHS7009

Lecturer : Dr Besty Jose

Student Names:
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Introduction

- Heart attacks may happen at any time and may not be clearly predicted, posing a threat to unexpected failure (Sinha *et al.* 202).
- The cardiac symptoms exhibited at an early age are delicate and can hardly be identified without constant monitoring assistance.
- The purpose of continuous wearable monitoring is to identify warning signs in time and provide quicker medical attention

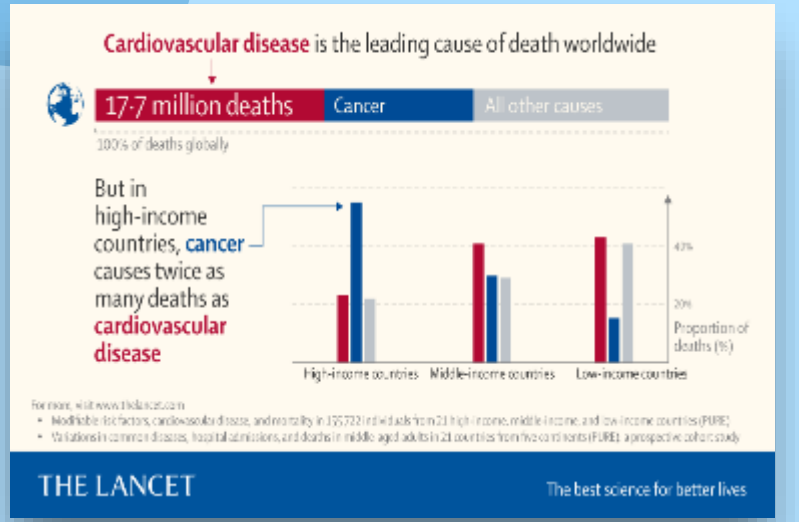
(Source: Emergency Physicians, 2025)

Problem Being Addressed

- Sleeping heart attacks are on the rise, and they usually remain unnoticed.
- People might not realise or experience any of the warning signs, which include having mild chest pain or an irregular heartbeat (Cleveland Clinic, 2023).
- A French student, who is 20 years old, collapsed during the hike, which is why the problem of cardiac conditions under wraps is, raised (Burchell, 2024).
- This is because of sudden cardiac deaths due to the absence of immediate medical intervention (Markwerth *et al.* 2021).

(Source: Neuroscience News, 2025)

Why It Is a Problem



(Source: The Lancet, 2019)

- Heart disease is among the major causes of mortality in the world (Shahim *et al.* 2023).
- **All age groups are affected:**
- Heart attack not only happens to older people young and middle aged people also gets affected due to poor health,stress, anxiety ,depression and poor eating habits*(World Health Organization, 2023*

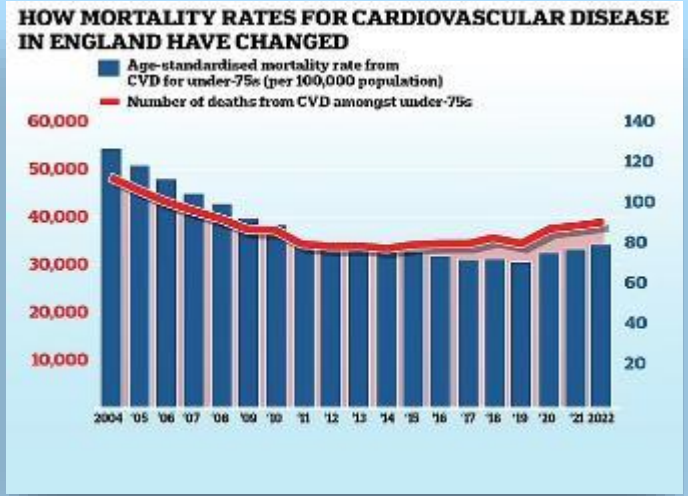
Expanding on the Problem

(Source: Westcott, 2017)

- Heart attacks are usually not noticed since they have mild symptoms that are hard to recognise without any monitoring (Yeghiazarians *et al.* 2021).
- Sometimes medical supervision is lacking, which is part of the delay in treatment and avoidable deaths.
- It should be constantly monitored in order to notice abnormal heart activity as soon as possible.

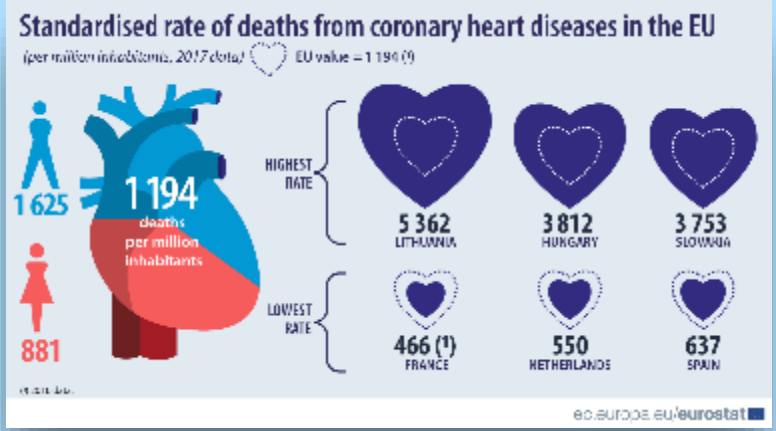
National Statistics

- WHO reports that the annual number of deaths in the world caused by cardiovascular disease is approximately 17.9 million (World Health Organization, 2025).
- According to the British Heart Foundation, it is reported that one person is taken to hospital with a heart attack every five minutes in the UK (British Heart Foundation, 2025).



