NICE National Institute for Health and Care Excellence

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HealthTech Programme

Medical Technologies Advisory Committee (MTAC

HTE10060 Digital platforms to support cardiac rehabilitation – 1st meeting

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Link to SCM list for topic:	https://www.nice.org.uk/guidance/indevelopment/gid-hte10060/documents

The following documents are made available to the Committee:

1. Cover sheet

2. External assessment report overview (ARO)

3. Patient group, professional group and NHS organisation submissions
   3a. Sommerville Heart Foundation submission – received on time and passed to EAG to inform their report
   3b. Cardiomyopathy UK – received late after the deadline, passed to EAG for information only

4. External assessment report (EAR)

5. Stakeholder comments on the economic model and draft external assessment group (EAG) responses to comments [no CON]

6. Stakeholder comments on the External Assessment Report (EAR) and draft external assessment group (EAG) responses to comments [no CON]

7. Register of interests

Early value assessment

Digital platforms to support cardiac rehabilitation

Assessment report overview

This overview summarises key information from the assessment and sets out points for discussion in the committee meeting. It should be read together with the final scope and the external assessment report. A list of abbreviations used in this overview is in appendix A.

1. The technologies

Digital technologies to support cardiac rehabilitation are a possible treatment option for people with cardiovascular disease (CVD). They can be used via mobile phones, tablets or computers, and are intended to be offered as an option to deliver cardiac rehabilitation programmes remotely, enabling people with CVD to self-manage their care at a time and location that is convenient to their lifestyle.

Thirteen technologies were included in the scope and external assessment report (EAR). Technologies typically cover most or all of the standard components of conventional cardiac rehabilitation (BACPR, 2023) and many of the technologies are in use in the NHS. Digital platforms for cardiac rehabilitation vary in terms of the mode of delivery (website, applications or digital manuals), the components of cardiac rehabilitation that are offered, target populations, duration of programme, the frequency and level of support by healthcare professionals, and other features.

The technologies included in this assessment are shown in table 1.

Table 1: Interventions

Company/ Technology	CE/UKCA mark	Description
University Hospitals of Leicester NHS trust • Activate your heart	NR	• Web based platform • Personalises features such as exercise programmes and educational resources using input from a healthcare professional and the user • Provides direct access to healthcare professionals and an interactive forum • Users retain access for 12 months after discharge from cardiac rehabilitation services
Avegen Ltd • Beat Better	NR	• App based platform • Exercise, educational resources on heart health and dietary recommendations for users chosen by clinicians • Users can track health measurements, exercise symptoms, mood and medication via the app which can be reviewed by clinicians
Datos Health Ltd • Datos Health – AI driven Hybrid Care Platform	No	• App based platform • Allows users to track vitals, report symptoms, complete assessments, and receive personalised educational content. • Allows users to communicate with their care team through secure in-app messaging, SMS, and phone or video call • Clinician dashboard provides real-time patient insights, automated alerts, and remote intervention capabilities, allowing clinicians to monitor progress, adjust care plans, and facilitate virtual consultations
Health and Care Innovations • D:REACH HF	NR	• Web based platform • Provides exercise programmes, educational content, progress tracking, resources for family and friends. Requires support from a healthcare professional.

		• Users can track their own exercise and health parameters, which are accessible to clinicians through an online platform. • Psychosocial support is provided to the user and family and friends via a stress management programme
NHS Lothian • Digital Heart Manual	NR	• Web based platform • Different versions available for people who have had a myocardial infarction or angioplasty and for people who have had revascularisation (angioplasty and coronary bypass) but no myocardial infarction • Provides exercise guide, education, diet, and psychological support
Medtronic • Get Ready – Solution	Class 1 Seeking class 2a	• Access via website and app • Deliver educational content on cardiac conditions and risk factors and general guidance on daily activities and can be customised by healthcare professionals for local needs. • Provides reminders to keep users on track, document progress and also record and share clinical measurements through wearables and connected devices which can be shared with clinicians
DDM health • Gro Health HeartBuddy	Class 1	• App based • Provides education, exercise programmes, health tracking, dietary support, psychosocial support, lifestyle and behavioural modifications based on input from user and clinician engagement.
Ki Performance Lifestyle Limited • KiActiv	Seeking class 1	• Incorporates a web application, mobile application and a proprietary wearable device that collects and processes physical activity data. • Provides interactive tools for users to log and self-monitor medication use, physical activity data, pain, stress, fatigue, overall health, lifestyle behaviours and symptoms • Signposts users to educational resources at set times
Luscii healthtech B.V. • Luscii Vitals	Class 2a	• App based platform • Provides personalised exercise plans that are developed with the cardiac rehabilitation team.

		• The platform allows users to contact their healthcare team and supports video consultations. • Users can self-monitor by recording their symptoms or completing questionnaires, and outputs such as educational resources can be personalised based on these inputs.
my mhealth Limited • myHeart	Class 1 UKCA	• App and web-based platform • Automatically personalises educational content and guidance using the user's diagnosis and information about lifestyle including smoking cessation and weight management • Provides psychological support, lifestyle and risk factor interventions such as symptom trackers activity diary, medication diary, and electrocardiograph and echocardiogram results tracking.
Pumping Marvellous Foundation • Pumping Marvellous Cardiac Rehab Platform	NR	• Web-based platform • Provides exercise programmes based on the person's ability to exercise (low and medium). • Provides educational material and psychosocial support through a peer-to-peer online community
RPlusHealth Limited • R Plus Health	Class 1	• App and web-based platform • Allows users to follow their exercise prescriptions, access education materials and psychosocial support, record vitals and diet and complete questionnaires • Clinician can review and revise personalised fitness tests and exercise prescriptions suggested by the tool, monitor users' exercise logs and health metrics, adjust care plans or conduct reassessments and create personalised educational content
Sword Health • Sword Move	Seeking class 1	• App-based platform • Provides personalised exercise and guidance developed with a company-employed physical health specialist.

		• Uses an AI model to analyse and collect the user's history and performance, suggest actions and alert abnormalities to the physical health specialists via the clinician portal • An optional feature for users to track activity and record heart rate during exercise using a proprietary wearable or other compatible device.

Abbreviations: NR, not required; AI, artificial intelligence

See section 2, Table 1 and 2 in the EAR for additional details about the included technologies.

2. The condition

Cardiovascular disease (CVD), also known as heart and circulatory disease, is a long-term condition that affects the heart and blood vessels supplying different organs in the body. The term CVD includes but is not limited to:

- Coronary heart disease – conditions that cause narrowing or complete blockage of the blood vessels supplying the heart. This results in increased pressure on the heart and can lead to acute coronary syndrome and heart failure.
- Acute coronary syndromes – medical emergencies that include myocardial infarction (heart attack) and unstable angina (unexpected, severe chest pain).
- Heart failure – a structural or functional abnormality of the heart in which the heart is not able to pump blood efficiently.
- Valvular heart disease – conditions in which one or more of the valves in the heart does not function properly.
- Congenital heart disease – a group of conditions present at birth that affect the structure of the heart and the normal way the heart works.
- Peripheral arterial disease – a condition that results from build-up of fatty deposits in the walls of the arteries which restrict blood supply to the muscles in the leg.

3. Current practice

Cardiac rehabilitation is an option for secondary prevention of cardiovascular disease. The core components of cardiac rehabilitation are health behaviour change and education, lifestyle risk factor management, psychosocial health, medical risk management and long-term strategies. The British Association for Cardiovascular disease Prevention and Rehabilitation (BACPR) recommends that cardiac rehabilitation be offered to individuals who have had an eligible cardiovascular condition before discharge from hospital. Currently, cardiac rehabilitation in England, Northern Ireland and Wales is prioritised for people with acute coronary syndromes, coronary revascularisation or heart failure (National Audit of Cardiac Rehabilitation, 2024), in line

with NHS commissioning standards. Face-to-face cardiac rehabilitation is an established treatment option for coronary heart disease. A meta-analysis comparing cardiac rehabilitation programme with at least 6 months follow up data to no-exercise control reported statistically significant risk reduction in cardiovascular mortality and hospitalisations (Dibben et al, 2023). The EAG notes benefits accrue over time with evidence showing statistically significant reductions in all-cause mortality after 12 months and up to 5 years for people who received cardiac rehabilitation compared to those who did not.

The duration of cardiac rehabilitation programmes varies across the UK, with a median length of 8 weeks (NACR, 2024). There is variation in how cardiac rehabilitation is delivered between NHS centres or trusts. Conventional cardiac rehabilitation could consist of face-to-face sessions, or a hybrid programme of in-person group-based and home-based programmes (including paper manuals, live online classes, home visits, or telehealth).

4. Unmet need

Cardiovascular disease (CVD) is a leading cause of death and disability affecting over 7.6 million people in the UK. CVD causes about a quarter (26%) of all deaths in the UK. Healthcare costs relating to managing heart and circulatory diseases in the UK are estimated at £12 billion each year (BHF UK Factsheet, 2025).

In England, only 41% of eligible individuals with acute coronary syndrome and 13% of those with heart failure participate in cardiac rehabilitation programmes (NACR, 2024). The NHS Commissioning standards for cardiovascular rehabilitation suggests some ways of improving access to cardiac rehabilitation services, including delivery of programmes via a variety of modes, supporting people to move between delivery modes, and providing processes for re-offer and re-entry into rehabilitation. Clinical experts also advised that people who opt for digitally supported cardiac rehabilitation are more likely to be younger or working full-time, as in-person cardiac rehabilitation groups are typically in the week during working hours.

There is a potential benefit for digital platforms to improve access, uptake and adherence to cardiac rehabilitation programmes, leading to a reduction in unplanned hospital admissions and acute events resulting from deterioration of the condition. Improved access could also reduce health inequalities (see section 9).

Further details on the interventions, comparator, and care pathway are in the final scope.

5. Clinical effectiveness

The external assessment group (EAG) did a search to identify relevant published clinical evidence, which was supplemented by company responses to requests for information from NICE. The search and selection methods are described in section Appendixes A to C of the EAR.

5.1 Overview of key studies

A total of 32 papers (29 for clinical effectiveness and 3 for cost effectiveness) were identified**.** The EAG prioritised 15 clinical effectiveness studies based on quality and relevance to the objectives of this assessment, of which 5 were randomised controlled trials (RCTs). Eligible evidence was available for 8 of the 13 technologies: 3 studies on Activate your heart, 1 study on Datos health, 2 studies on D:REACH HF,1 study on Digital Heart Manual, 1 study on Gro Health HeartBuddy, 2 studies on KiActiv, 2 studies on myHeart, and 3 studies on R Plus Health.

RCT evidence was available for Activate Your Heart, KiActiv, myHeart and R Plus Health, of which 3 were versus conventional in-person cardiac rehabilitation. Only single-arm non-comparative evidence was available for Datos Health, D:REACH-HF, Digital Heart Manual, and Gro Health HeartBuddy. Evidence for D:REACH-HF was qualitative and 1 study for myHeart used a retrospective observational design. Beat Better, Get Ready - Solution, Luscii Vitals, Pumping Marvellous Cardiac Rehab Platform and Sword Move had no included studies. Where no evidence was available against conventional in-person cardiac rehabilitation, the EAG considered studies compared to

usual care. Usual care, where described, differed between studies and was either defined as referral back to GP for periodic but no active interventions, or was undefined.

Studies for 6 of the technologies were conducted in the UK and included urban and rural settings. Evidence for Datos Health was based in Israel, while evidence for R Plus Health was in China and the USA. The EAG noted the limited generalisability of these studies to a UK population due to differences in population characteristics and healthcare setting.

Clinical populations assessed varied across interventions and reflect the variety of clinical conditions of people accessing cardiac rehabilitation services in the UK. Studies cover a wide range of types of CVD, including angina, myocardial infarction, heart failure, coronary artery disease, cardiac interventions and broad cardiovascular disease populations. Some studies may not reflect the population that is prioritised for cardiac rehabilitation in the NHS. Sample sizes varied widely from 10 participants up to 434 participants in a large retrospective real-word study. Population characteristics commonly reported by the EAG were age and sex. Study populations typically included older adults (mean or median ages between 50 to 66 years) with a higher proportion of male participants and cardiovascular conditions prioritised for cardiac rehab. People who lacked digital literacy or access to internet or smartphones were commonly excluded across studies. The EAG notes that this reflects clinical practice as people who lack digital literacy are less likely to be offered or to take up digitally supported cardiac rehabilitation.

There was a variation in the outcomes available, and how they were assessed between studies and technologies. There was no single outcome that was universally available across all studies. Exercise, adherence, and usability and acceptability were commonly included outcome measures. The EAG noted variation across studies in definitions of completion and uptake, which are key model parameters. A small number of studies reported on health-related quality of life (HRQoL), psychological wellbeing, nutrition status and hospital readmissions. None of the studies reported on mortality and medication adherence. The EAG did not identify any other evidence addressing the

scoped subgroups. Due to the significant heterogeneity of data reported in the studies, it was not possible for the EAG to synthesize the evidence.

Table 2 presents an overview of the study design and characteristics of the included studies. Further details of the study design and characteristics are in section 4 of the EAR.

Table 2: Study design and characteristics of prioritised studies

Technology/ Reference	Study design & country	Population	Intervention	Comparator(s)
Activate Your Heart Devi et al, 2014[9]	RCT (not blinded), UK (Leicester). Intervention group n=48, 71% male, mean (SD) age 66.27 (8.35) years. Control group n=46, 78% male, mean (SD) age 66.20 (10.06) years.	Stable angina managed in primary care. No conventional CR within the past year, unstable angina, severe anxiety or depression, conditions preventing physical activity, inability to read English, or computer illiteracy.	Activate Your Heart, follow-up after 6 weeks, introductory face-to-face meeting then web-based (no further face-to-face contact).	Treatment as usual by GP – placed on coronary heart disease register and attend annual review.
Activate Your Heart Brough et al, 2014[12]	Pilot study (prospective observational), UK (Leicester). n=41, 90% male, mean (SD) age 60.5 (11.1) years.	Low-risk coronary heart disease. Percutaneous coronary intervention or coronary artery bypass graft in the last 3 months or medically managed for coronary heart disease. No unstable angina, severe anxiety or depression, conditions preventing physical activity, inability to	Activate Your Heart, follow-up after 8 weeks. Participants were contacted if they hadn't logged in for 7 days or were not progressing.	None.

		read English, or computer illiteracy.		
Activate Your Heart Houchen-Wolloff et al, 2018	Feasibility RCT (blinded assessment), UK (Leicester and Lincolnshire). Intervention group, n=37, 89% male, mean (SD) age 62 (10) years. Control group, n=23, 91% male, mean age 61(8) years.	Coronary heart disease eligible for conventional CR (but declined or dropped out in past 12 months). No severe anxiety or depression, poor exercise capacity, inability to read English, or computer illiteracy.	Activate Your Heart, follow-up after 8 weeks and 6 months.	Usual care – referral back to GP and general advice in the form of standard verbal advice and guidance booklets. Offered opportunity to participate in Activate Your Heart after 6-month follow-up.
Datos Health Nabutovsky et al, 2020	Prospective single-arm study, Israel. n=22, 77% male, mean (SD) age 52.7 (0.81).	People with established coronary artery disease and low cardiovascular risk. No heart failure or severe orthopaedic or neurological or cognitive impairment.	Datos Health (six-month programme).	None.
D: REACH HF Cross et al, 2023[16]	Qualitative, UK. n=10 (5 of which are people with heartfailure)	People with heart failure, caregivers, and health professionals.	D: REACH-HF (12-week programme).	None.

D: REACH HF Van Beurden et al, 2022[17]	Qualitative, UK. Total n=19.	People with heart failure, caregivers, and health professionals.	D: REACH-HF.	None.
Digital Heart Manual Deighan et al, 2017[18]	Pilot study (single-arm, mixed methods), UK. N=28 (of which 17 were service users or their partners).	People who had completed the paper Heart Manual intervention or their partners (plus health professionals). History of myocardial infarction or revascularisation, stable condition, and internet access.	Digital Heart Manual.	None.
Gro Health Heart Buddy Rai et al, submitted[21]	Real-world service evaluation, UK (London) n=66 (enrolled), [redacted]	People aged 18 or over with recent myocardial infarction, percutaneous coronary intervention (PCI), coronary artery bypass grafting (CABG), or heart failure.	Gro Health HeartBuddy. [redacted]	[redacted]
KiActiv Meenamkuzhy-Hariharan et al, 2024[22]	Prospective, parallel group, open label RCT, UK (Liverpool area). Intervention group n=65, 75% male, mean (SD) age 60 (8.8). Control group n=65, 79% male, age 60 (10.7).	130 people eligible for CR.	8-week conventional cardiac rehab plus contextualized data feedback via KiActiv Heart.	conventional cardiac rehab – defined as 1-2 hours of face-to-face contact per week, meaning that the programme is 98-99% unmonitored.

KiActiv Rayner et al, 2022[25]	Before and after interventional study, UK. n=17, 82% male, mean age 58.	Patients referred for CR between September 2020 and April 2021.	KiActiv Health 12-week programme in addition to a pandemic-limited conventional CR service.	None
myHeart Blythin et al, 2023[32]	Retrospective real-world study, UK. n=434, mean (SD), 73% male, age 62.4 (11.8), where data available.	Adults over 18 years referred for CR. Access to an internet connected device, a basic understanding of technology, and willingness to use myHeart.	myHeart 12-week programme.	None.
myHeart Smith and D'Angelo, 2023[31]Smith and D'Angelo, 2023[31]	Three-way RCT, UK. n=57.	Low-moderate risk people with coronary heart disease	8-week web-based programme using the myHeart platform (WB-CR) completed exercise and educational sessions using the myHeart app.	Traditional CR programme delivered in a hospital setting, one session per week, plus an education day, or a combination of Traditional CR as above and myHeart.
R Plus Health Bilbrey et al, 2024[35]	Prospective, single-arm trial, USA. N=75, 49% male, mean (SD) age 64.6 (10.0).	Adults with cardiovascular disease aged at least 40 with stable angina pectoris, myocardial infarction, or heart failure.	12-week digital home-based CR program (RecoveryPlus.Health) that integrates both telehealth and mHealth modalities.	None.

R Plus Health Cai et al, 2022[1]	RCT (blinded), China. Intervention n=49, 63% male, mean (SD) age 57 (11). Control n=48, 67% male, mean (SD) age 57 (9).	People who underwent ablation for atrial fibrillation.	Comprehensive, domiciliary, mobile application-guided and tele-monitored CR program (intervention group).	Conventional cardiac rehabilitation.
R Plus Health Xia et al, 2023[34]	Quasi-experimental single-arm study, China. n=31, 97% male, mean (SD) age 56.2 (13.4).	People aged 18 or above with stable coronary heart disease who own and use a smartphone.	12-week remote digital CR program. Wearable heart rate monitoring device connected with an app to monitor the patients' exercise intensity.	None.

Abbreviations: CR, cardiac rehabilitation; GP, general practitioner; RCT, randomised controlled trial; SD, standard deviation; UK, United Kingdom

5.2 Results

Full details of the outcomes of the clinical review are in section 5 and Appendices D and E in the EAR.

A summary of data across key outcomes is presented here.

Uptake

Definition of uptake varied between the 8 studies which reported this outcome. However, the EAG defined it as number of people meeting inclusion criteria versus number recruited. Studies for Activate Your Heart reported uptake rates of 15.5% and 7.51% (Devi et al, 2024; Houchen-Wollof et al, 2018). Rai et al (2025) reported that 91.7% of people referred for Gro health HeartBuddy completed onboarding with a 95.5% programme initiation rate. Blythin et al (2023) reported an uptake rate of 80.6% for myHeart (n=350 out of 434 registered). The uptake rate was reported as 46.3% and 100% in two studies for R Plus Health (Bilbrey et al, 2024; Xia et al, 2023).

Adherence

Eleven studies reported adherence (concordance rates) for intervention and long-term strategies. Studies on activate your heart defined this outcome as number of logins per participant. Houchen-Wolloff et al (2018) reported that participants logged in an average 3 times per week at 8-weeks and 2 times a week at 6 months with low phone calls and emails to staff and not using the group forum. Nabutovsky et al (2020) reported that more than 63% of participants took part in at least 150 minutes exercise weekly for up to 6 months. Menamkuzhy-Hariharan et al (2024) reported that sufficient data for analysis was collected from 93% of participants in the KiActiv group, with an average of 38 complete days of data per person out of 56 days expected across both groups. Participants wore the device for 95% of the days and accessed the KiActiv platform for 31% of the days during the program. The myHeart app was accessed 12 times (median, IQR 1-47) in the Blythin et al (2023) study. The Cai et al (2022) study on R Plus health reported significant differences in adherence between groups. People in the intervention

group were adherent for 9.6 weeks (SD 3.1) of the 12-week program while those in the control group were adherent during 5.0 ± 3.8 of the 12 weeks.

Completion and attrition

Eleven studies also reported on completion and attrition rates. One study on Activate your heart, which required completion of the full programme, reported a 40% intervention completion rate (Devi et al, 2014). The EAG noted the strict definition of completion in this study as a main factor for the lower completion rate when compared to other studies. Houchen-Wolloff et al (2018) reported a 78% completion rate after 6 months of the program and Brough et al (2014) reported 80% completion of follow-up. The study by Rai et al on Gro Health HeartBuddy found [redacted] and 92.4% completion of follow up. Studies on KiActiv reported an 88% completion for the 51% subgroup within the intervention group, who did not attend face-to-face cardiac rehab classes (Meenamkuzhy-Hariharan et al, 2024) and 82% of participants (n=14) completed the program in the study by Raynar et al (2022). Smith D'Angelo (2023) reported that 54 participants completed the study out of 57 with 3 people dropping out. Cai et al (2022) reported that 49 of 100 randomised participants completed 3-month follow up in the R Plus Health intervention arm compared to 48 in the control arm. Three participants in total dropped out from both arms.

Exercise capacity

There were 10 studies which reported on the effects of digital cardiac rehabilitation on exercise capacity and performance; however measures of this outcome differed across these studies. At 6 weeks follow up, Devi et al (2014) reported statistically significant improvements in exercise capacity for participants in the Activate Your Heart group, for example, effect on daily steps walked: intervention +497 (SD 2171), control −861 (SD 2534), 95% CI 263 to 245, p=0.02). However, there were no significant findings for any of the groups at 6 months follow up. Exercise capacity in Nabutovsky et al (2020) for Datos health was assessed as estimated metabolic equivalents on pre- and post-stress tests which increased from 0.6 (SD 0.5) to 12.3 (SD 0.5), p=0.002. A significant improvement was also recorded in average heart recovery rate from the second month. The probability of meeting recommended daily activity in the Meenamkuzhy-Hariharan

et al (2024) study was statistically significantly higher in the intervention group using KiActiv versus conventional cardiac rehab. Rayner et al (2022) also reported improvements in physical activity, non-sedentary time, calorie burn and moderate bouts of physical activity following use of KiActiv. Smith D'Angelo (2023) found statistically significant improvements for metabolic equivalent (METs) across both myHeart and comparator groups after 8 weeks of cardiac rehab based on the pre and post incremental shuttle walk test (ISWT) results. A reduction in heartbeats for every 100 m walked was also noted. Studies on R Plus Health had different measures for exercise capacity and showed significant improvements. Cai et al (2022) found a significant difference in change in VO2peak within groups and between groups (control: 4.9 ± 6.6, intervention: 9.3 ± 8.0, p=0.003 as the change in VO2peak [ml/(min × kg)]) at baseline and 12 weeks follow up. There was also a statistically significant increase in self-reported physical activity between baseline and follow-up in both arms, control pre: 16 (33.3%), post: 27 (56.3%) p=0.024; intervention pre: 12 (24.5%), post: 42 (85.7%), p<0.001.

Hospital readmissions, referral to specialist services, clinic visits and mortality

Five studies reported on at least 1 of these outcomes. Cai et al (2022) reported the recurrence of atrial arrhythmia after ablation in 6.1% (3 of 49) of people in the intervention group and 6.5% (3 of 46) of people in the control group, with no significant difference between the two groups at the three-month follow-up. There were no hospitalisations or injuries due to this event. Muscular weakness and pain were reported by some participants in the Xia et al (2023) study.

Cardiovascular risk profile

This outcome was assessed by 7 studies with variations in outcome measures.
At 6 weeks follow up, Devi et al (2014) found a significant effect of the intervention on weight (–0.56 kg, 95% CI –1.78 to –0.15, p=0.02). A significant difference in blood pressure was observed that favoured the control group (ES=0.68, 95% CI 2.99 to 13.91, p=0.001. The study on Datos Health reported significant improvement on only HDL

levels, there was no effect on other parameters including heart rate, blood pressure, lipid profile and blood glucose levels in the intention group (Nabutovsky et al, 2020). Rai et al (2025) found that those who used Gro Health HeartBuddy for cardiac rehab had reductions in systolic blood pressure, diastolic blood pressure and weight (mean reduction 2.3 kg [redacted]. Xia et al (2023) reported a significant decrease in mean diastolic blood pressure at rest, low and high density lipids, total cholesterol, blood glucose, triglycerides and increase in peak VO2.

Health Related Quality of Life (HRQoL) and psychological wellbeing

There were 8 studies which reported at least 1 or both outcomes with varying outcome measures. Devi et al (2014) reported statistically significant improvements over usual care on emotional QoL MacNew score and Seattle Angina Questionnaire (SAQ) angina frequency score at 6 weeks, and social QoL MacNew score and SAQ angina frequency score at 6 months follow up. The other 2 studies for Activate Your Heart either found no significant effect or did not assess significance. A significant intervention effect was found with Gro Health HeartBuddy (Rai et al, 2025). The EQ-5D index score was improved by 10 points, anxiety median reduced by 3.5 points, excessive daytime sleepiness mean reduced by 1 point and wellbeing median scored increase by 3 points at 6 months follow up. Rayner et al, 2022 reported a statistically significant improvement in at least one domain of QoL, physical fitness and overall health ($p<0.05$) with before and after use of KiActiv. Bilbrey et al (2024) reported improvements in the average 12-Item Short-Form Health Survey physical and mental summary scores with R Plus Health by 2.7 and 2.2 points respectively. Cai et al (2022) reported significant improvements on health beliefs related to cardiovascular disease and exercise self-efficacy within groups pre and post study and between both arms of the study.

Usability and acceptability

Nine studies reported on usability and acceptability of a digital cardiac rehabilitation platform. Cross et al (2023) found that patients and caregivers reported improvements in physical and mental health, better self-management of heart failure symptoms and perceived independence with D:REACH HF. Brough et al (2014) reported that 54% of users of Activate Your Heart would not have attended conventional outpatient cardiac

rehabilitation. In Houchen-Wolloff et al. (2018), participants reported administration of intervention and assessment to be feasible. Participant satisfaction with the Datos Health program was 4.05 out of 5 in Nabutovsky et al. (2020), and [redacted] for Gro Health HeartBuddy in Rai et al. (2025). The EAG notes that the scales used are not validated. Barriers reported in some studies include technological issues, support, navigation, design and complex functionality. Blythin et al (2023) reported a statistically significant increase in self-management confidence after having access to the myHeart App as reported by 36% of users. Rayner et al (2022) study also reported positive reports for KiActiv.

5.3 Ongoing studies

An overview of ongoing studies can be found in table 41 of the EAR.

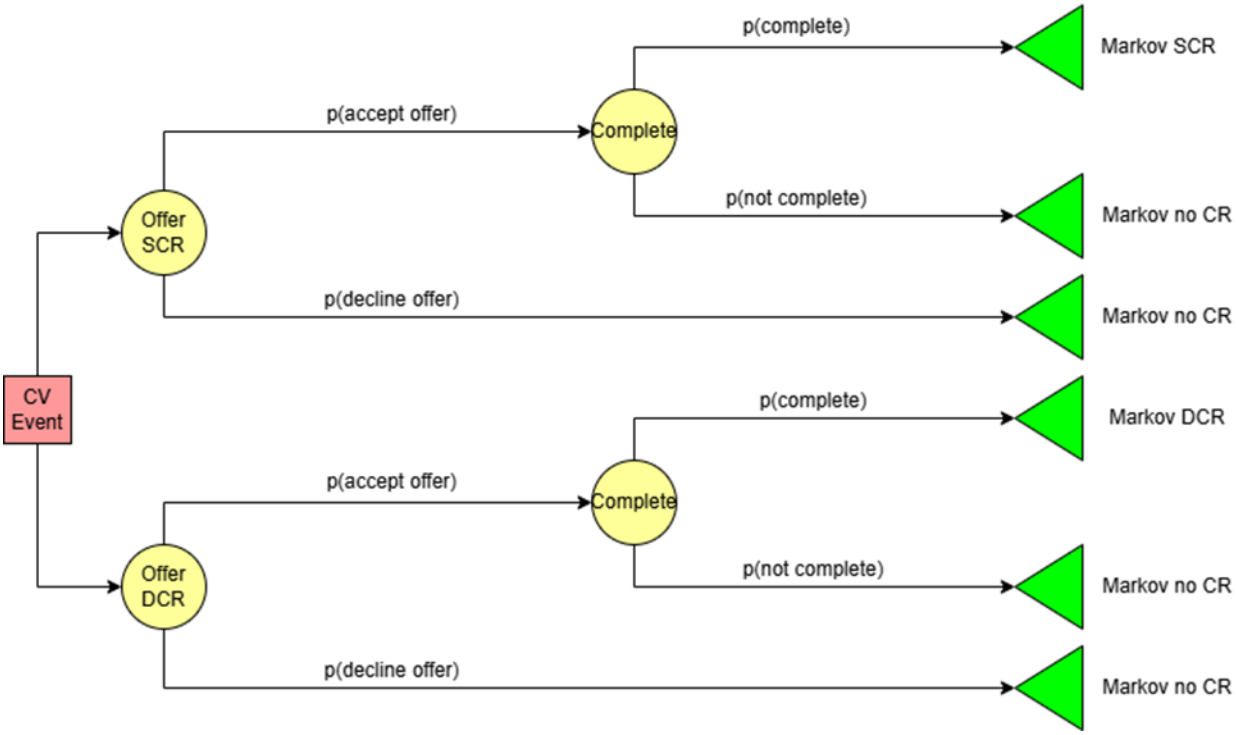
6. Health economic evidence

The EAG did a review to identify existing health economic evidence, including relevant health economic models. They found no economic evaluations relevant to the decision problem but identified 3 studies and NICE guideline NG148 for conventional cardiac rehabilitation which were used to develop the EAG's economic model and inform parameters within it. An overview of these is in section 6.2 and appendices A to D of the EAR.

6.1 Health economic model

The EAG developed an early economic model that estimates the cost-effectiveness of digitally supported cardiac rehabilitation compared with conventional cardiac rehabilitation. The model was based on a 2013 model used for NICE's clinical guideline on secondary prevention in primary and secondary care for patients following a myocardial infarction (CG48). It consists of a short-term decision tree (figure 1) and a long-term state transition model (figure 2) with a 10-year time horizon.

Figure 1 Decision tree model structure



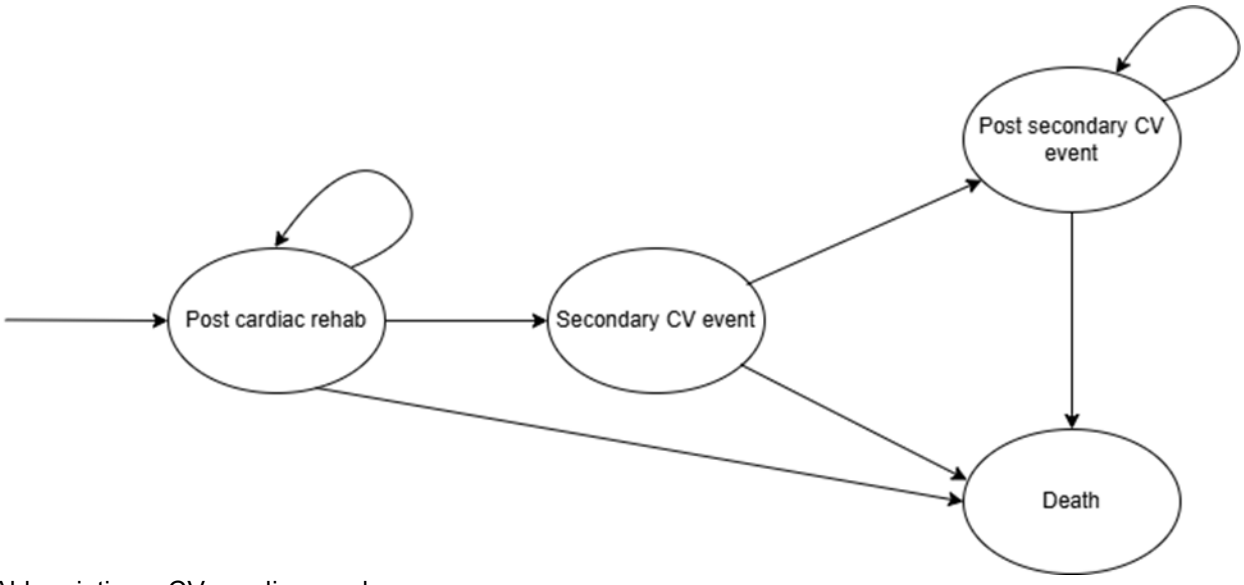
Abbreviations: DCR, Digital cardiac rehabilitation; CCR, conventional cardiac rehabilitation; CV, cardiovascular

People who have had a cardiovascular (CV) event enter the decision tree and are offered either standard or digital cardiac rehabilitation. They can then:

- Accept the offer of cardiac rehabilitation (or not); and
- Complete the programme (or discontinue).

Each branch of the tree is associated with different costs for the length of a course of cardiac rehabilitation (6-12 weeks).

Figure 2 State transition model structure



Abbreviations: CV, cardiovascular

The Markov model (Figure 2) captures long-term health outcomes and comprises 4 mutually exclusive states (post cardiac rehab, secondary CV event, post-secondary CV event and death) following the initial rehabilitation period. The secondary CV event state is a tunnel state for a single cycle, from which people transition either into the post-secondary CV event or death state. The model is run over a lifetime (mean age of 100 years). A half cycle correction was implemented to reflect the timing of events within the cycle, and costs and QALYs were discounted at a rate of 3.5%.

Population

The modelled population was 46% female, with a mean age of 66 for males and 70 for females based on data from the National Audit of Cardiac Rehabilitation (NACR).

Key assumptions

- All cardiovascular event types were considered as a single health state, because no data was available to differentiate different types of cardiovascular events according to how cardiac rehab was delivered, and the treatment effects of conventional cardiac rehab were similar across the event types included in the NICE CG48 model.
- Risk of secondary CV events and mortality was based on data for myocardial infarction.

- Where no technology-specific data were available, uptake, completion, and risk of secondary CV events were assumed to be the same as conventional cardiac rehab.
- Any health benefits of digital cardiac rehab over conventional cardiac rehab were maintained over 10 years.
- Where no training cost data was provided, the mean of training cost estimates from other companies was used.
- Based on clinical input, on-boarding and off-boarding visits would be necessary for all technologies and would be consultant led. Other sessions for conventional cardiac rehab would not be consultant led.
- Conventional cardiac rehab involves 2 consultant led appointments (the first and final appointments), and 6 non-consultant led appointments (the 6 sessions of rehab).
- For people who did not complete conventional cardiac rehab, half the sessions were used.
- For people who did not complete the course of cardiac rehab (conventional or digital), no health benefit was gained by only partially completing the course.
- Where data was not available to inform the uncertainty of parameters, a standard error of 20% of the mean was used.

Further details of the economic modelling are in section 9 of the EAR.

Model inputs

Uptake and completion

The uptake and completion rates used by the EAG are presented in the table below.