(Source: Senior and Fernandez, 2024)

Comparison with Other Countries

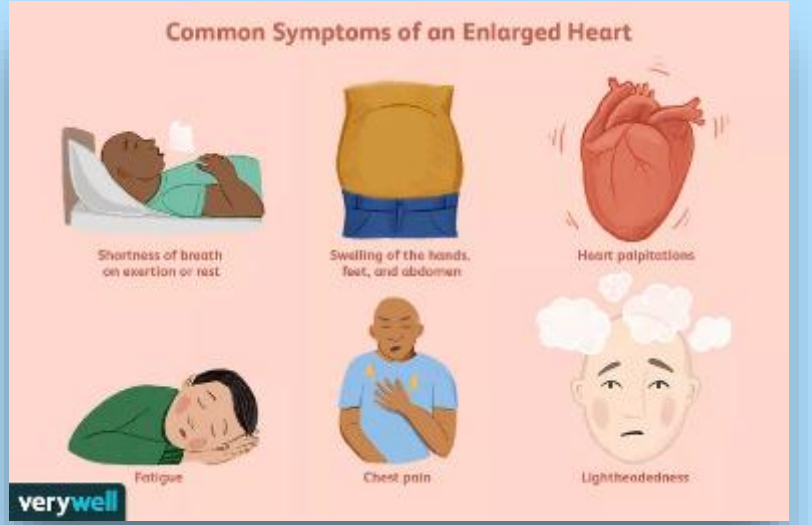


(Source: Eurostat, 2020)

- Other countries, such as Sweden and Spain, are associated with reduced mortality associated with heart attacks because of their robust preventive care systems (World Heart Federation, 2020).
- The reason is that both the UK and the US have higher rates, as the diagnosis will be made at a later stage, when severe cardiac events take place.
- This analogy justifies the implementation of preventive surveillance measures in the target group.

Consequences of Not Addressing the Problem

- Individuals who survived severe attacks on their hearts can become long-term disabled and live a lower quality of life (Schnaubelt *et al*. 2022).
- Late diagnosis is associated with both emotional and financial pressure on the family (Baghdadi *et al*. 2023).
- Lack of emphasis on prevention leads to greater treatment expenses for the public health systems (AbdulRaheem, 2023).



(Source: Charles, 2025)

Intervention: HeartGuard Wearable Health Monitor

- HeartGuard is a smart wearable that is used to check the heart rate, rhythm, and oxygen levels constantly.
- It employs artificial intelligence algorithms to identify the early warning signs of the risk of a heart attack.
- The aim is to facilitate prompt medical response and avoid sudden cardiac arrest.

(Source: Philly Voice, 2021)

Description of the Intervention

(Source: Francisco, 2024)

- The HeartGuard device continuously measures the heart rate, oxygen saturation, as well as rhythm in sleep.
- It relies on AI applications to identify unusual indicators that are associated with the risk of a heart attack.

Target Group

(Source: Sahuja, 2023)

- The intervention is aimed at adults aged 20 to 55 years, as they are more susceptible to cardiovascular disease.
- This involves persons with high blood pressure, diabetes, obesity, high cholesterol, or a history of heart disease in their family.
- Early diagnosis and daily check-ups are beneficial to the target population.

Rationale for the Target Group

(Source: Campbell, 2018)

- Age-related physiological changes increase cardiac risk in adults 20 and above (Kaneko *et al*. 2023).
- They are at risk of diabetes, high blood pressure, and obesity.
- Unremitting surveillance offers essential care in terms of early detection and prevention among this population (Rysz *et al*. 2021).

Setting

- The device will be applied within the home set-up where its major use will be at the time of sleeping.
- It is facilitated in routine cardiovascular monitoring, not in hospitals.
- This device is also able to connect with community health programs and digital healthcare platforms.

(Source: AARP, 2023)

Unique Selling Point

- HeartGuard narrows down to identifying cardiac distress when asleep, and the monitoring is most required.
- It is a hybrid of accuracy in medical-grade monitoring, as well as comfort to be used in the normal environments of homes.
- The gadget offers automatic messages of emergency messages, unlike other normal fitness trackers.

(Source: Vcmo, 2025)

Supporting National Guidelines

- The NHS Long Term Plan (2019) focuses on the prevention of cardiovascular disease and the enhancement of the situation with the early detection (Charles *et al.* 2019).
- Digital health technologies are promoted as a way of monitoring long-term conditions through national guidance.
- HeartGuard conforms directly to these recommendations in that it would assist in home-based preventative care.

(Source: Medtech World, 2022)

Similar Interventions

(Source: Forbes Councils, 2025)

- Smart watches are able to track heart rate, but have no medical-grade accuracy or emergency alerts.
- Hospital cardiac monitors are only practical because they give correct readings, but cannot be used at home continuously (Galzerano, 2022).
- HeartGuard fills all these gaps by providing reliable monitoring in a wearable and comfortable device.

Justification Summary

- The intervention deals with a preventable community health problem that is related to high mortality.
- The target population was chosen regarding evident clinical risk factors and research evidence (Rysz *et al*. 2021).