Table 3: Model base case uptake and completion rates

Intervention	Base case completion rate	Source
Conventional cardiac rehab and all other technologies	55%	NACR, 2024
Activate your heart	52%	Devi et al, 2014; Houchen-Wolloff, 2018
KiActiv	71%	Meenamkuzhy-Hariharan, 2023
R Plus Health	72%	Cai et al, 2022

Abbreviations: NACR, national audit of cardiac rehabilitation

The base case uptake rates were assumed to be the same as conventional cardiac rehab for all technologies, which is 41%. The base case completion rates were derived by calculating the odds ratio for the technology versus the comparator where data was available and applying it to the completion rate of conventional cardiac rehab. The EAG assumed the same rates as conventional cardiac rehab for technologies where data was not available.

Transition probabilities

Mortality risk is highest in the first year following a secondary CVD event before declining annually from year 2. People who complete cardiac rehab have mortality rates equivalent to the general population. The estimates for mortality risk were derived from 3 studies which report the costs of cardiovascular events. Two digital cardiac rehab treatments showed a significant benefit in reducing the following parameters which could impact secondary CVD risk: total cholesterol (risk reduction 0.14% per year) and [redacted].

The EAG note that this is an optimistic assumption as much of the available evidence demonstrated loss of benefit over time.

Table 4: Probability of transition between states

Health state	Relative risk to general population	Source
Secondary CV event --> Death	7.89 (year 1) 2.84 (year 2+)	Danese et al, 2016
Post CR --> Death	Standardised mortality ratio = 2	Smolina et al, 2012
Post CR --> Secondary CV event	No CR: 0.06 (rate per person) CR: Relative risk of 0.82 applied	Dibben et al, 2023

Abbreviations: CR, cardiac rehabilitation; CV, cardiovascular

Costs

Costs included the licence for digital cardiac rehab technologies, training for NHS staff, devices and internet access, and healthcare professional resource use for delivery of cardiac rehabilitation and for treating secondary cardiovascular events.

Technology costs

All companies provided their license costs or per patient costs which are summarized in the table below. For companies that provided licence costs per trust, the EAG calculated the costs per patient per course of cardiac rehab using the average number of patients attending cardiac rehab in England per NHS trust (n=256). The per patient license costs used in the model ranged between £0.00 to £293.33. The EAG also included additional costs in the base case for a tablet computer (£80) and for the monthly cost of a mobile internet connection (£15) to be provided by the NHS trust. Training costs of NHS staff per patient per year were also included in the costs of technologies. The cost per patient per year for Activate your heart, Datos health, Luscii vitals, Gro Health HeartBuddy and Get Ready, included a one-off implementation cost over the 10-year time horizon for an average of 256 patients per service per year derived from NACR, 2024 report. Other implementation costs were provided by Datos Health, Gro Health HeartBuddy, Activate Your Heart, Luscii Vitals, Get Ready – Solution and KiActiv.

Table 5 Technology costs

Technology	Per patient licence cost used in model	Training costs per patient per year
Activate Your Heart	£50.00	£0.37
Beat Better	£6.00	£0.24
D Reach-HF*	£22.39	£0.34
Datos Health – AI Driven Hybrid Care Platform	£293.33	£0.24
Digital Heart Manual	£26.00	£0.22
Get Ready - Solution	£62.69	£0.00
Gro Health HeartBuddy	£250.00	£0.05
KiActiv	£199.00	£0.00
Luscii Vitals	£15.00	£0.00
myHeart	£66.67	£0.24
Pumping Marvellous	£0.00	£0.24
R Plus Health	£142.80	£0.00
Sword Move	£187.50	£0.24

Healthcare professional resource use

For the base case, the cost for each cardiac rehab session was based on NHS reference costs as £94.64 per non-consultant led session and £147.18 per consultant led session. The EAG applied a half cycle cost correction to resource use to reflect the reduced number of appointments for those who do not complete digitally supported and standard cardiac rehabilitation.

Table 6: Resource use for delivery of cardiac rehabilitation

Cardiac Rehabilitation	Number of sessions (completers)	Cost per course (completers)	Cost per course (non-completers)	Source
Conventional cardiac rehab	8 (2 consultant led initial and final sessions)	£862.17	£431.10	NHS reference costs
D REACH-HF	6	£620.35	£336.45	Provided by company
All other digital technologies	2	£294.35	£147.18	Provided by companies

Abbreviations: NHS, national health service

Other treatment costs

The costs for health states are derived from NHS Cost Collection Costs 2023/24 and include:

- Resource use for secondary CV events
- Annual review GP appointment cost
- Quarterly blood test cost.

For further details on the costs in the model see section 7.3.3 of the EAR.

Health-related quality of life

Health state utilities were derived by adjusting the general population utilities from Hernandez Alava (2022) with the utility weights for cardiovascular events from NICE Guideline CG48, MI – Secondary Prevention (2013).

Table 7: Utility weights for model event states

Event state	Utility multiplier
Post cardiac rehab uptake state	0.88
Survival post-secondary cardiac rehab	0.88
Secondary CVD	0.78 (mean of revascularisation and MI: 0.76, 0.80

Abbreviations: CVD, cardiovascular disease; MI, myocardial infarction

Details of the utility values at the different health states are in section 7.3.4 of the EAR.

6.2 Model results

Base case

The total cost, QALYs and ICERs from the base case are presented in table 8.

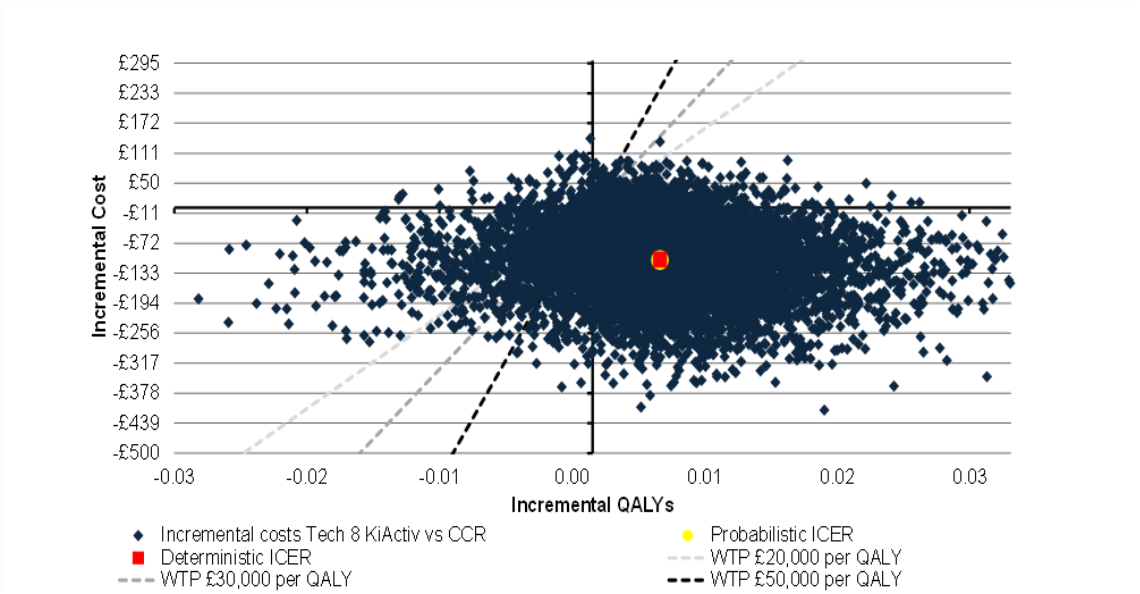
Table 8: Base case results

Interventions	Total Cost	Total QALYs	ICER vs CCR
Conventional CR	£4,570.65	6.275	
Activate Your Heart	£4,455.67	6.269	£109, 966 SW
Beat Better	£4,432.30	6.275	Dominant
Datos Health - AI Driven Hybrid Care Platform	£4,548.64	6.275	Dominant
D REACH-HF	£4,549.68	6.275	Dominant
Digital Heart Manual	£4,440.55	6.275	Dominant
Get Ready - Solution	£4,460.04	6.275	Dominant
Gro Health HeartBuddy	£4,528.68	6.275	Dominant
KiActiv	£4,464.85	6.279	Dominant
Luscii Vitals	£4,432.64	6.275	Dominant
myHeart	£4,457.36	6.273	Dominant
Pumping Marvellous Cardiac Rehab Platform	£4,429.83	6.275	Dominant
R Plus Health	£4,445.11	6.282	Dominant
Sword Move	£4,507.26	6.275	Dominant

Abbreviations: QALYS, quality adjusted life years; ICER, incremental cost effectiveness ratio; CCR, conventional cardiac rehabilitation; SW, southwest quadrant

Both probabilistic and deterministic base case results showed that most of the digital technologies dominated conventional cardiac rehabilitation or had an ICER in the SW quadrant (1 technology produced fewer QALYs but had lower costs). All technologies cost slightly less than conventional CR with very small differences in QALYs produced, so the results were largely driven by differences in costs. Figure 3 shows the cost-effectiveness plane with the probabilistic sensitivity analysis for KiActiv. At a willingness to pay threshold of £20,000 per QALY gained, or £30,000 saved per QALY lost (for south-west quadrant ICERs), all technologies would be considered cost-effective. Beat Better and Luscii Vitals had the highest probability of cost effectiveness, both at 98.8%, although neither had clinical data to inform model inputs.

Figure 3: Representative cost effectiveness plane: KiActiv vs conventional cardiac rehab



Abbreviations: QALY, quality adjusted life years; CCR, conventional cardiac rehab; ICER, incremental cost effectiveness ratio

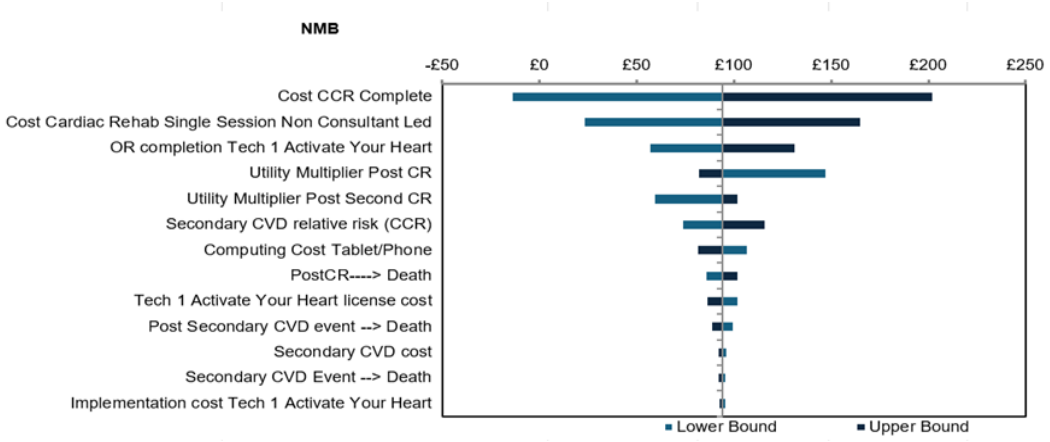
Scenario and sensitivity analyses

The EAG performed a one-way sensitivity analysis and scenario analysis to explore which key structural and parameter assumptions have an impact on pairwise ICERs and the degree of uncertainty.

One-way sensitivity analyses

One way sensitivity analyses were conducted by varying individual parameters across possible ranges while holding other parameters at base case values. Representative results are presented in a tornado diagram (figure 4), with parameters ranked by the level of impact on pairwise ICERs. Results were most sensitive to the cost of a face-to-face CR session, health state utilities (for KiActiv, R Plus Health and Activate Your Heart), and the overall effectiveness of cardiac rehabilitation.

Figure 4 Representative tornado diagram (Activate Your Heart) showing impact of parameters on pairwise ICERs



Abbreviations: CR, cardiac rehab; CVD, cardiovascular disease; CCR, conventional cardiac rehab; OR, odds ratio

Table 9 below contains the results of the scenario analyses. The cost effectiveness results were largely insensitive to scenarios tested, with the exception of alternative costs of an in-person session and use of naïve data for digital cardiac rehab.

Table 9: Alternative scenario analysis inputs and results

Alternative Scenario	Base case Inputs	Scenario inputs	Reason	Key results
Use of naïve data for DCR where available	Odds ratio applied to base CCR rates where data was available. Otherwise assumed to be the same as CCR. **Uptake:** **41% for both arms** **Completion:** CCR, 55% Activate Your Heart, OR 0.87 KiActiv, OR 2.03 R Plus Health, OR 2.04	Naïve rates used where available. **Uptake:** Datos Health, 95% Digital Heart Manual, 60% Gro Health HeartBuddy, 92% KiActiv, 58% R Plus Health, 46% **Completion:** Activate Your Heart, 78% Gro Health HeartBuddy, 92% KiActiv, 86% myHeart, 100% R Plus Health, 98%	The base case applied an odds ratio to completion rates for CCR where possible. The impact of using naïve rates (i.e. as reported in the source) was examined as this data was more widely available.	All technologies dominate conventional CR using naïve completion rates.
Impact of DCR on secondary CV event	All assumed equal to CCR except Gro Health and R Plus Health, which had additional risk reductions applied:	Reduction in effectiveness in decrements of 10% from assuming equal to conventional CR to the same level as no CR.	Test assumption of equivalent effectiveness of DCR and CCR	Only cost effective when 10-year risk of CV events is below 5.3% to 5.5%

	Gro Health HeartBuddy, [redacted] R Plus Health 0.14%			
The impact of relative risk of conventional cardiac rehab vs no cardiac rehab on secondary CV events	Inputs derived from effectiveness of CR in people with MI. Secondary CVD risk (no CR) = 0.06 Secondary CVD relative risk (CCR) = 0.82	Relative risk from 0.5 to 1	This scenario was tested to examine the impact of the effectiveness of cardiac rehab overall, to evaluate performance in populations where the effectiveness of cardiac rehab is not as well evidenced as MI	The results are mostly insensitive to the effectiveness of cardiac rehab vs no cardiac rehab except Activate your heart. Both conventional and digital cardiac rehab are not cost-effective when there is no benefit of cardiac rehab (relative risk of 1).
Excluding the cost of computing equipment	Computing Cost Tablet/Phone £79.99 Computing Cost SIM Card £8.00	No cost	This scenario tests whether the cost effectiveness conclusions remain if only patients who already have their own equipment are offered the technology	No significant change in results
Excluding implementation and training costs	Implementation cost for technologies ranges from £2.07 to £13.45 Training costs range from £0.00 to £0.32	No cost	Implementation and training costs are one-off costs which may not have impact on the long-term cost effectiveness of digital interventions	The results are largely insensitive to excluding cost of implementation and training
Sensitivity to the cost of an in-person session	Cost of conventional cardiac rehab complete = £875.88	Micro-costing using the Beswick 2004 method and current prices = £589.69	This scenario tests the sensitivity of the model to alternative cost inputs and sources due to large	Some of the technologies are dominated by conventional cardiac

		Inflating the NICE CG48 minimum estimation used in the model and maximum (£80.67, £335.58, £1,148.70)	variations in costs of cardiac rehabilitation from different sources.	rehab or have ICERs above the threshold when using the Beswick 2004 cost results. NICE CG48 minimum and maximum costs results in none and all of the technologies being cost-effective.
Sensitivity to the modelled time horizon	Lifetime time horizon	5 years 10 years	This scenario tests whether the cost savings and observed benefits from use of digital interventions is sustained in the long term, therefore, captures the full clinical and economic benefits of digital cardiac rehab over 5 years and then 10 years	The results are insensitive to the model time horizon. Activate your heart has a large SW-quadrant ICER at 5 and 10-year time horizons.

Abbreviations: CCR, conventional cardiac rehabilitation; OR, odds ratio; DCR, digital cardiac rehabilitation; CV, cardiovascular; CR cardiac rehabilitation; MI, myocardial infarction; CVD, cardiovascular disease

The EAG performed a 2-way sensitivity analysis for the impact of uptake and completion rates for digital cardiac rehabilitation, holding uptake and completion rates for conventional cardiac rehabilitation constant. The results showed that at a WTP threshold of £20,000, digital technologies were cost effective if uptake and completion rates were each at least 45%.

The EAG notes that in a scenario where digital cardiac rehab is offered as an alternative to conventional cardiac rehab, the total costs and utilities would be a weighted average dependent on uptake rates of each mode. As both are cost-effective compared with no cardiac rehabilitation, this combination would be as well.

See section 7.4 of the EAR for additional detail on the results of the economic modelling.

7. Evidence gaps

See section 8.2 in the EAR for the EAG's full evidence gap analysis for the decision problem.

The key areas identified by the EAG for evidence generation include:

- Comparative RCTs or comparative prospective observational studies in a UK context.
- Standardisation of outcomes and outcome measurement to enable a network meta-analysis, such as:
  - quality of life (using EQ-5D)
  - uptake and completion
  - impact on longer-term events such as secondary cardiac events, using longer-term follow-up to detect events that take longer to develop and to verify that observed benefits persist over a longer period.
- Clearer definition of the cost of conventional cardiac rehabilitation.
- Consideration of how changing mode of delivery, for example paper manual to digital intervention, could impact on clinical effectiveness, even if the content itself is equivalent.

- Implementation considerations including training, inter-operability with existing NHS systems and whether devices would be provided to patients to avoid digital exclusion.
- Research into barriers for patients, for example digital competency issues, accessibility, and acceptability and effectiveness of digital interventions in hard-to-reach groups

8. Equality considerations

The final scope and the scoping equality impact assessment describe equality considerations for this assessment. The key studies in this assessment did not report subgroup data.

The EAG further noted that:

- Digitally supported cardiac rehabilitation may benefit people who struggle to attend daytime in-person cardiac rehabilitation groups due to work or caring responsibilities.
- Digitally supported cardiac rehabilitation may address issues faced by people living in rural communities with long travel times to clinic appointments, especially by public transport, although this would depend on access to a reliable internet connection.

9. Key points, limitations and considerations

9.1 Clinical effectiveness

Key points

- Evidence across technologies is varied and some technologies had little, or no published evidence identified.
- There was a lack of evidence comparing digital and conventional cardiac rehabilitation, and a lack of evidence comparing offering the choice of digital alongside conventional cardiac rehabilitation versus only conventional cardiac rehabilitation.