(Source: Miranda, 2022)

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Student ID: 2435901

Introduction

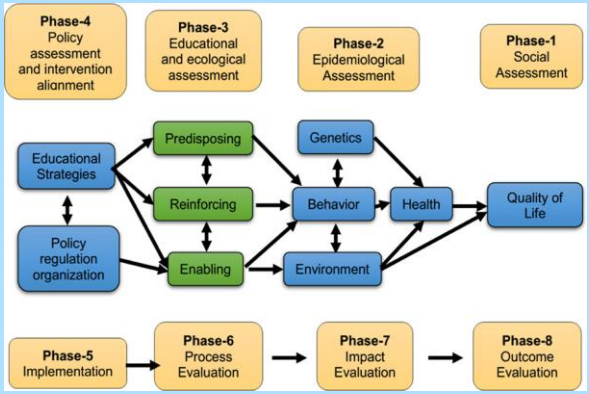
- Heart attacks are a major health issues
- Continuous monitoring is the only way to detect the chances of cardiac events
- The absence of continuous monitoring tools or immediate medical interventions are increasing the chances of cardiac deaths
- HeartGuard aims to fill this gap by introducing a smart wearable which can track oxygen levels, heart rate and rhythm
- This study focuses on describing the uniqueness and potential benefits of HeartGuard

(Source: Neuroscience News, 2025)

The Planning model

Critical understanding of the planning model

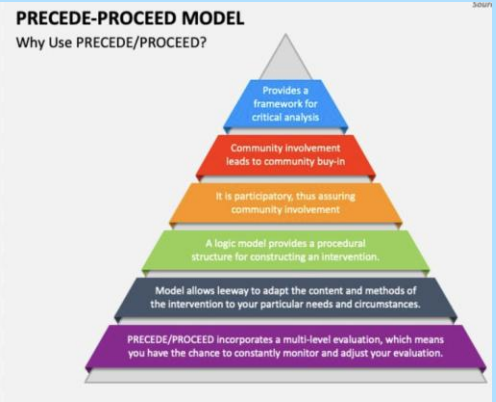
- The PRECEDE–PROCEED model behavioural, environmental and social perspectives in the designing and implementation process (Kim *et al.* 2022)
- It can offer comprehensive benefits for technology driven and complex interventions
- This model starts with a detailed diagnosis related to health issues and the determinants before the implementation (Bahadori *et al.* 2021)
- The model ensures that the specific intervention should be data-driven and has proper focus on the actual requirements of the target audience
- It offers appropriate flexibility in the context of technology interventions
- Continuous feedback collection as well as data monitoring are crucial elements in technological interventions



(Source: Based on Kim *et al.* 2022)

Critical Understanding Of The Planning Model

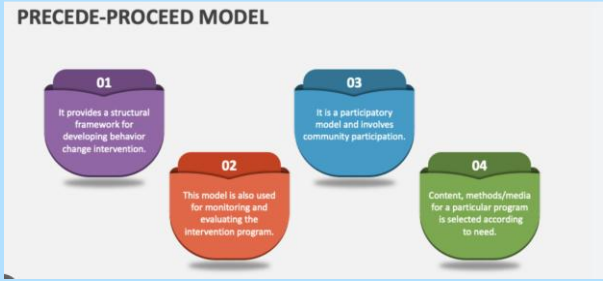
- Extensive data and stakeholder collaboration are critical components while implementing the PRECEDE–PROCEED model
- The model assumes that behaviour change is a linear approach
- The model focuses on rational assessments to predict behaviour change
- Cultural and emotional characteristics are not included in this model (Selvaraj and Sriram, 2022)
- The model has limited focus on technology acceptance
- Data security concerns, usability or perceived ease of use are not integrated in this model
- Cross sector collaboration is one of the most crucial aspects to ensure long term success of this model



(Source: Based on Kim *et al.* 2022)

Justifying The Use of The Model

- The PRECEDE–PROCEED model offers multiple features such as evidence-based characteristics, systematic nature and community-oriented framework
- It helps in the implementation, planning as well as analysis of the digital health initiative
- The model focuses on developing a comprehensive analysis of the environmental, social, epidemiological and behavioural factors
- All these factors can significantly influence the risk factor of cardiovascular issues among adults (Wen *et al.* 2024)
- Implementation of this model will help to ensure that the HeartGuard initiative is not only Technology effective but also aligned to the real behavioural patterns and health requirements of the target audience

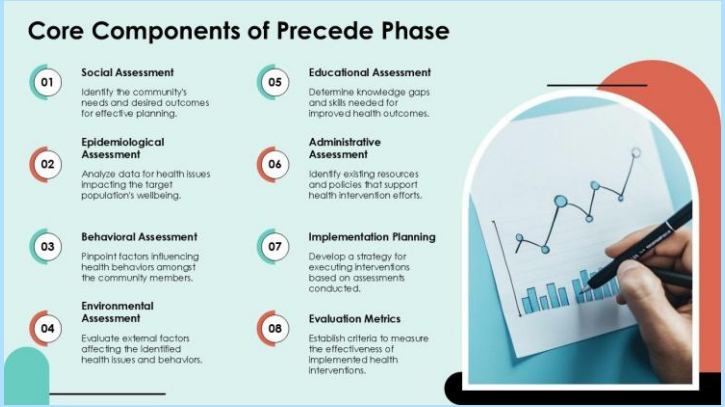


(Source: Based on Wen *et al.* 2024)