- The limited evidence available suggested that digitally supported cardiac rehabilitation may have similar outcomes and benefits to conventional cardiac rehabilitation, compared to GP monitoring with no cardiac rehabilitation.
- Exclusion of people with low digital literacy or limited access to internet or smartphones was common across studies, which may reflect clinical practice.

Limitations

- Studies cover a wide range of types of cardiovascular disease, which introduces heterogeneity and makes it difficult to compare the results of studies.
- Limited evidence versus the scoped comparator of cardiac rehabilitation where digital platforms are not offered as an option (only 3 technologies).
- RCT evidence was only available for 4 of the scoped technologies.
- The single-arm and observational evidence for some technologies provide limited evidence for proving cause and effect due to lack of comparison group or randomization.
- Generally, sample sizes for the RCTs were quite small.
- Study populations typically included adults aged 50 years and older with a higher proportion of male participants and people with coronary heart disease. It is unclear if this is representative of the current population that would be offered cardiac rehabilitation.
- Length of follow-up was relatively short, and benefits were not captured for longer than 6 months (**Error! Reference source not found.**), which makes it challenging to evaluate maintenance of benefit over a longer term.
- Studies generally excluded people with low digital literacy or access to internet or smartphones, which are factors that may affect people who currently benefit less from cardiac rehabilitation
- No evidence for outcomes in the subgroups defined in the scope.
- Reported outcomes varied across studies

Considerations for committee

- Is evidence from other settings generalisable to the UK NHS?

- Are results across studies comparable in the context of varying population?
- Are the populations included in the prioritised clinical evidence representative of the population who would likely be offered or take up offers of cardiac rehabilitation?
- Does the evidence suggest a potential clinical benefit for the use of digitally supported cardiac rehabilitation as an option to deliver cardiac rehabilitation?
- Are there specific patient populations where digital cardiac rehab would be especially valuable or problematic? Particularly in groups which have a higher prevalence of CVD, or who are less likely to begin cardiac rehabilitation.

9.2 Health economic evidence

Key points:

- Economic modelling suggests that digital cardiac rehab is potentially cost-effective compared to conventional cardiac rehab.
- In general results were most sensitive to assumptions about the cost of a face-to-face CR session and health state utilities.
- The model was sensitive to uptake and completion rates as long as they were comparable to the uptake and completion rates of conventional cardiac rehab.

Limitations:

- The probability estimates for secondary CV events, mortality and utilities were derived from studies focusing on myocardial infarction which may not reflect to the broader population of people with cardiovascular disease and limit generalizability of results.
- The assumption of equivalence of benefit of digital cardiac rehab and conventional cardiac rehab may not accurately reflect differences in outcomes between both delivery modes.
- There was not enough evidence to compare technologies directly against each other.
- The cost of conventional cardiac rehab is a key area of uncertainty which drives the results of model.

- Most companies did not provide implementation costs which is a key area of uncertainty.
- The results were sensitive to the estimates of the cost of cardiac rehab and this parameter was uncertain.
- No specific information on medication use or medication adherence was available for the individual technologies and limited adverse event data were available. Therefore, these could not be included in the model

Considerations for committee:

- Are the economic model structure, assumptions and clinical and cost parameters suitable to answer the decision question (see final scope) for this assessment
- What is the most likely true cost of conventional cardiac rehab?
- What do the model results suggest about the cost-effectiveness of the digital technologies?
    - Are the base case results plausible?
    - What can the model tell us about the likely implementation where both conventional and digital CR are offered?
- Can the probability estimates, and utility values related to myocardial infarction be generalised to other conditions

Appendix A: Abbreviations

BHF	British Heart Foundation
CABG	Coronary artery bypass graft
CI	Confidence interval
CR	Cardiac rehabilitation
CCR	Conventional cardiac rehabilitation
CVD	Cardiovascular disease
DCR	Digital cardiac rehabilitation
EAG	External assessment group
EAR	External assessment report
GP	General practitioner
HCP	Healthcare professional
ICER	Incremental cost-effectiveness ratio
METs	Metabolic equivalent
MI	Myocardial infarction
NACR	National audit of cardiac rehabilitation
NMB	Net monetary benefit
OR	Odds ratio
QALY	Quality-adjusted life year
RCT	Randomised controlled trial
RFI	Request for information
SD	Standard deviation
SW	Southwest
WTP	Willingness to pay threshold

Appendix B: Functionality of included technologies

Technology/ Functionality	Activate Your Heart	Beat Better	Datos Health	D:REACH HF	Digital Heart Manual	Get Ready	Grohealth HeartBuddy	KiActiv	Luscii vitals	myHeart	Pumping Marvellous cardiac rehab platform	R Plus Health	Sword Move
Health behaviour change and exercise	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lifestyle risk factor management	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Medical risk management	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
Psychosocial health	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓
Long-term strategies	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓
Length of programme (weeks)	6	Avg 12	24	12	6	flexible	12	flexible	flexible	12	8	flexible	flexible
Clinician dashboard/portal	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓

Remote monitoring				✓		✓	✓	✓	✓	✓		✓	✓
Connectivity to other devices			✓			✓	✓		✓	✓		✓	✓
Communication with NHS HCP via platform	✓	✓	✓	✓		✓	✓		✓			✓	✓
Access to company-employed support staff		✓	✓			✓	✓	✓		✓	✓	✓	✓

National Institute for Health and Care Excellence
Patient Organisation Submissions for Health Technologies- Digital platforms to support cardiac rehabilitation

NICE Medical Technologies Advisory Committee

Please read the guide to completing a submission fully before completing this template.

Information about your organisation		
Organisation name	Somerville Heart Foundation	
Contact person's name	Michelle Woods	
Role or job title	General Manager	
Email	Michelle.woods@sfhearts.org.uk	
Telephone	01473 252007/ 07950671139	
Organisation type	Patient/carer organisation (e.g. a registered charity)	
Organisation purpose (tick all that apply)	Advocacy	Yes
	Education	Yes
	Campaigning	
	Service provider	Yes
	Research	
	Other, please specify:	
What is the membership of your organisation (number and type of members, region that your organisation represents, demographics, etc)? UK wide – young people and adults born with a heart condition		

Please note, all submissions will be published on the NICE website alongside all evidence the committee reviewed. Identifiable information will be redacted.

If you haven't already, please register as a stakeholder by completing the stakeholder registration form and returning it to medtech@nice.org.uk

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Further information about registering as a stakeholder is available on the NICE website.
Did you know NICE meetings are held in public? You can register on the NICE website to attend a meeting up to 20 working days before it takes place. Registration will usually close 10 days before the meeting takes place. Up to 20 places will be available, depending on the size of the venue. Where meetings are oversubscribed NICE may need to limit the number of places we can offer.
Sources of information
What is the source of the information about patients' and carers' experiences and needs that are presented in this submission? Clinical consensus and credit to the Principle Congenital Heart Physiotherapist, Louisa Nielson at University Hospital Southampton for help with collating the information

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Impact of the symptoms, condition or disease

1. How do symptoms and/or the condition or disease affect people's lives or experiences?

Condition

Adult Congenital Heart Disease (ACHD)

ACHD is a chronic condition, which requires lifelong attendance of appointments +/- interventions.

Due to improvements in interventions and treatments, the number of adults living with congenital heart disease now outnumbers the number of children diagnosed with CHD.

Some individuals may require multiple cardiac invasive procedures to manage their condition. The incisions required for open heart surgery include a thoracotomy +/- sternotomy. The scar tissue following these incisions can often cause chronic complications including keloid or hypertrophic scar tissue, biomechanical dysfunction, neuromuscular impairment, postural adaptions, restrictive lung disease and body dysmorphia.

Patients requiring prolonged intensive care are the most likely to be affected with conditions such as critical care myopathy, neuropathy, delirium and Post Traumatic Stress Syndrome.

Symptoms

Unable to keep up with peers

Fear avoidance due to complex physical activity/exercise consensus documents and lack of evidence to support exercise prescription.

Social withdrawal; Depression and anxiety

These factors may influence a declining cycle of sedentary behaviour and unhealthy lifestyle choices, resulting in an increased risk for:

- Acquired heart conditions – Coronary Artery Disease (CAD)
- Obesity
- Diabetes
- Osteoporosis
- Cancer
- Hypertension
- Hypercholesteremia
- Blood clots
- Immunosuppression
- Sleep disturbance
- Early onset fatigue
- Increased risk for future surgical interventions and hospitalisation
- Social economic burden

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A functional decline in ACHD is related to a loss of independence and increased reliance on community support services

Reduced exercise capacity is associated with a greater risk of morbidity and mortality.

The most effective non-invasive therapy to manage exercise intolerance is exercise training. Therefore, introduction of tailored digital platforms to support cardiac rehabilitation for ACHD patients before and after cardiac surgery could result in huge physical, psychological and financial benefits.

Provision of Cardiac Rehabilitation services

National benchmarking has identified inequality of cardiac rehabilitation provision for adult congenital heart patients and those not presenting with CAD. This is predominantly due to commissioning and an increasing patient population.

People with ACHD have relatively low levels of physical activity compared to their age-matched peers, with few achieving the UK recommendations for physical activity for health.

The European Society of Cardiology (ESC) states regular exercise at the recommended levels should be encouraged in all adults with ACHD.

Exercise intolerance has been documented in all ages of congenital heart disease (CHD) and is associated with an increased risk for hospitalization and death. Most studies of exercise testing and of cardiopulmonary rehabilitation and exercise programs to improve capacity are in young adults (20–40 years of age) but show significant benefit.

2. How do symptoms and/or the condition or disease affect carers and family?

Misconceptions on physical activity can result in over protection and fear of causing harm to loved ones.

Discouragement of exercise in childhood by parents, carers, teachers and health professional may enhance fear and create barriers for participating in exercise

3. Are there groups of people that have particular issues in managing their condition?

High risk ACHD conditions include those presenting with: Left ventricular outflow tract obstruction, poor ventricular function, uncontrolled arrhythmias, tetralogy of fallot, transposition of the great arteries, aortic stenosis, Eisenmenger syndrome, severe cardiomegaly, congenital coronary artery anomalies, Marfan's, aortopathy and coarctation of the aorta.

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Experiences with currently available technologies

4. How well do currently available technologies work?

There has been positive experience with the use of Smart phones to utilise step count, distance and log activity levels. Couch to 5K can facilitate a progressive increase in activity and endurance for some patients

Inexpensive or free apps that can provide tailored exercise videos and tips would be helpful.

A large proportion of our ACHD patients are technologically adept.

5. Are there groups of people that have particular issues using the currently available technologies?

Yes, potentially those who present with learning disabilities or cognitive impairments. Although, family and carers have been generally happy to support.

Elderly patients who are not familiar with new technology

Patients who have a low income may not be able to afford apps that incur a charge

About the medical technology being assessed

6. For those <u>with</u> experience of this technology, what difference did it make to their lives?

Having the ability for a professional to obtain electronic data demonstrating the proposed exercise prescription help to keep the patient engaged. Grafts also help to show patient progress and success.

7. For those <u>without</u> experience of the technology being assessed, what are the expectations of using it?

Learning new systems and monitoring patient compliance and safety

8. Which groups of people might benefit most from this technology?

Those with lifelong chronic cardiac conditions (like ACHD) who are unable to access cardiac rehabilitation after cardiac surgery due to the lack of commissioning

Those who are unable to attend regular appointments due to commitments, childcare, education, employment, access to transport, travel expense and disability

ACHD patients on the waiting list for cardiac surgery (pre-optimisation), ERAS principles

Maintaining lifelong healthy active lifestyle for ACHD patients

Evidence suggests commencing early rehabilitation following cardiac surgery is associated with improved recruitment, engagement and outcomes

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Additional information
9. Please include any additional information you believe would be helpful in assessing the value of the medical technology (for example ethical or social issues, and/or socio-economic considerations) N/A
Key messages
10. In up to five statements, please list the most important points of your submission. • **ACHD patients are not routinely offered Cardiac Rehabilitation following cardiac surgery** • **There is currently national inequality in the provision of Cardiac rehabilitation programmes to patients following cardiac surgery** • **Digital platforms could provide valuable lifestyle education and tailored exercise programmes for congenital heart patients** • **Cardiac rehabilitation platforms could be utilised in optimising patients pre and post operatively as well as maintaining lifelong healthy active lifestyles** • **Engaging in early cardiac rehabilitation can improve engagement and outcomes** • **Reducing risk factors associated to inactivity could have a huge financial implication to the NHS**

Thank you for your time. Please return your completed submission to medtech@nice.org.uk

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Patient Organisation Submissions for Health Technologies- Digital platforms to support cardiac rehabilitation

NICE Medical Technologies Advisory Committee

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Information about your organisation	
Organisation name	Cardiomyopathy UK
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Telephone	
Organisation type	Patient/carer organisation (e.g. a registered charity) ☒ Informal self-help group ☐ Unincorporated organisation ☐ Other, please state:
Organisation purpose (tick all that apply)	Advocacy ☒ Education ☒ Campaigning ☒ Service provider ☐ Research ☒ Other, please specify:

What is the membership of your organisation (number and type of members, region that your organisation represents, demographics, etc)?

Cardiomyopathy UK is the charity for anyone affected by cardiomyopathy, which is a leading cause of heart failure. Many people in our community are living with heart failure. Even those who are not yet in heart failure might be considered to be in 'pre-heart failure' given the usual trajectory of the condition.

Cardiomyopathy is a particularly important cause of heart failure amongst younger people living with the condition.

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There are over 7,000 people on our contact database. Last year 1,588 people were supported online/over the phone by our specialist nurses, and we ran 258 support group meetings. There are over 2,819 active members of our Facebook support group.

Please note, all submissions will be published on the NICE website alongside all evidence the committee reviewed. Identifiable information will be redacted.

If you haven't already, please register as a stakeholder by completing the stakeholder registration form and returning it to medtech@nice.org.uk

Further information about registering as a stakeholder is available on the NICE website.

Did you know NICE meetings are held in public? You can register on the NICE website to attend a meeting up to 20 working days before it takes place. Registration will usually close 10 days before the meeting takes place. Up to 20 places will be available, depending on the size of the venue. Where meetings are oversubscribed NICE may need to limit the number of places we can offer.

Sources of information

What is the source of the information about patients' and carers' experiences and needs that are presented in this submission?

Our MyInsight survey of our community, and internal research/organisational knowledge.

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Impact of the symptoms, condition or disease

1. How do symptoms and/or the condition or disease affect people's lives or experiences?

People with heart failure caused by cardiomyopathy experience breathlessness and fatigue, swollen ankles. Exercise becomes extremely difficult, with even light exercise such as walking becoming impossible for many. These symptoms can have a very negative impact on people's lives.

In 2024 Cardiomyopathy UK conducted a large survey of our community, alongside Picker Institute, according to a robust methodology. 1323 responses were received (including patients and parents and carers). Though please note we did not ask whether people were in active heart failure.

Key findings of relevance included

- 10% (n=134) reported that the cardiology team had discussed their mental health and wellbeing in the last two years. 40% (n=529) said that the cardiology team had not discussed their mental health and wellbeing in the last two years, but they had wanted or needed this.
- Impact of cardiomyopathy: 62% said their exercise levels, 51% said their self-confidence, and 49% said their mental health had been negatively impacted in the last two years because of the cardiomyopathy diagnosis
- 12% or respondents had had cardiac rehab and found it useful. 3% had had it but not found it useful. 34% (n=429) had wanted or needed cardiac rehabilitation within the last two years but had not received it.
- There was a significant need for more physical activity support, with 39% (n=490) reporting they or the person they care for had not received this but wanted or needed it.
- Similarly 35% (n=437) reporting they or the person they care for had not received nutritional support but wanted or needed it.
- Of respondents diagnosed in the past two years, 27% (n=51) either did not receive any information about their condition at all, or they did not receive information about their condition in a way they could understand.
- 50% (n=96) of respondents diagnosed in the last two years reported they had not received enough support to come to terms with their diagnosis.

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2. How do symptoms and/or the condition or disease affect carers and family?

3. Are there groups of people that have particular issues in managing their condition?

Across our MyInsight survey we found that females report worse experience and a higher level of need. This held true for answers relating to cardiac rehab. Whereas 27% of men (n=147/552) responded 'No, but I wanted or needed this' in response to being asked whether they had received cardiac rehab in the last two years, 40% (n=272/682) of women gave the same response. Indeed, this difference was consistent across several fields relevant to cardiac rehab:

***Table 1**: Percentage of respondents answering 'No, but I wanted or needed this' in response to being asked whether they had received the following types of health and social care support in the last two years (Q13).*

Health and Social care support	Male	Female
Mood or emotional support	**26%** (n=144/560)	**36%** (n=252/698)
Support around physical activity	**31%** (n=173/556)	**45%** (n=307/684)
Sexual or reproductive health support	**19%** (n=106/551)	**15%** (n=103/678)
Nutritional support	**29%** (n=159/551)	**39%** (n=265/677)
Cardiac rehabilitation	**27%** (n=147/552)	**40%** (n=272/682)

A higher level of need can also be remarked amongst people from Black and Minority Ethnic backgrounds (though NB – need for interpreting with caution given low numbers). Interestingly, there was a substantially higher level of need for some of the component parts of cardiac rehab than cardiac rehab itself, as well as a much more distinct difference in levels of need between ethnic groups for these constituent components than for cardiac rehab.

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***Table 3**: Percentage of respondents answering 'No, but I wanted or needed this' in response to being asked whether they had received the following types of health and social care support in the last two years (Q13).*

Health and Social care support	White	Mixed, Asian, Black and Other ethnic groups
Mood or emotional support	**30%** (n=363/1194)	**47%** (n=27/57)
Support around physical activity	**38%** (n=442/1175)	**52%** (n=30/58)
Sexual or reproductive health support	**16%** (n=186/1166)	**29%** (n=16/56)
Nutritional support	**33%** (n=387/1164)	**56%** (n=32/57)
Cardiac rehabilitation	**34%** (n=392/1170)	**39%** (n=22/57)

Experiences with currently available technologies

4. How well do currently available technologies work?

At present, people with cardiomyopathy often don't get access to cardiac rehab programmes available to people with heart failure caused by other factors. Cardiomyopathy has historically been considered too much of a risk factor, meaning people cannot participate in any exercise and are ruled out from cardiac rehab programmes accordingly.

We've not heard from our patient community about access to cardiac rehab via existing technologies.

5. Are there groups of people that have particular issues using the currently available technologies?

People with cardiomyopathy often find they just aren't offered access to cardiac rehab of any kind, as illustrated by some quotes from our 2024 MyInight survey below. Respondents often felt denied access to the cardiac rehab that they wanted – and felt they needed – due to having cardiomyopathy, as opposed to another cardiac condition.

"For those having open heart surgery (bypasses etc) hospital cardiac rehabilitation is automatically included in their ongoing care. For me with HOCM [hypertrophic obstructive cardiomyopathy] and after two septal ablations and the fittings of a pacemaker (initially) I had to fight to gain access to the cardiac rehab programme automatically offered to those with other types of heart surgeries."

"I have asked for cardiac rehabilitation in the past from arrhythmia nurse and nurse specialist to improve my exercise tolerance from my cardiac nurses to regain confident in exercising and be as healthy as is within my capability and have not been able to access it through the local service… I

would like to have equal access to cardiac rehabilitation as others with other cardiac conditions have…."

"… Although I am feeling somewhat better now nearly a year later (after diagnosis/treatment), I can't access cardiac rehab or adequate mental health services."

"I have had to see mental health support on the NHS myself for long term conditions as I was told counselling was not offered by my inherited cardiac conditions unit. Very disappointing and also I would like cardiac rehab and advice on what exercise I can do safely but have not been informed of this. I've put on 6 kg and desperately would like to know what I can do. I try to walk a lot and was told that was fine but feel I need more."

"Having suffered an OOHCA [out of hospital cardiac arrest], being told that I have Dilated Cardiomyopathy, and being fitted with an ICD, I was discharged from hospital with a bag of medication and a handful of leaflets… I know that, had I had a heart attack, my cardiac rehab would have been 100% more than any rehab I've had. It feels that SCA [sudden cardiac arrest] survivors are sent off to get on with life with little or no support despite having been through a major trauma."

Moreover, there was felt to be a 'postcode lottery' with better access in some areas than others.

"The only thing I would benefit from is cardiac rehab but it isn't offered for DCM in the West Midlands."

"I think that people with cardiomyopathy should automatically be eligible for cardiac physio & rehab and such offerings not be a postcode lottery. I had a septal myectomy & mitral valve repair for my HOCM [hypertrophic obstructive cardiomyopathy] & an IED fitted but was told I was not eligible for cardiac physio and/or rehab which is a travesty."

"Cardiac rehabilitation isn't available everywhere, particularly the two areas I have lived after being diagnosed with DCM."

Some people with cardiomyopathy feel that current offering is not appropriate due to being aimed at people who are inactive. Some people with cardiomyopathy were asymptomatic prior to experiencing a cardiac arrest, and many are diagnosed having led healthy, active lives. In a similar vein, thought needs to be given to progression after cardiac rehab – what are the next steps to enable people who want to continue improving their function to do so.

"The cardiac rehab is for non active people and there needs to be support and guidance for active people on how far they can push their exercise."

" I was offered cardiac rehab which was great but then when I progressed into gym membership this stopped and in 10 years I have had no other advice or support around my wellbeing."

"I would really like to have been able to have [cardiac rehab], which could enable me to consider a gym membership."

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We note that the Heart Failure NICE guideline is under review and there is a proposed wording amend to section 1.11.1 to the effect that cardiac rehab should henceforth be offered to all with heart failure – not just those whose condition was considered stable as before. Should this change be approved, and the digital platforms to support cardiac rehab likewise, we could see a significant improvement in access to cardiac rehab for people with cardiomyopathy.

About the medical technology being assessed

6. For those <u>with</u> experience of this technology, what difference did it make to their lives?

People with cardiomyopathy who have managed to access cardiac rehab (very much not a given – as above) have a broad range of views about it, as illustrated by a couple of quotes from our MyInsight survey below.

"Cardiac rehab was a total game changer for me, in a very positive way"

"Rehabilitation was not routinely offered and, even when I asked for it, was inappropriate and absolutely not helpful; it did not allay any concerns, nor did it give me any form of guidance."

7. For those <u>without</u> experience of the technology being assessed, what are the expectations of using it?

8. Which groups of people might benefit most from this technology?

As a whole group, people with cardiomyopathy stand to benefit significantly from any improvement in access to cardiac rehab that results from this technology being approved. The statistics given in the response to question 1 above highlight the level of need not only for cardiac rehab, but the components that make up most cardiac rehab programmes. Improved access to cardiac rehab offered through this technology, and (hopefully) an update to the NICE heart failure guideline, could result in significant improvements in people's experiences, and in these figures accordingly.

People with cardiomyopathy reflect their broader population in their use of technology i.e. there are many who are very happy with the use of technology, but an important subset

who find technology unintuitive and challenging, or impossible, to deal with. However, compared to the broader heart failure population, people with cardiomyopathy may be broadly somewhat younger on average/there are people with cardiomyopathy in their 20s, 30s and 40s – age groups that typically embraced new technologies and are digitally literate.

So, while we know that a proportion of people will not want to use technologies – preferring face to face programmes, we also know that younger people tend to prefer a digital first approach. Indeed, we tend to find that younger people prefer psychosocial support via use of videos, and text functions that speaking on a phone or attending support group meetings.

So, extending the range of cardiac rehab through additional technologies would likely serve this population of younger people with cardiomyopathy particularly well.

Additional information

9. Please include any additional information you believe would be helpful in assessing the value of the medical technology (for example ethical or social issues, and/or socio-economic considerations)

We note that just one of the technologies under consideration (KiActiv) specifies that it is suitable for people with cardiomyopathy.

We would be very keen that more of the technologies included in this assessment specify whether or not they are open to people with heart failure caused by cardiomyopathy. There is a risk that, if underspecified, people's clinicians will take a risk-averse approach and not refer them/signpost them onto these technologies, meaning people miss out on an important source of support which may well be perfectly suitable for them. In turn, this could reduce the value of the medical technology, as fewer people than arguable ought to be using it end up doing so – given cardiomyopathy is one of the leading causes of heart failure.

The Moving Medicine initiative (https://movingmedicine.ac.uk/) may be of relevance in rolling out the technologies. Moving Medicine aims to help equip healthcare professionals integrate physical activity conversations into routine clinical care, though a tool to inform conversations with patients, and a series of resources for both HCPs and patients. There is a section on hypertrophic cardiomyopathy, from which the technologies under consideration might perhaps be able to be linked?

There is a risk that these technologies, if only commissioned in certain areas, may further entrench the differences between areas in access to cardiac rehab. Whilst we are very keen for additional sources of cardiac rehab – given the level of need felt in the community as illustrated in the quotes above – we want to see a levelling up. Whilst take up may be beyond the remit of the committee when assessing the technology, we would want NICE implementation team to support this in due course.

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Key messages
10. In up to five statements, please list the most important points of your submission. • People with cardiomyopathy currently have much less access to both cardiac rehab, and aspects of cardiac rehab (support with exercise, nutrition, mental health) than they would like. Access is felt to be patchy across the country, and poorer than for many other cardiac conditions. • Women and Black and Minority Ethnic people seem to have higher felt need for the component parts of cardiac rehab. Technologies need to reflect this e.g. through appropriate look and feel of the technology. • Some of the cardiomyopathy-induced heart failure population is younger than your typical heart failure patient. In our experience, younger people often prefer digital solutions to the more traditional face to face/telephone sources of support. • Some people with cardiomyopathy have found existing cardiac programmes inappropriate, where they assume prior physical inactivity. • Overall, people with cardiomyopathy would be very in favour of improved access to cardiac rehab through these technologies. However there remains a risk of existing access problems being perpetuated, due to the vast majority of the programme not obviously stating that they are suitable for people with cardiomyopathy, on the info shared by NICE. If this came to pass the existing gap in access to cardiac rehab between people with cardiomyopathy and people with other cardiac conditions could widen further still.

Thank you for your time. Please return your completed submission to medtech@nice.org.uk

Digital Platforms to Support Cardiac Rehabilitation: Early Value Assessment [GID-HTE10060]
External assessment report

Produced by	Peninsula Technology Assessment Group (PenTAG) University of Exeter Medical School
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Author contributions

Maxwell S. Barnish	*Project manager. Led the EAG's systematic reviews. Contributed to writing and editing the report.*
Saul Stevens	*Contributed to the development of the EAG economic model and the economic analysis. Contributed to the writing and editing of the report*
Jemma Perks	*Contributed to the data extraction, writing, and editing of the report.*
Sophie Robinson	*Designed and carried out the literature searches. Contributed to writing and editing the report.*
Koh Jun Ong	*Contributed to the development of the EAG economic model, analysis and rationale for economic model inputs.*
Josh Martin	*Contributed to the development of the EAG economic model, analysis and rationale for economic model inputs.*
Frank Grimsey Jones	*Contributed to development of EAG Excel model.*
Matthew Annals	*Clinical advice to the EAG.*
Dawn Lee	*Provided additional support including health economics analysis and review of the report*
Edward C.F. Wilson	*Contributed to the development of the EAG economic model, analysis and rationale for economic model inputs. Contributed to writing and editing the report. Guarantor.*

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Abbreviations

AAA	Abdominal aortic aneurysm
AI	Artificial intelligence
CCR	Conventional cardiac rehabilitation
CAD	Coronary artery disease
CE	Cost-effectiveness
CEA	Cost-effectiveness analysis
CI	Confidence interval
CNY	Chinese Yuan
COMBI-CR	Combined cardiac rehabilitation
CR	Cardiac rehabilitation
CV	Cardiovascular
CVD	Cardiovascular disease
DCR	Digital cardiac rehabilitation
DHSC	Department of Health and Social Care
Dom	Dominant
DTx	Digital therapeutics
EAG	External Assessment Group
EAR	External Assessment Report
eGFR	Estimated glomerular filtration rate
EJP	Economically justified price
ES	Effect size
EVA	Early value assessment
GAD-7	Generalised Anxiety Disorder – 7 items
GP	General practitioner
HERC	Health Economics Research Centre
HDL	High-density lipoprotein
HRQoL	Health-related quality of life
HRWSI	Heart rate walking speed index
hsCRP	High-sensitivity C-reactive protein
HTA	Health technology assessment
ICER	Incremental Cost Effectiveness Ratio
ICTRP	International Clinical Trials Registry Platform
INAHTA	International Network of Agencies for Health Technology Assessment
INHB	Incremental Net Health Benefit
IQR	Interquartile range
ISWT	Incremental shuttle walk test
MAUDE	Manufacturer and User Facility Device Experience

MD	Mean difference
MeSH	Medical subject headings
MET	Metabolic equivalent
Mgmt.	Management
MHRA	Medicines & Healthcare products Regulatory Agency
MI	Myocardial infarction
N/A	Not applicable
NACR	National Audit for Cardiac Rehabilitation
NG	NICE guideline
NHB	Net Health Benefit
NHS	National Health Service
NICE	National Institute for Health and Care Excellence
NLM	National Library of Medicine
NNT	Number needed to treat
NR	Not reported
NYHA	New York Heart Association
PAD	Peripheral artery disease
PenTAG	Peninsula Technology Assessment Group
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PSA	Probabilistic sensitivity analysis
QALY	Quality Adjusted Life Year
QoL	Quality of life
RCT	Randomised controlled trial
RFI	Request for Information
RR	Risk ratio
SAQ	Seattle Angina Questionnaire
SBP	Systolic blood pressure
SCM	Specialist Committee Member
SD	Standard deviation
SW	Southwest
UK	United Kingdom
UKCA	UK Conformity Assessed
USA	United States of America
VAS	Visual analogue scale
VAT	Value added tax
WB-CR	Web-based cardiac rehabilitation
WHO	World Health Organization
WTP	Willingness to pay

Executive Summary

Background and objectives

The NICE prioritisation board agreed that digital platforms have the potential to address system needs in cardiac rehabilitation. This topic is being evaluated by the NICE HealthTech Programme as an early value assessment (EVA). This appraisal assesses evidence for the clinical- and cost-effectiveness of digital technologies to support cardiac rehabilitation for people with cardiovascular disease.

Evidence review – clinical and service use outcomes

Following its own searches and review of information submitted by companies, the EAG was able to identify relevant evidence for eight out of the 13 scoped technologies. These are: Activate Your Heart, Datos Health, D:REACH-HF, Digital Heart Manual, Gro Health HeartBuddy, KiActiv, myHeart, and R Plus Health. Six of these technologies had UK evidence. Evidence for Datos Health was only available in an Israeli setting. Evidence for R Plus Health was only available in Chinese and US settings. The generalisability of these healthcare settings to UK clinical practice is uncertain. RCT evidence was available for Activate Your Heart, KiActiv, myHeart and R Plus Health. Three technologies (KiActiv, myHeart and R Plus Health) had evidence versus conventional in-person cardiac rehabilitation. The other comparative studies were versus usual care, which where information was available, was defined as referral back to GP for periodic monitoring without active cardiac rehabilitation. Only KiActiv, myHeart and R Plus Health had evidence compared to the scoped comparator, so the evidence for these technologies may have greater relevance for consideration, although the uncertainty in generalisability of the evidence for R Plus Health from the Chinese and US health systems to the UK should be noted.

Overall, there is some evidence that digitally supported cardiac rehabilitation – using a range of different technologies – may have satisfactory uptake, adherence and completion, may be usable, acceptable and satisfactory to patients, and may offer benefits especially in terms of exercise capacity, psychological outcomes and health-related quality of life compared to usual care, i.e. GP monitoring with no cardiac rehabilitation. However, it should be noted that RCT evidence was only available for four of the scoped technologies, while single-arm and observational evidence is limited in the causal inference it can offer. As comparisons to

conventional cardiac rehabilitation were seldom made in included studies, we know that digitally supported cardiac rehabilitation is likely to be more effective than no cardiac rehabilitation. However, we do not know whether it is less effective than conventional face-to-face cardiac rehabilitation, and if so, by how much.

Economic evidence and analysis

None of the studies identified in the literature review directly addressed the decision problem in terms of setting or comparators and the quality of the assessments conducted was generally poor. In addition to the models specifically addressing the impact of digital CR identified in the literature the NICE guideline model for CR was reviewed.[1] Key learnings from this model included:

- High levels of variability in the cost of conventional CR
- The importance of considering uptake and completion as key outcomes

The economic analysis conducted was broadly based upon the NICE guideline model[1]. Based upon the data available it is plausible that use of digital CR is cost saving as the licence costs were substantially lower than the cost of eight sessions of conventional CR at the relevant NHS reference cost. Evidence on relative completion and uptake rates were mixed, however, there did not appear to be a pattern of reduced uptake or completion in the data available. Very little data were available for long-term outcomes or biomarkers related to these, however, where there were data, they indicated a trend towards improved outcomes with digital CR. Expected quality-adjusted life-year (QALY) differences were very small with cost-related items driving the economic analysis. Implementation costs were provided by six companies and included in the analysis. One clinical expert advised the EAG that it is reasonable to assume significant implementation cost, but it is not possible to specify a figure, as it will depend on service enthusiasm for technology uptake, feasibility of system integration, as well as time available to train clinicians and patients to use the platform.

Key points for decision makers

The key clinical effectiveness points for decision makers were as follows:

- Only three technologies had evidence compared to the scoped comparator.

- myHeart had evidence from a UK RCT, but this was only reported as a conference abstract.
- Evidence for myHeart also included a full-text paper from a UK real-world retrospective study.
- Otherwise, evidence was largely single arm in nature or compared to usual care by GPs (i.e. no cardiac rehabilitation), which was not a scoped comparator for this appraisal.
- Overall, the available evidence to address the decision problem was limited and the evidence gap analysis revealed several key areas of clinical uncertainty.

The key cost effectiveness points for decision makers were as follows:

- Expected to be cheaper – due to resource use saving from fewer face-to-face appointments
- Costs of implementation, however, not addressed in most company RFIs (6 of 13 reported implementation costs) and a key area of uncertainty
- Effectiveness uncertain although appears to have comparable levels of uptake / completeness from the data available; information to analyse impact on long-term outcomes very limited

Plain Language Summary

- Cardiac rehabilitation is a treatment approach that involves exercise and education for people with cardiovascular disease. Online cardiac rehabilitation tools have been developed to support people with their recovery. PenTAG was commissioned to provide an initial view on whether digitally supported cardiac rehabilitation is beneficial and safe for adults with cardiovascular diseases, and whether these technologies represent good value for money for the National Health Service (NHS).
- Thirteen online tools were identified to be considered. A search was conducted to identify all of the evidence that had evaluated online tools developed to support people with cardiac rehabilitation. This included published evidence and confidential data from companies who develop the online tools. The review identified 29 studies that evaluated how beneficial the online tools are to support adults with their cardiac rehabilitation and 3 studies that evaluated whether these tools are good value for money.
- Studies for six of the technologies identified were based in the UK and thus had relevant evidence for use in the NHS. Three of the technologies compared the online tools to standard in-person cardiac rehabilitation treatment. Overall, there is some evidence that online tools for cardiac rehabilitation may be usable, acceptable and satisfactory to patients, and may offer benefits for quality of life, for the ability to exercise and for psychological well-being.
- To assess whether online tools for cardiac rehabilitation would be good value for money for the NHS, we looked at two technologies in particular that had enough information available. It is possible that use of online tools for cardiac rehabilitation is good value, as the costs were much lower than the cost of having six sessions of standard care. There was not much information available on long-term outcomes for the treatment, but the information we did identify showed a trend towards improved outcomes for people using online tools for cardiac rehabilitation.