Applying The Planning Model To The Digital Health Promotion Intervention

PRECEDE Phase

- The first phase is social assessment
- Addressing the quality-of-life concerns within the adults over the age of 45
- The second task is to address the prevalence related to diabetes, heart disease, hypertension and obesity within the selected is group
- Analysing lifestyle habits of the target age group by collecting primary and secondary information
- Addressing the predisposing factors such as attitudes or awareness regarding digital health tools
- Understanding the enabling factors such as affordability of the new intervention and access to smartphones among the target age group
- Addressing the rain forcing factors such as support from healthcare professionals or family members



(Source: Based on Wen *et al.* 2024)

Applying The Planning Model To The Digital Health Promotion Intervention

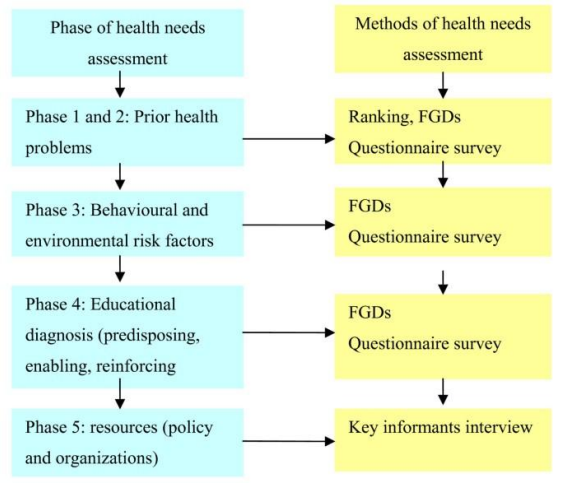
PROCEED Phase

- Introducing the HeartGuard intervention bhai Health Care provider partnerships and digital campaigns
- Introducing proper educational initiatives or awareness initiative to promote the overall benefits of the new intervention
- Evaluation is the most important task while introducing a new project or product (Ghannadi *et al.* 2024)
- Monitoring the overall user engagement, adoption rate as well as functionality regarding the emergency alert system
- Measuring the short-term changes like improved sleep monitoring or enhanced health awareness
- Analysing the long-term outcomes of the intervention such as significant reduction in cardiac emergencies as well as enhanced cardiovascular health within the users

(Source: Based on Ghannadi *et al.* 2024)

Critically Analysing The Chosen Planning Model's Use

- This model is properly linked to data driven assessment (Rakhshani *et al.* 2024)
- Proper linkage to Community centre planning and data can offer long term success to the implementation
- It successfully integrates both environmental factors and Technology factors regarding the selected age group
- Substantial data, time as well as cross sector collaboration will be required to implement all the phases of this model successfully
- There is important to provide proper focus to understand and interpret required resources for implementing each stage
- The model is not suitable while using user-centred design cycles
- However, this model focuses on understanding and interpreting real life issues or expectations



(Source: Based on Rakhshani *et al.* 2024)

Financial Implication

- Financial implications are at central while developing the HeartGuard device
- Appropriate financial implications can ensure long term sustainability, accessibility and scalability to that target audience (Salamah, 2023)
- Maintaining cost effectiveness is the most important priority of this intervention
- The HeartGuard device has the aim to offer automated and continuous cardiac monitoring facilities through the integration of an AI based device
- It can reduce the requirements of costly diagnostic procedures, frequent hospital visits as well as emergency interventions
- Early detection related to cardiac distress during sleeping time can be helpful to ensure timely medical response and it can potentially save lives
- This technology can reduce the major cost factors related to advanced cardiac treatment, post heart attack care and hospitalisation

(Source: Based on Charles and Ochieng, 2023)

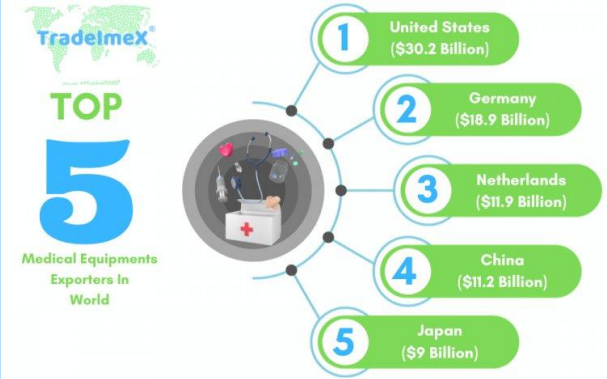
Financial Implication

- Investment in this preventive Technology can offer significant return on investment for both the healthcare systems and individuals
- Maintaining cost efficiency in the production is important to ensure long term profitability and scalability
- Outsourcing manufacturing components from China can significantly improve cost efficiency of the project (Charles and Ochieng, 2023)
- China is recognised as the global leader in electronic chips, medical sensors and wearable technology components manufacturing
- China exported approximately $62.3 billion worth of semiconductor devices in 2023 (Oec.world, 2025)
- China exported approximately $11.4 billion worth of medical instruments in 2023-2024 financial year (Fortuneindia.com, 2025)

(Source: Based on Oec.world, 2025)

Financial Implication

- Making collaboration with reliable and credible Chinese suppliers can help in this project to reduce assembly, production and logistic costs
- The Chinese manufacturers are known for not compromising product quality and contract manufacturing strategy can be helpful in this aspect
- It will help to offer competitive price based on the standard of the digital health market
- Integration of AI based analytics as well as cloud based monetary can reduce the cost of operations over a longer time period
- Traditional Healthcare models generally depend on continuous supervision of human
- The completely automated system of HeartGuard will help to reduce the requirements of continuous involvement of medical personnel
- It will help to reduce labour cost