1. DECISION PROBLEM

The decision problem for this assessment is described in the NICE scope[2] and EAG comments and planned assessment methods are included in the protocol.[3]

During its assessment, the EAG made the following minor adjustment to the planned methods outlined in the protocol:

The scoped comparator was “cardiac rehabilitation where digital platforms are not offered as an option. This could consist of face-to-face cardiac rehabilitation programmes or a hybrid of in-person group-based and home-based programmes (including paper manuals, live online classes, home visits, or telehealth)”. Single arm studies were included as per the protocol. Evidence compared to the scoped comparator was only available for KiActiv, myHeart and R Plus Health. Therefore, studies compared to usual care (i.e. without current access to cardiac rehabilitation) were included in the review, following the pragmatic nature of the EVA methods guide,[4] to include available evidence for all scoped technologies. However, the EAG considered that studies compared to the scoped comparator would likely be the most relevant for decision-making.

The EAG noted that the evidence specifically for D:REACH-HF and the Digital Heart Manual was restricted to qualitative studies and a single-arm pilot study respectively. The EAG was aware of the evidence underpinning the original paper manual REACH-HF and Heart Manual and noted that the content of the interventions was the same as for the digital versions. The EAG did not, however, include evidence for the paper manual versions in this appraisal. This was supported by clinical expert advice that paper manual versions are better seen as comparators than interventions in this appraisal, because paper manuals and digital versions do not perform the exact same role in cardiac rehabilitation and the scope focuses solely on digitally supported cardiac rehabilitation and lists paper manuals under comparators. It is also possible that paper manual and digital versions may appeal to different patients and uptake and completion rates may differ due to differences in the delivery format.

2. TECHNOLOGIES

A brief overview of the programme features of the technologies included in the assessment can be found in Table 1, while accessibility, connectivity and safety considerations are shown in Table 2. Please see the NICE Scope for further details. Information available on the technologies in the NICE Scope[2] was limited. Further information was therefore sought from companies, although some companies did not provide all requested information to fill a post-scoping workshop technology features table.

Technologies typically cover most or all of the standard components of conventional cardiac rehabilitation. Where information on length of programme was available, this ranged from six to twelve weeks, although Get Ready – Solution, R Plus Health, and Sword Move offer a programme of flexible duration. It is known that Gro Health HeartBuddy, Luscii Vitals, myHeart, and R Plus Health have UKCA/CE marking. Whether technologies require this depends on the product features.

Four technologies (Beat Better, Digital Heart Manual, myHeart, and Pumping Marvellous Cardiac Rehab Platform), do not offer communication with the NHS HCP platform. This may be important for accessing health professional support. Availability of remote monitoring and access to company-employed staff within the platform also varied across technologies. Where technologies offer remote monitoring, this may make them more attractive to patients, according to SCM advice, as current day health apps have incorporated this, such as virtual wards. This could be useful for higher risk patient groups. Patient access to the platform also varies across technologies, for example they can be web-based, app-based, or both. An SCM noted that R Plus Health required telemonitoring as part of its delivery – it is unclear to the EAG whether any other apps require non-digital forms of monitoring.

The EAG received input from two clinical advisors, reflecting experience in Greater Manchester and Leicester respectively. One advised that he had not seen the routine use of digital resources such as apps in cardiac rehabilitation in clinical practice, although videoconferencing may be used for some educational activities to reach a group of patients at the same time. The other advised that all or almost all patients are offered digitally supported cardiac rehabilitation in the centre where he works, although over three quarters of patients opt for the face-to-face option. In that centre, only Activate Your Heart is used, although the clinical advisor was aware of use of myHeart in other centres in the West Midlands. The EAG noted active use of many of

the other technologies in the NHS as stated in company RFI forms and acknowledged that the experience of its two clinical advisors is unlikely to generalise to NHS practice across the UK, given variability in the use of digitally supported cardiac rehabilitation.

Table 1. Description of programme features for technologies included in the assessment

Company	Technology	Health behaviour change and education	Lifestyle risk factor mgmt	Medical risk mgmt	Psychosocial health	Long term strategies	UKCA/ CE Mark	Length of programme
University Hospitals of Leicester NHS Trust	Activate Your Heart	Yes	Yes	Yes	Yes	Yes	No	6 weeks minimum
Avegen Ltd	Beat Better	Yes	Yes	No*	Yes	Yes	No**	12 weeks on average
Datos Health Ltd	Datos Health - AI Driven Hybrid Care Platform	Unclear	Unclear	Unclear	Unclear	Unclear	No – but applying	6 months
HCI Ltd	D REACH-HF	No	Yes	Yes	Yes	Yes	No**	12 weeks
NHS Lothian	Digital Heart Manual	Yes	Yes	Yes	Yes	Yes	No	6 weeks minimum
Medtronic	Get Ready - Solution	Yes	Yes	Yes	Yes	No	Yes	Flexible
DDM Health	Gro Health HeartBuddy	Yes	Yes	Yes	Yes	Yes	Yes	12 weeks
Ki Performance Lifestyle Ltd	KiActiv	Yes	Yes	Yes	Yes	Yes	In progress	6 weeks minimum (flexible)
Luscii Healthtech B.V	Luscii vitals	Unclear	Unclear	Unclear	Unclear	Unclear	Yes	Unclear
my mhealth Ltd	myHeart	Yes	Yes	Yes	Yes	Yes	Yes	12 weeks
Pumping Marvellous Foundation	Pumping Marvellous Cardiac Rehab Platform	Yes	Yes	No	Yes	Yes	No**	8 weeks
RPlusHealth Ltd	R Plus Health	Yes	Yes	Yes	Yes	Yes	Yes	Flexible
Sword Health Ltd	Sword Move	Yes	Yes	Yes	Yes	Yes	In progress	Flexible

Abbreviations: CE, Conformité Européenne (European conformity standard), mgmt.; management, N/A, not available; NHS, National Health Service; UKCA, UK Conformity Assessed. Source: Information is taken from the NICE scope for this assessment as well as request for information (RFI) and post-scoping workshop

forms supplied by companies, responses to queries and publications. * - although use is restricted to patients considered suitable by a health professional. ** not required.

Table 2. Accessibility, connectivity and safety considerations for technologies included in the assessment

Company	Technology	Clinical dashboard/portal	Remote monitoring	Connectivity to other devices	Communication with NHS HCP platform	Access to company-employed support staff
University Hospitals of Leicester NHS Trust	Activate Your Heart	Yes	Unclear	Yes	Unclear	No
Avegen Ltd	Beat Better	Yes	No	Yes	Yes	No
Datos Health Ltd	Datos Health - AI Driven Hybrid Care Platform	Yes	Yes	Yes	Yes	No
HCI Ltd	D REACH-HF	Yes	Yes	No	Yes	No
NHS Lothian	Digital Heart Manual	Yes	No	No	No	No
Medtronic	Get Ready - Solution	Yes	Yes	Yes	Yes	No
DDM Health	Gro Health HeartBuddy	Yes	Yes	Yes	Yes	Yes
Ki Performance Lifestyle Ltd	KiActiv	Yes	Yes	No	No	Yes
Luscii Healthtech B.V	Luscii vitals	Yes	Yes	Yes	Unclear	No
my mhealth Ltd	myHeart	Yes	No	Yes	No	Yes
Pumping Marvellous Foundation	Pumping Marvellous Cardiac Rehab Platform	No	No	No	No	Yes
RPlusHealth Ltd	R Plus Health	Yes	Yes	Yes	Yes	No
Sword Health Ltd	Sword Move	Yes	Yes*	Yes	Yes	Yes

Abbreviations: HCP, Healthcare professional; NHS, National Health Service. * heart rate tracking not live monitored.

Source: Information is taken from the NICE scope for this assessment as well as request for information (RFI) forms supplied by companies.

3. CLINICAL CONTEXT

3.1. Care pathway

The care pathway for cardiac rehabilitation in the NHS is described in the NICE scope for this assessment. As part of its assessment, the EAG noted the following additional considerations based on clinical expert advice:

- The 2024 National Audit for Cardiac Rehabilitation (NACR)[5] provides an estimate for modes of delivery in 2023 with just under 40% (exact figures not stated on the graph) each receiving group-based in-person cardiac rehabilitation and home-based/self-managed cardiac rehabilitation (which may or may not be digital), and 24% receiving a hybrid of the two modes of delivery. Clinical expert advice to the EAG was that use of digitally supported cardiac rehabilitation, as well as the specific technologies used, is likely to vary considerably between centres.
- A minority of patients opt for digitally supported cardiac rehabilitation and those who do so are more likely to be younger and/or working full-time, as in-person cardiac rehabilitation groups are typically in the week during working hours.
- Familiarity with technology is likely to be a key determinant of willingness to use digitally supported cardiac rehabilitation, both for patients and clinicians.
- A further consideration for clinicians is finding time to complete training for the digitally supported cardiac rehabilitation software used in their centre.
- Reading age and translation of the platforms, given people with low literacy levels and English as an additional language are often high non-attenders at in-person cardiac rehabilitation.
- The ability of in-person cardiac rehabilitation to make the programme personalised to the patient with progression and feedback from cardiac rehabilitation practitioners.

3.2. Effectiveness of conventional cardiac rehabilitation versus usual care

In order to undertake the economic modelling and interpretation of clinical effectiveness results, the EAG considered the effectiveness of conventional cardiac rehabilitation versus usual care. Face-to-face cardiac rehabilitation is an established treatment for coronary heart disease. A meta-analysis of 85 RCTs including 23,430 people with myocardial infarction, angina pectoris, or following coronary artery bypass graft, or percutaneous coronary intervention (published in

2023 with searches in September 2020)[6] showed that, considering interventions with at least six months of available follow-up data compared to no-exercise control, there was:

- A statistically significant risk reduction in cardiovascular mortality: risk ratio (RR) 0.74, 95% confidence interval (CI): 0.64 to 0.86, number needed to treat (NNT): 37.
- A statistically significant risk reduction in hospitalisations: RR: 0.77, 95% CI: 0.67 to 0.89, NNT: 37.
- A statistically significant risk reduction in myocardial infarction: RR: 0.82, 95% CI: 0.7 to 0.96, NNT: 100.
- A statistically significant improvement in SF-36[7] mental MD: 2.14, 95% CI: 1.07 to 3.22) and physical component scores (MD: 1.70, 95% CI: −0.08 to 3.47), but not in EQ-5D VAS (MD 0.05, 95% CI −0.01 to 0.10).
- No statistically significant differences in overall mortality (RR: 0.96, 95% CI: 0.89 to 1.04), coronary artery bypass graft (RR: 0.96, 95% CI: 0.8 to 1.15), percutaneous coronary intervention (RR: 0.84, 95% CI: 0.6 to 1.02) or by patient group or follow-up duration.

The EAG also noted time dependency. For example, there was no statistically significant difference in all-cause mortality at 12 months (20 trials, RR=0.97, 95% CI 0.82 to 1.14) between those who had and those who had not received cardiac rehabilitation. However, there was evidence of a statistically significant reduction in all-cause mortality at 24 months (6 trials, RR=0.53, 95% CI 0.35 to 0.81) in those who had received cardiac rehabilitation compared to those who had not. Furthermore, at five years, there was also a statistically significant effect on all-cause mortality (7 trials, RR=0.77, 95% CI 0.63 to 0.93) in the same direction. This may reflect that benefits take time to accrue.

3.3. Considerations for implementing digitally supported cardiac rehabilitation in clinical practice

Based on clinical expert advice, the EAG considered the key considerations for implementing digitally supported cardiac intervention were likely to be overcoming lack of familiarity and confidence on the part of clinicians in using digitally supported technologies as well as overcoming resourcing challenges to find time to complete relevant training. The EAG also considered the issue of ‘supplementation’, the extent to which digitally supported cardiac rehabilitation would replace existing treatments or be an additional treatment alongside them. It would not be expected that digitally supported cardiac rehabilitation would replace usual care in

the form of annual monitoring reviews by GPs due to the duration of digitally supported cardiac rehabilitation programmes. These had a minimum of six weeks according to the NICE Scope,[2] maximum intended length in clinical practice 12 weeks (Table 4). The Scope stated that technologies that replaced the initial and final face-to-face appointments of cardiac rehabilitation would not be considered. Clinical expert advice to the EAG was that where digitally supported cardiac rehabilitation was used, only these two face-to-face appointments would routinely take place, and all other appointments would be replaced by the self-guided digital technology. The EAG was advised that digitally supported cardiac rehabilitation would be offered as an alternative mode of delivery, i.e. patients would be able to choose between in-person and digitally supported cardiac rehabilitation, rather than completely replacing in-person delivery within a given centre.

3.4. Equality issues

Equality considerations for this assessment were noted in the NICE Scope. Further to these, the EAG noted that:

- Digitally supported cardiac rehabilitation may benefit people who struggle to attend daytime in-person cardiac rehabilitation groups due to work or caring responsibilities.
- Digitally supported cardiac rehabilitation may address issues faced by people living in rural communities with long travel times to clinic appointments, especially by public transport, although this would depend on access to a reliable internet connection.

4. CLINICAL, SERVICE AND TECHNOLOGICAL EVIDENCE SELECTION

4.1. Evidence search strategies and study selection

The search strategies are presented in Appendix A and the PRISMA diagram for the evidence selection is presented in Appendix B.

Search strategies were based on those devised during the initial scoping searches by NICE Information Services with some amendments. The search strategies used relevant search - terms, comprising a combination of indexed keywords (e.g., Medical Subject Headings, MeSH) and free-text terms appearing in the titles and/or abstracts of database records and were adapted according to the configuration of each database. No date, language or publication status (published, unpublished, in-press, and in-progress) limits were applied. Searches for clinical and cost-effectiveness were combined and carried out in one search strategy.

Databases searched were Medline (including Medline in Process), Embase, Cochrane, INAHTA, CEA Registry and HERC. Additional trial registries searched were Clinicaltrials.gov (NLM) and ICTRP (WHO). The websites of the individual companies were searched; NICE and SIGN websites were searched for related guidelines, and MAUDE and MHRA were searched for adverse events data. Following deduplication (in Endnote v20), a total of 1382 records of potentially relevant evidence on clinical and/or cost effectiveness were retrieved and uploaded to Rayyan for screening. The company submission references were also scanned for additional references—from which 43 new articles were identified.

4.2. Included and excluded studies

137 of the articles screened at title and abstract were selected for full text screening. Of these 32 papers (29 for clinical effectiveness and three for cost effectiveness) were included in this review, although not all included papers are presented in detail within the report due to prioritisation as part of the EVA process.

A list of studies excluded along with the rationale for exclusion is provided in Appendix C. A PRISMA diagram of the search and screen process is provided in Appendix B.

A breakdown of the number of studies evaluating each technology is shown in Table 3.

Table 3. Evidence landscape for studies meeting inclusion criteria

Technology	RCTs	Single-arm studies	Qualitative/mixed methods
Activate Your Heart (all evidence was from the UK)	Devi et al, 2014[8] Houchen-Wolloff et al, 2018[9] – feasibility ISRCTN10726798[10] – same feasibility trial	Brough et al, 2014[11]	None
Beat Better	None	None	None
Datos Health (all evidence was from Israel)	None	Nabutovsky et al (2020)[12] Nabutovsky et al (2019)[13] – abstract from same study Klempfner et al (2019)[14] – abstract from same study	None
D:REACH-HF (all evidence was from the UK)	None	None	Cross et al (2023)[15] – abstract Van Beurden et al (2022)[16] – abstract

Digital Health Manual (all evidence was from the UK)	None	None	Deighan et al (2017)[17] Deighan et al (2015)[18] – abstract from same study Deighan et al (2016)[19] – abstract from same study
Get Ready - Solution	None	None	None
Gro Health HeartBuddy (all evidence was from the UK)	None	Rai et al[20] – abstract of manuscript not confidential	None
KiActiv (all evidence was from the UK)	Meenamkuzhy-Hariharan et al, 2024[21] Fisher et al, 2023[22] – abstract from same study Fisher et al[23] – subset analysis Del Angel Martinez et al[24] – abstract of manuscript not confidential – secondary analysis of RCT	Rayner et al (2022)[26] – abstract Duvva et al[27] – abstract Cranwell et al[28] Cranwell et al[29]	

	Del Angel Martinez et al[25] – conference abstract – secondary analysis of RCT		
Luscii Vitals	None	None	None
myHeart (all evidence was from the UK)	D'Angelo and Smith (2023)[30] – abstract Smith and D'Angelo (2023)[31] – abstract from same study	Blythin et al (2023)[32] Scordis and Glover (2023)[33] – abstract from same study	None
Pumping Marvellous Cardiac Rehab Platform	None	None	None
R Plus Health (Cai et al and Xia et al were from China, Bilbrey et al was from the USA)	Cai et al (2022)[34]	Xia et al (2023)[35] Bilbrey et al (2024)[36]	None
Sword Move	None	None	None

Evidence was available for eight of the thirteen scoped technologies. There was no eligible evidence for Beat Better, Get Ready - Solution, Luscii Vitals, Pumping Marvellous Cardiac Rehab Platform and Sword Move. Beat Better submitted one paper (McCartan et al, 2017[37]), which was an example of how digitally supported cardiac rehabilitation could benefit people and was not related to their specific technology. Sword Move submitted their Member Database 2023-2024,[38] but it was from all populations, not focused on cardiac rehabilitation. Neither of these studies met the inclusion criteria nor were considered to offer valuable evidence to inform this appraisal.

Limited prioritisation was generally required in the context of this appraisal.[9] For Activate Your Heart, the published paper (Houchen-Wolloff et al, 2018[9]) was prioritised ahead of the trial registry entry (ISRCTN10726798[10]) for the same study. For Datos Health, the full-text paper (Nabutovsky, 2020[13]) was prioritised over the conference abstracts (Nabutovsky et al, 2019[14]; Klempfner et al, 2019[17]). For Digital Heart Manual, the published paper (Deighan et al, 2017[17-19]) was prioritised ahead of conference abstracts (Deighan et al, 2015[18]; Deighan et al, 2016[19]) from the same study. For KiActiv, the published full-text RCT paper (Meenamkuzhy-Hariharan et al, 2024[26,31]) and real-world evidence conference abstract (Rayner et al, 2022[26]) were prioritised ahead of the conference abstract from the same RCT (Fisher et al, 2023[22]) as well as unpublished abstracts and manuscripts. For myHeart, Smith and D'Angelo (2023)[31,39] was prioritised over D'Angelo and Smith (2023)[39] because it was the same conference abstract presented by a different lead author and over Scordis and Glover (2023)[33] as this abstract contained few results. Table 4 presents a detailed overview of the study design and characteristics of each prioritised study.

Table 4. Study design and characteristics of prioritised clinical and technological evidence

Reference	Study design & country	Population	Intervention	Comparator(s)	EAG comments
*Activate Your Heart (*number of prioritised studies = 3)					
Devi et al, 2014[8]	RCT (not blinded), UK (Leicester). Intervention group n=48, 71% male, mean (SD) age 66.27 (8.35) years. Control group n=46, 78% male, mean (SD) age 66.20 (10.06) years.	Stable angina managed in primary care. No conventional CR within the past year, unstable angina, severe anxiety or depression, conditions preventing physical activity, inability to read English, or computer illiteracy.	Activate Your Heart, follow-up after 6 weeks, introductory face-to-face meeting then web-based (no further face-to-face contact).	Treatment as usual by GP – placed on coronary heart disease register and attend annual review.	UK-based RCT (not pragmatic), although limited to one region. Potential of additional encouragement of high-risk participants to perform well (as the same researcher delivered outcomes and delivered intervention)
Brough et al, 2014[11]	Pilot study (prospective observational), UK (Leicester). n=41, 90% male, mean (SD) age 60.5 (11.1) years.	Low-risk coronary heart disease. Percutaneous coronary intervention or coronary artery bypass graft in the last 3 months or medically managed for coronary heart disease. No unstable angina, severe anxiety or depression, conditions	Activate Your Heart, follow-up after 8 weeks. Participants were contacted if they hadn't logged in for 7 days or were not progressing.	None.	UK-based study, although limited by single-arm design. Only assessed a low-risk population.

		preventing physical activity, inability to read English, or computer illiteracy.			
Houchen-Wolloff et al, 2018[9]	Feasibility RCT (blinded assessment), UK (Leicester and Lincolnshire). Intervention group, n=37, 89% male, mean (SD) age 62 (10) years. Control group, n=23, 91% male, mean age 61(8) years.	Coronary heart disease eligible for conventional CR (but declined or dropped out in past 12 months). No severe anxiety or depression, poor exercise capacity, inability to read English, or computer illiteracy.	Activate Your Heart, follow-up after 8 weeks and 6 months.	Usual care – referral back to GP and general advice in the form of standard verbal advice and guidance booklets. Offered opportunity to participate in Activate Your Heart after 6-month follow-up.	UK-based feasibility RCT, covers one largely urban region and one largely rural region. Restricted to those who declined or dropped out of conventional CR. Only 25% of those eligible to participate decided to take part (which corroborates clinical expert estimate of uptake to EAG).
Beat Better (number of prioritised studies = 0)					
Datos Health (number of prioritised studies = 1)					
Nabutovsky et al, 2020[40]	Prospective single-arm study, Israel. n=22, 77% male, mean (SD) age 52.7 (0.81).	People with established coronary artery disease and low cardiovascular risk. No heart failure or severe orthopaedic or neurological or cognitive impairment.	Datos Health (six-month programme).	None.	Limited by single-arm design. Based in an Israeli healthcare context. Restricted to low-risk population.

D:REACH-HF (number of prioritised studies = 2)					
Cross et al, 2023[15]	Qualitative, UK. n=10 (5 of which are people with health failure)	People with heart failure, caregivers, and health professionals.	D: REACH-HF (12-week programme).	None.	UK-based study, though limited by single-arm design. Qualitative design offers limited insight into effectiveness. Conference abstract only.
Van Beurden et al, 2022[16]	Qualitative, UK. Total n=19.	People with heart failure, caregivers, and health professionals.	D: REACH-HF.	None.	UK-based study, though limited by single-arm design. Qualitative design offers limited insight into effectiveness. Conference abstract only.
Digital Heart Manual (number of prioritised studies = 1)					
Deighan et al, 2017[17]	Pilot study (single-arm, mixed methods), UK. N=28 (of which 17 were service users or their partners).	People who had completed the paper Heart Manual intervention or their partners (plus health professionals). History of myocardial infarction or revascularisation, stable condition, and internet access.	Digital Heart Manual.	None.	UK-based study, though limited by single-arm design.
Get Ready - Solution (number of prioritised studies = 0)					
Gro Health HeartBuddy (number of prioritised studies = 1)					
Rai et al, submitted[20]	Real-world service evaluation, UK (London)	People aged 18 or over with recent myocardial infarction,	Gro Health HeartBuddy. [redacted]	[redacted]	UK-based study, though limited by single-arm design [redacted]

	n=66 (enrolled), [redacted]	percutaneous coronary intervention (PCI), coronary artery bypass grafting (CABG), or heart failure.	[redacted]		
KiActiv (number of prioritised studies = 2)					
Meenamkuzhy-Hariharan et al, 2024[21]	Prospective, parallel group, open label RCT, UK (Liverpool area). Intervention group n=65, 75% male, mean (SD) age 60 (8.8). Control group n=65, 79% male, age 60 (10.7).	130 people eligible for CR.	8-week conventional CR plus contextualized data feedback via KiActiv Heart.	Conventional CR – defined as 1-2 hours of face-to-face contact per week, meaning that the programme is 98-99% unmonitored	UK-based RCT, although focused on a single, largely urban area.
Rayner et al, 2022[26]	Before and after interventional study, UK. n=17, 82% male, mean age 58.	Patients referred for CR between September 2020 and April 2021.	KiActiv Health 12-week programme in addition to a pandemic-limited conventional CR service.	None	UK-based study. Abstract only. Limited by single-arm design.
Luscii Vitals (number of prioritised studies = 0)					
myHeart (number of prioritised studies = 2)					

Blythin et al, 2023[32]	Retrospective real-world study, UK. n=434, mean (SD), 73% male, age 62.4 (11.8), where data available.	Adults over 18 years referred for CR. Access to an internet connected device, a basic understanding of technology, and willingness to use myHeart.	myHeart 12-week programme.	None.	UK-based real world evidence study. Specific to COVID-19 era. The sample reflected as closely as possible the timeline of conventional CR, but there was no separate control group.
Smith and D'Angelo, 2023[31]	Three-way RCT, UK. n=57.	Low-moderate risk people with coronary heart disease	8-week web-based programme using the myHeart platform (WB-CR) completed exercise and educational sessions using the myHeart app.	Traditional CR programme delivered in a hospital setting, one session per week, plus an education day. By itself or combined with myHeart.	Abstract only. UK-based RCT compared to traditional CR either by itself or alongside digitally supported CR.
Pumping Marvellous Cardiac Rehab Platform (number of prioritised studies = 0)					
R Plus Health (number of prioritised studies = 3)					
Bilbrey et al, 2024[36]	Prospective, single-arm trial, USA. N=75, 49% male, mean (SD) age 64.6 (10.0).	Adults with cardiovascular disease aged at least 40 with stable angina pectoris, myocardial infarction, or heart failure.	12-week digital home-based CR program (RecoveryPlus.Health) that integrates both telehealth and mHealth modalities.	None.	Based in a US healthcare context. Limited by single-arm design.

Cai et al, 2022[34]	RCT (blinded), China. Intervention n=49, 63% male, mean (SD) age 57 (11). Control n=48, 67% male, mean (SD) age 57 (9).	People who underwent ablation for atrial fibrillation.	Comprehensive, domiciliary, mobile application-guided and tele-monitored CR program (intervention group).	Conventional cardiac rehabilitation.	RCT compared to conventional CR. Based in a Chinese healthcare context. Adherence was measured differently in the two arms.
Xia et al, 2023[35]	Quasi-experimental single-arm study, China. n=31, 97% male, mean (SD) age 56.2 (13.4).	People aged 18 or above with stable coronary heart disease who own and use a smartphone.	12-week remote digital CR program. Wearable heart rate monitoring device connected with an app to monitor the patients' exercise intensity.	None.	Based in a Chinese healthcare context. Limited by single-arm design.
Sword Move (number of prioritised studies = 0)					

Abbreviations: CR, cardiac rehabilitation; GP, general practitioner; RCT, randomised controlled trial; SD, standard deviation; UK, United Kingdom.

4.2.1. Study design, intervention and comparator

RCT evidence was available for Activate Your Heart, KiActiv, myHeart and R Plus Health. The remaining evidence was largely single-arm studies, while evidence for D:REACH-HF (Cross et al, 2023[15]; Van Beurden et al, 2022[16]) was qualitative and the Blythin et al (2023)[32] study for myHeart used a retrospective observational design. Eligible evidence was available for eight of the scoped interventions. Beat Better, Get Ready - Solution, Luscii Vitals, Pumping Marvellous Cardiac Rehab Platform and Sword Move had no included studies. The EAG considered that the self-guided nature of technologies meant that intervention delivery in clinical practice would likely be well aligned to the clinical study evidence. However, it was noted that one study for R Plus Health[35] (although not the pivotal RCT) used a much more intensive intervention than the other studies both for this and other technologies. Following Chinese cardiac rehabilitation guidelines,[41] participants were prescribed 30-60 minutes of exercise therapy per day, ideally seven days per week. This would be considerably more intensive than in a UK context.

Three technologies (Ki Activ, myHeart and R Plus Health) had evidence versus the scoped comparator of cardiac rehabilitation where digital platforms are not offered as an option. In each case, this took the form of conventional in-person cardiac rehabilitation. All other comparative studies were compared to usual care. Where this was defined, it was referral back to GP services with periodic review but no active interventions. Only single-arm non-comparative evidence was available for Datos Health, D:REACH-HF, Digital Heart Manual, and Gro Health HeartBuddy. Where studies used usual care as the comparator, it was assumed that this was a background treatment in the intervention group too, even where it was not clearly stated. This is because it is typically considered unethical to withdraw access to usual care. The EAG considered that studies compared to usual care were less relevant to the decision problem, but could still provide relevant information, probably more so than single-arm studies, in cases where evidence against the scoped comparator was not available.

The prioritised comparative evidence was:

- Devi et al,[8] RCT, Activate Your Heart vs usual care, UK.
- Houchen-Wolloff et al,[9] feasibility RCT, Activate Your Heart vs usual care, UK.
- Meenamkuzhy-Hariharan et al,[21] RCT, KiActiv vs conventional CR , UK.
- Smith & D'Angelo,[31] RCT (abstract only), myHeart vs conventional and hybrid CR, UK.
- Cai et al,[34] RCT, R Plus Health vs conventional CR, China.

4.2.2. Participants and setting

Most eligible studies were conducted in the UK. Of the eight technologies that had eligible evidence, six had UK evidence. In each case, all the available evidence for the technology was from the UK. Activate Your Heart was developed in Leicester, a largely urban area in the East Midlands of England, and all of the three studies include participants from Leicester. It was noted that Leicester is also very ethnically mixed, which may have implications given the differential risk of CVD in South Asian populations.

The feasibility RCT (Houchen-Wolloff et al, 2018)[9] also included participants from Lincolnshire, which is a predominantly rural county in the East Midlands of England. The D:REACH-HF abstracts did not state where in the UK the studies were conducted, although the key RCT for the paper manual REACH-HF (Dalal et al, 2019)[42] was conducted in four contrasting locations across the UK: Birmingham, Cornwall, Gwent and York. The Deighan et al (2017)[17] paper does not say where participants were recruited to assess the Digital Health Manual, although the intervention was developed by NHS Lothian, covering both urban and rural areas in and around Edinburgh in Scotland. Evidence for Gro Health HeartBuddy (Rai et al, unpublished)[20] comes from London. The pivotal trial for KiActiv (Meenamkuzhy-Hariharan et al, 2024)[21] was based in Liverpool, a major urban centre in North West England, which is an area of high socioeconomic deprivation (mean Index of Multiple Deprivation score in the study 3.6). The Blythin et al (2023)[32] study for myHeart was based in centres in Scotland, the Northeast and Southwest of England. Evidence for Datos Health comes solely from Israel, while evidence for R Plus Health comes from China and the USA.

Clinical populations assessed varied across interventions. Details are provided in Table 4. In summary, studies covered broad cardiac rehabilitation populations, as well as narrower populations such as myocardial infarction, heart failure, angina and atrial fibrillation. Population characteristics were generally reported well.

Exclusion of people who lacked digital literacy and/or access to internet or smartphones was common across studies. This may, however, reflect clinical practice, as clinical expert advice was that people who lack digital literacy are less likely to be offered or to take up digitally supported cardiac rehabilitation. However, one clinical expert advised that if NHS teams are to adopt digital platforms, the idea would be to engage even technically averse patients.

Therefore, the exclusion of people based on digital literacy or device access could be problematic, as people from lower socioeconomic backgrounds are more likely to face these challenges and have a lower completion rate for cardiac rehabilitation. As such, the clinical expert advised that if digital platforms are to address inequalities, they should target specifically groups who currently benefit less, rather than excluding them, and that if studies focus only on the most digitally literature patients, there will be a large research-practice gap. Inclusivity in digital healthcare has been cited as an important consideration within the NHS.[43]

4.2.3. Outcomes

The outcomes reported by, or calculable from, the included studies are shown in Table 5[44]. Outcomes available, as well as how they were assessed, varied between studies and between technologies. There was no single outcome that was universally available across studies. Exercise, adherence, and usability and acceptability were among the more frequently assessed outcomes. Health-related quality of life was often assessed using disease-specific tools, such as the MacNew questionnaire[44] or the Seattle Angina Questionnaire.[8,45] The EAG noted that completion and uptake are key model parameters and definitions vary across studies, especially for completion. The definition of completion in Devi et al,[8] for example, was particularly strict, requiring completion of the full programme, which may explain the lower completion rate. It was noted that information on medication adherence (i.e. pharmaceuticals) was not available for any scoped technologies.

Table 5: Outcomes available from the included studies

First author (Date)	Adherence	Uptake	Completion	Attrition	Hospital	Mortality	Exercise	CV risk	Psych	HRQoL	Nutrition	Medication adherence	Time to rehab	Usability and acceptability
Activate Your Heart														
Devi et al, 2014[8]	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No	No	No
Brough et al, 2014[11]	Yes	No	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes
Houchen-Wolloff et al, 2018[9]	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	No	No	No	Yes
Datos Health														
Nabutovsky et al, 2020[40]	Yes	Yes	No	No	Yes	No	Yes	Yes	No	No	No	No	No	Yes
D: REACH-HF														
Cross et al, 2023[15]	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes
Van Beurden et al, 2022[16]	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes
Digital Heart Manual														
Deighan et al, 2017[17]	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes
Gro Health HeartBuddy														
Rai et al, submitted[20]	Yes	Yes	[redacted]	Yes	[redacted]	[redacted]	[redacted]	Yes	Yes	Yes	[redacted]	[redacted]	[redacted]	[redacted]
KiActiv														
Meenamkuzhy-Hariharan et al, 2024[21]	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	No	No	No	No	No
Rayner et al, 2022[26]	Yes	No	Yes	No	No	No	Yes	No	No	Yes	No	No	No	Yes
myHeart														
Blythin et al, 2023[32]	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	Yes

First author (Date)	Adherence	Uptake	Completion	Attrition	Hospital	Mortality	Exercise	CV risk	Psych	HRQoL	Nutrition	Medication adherence	Time to rehab	Usability and acceptability
Smith and D'Angelo, 2023[31]	No	No	Yes	Yes	No	No	Yes	No	No	No	No	No	No	No
R Plus Health														
Bilbrey et al, 2024[36]	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes	No	No	Yes	No
Cai et al, 2022[34]	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No
Xia et al, 2023[35]	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	No	No

Abbreviations: CV, cardiovascular; HRQoL, health-related quality of life.

Note: Only interventions with included evidence are shown in this table. Short versions of outcome names are used to fit. Full names are shown in the table in Appendix D. This table includes outcomes that are reported in the results sections of papers but are not listed as outcomes in the methods section. The outcome behavioural change is already covered under exercise capacity and performance (exercise behaviour), cardiovascular risk profile (smoking) and nutrition status (dietary changes). Therefore, this outcome is not extracted separately.

4.3. Quality appraisal of studies

As this was an EVA, no formal quality assessment of the included studies was conducted. The EAG noted that most available studies, comprising the totality of the evidence for six of the interventions, were conducted exclusively in a UK context. This is likely to be beneficial for generalisability to the UK decision-making context in terms of population characteristics and similarity of healthcare setting. However, the EAG considered that the Israeli healthcare context of the evidence for Datos Health[40] and the Chinese[34,35] and US[36] healthcare contexts of the evidence for R Plus Health are less likely to generalise well to the appraisal context.

Studies cover a wide range of types of cardiovascular disease, including angina, heart failure and broad cardiovascular disease populations. This introduces heterogeneity and makes it difficult to compare the results of studies. It should, however, be noted, that these various populations are all eligible to receive cardiac rehabilitation in the UK under relevant guidelines.[46-48]

Study designs varied, including between scoped technologies. The evidence for D:REACH-HF[15,16] and Digital Health Manual[17] was restricted to qualitative and single-arm mixed methods, since, based on clinical expert advice, the EAG did not include evidence for the paper manuals upon which these interventions were based. Therefore, the available evidence for these technologies is limited to feasibility and acceptability rather than clinical effectiveness. Many studies used a single-arm design. This is limited, because it is not possible to determine whether any observed effect is due to the intervention or other potential factors. The Blythin et al[32] study for myHeart used a retrospective observational design. Advantages of this study design include high levels of generalisability, given it is real-world evidence situated in the context of UK clinical practice and is free of the stringent inclusion criteria often observed in trials which can exclude many patients seen in routine clinical practice. However, the lack of randomisation increases the risk that other factors besides the intervention could influence the observed effect. Furthermore, while the sample matched the timeline of conventional cardiac rehabilitation as closely as possible, there was no separate control group.