(Source: Based on Fortuneindia.com, 2025)

Financial Implication

- The subscription based Digital services as well as data sharing partnerships with Healthcare organisations can significantly generate revenue streams
- It will help to maintain continuous and strong financial sustainability
- The overall scalability of this new technology will help to expand this technology in the emerging markets with minimal incremental cost
- It can use the already existing digital infrastructure to promote sustainability
- However, it is important to maintain proper balance between cost saving measurements and quality standards
- It is important to maintain strong partnership only with certified suppliers who are capable to follow the standards of international medical devices

(Source: Based on Dobrovolska *et al.* 2024)

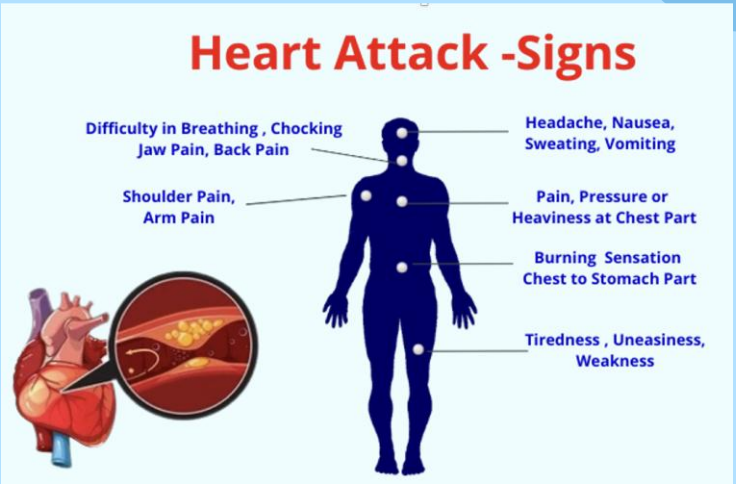
Financial Implication

Component	Source	Cost for each unit ($)	Description
Oxygen sensor and optical heart rate sensor	Outsourcing from China	15	High quality standards
Casing materials and battery	China	6	Durable and lightweight
AI chip and microcontroller	China	10	Effective for data processing
Import duties and shipping	China to the UK	5	Bulk shipment
Packaging and assembly	China	6	Quality testing included
Total cost		$42	

- The outsourcing strategy can help to reduce manufacturing cost by 30 to 40% compared to Western manufacturing

Need For This Intervention

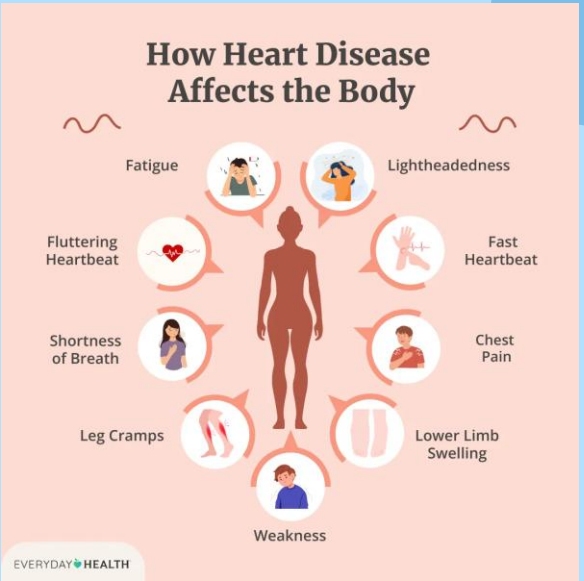
- Adults above the age of 45 are at higher risk of heart disease due to multiple factors such as obesity, hypertension or diabetes (Venkatesh *et al.* 2022)
- Continuous monitoring by HeartGuard intervention will help to address early warnings
- There are significant gaps within the early detection as well as prevention mechanism
- Many individuals within the selected age bracket do not complete regular cardiac screening due to lack of accessibility, high cost and lack of time
- It indicates the requirements of an at home prevention tool which can inform both care providers and patients



(Source: Based on Dobrovolska *et al.* 2024)

Need For This Intervention

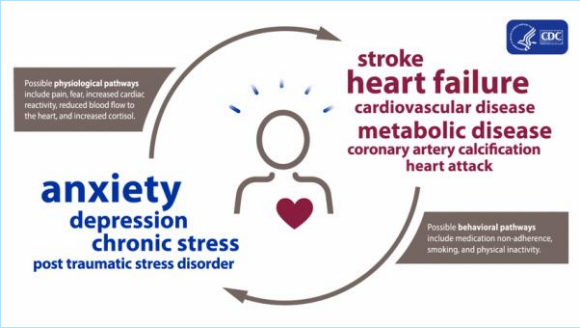
- The simple and accessible app design will help target older adults with large icons, clear visuals as well as multilingual support (Zhou *et al.* 2024)
- Cyber security and cloud storage facilities are required to ensure protection of highly sensitive health data (Dobrovolska *et al.* 2024)
- Machine learning models will be required to train diverse data sets for insuring accuracy in detection
- Proper compliance with UK MHRA medical device regulations and GDPR will be needed (Gov.uk, 2025)



(Source: Based on Dobrovolska *et al.* 2024)

Describing Outcomes Compared With How People Effected

- The WHO recognises cardiovascular disease as one of the leading causes of Global deaths
- Many cases are results of late diagnosis as well as the absence of preventive monitoring (Niwa *et al.* 2021)
- The HeartGuard intervention will offer continuous monitoring and it will help to reduce hospital admissions and Healthcare expenses
- Anxiety and fear related to heart health are common among older adults and they are living with uncertainty regarding the actual cardiac condition
- Continuous monitoring feature of this technology will help to address anxiety and fear related to heart health
- Limited access to continuous monitoring feature is influencing individuals to depend on periodic checkups or hospital visits
- Continuous monitoring feature through AI integration will help to identify irregular regions of heart and oxygen drops



(Source: Based on Dobrovolska *et al.* 2024)

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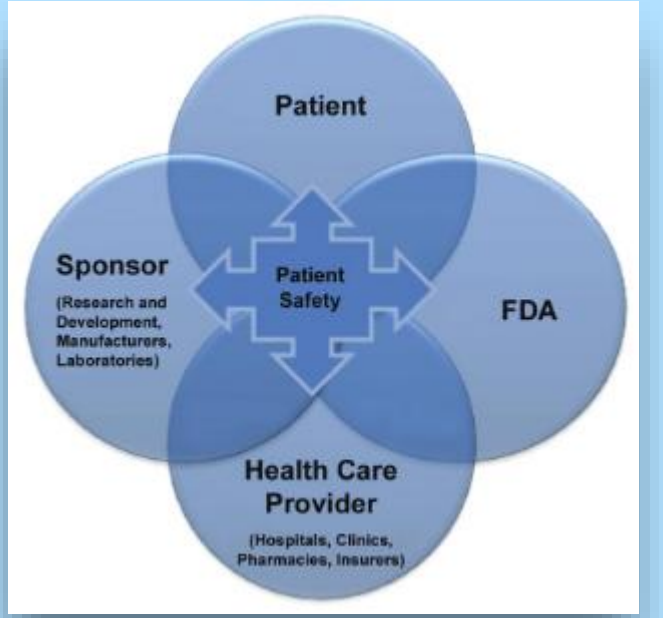
Stakeholders in Digital Health Promotion

- Among the stakeholders, there are healthcare providers, technology developers, patients, policymakers, and funding agencies (Wu *et al.* 2019).
- Teamwork and cooperation are the keys to effective implementation and long-term sustainability of HeartGuard intervention.
- All stakeholders lead to the technical, clinical and ethical control.

(Source: Asian Heart Institute, 2024)

Healthcare Stakeholders



(Source: Cupryk, 2011)

- Data on HeartGuard is analysed by NHS Digital, cardiologists, and emergency services in order to make timely interventions.
- Primary care teams make use of insights to monitor the patient and diagnose early.
- Through collaboration, AI technologies can be more integrated into the work of the NHS (Scobie and Castle-Clarke, 2020).

Technology and Industry Stakeholders

- The reliability and safety of the systems are guaranteed by AI engineers, the manufacturers of the devices, and cybersecurity (Emehin *et al.* 2024).
- The developers ensure algorithm transparency, updates and interoperability with clinical databases.
- The partnerships in the industry encourage innovation and adherence to the standards of the medical devices.

(Source: IBM, 2021)

Community and Policy Stakeholders

(Source: Stock, 2025)

- Awareness is encouraged at the level of patients, caregivers and such advocacy agencies as the British Heart Foundation (Nwosu *et al.* 2022).
- NICE and MHRA control the approval of devices and their quality.
- Along with national strategies against cardiovascular prevention, the policy actors establish alignment.

Importance of Multi-Stakeholder Collaboration

- The technological, policy, and health fields can collaborate to provide effective data exchange and interventions (Chianumba et al. 2021).
- Develops trust in patients and increases the use of technologies in the communities.
- Cultivates the culture of solid ethical responsibility and sustainability of HeartGuard implementation.

(Source: Boseley, 2015)

Overview of Barriers

(Source: Lifestyle Desk, 2019)

- There are technical, behavioural, financial and organisational barriers.
- Such difficulties decrease the adoption, equity and the effectiveness of the programme in general.
- Early detection can be used to develop contextual solutions to HeartGuard rollout.

Technical and Infrastructure Barriers

- These issues of connectivity and inadequate interoperability within the NHS have an impact on real-time monitoring.
- The system reliability is lowered by the presence of algorithm inaccuracy and the cost of maintenance.
- There are also data storage and data security threats that pose a challenge to user confidence (Nifakos *et al.* 2021).

(Source: GeeksforGeeks, 2023)

Behavioural and Socio-Cultural Barriers

(Source: Miranda, 2022)

- Poor digital skills among the older individuals reduce the use of HeartGuard.
- There are privacy apprehensions and a cultural distrust that prevent the involvement of AI-based monitoring (Williamson and Prybutok, 2024).
- Perceived health benefit is lacking hence decreasing the levels of engagement.

Organisational and Financial Barriers

- Small-scale use of HeartGuard is limited by the small NHS budgets available as well as the high cost of devices.
- Lack of adequate training of the staff minimises the impact of implementing the technology.
- The absence of single digital health policies slows the process of integrating into the existing care pathways (Chow *et al.* 2020).

(Source: Shutterstock, 2025)

Ethical Barriers

(Source: M3 India, 2018)

- The ethical issues of transparency of the AI algorithms and data decision-making are also raised (Thiruma Valavan, 2023).
- There is the possibility of algorithm training bias, which will put some groups of people at a disadvantage.
- Poor patient knowledge could restrict informed consent to using data.

Solutions to Technical Barriers

- The interoperability can be enhanced with the help of integrating HeartGuard data with NHS secure networks.
- Software validation is regular so that the algorithm is correct and the devices can work reliably (Pospieszny *et al.* 2018).
- Stronger encryption procedures improve the security and loyalty of users.

(Source: Marr, 2022)

Solutions to Behavioural and Organisational Barriers

(Source: Tokel, 2024)

- The older adults can be empowered through digital literacy workshops to be confident to use wearable monitors.
- The training programmes of healthcare staff are effective in enhancing digital practice readiness and confidence (Kruszyniak *et al.* 2022).
- HeartGuard technology can be accepted and made more accessible to the population through public health campaigns.

Sustainability and Continuous Improvement

- Constant feedback from the user will make HeartGuard receptive to patient demands and available technology.
- The maintenance and software updates regularly ensure that the system is more reliable and safer with time.
- Incorporation of sustainability objectives assists in scaling the former long-term in cardiovascular health programmes on the national scale (Rajagopalan *et al.* 2025).

(Source: Prasad, 2022)

Legal and Regulatory Issues

(Source: Bennett University, 2024)

- To safeguard personal and sensitive health information, HeartGuard will have to follow GDPR 2018 (Zaeem and Barber, 2020).
- MHRA regulatory approval assures that the standards of the device meet medical-grade requirements of safety (Manfrin *et al.* 2025).
- The responsibility for misusing or misbehaving data should be established well between the manufacturers and healthcare providers (Ullagaddi, 2024).

Addressing Legal and Ethical Issues

- The privacy and security issues can be addressed with data anonymisation and user consent policies.
- AI monitoring must be conducted on transparent and algorithmic reporting, which fosters fairness and does not choose biased results.
- Data management by NHS Digital is ethical and legal in compliance with the Data Security and Protection Framework (Ogbodo *et al.* 2025).

(Source: SGT University, 2023)

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Introduction

- Different kinds of benefits together with their vast implications and predicted future results of the intervention are discussed in this part of the presentation.
- Effective revampment in the promotion of public health along with professional practices is also highlighted here.
- The study shows how HeartGuard is useful in digital cardiovascular prevention.

(Source: Cardiology Associates Of Michigan, 2019)

Core Objective of HeartGuard

(Source: Stockwell Safety, 2019)

- HeartGuard is a device that is designed to monitor heart distress in the person when they are asleep to avert fatalities.
- The intervention encourages unremitting health surveillance and prompt response.
- It promotes national goals of lessening premature cardiovascular mortality.

Health Benefits to Target Population

- Constant control is the key in the early detection of irregular heartbeats and the drop in oxygen (Dias and Paulo Silva Cunha, 2018).
- Adults will get a proactive alert at the age of 45 years and above, and this will lessen the emergency delays.
- It is an intervention that is beneficial to increase the survival rates and wellbeing in the long term.

(Source: Harvard Health, 2014)

Clinical Benefits

(Source: CareRev, 2024)

- Real-time information helps the clinicians in recognising the risk tendencies prior to the onset of vital occurrences (Kalid *et al.* 2018).
- Remote assessment and teleconsultation are favoured with the integration with NHS systems.
- Early identification means that the treatment becomes timely and the rates of readmission in hospitals decrease.

Psychological and Social Benefits

- The customers are less stressed about the fact that they constantly monitor health indicators (Ajana, 2020).
- Real-time notifications and access to health improve the level of confidence in families.
- It enhances social connectedness amongst patients, families and healthcare teams.

(Source: Economic Times, 2022)

Economic Benefits

(Source: Sprint Medical, 2020)

- The prevention of events that cause serious cardiac diseases reduces healthcare costs in the long term.
- A shorter hospitalisation saves the NHS resources and enhances the efficiency of work (Dean *et al.* 2022).
- Preventive digital surveillance completely changes the expenditure of treatment to prevention.

Public Health Outcomes

- The intervention is adding to national cardiovascular preventative objectives.
- It aids WHO technology-induced community health promotion.
- The benefits of a healthier heart are less mortality and morbidity in the country (Nowbar *et al.* 2019).

(Source: Nizalova, 2016)

Expected Behavioural Outcomes

(Source: Dhruv, 2024)

- Frequent observation will make the users change their lifestyles to healthier ones.
- The physical activity and adherence to medication are encouraged by the real-time feedback (Western *et al.* 2022).
- Increased self-awareness facilitates behaviour change and continued interest.

Policy Development and Innovation Support

- HeartGuard is evidence that can inform digital-health policy frameworks in the future.
- Public-private partnerships can help scaling through innovation funding.
- Success in an initiative can affect national technology.

(Source: Economic Times, 2021)

Policy Implications

(Source: CVG, 2025)

- HeartGuard is in favor of NHS digital transformation, and preventive care strategies.
- Reasoned information may also inform novel heart examination models (Aerts *et al.* 2022).
- Implementation evidence can influence the future guidelines of e- health in the country.

Integration with National Health Strategies

- Conforms to supporting early diagnosis and self-care suggested at the NHS Long Term Plan (2019) (Mair *et al.* 2024).
- Promotes proliferation of electronic surveillance devices in the community.
- Illustrates the ways in which innovation reinforces already held health infrastructure in the population.

(Source: Solh Counselor, 2023)

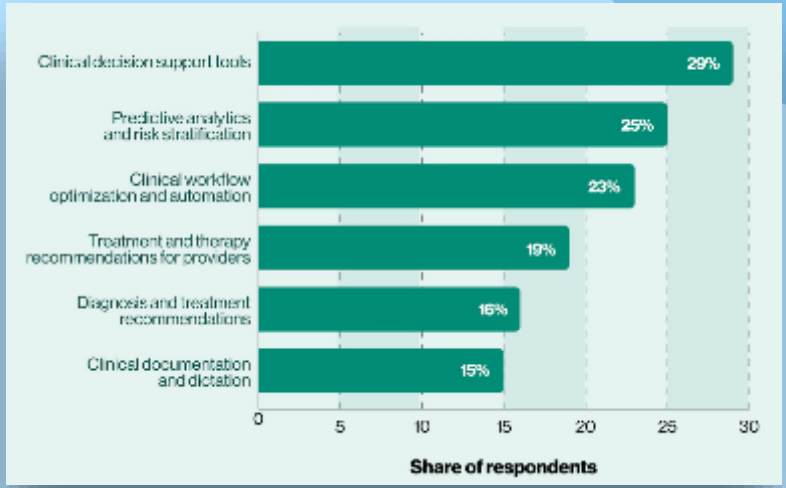
Implications for Health Education

(Source: Thaain, 2025)

- It encourages the digital literacy education of healthcare providers and patients.
- It urges colleges and universities to integrate AI and digital surveillance into the curriculum (George and Wooden, 2023).
- It develops a human resource that is able to support technology-based preventive care.

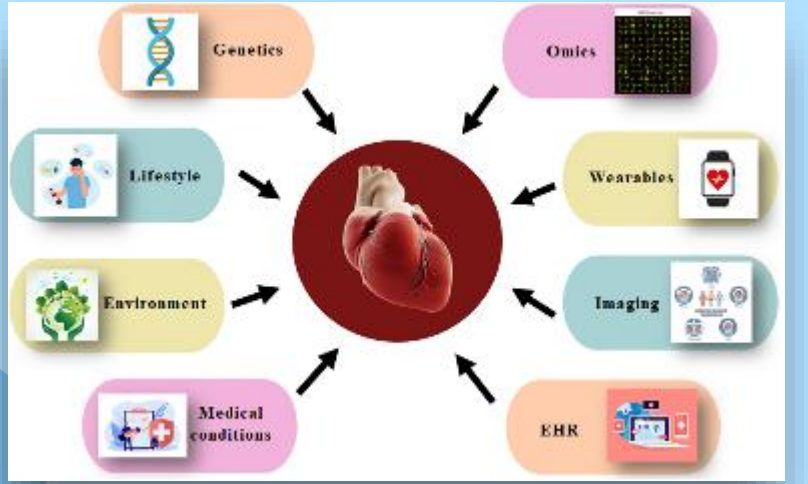
Professional Development and Training

- The AI-generated health data is being interpreted and gaining experience by healthcare providers (Nouis *et al.* 2025).
- Confidence in the use of wearables can be enhanced by continuous learning programmes.
- The intervention encourages interdisciplinary cooperation between the clinicians and the technologists.



(Source: AIPRM, 2024)

Research Implications

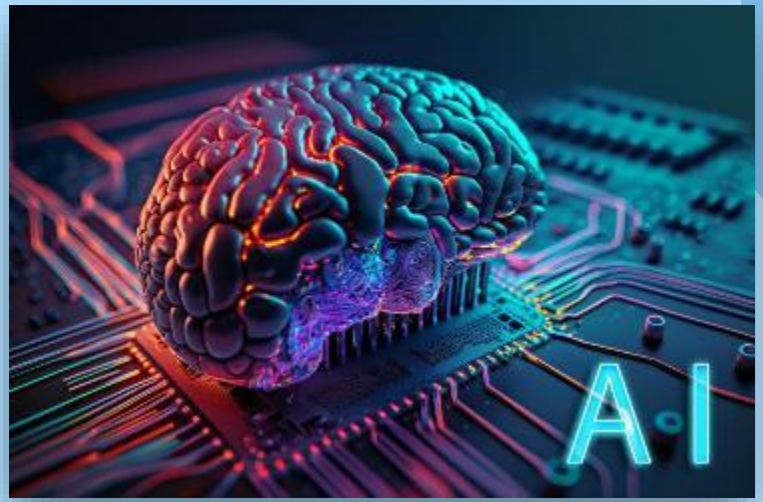


(Source: Singh *et al.* 2024)

- An enormous amount of data can be generated by HeartGuard to aid predictive modelling studies.
- The results may be used to influence the development of AI-based cardiac risk prediction (Ekundayo and Nyavor, 2024).
- Facilitates the wearable health technologies to be refined and evidence-based.

Ethical and Social Research Impact

- Ethical studies of AI provide equity, data confidentiality, and integrity of online surveillance.
- Research is a possibility in regard to patient acceptance and cross-cultural adaptability (Prakash *et al.* 2019).
- This piece of evidence guides the international efforts in digital health equity.



(Source: Hicks, 2023)

Conclusion

(Source: The HashTag Magazine, 2023)

- The presentation on our group project – “HeartGuard: Early Detection of At-Risk Cardiac Patients” – explains how it is in alignment with national health priorities and digital health initiatives.
- If no interventions are made, undetected nighttime cardiac events will continue, causing preventable mortality and long-term disability.
- The future plans encompass large-scale integration with NHS, regular refinement of AI models, and introduction to other cardiovascular-risk populations.

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