RCT evidence was available for four technologies (Activate Your Heart, KiActiv, myHeart and R Plus Health). Generally, sample sizes for the RCTs were quite small and length of follow-up was relatively short (Table 4), which makes it challenging to evaluate maintenance of benefit. Where 6-month follow-up was also available, benefits were often not maintained to this time point (Section 5.1).The only RCT known to be blinded,[34] which compared R Plus Health with

conventional cardiac rehabilitation in people who underwent ablation for atrial fibrillation, was conducted exclusively in a Chinese healthcare setting.

5. CLINICAL, SERVICE AND TECHNOLOGICAL EVIDENCE RESULTS

5.1. Results from the evidence base and evidence synthesis

The following section reviews in turn each scoped technology for which eligible evidence has been identified. Detailed tabulated information on extracted results is shown in Appendix E. SCM advice to the EAG was that the lack of evidence on long-term outcomes for digitally supported cardiac rehabilitation makes it difficult to compare with face-to-face conventional cardiac rehabilitation, which is known to confer about a 40% reduction in mortality. SCM advice also noted that there is very limited available evidence for digitally supported cardiac rehabilitation in relation to specific biomarkers, with reports of improvement in HDL only available for Datos Health, which was studied exclusively in an Israeli context.

5.1.1. Activate Your Heart

Prioritised evidence for Activate Your Heart comes from one RCT (n=94) versus usual care on people with stable angina (Devi et al, 2014[8]), one feasibility RCT against usual care (Houchen-Wolloff, 2018[9]) and one single-arm study (Brough et al, 2014[11]), all from the UK. The pivotal RCT (Devi et al, 2014[8]) showed that participants on average logged in three times a week, although only 15% of those approached consented and 40% of those who initiated treatment completed the programme. 75% of participants completed their 6-month follow-up (89% at six weeks). Statistically significant improvements versus usual care in measures of exercise capacity and performance were observed at the 6-week follow-up, for example a mean (SD) increase of 471 (2171) daily steps in the intervention group compared to a mean decrease of 861 (2534) daily steps in the control group, p=0.02. However, no improvements in exercise measures met statistical significance at the 6-month follow-up.

The only cardiovascular marker to show a statistically significant improvement over usual care at the 6-week follow-up was weight (intervention effect -0.56kg, 95% CI -1.78 to -0.15, p=.02), and no improvements in cardiovascular markers were statistically significant at the 6-month follow-up. The only statistically significant improvement over usual care in any psychological measure at either timepoint was self-efficacy at the 6-week follow-up (ES=0.52, 95% CI 0.30 to 4.79, p=.03). The only statistically significant improvements over usual care in health-related quality of life were on emotional QoL MacNew score (ES=0.48, 95% CI 0.01 to 0.54, p=.04) and Seattle Angina Questionnaire (SAQ) angina frequency score (ES=0.77, 95% CI 8.57 to 35.05, p=0.002) and social QoL MacNew score (ES=0.60, 95% CI 0.05 to 0.54, p=.02) and SAQ

angina frequency score (ES=0.63, 95% CI 1.89 to 29.41, p=.03), all at the 6-week follow-up. No statistically significant improvements over usual care were observed in nutrition measures. Typically results from the other studies (Brough et al, 2014[11]; Houchen-Wolloff et al, 2018[9]) were fairly consistent, where data were available. Brough et al (2014)[11] found no statistically significant benefit on exercise behaviour in a single-arm design. In Houchen-Wolloff et al (2018),[9] the consent rate was low (8%), although 85% of potential participants were found to be ineligible. No information on other scoped outcomes was available for this technology.

5.1.2. Datos Health

Prioritised evidence for Datos Health comes from one small (n=22) single-arm study from Israel (Nabutovsky et al, 2020[40]) on people with established coronary artery disease and low cardiovascular risk. It was shown that, on average, participants were able to adhere to treatment using Datos Health. For example, “more than 63%” of participants took part in at least 150 minutes of moderate intensity exercise per week and, on average, participants used Datos Health four days a week. One participant (5%) dropped out in advance of the programme due to finding the technology too complex. There were two emergency department visits due to abdominal pain and chest pain, although both were discharged following evaluation. There was a statistically significant improvement in exercise capacity from pre-test to post-test (0.6 (SD 0.5) to 12.3 (SD 0.5), p = 0.002). While average heart rate during aerobic exercise did not change significantly over the six months, there was a statistically significant (p<0.001) improvement in average heart recovery rate in the second month, with no further significant improvement thereafter. It should be noted that the paper said “from the second month”, but the EAG interpreted that it had to mean “in” given no further improvement thereafter. Most cardiovascular risk markers remained largely unchanged, although there was a statistically significant improvement in high-density lipoproteins levels from 41 (SD 2.4) to 44.5 (SD 2.6), p = 0.016. Average participant satisfaction with the Datos Health programme was 4.05 out of 5, although this was a subjective assessment using a non-validated scale. No information on other scoped outcomes was available for this technology.

5.1.3. D:REACH-HF

Prioritised evidence for D:REACH-HF comes from two small (n=10, n=19) qualitative studies from the UK (Cross et al, 2023[15]; Van Beurden et al, 2022[16]) on people with heart failure, caregivers, and health professionals. Patients and caregivers reported improvements in physical and mental health, better self-management of heart failure symptoms and perceived

independence, however these were assessed as feasibility and acceptability rather than effectiveness outcomes. Health-related, technological and support barriers to engagement were identified with healthcare professionals reporting that programme delivery was impacted by both patient and healthcare professional digital competence and the engagement of the patient in use of the digital platform. No information on other scoped outcomes was available for this technology.

5.1.4. Digital Heart Manual

Prioritised evidence for the Digital Heart Manual comes from one small (n=28) mixed methods single-arm study (Deighan et al, 2017[17]) from the UK on people with history of myocardial infarction or revascularisation who had completed the paper Heart Manual. What are described in the paper as 'rich data' showed that participants considered the Digital Heart Manual to be user-friendly and effective at communicating the programme's key messages. Suggestions for improvement were given, which were stated to inform the development of the resource. No information on other scoped outcomes was available for this technology.

5.1.5. Gro Health HeartBuddy

Prioritised evidence for Gro Health HeartBuddy comes from one unpublished manuscript (Rai et al, unpublished[20]) from a single-arm real-world service evaluation in the UK. Participants spent a median of 208.0 minutes per week on the app. Over the 6-month course of the programme with a median of 6.5 workouts completed weekly 91.7% (66 out of 72) of potential participants referred to the programme enrolled. The follow-up completion rate was 92.4%. Given these are notably higher than other studies, the EAG considered there was a possibility of selection bias, particularly with regard to how potential participants were defined. Indeed, it was a real-world service evaluation, so it is likely that all potential participants had already actively considered digitally supported cardiac rehabilitation as a treatment option.

Statistically significant improvements were found on cardiovascular markers assessed: systolic blood pressure mean reduction 13.0 mmHg p<0.001,

diastolic blood pressure: mean reduction 6.0 mmHg [redacted] weight: mean reduction 2.3 kg [redacted] $p < 0.001$). Statistically significant improvements were also found on anxiety median reduction 3.5 points [redacted] $p < 0.001$, excessive daytime sleepiness mean reduction 1 point [redacted] $p < 0.001$), and wellbeing median increase 3.0 points [redacted] $p < 0.001$). A statistically significant improvement was found in quality of life assessed by EQ-5D index score,[49] improvement by 10 points [redacted] $p < 0.001$. [redacted]

[redacted]

5.1.6. KiActiv

Prioritised evidence for the KiActiv comes from two studies. Meenamkuzhy-Hariharan et al., 2024[21] was a prospective, parallel group, open label RCT from the UK including 130 people eligible for cardiac rehabilitation. The intervention included 8-weeks of conventional CR plus contextualised data feedback via KiActiv Heart; the control group included conventional CR only, as defined in Table 4. Five and eight patients, in the intervention and control group respectively, did not attend initial or first feedback session with mentor; therefore they were not included in the final analysis. Of 225 people invited to join the study, 130 were randomised (65 of which to KiActiv) and 4 did not have sufficient data for analysis. The primary outcome was a change in objectively assessed PA to achieve the ACPICR recommendations for “Daily Activity” and “At-home Training” between week 1 and week 8 of the intervention period. Secondary outcomes included change in exercise capacity/cardiorespiratory fitness measured via the incremental shuttle walk test, and adherence measured via the wrist worn accelerometer. The paper describes data for physical activity monitoring, with 93% of participants in the intervention group collecting sufficient data for analysis. Average complete days of data (i.e., monitor worn for >80% waking day) across both groups was 38 d/person out of a possible 56. The probability of meeting “Daily Activity” recommendation was statistically significantly greater in the intervention group versus control at week 8 ($p<0.05$). Patients had improvements in cardiorespiratory fitness in both groups, although the difference between groups was not statistically significant. No information on other scoped outcomes was available in this study.

Rayner et al., 2022[26] was a single arm before and after interventional study from the UK including 17 people referred for cardiac rehabilitation. The intervention included KiActiv Health 12-week programme in addition to a pandemic-limited conventional cardiac rehabilitation service. Data from the physical monitor and activity on the online platform were both used to monitor adherence. Eighty-two percent of patients completed the programme (n=14), whilst the

paper reports patients wore the physical activity monitor and visited the online platform on 95% and 31% of days during the programme, respectively. Improvements in physical activity were seen in one or more, three or more, and four or more domains for 92.9%, 78.6% and 64.3% of patients, respectively. There were increases in non-sedentary time, moderate activity, calorie burn, and moderate bouts of physical activity in patients on the programme. All patients reported an improvement in at least one domain of quality of life, with statistically significant improvements in physical fitness and overall health ($p<0.05$). All (100%) of those who provided information on usability and acceptability (57% response rate) indicated that they would recommend KiActiv to others and rated KiActiv 8+ out of 10 on a Likert scale. No information on other scoped outcomes was available within the prioritised evidence for this technology.

5.1.7. myHeart

Prioritised evidence for myHeart comes from two studies. Blythin et al., 2023[32] was a retrospective real-world study, from the UK. The paper included 434 adults referred for cardiac rehabilitation. Patients participated in the myHeart programme for 12 weeks. Whilst a total of 434 patients were registered to myHeart, 350 (80.6%) activated the app. Contact was made either by telephone or using in-app notifications for those who had activated. On average patients were contacted a mean 2.7 (SD 2.1) times and sent in-app notifications a mean 6.2 (SD 3.1) times during their respective 12-week programme. The paper also reports a total of 5,469 cardiac rehab videos were viewed by 314 (89.7%) users. Education videos were accessed a median 6 (IQR 1 to 7) times and exercise videos a median 9 (IQR 1-18) times. Within the first 6 weeks following activation 313 (99.7%) users viewed 3,606 cardiac rehab videos. Both clinicians and app users were invited to answer anonymised myHeart user questionnaires. There was a statistically significant difference observed before and after having access to the app, in terms of an increase in self-management confidence (n=18/50, $p<0.001$). Twenty-five clinicians were also asked to provide feedback on the app's functionality and suitability for service delivery, of which 20 (80%) responded. No information on other scoped outcomes was available in this study.

Smith and D'Angelo, 2023[31] was a RCT with three groups: the interventional group completed an 8-week web-based programme using the myHeart platform (WB-CR) Recovery Plus Health; the control group completed a traditional cardiac rehabilitation programme delivered in a hospital setting, including one cardiac rehab session per week plus an education day (TCR); the third group combined both the traditional cardiac rehab program with myHeart (COMBI-CR). The paper included 57 patients with coronary heart disease, although only 54 patients

completed the study. Exercise capacity (Metabolic equivalent [METs] and heart rate walking speed index [HRWSI]) were recorded from the incremental shuttle walk test (ISWT) at baseline, and 8 weeks. Statistically significant improvements were observed for METs across all three groups (p<0.001) after 8 weeks of cardiac rehab based on the pre and post ISWT results: WB-CR +0.9 METs; TCR +1.5 METs; COMBI-CR +1.4METs. HRWSI also demonstrated a significant decrease across all groups after intervention TCR - 1.1 (p=0.003), COMBI-CR -1.2 (p=0.005), WB-CR -1.4 (p=0.005) which equates to a reduction in heartbeats for every 100m walked of 11, 12, and 14 respectively. As this was a conference abstract, there was no information on whether formal comparison of the three arms was conducted for this outcome. No information on other scoped outcomes was available for this technology.

5.1.8. R Plus Health

Prioritised evidence for R Plus Health comes from three studies. Bilbrey et al., 2024[36] was a prospective, single-arm trial from the USA, in 75 adults with cardiovascular disease aged at least 40 years with stable angina pectoris, myocardial infarction, or heart failure. Thirteen people did not complete the study due to loss of interest. Patients received referral to cardiac rehab from a provider within 60 days. The intervention consisted of a 12-week digital home-based cardiac rehabilitation program, that integrates both telehealth and mHealth modalities. The paper reports feasibility (initiation and participation) and efficacy (6-minute walk test, resting heart rate, and HRQoL). Exercise capacity was measured using the 6-minute walk test, of which, fifty (81%) participants improved, with an average improvement of 40 (SD 63.39) metres (95% CI 25.6 to 57.1). HRQoL was measured using the 12-Item Short-Form Health Survey. Physical and mental summary scores improved by mean 2.7 (SD 6.47) points (95% CI 1.1 to 4.3), and 2.2 (SD 9.09) points (95% CI 0.1 to 4.5), respectively. The paper reports a small nonsignificant improvement in average resting heart rates (mean -1.1, SD 9.05, 95% CI -3.4 to 1.1).

App log data were used to extract platform engagement. Out of 62 participants, 50 (81%) completed at least 50% of cardiac rehab sessions. Adherence to both modalities (telehealth and mHealth) was high, although there were substantial variations in adherence to the mHealth exercise sessions. 83% participants completed the 12-week study and used the telehealth modality with mean 9.63 (SD 3.33) sessions completed, and 79% used the mHealth modality with 10.97 (SD 11.70) sessions completed. Among those who completed the study, all participants used the telehealth modality, and all but 3 participants used the mHealth modality. Participants completed an average of 654.1 (SD 113.6) minutes of telehealth sessions and 421

minutes (SD 306) of mHealth sessions. No information on other scoped outcomes was available in this study.

Cai et al., 2022[34] was a blinded RCT which enrolled 100 patients who had undergone an ablation for atrial fibrillation. The paper reports one drop-out from the intervention arm, and two from the control arm. The intervention consisted of a comprehensive, domiciliary, mobile application-guided and tele-monitored cardiac rehabilitation program; the control group took part in conventional cardiac rehabilitation. The EAG understood that cardiac rehabilitation may differ between the Chinese context in which this study was conducted and the UK clinical decision-making context. The control arm is described in the paper as standard outpatient rehabilitation, mainly involving in-hospital evaluations and education and out-of-hospital exercise training. During hospitalisation, all participants consulted with a physiotherapist, underwent a cardiopulmonary exercise test and were prescribed individual exercise specifications based on the test results.

The primary outcome was defined as the change in VO2peak [ml/(min × kg)] between baseline and 12 weeks. There was a significant difference between baseline and follow-up within groups in VO2peak. Control pre: mean 18.7 ± 4.9 SD; post: 22.9 ± 6.3, $p<0.001$; intervention pre: 19.1 ± 4.7, post: 27.3 ± 5.6, $p<0.001$. There was also a significant difference between groups in change in VO2peak control: 4.9 ± 6.6, intervention: 9.3 ± 8.0, $p=0.003$. The paper also reports a statistically significant increase in self-reported physical activity between baseline and follow-up in both arms, classified into the groups performing moderate and high levels of physical activity; control pre: 16 (33.3%), post: 27 (56.3%) $p=0.024$; intervention pre: 12 (24.5%), post: 42 (85.7%), $p<0.001$. The paper reports adherence among patients who were included in the final analysis. Those in the intervention group were adherent during 9.6 ± 3.1 of the 12 weeks (80.4% ± 26.1%), while those in the control group were adherent during 5.0 ± 3.8 of the 12 weeks (42.0% ± 31.6%). Adherence differed significantly between the study groups.

The paper also reports, at the three-month follow-up, 6.1% (3 of 49) of the patients in the intervention group and 6.5% (3 of 46) of the patients in the control group experienced the recurrence of atrial arrhythmia after ablation, with no significant difference between the two groups. No injuries or need for hospitalisation was reported as a result of participation in the rehab programme. The paper reports various improvements in psychological well-being reported as mean ± SD. There was a significant difference within the control and intervention groups, respectively, in health beliefs related to cardiovascular disease, using the Health Beliefs

Related to Cardiovascular Disease Scale.[50] Control pre: 69.9 ± 2.1, post: 74.7 ± 6.6, $p<0.001$. Intervention pre: 70.4 ± 2.5, post: 79.7 ± 8.4, $p<0.001$. There was a significant difference between groups in health beliefs related to cardiovascular disease. Control: 2.5 ± 15.2; intervention: 11.1 ± 10.5, $p=0.002$. There was no significant difference within the control group in exercise self-efficacy; pre: 50.3 ± 14.5, post: 52.8 ± 17.4, $p=0.417$. Yet there was within the intervention group; pre: 50.6 ± 15.2, post: 61.7 ± 15.6, $p<0.001$. There was a significant difference between groups in exercise self-efficacy. Control: 4.2 ± 5.3; intervention: 8.3 ± 4.8, $p<0.001$. No information on other scoped outcomes was available in this study.

Xia et al., 2023[35] was a quasi-experimental single-arm study which enrolled 31 patients with stable coronary heart disease, from China. All patients started the program, with 28 patients completing all interventions and follow-up. The reason(s) for the withdrawal included: one went abroad, one moved to another city, and “one refused to use it for webless”. This is the phrasing used by the authors – the EAG considered this may mean “one refused to use it due to lack of internet access” but was unable to confirm. The intervention consisted of a 12-week remote digital cardiac rehab program. No serious adverse events occurred during the 3-month intervention. The patients reported three muscular weaknesses, and three muscular pains. HRQoL was measured using the 12-Item Short-Form Health Survey. Median (IQR): baseline 32.00 (30.00 to 33.00), follow-up 32.00 (29.25 to 33.00) ($p=0.656$). The paper reports two measures of psychological well-being. Depression was measured using the Patient Health Questionnaire-9 and improved significantly between baseline and follow-up ($p=0.013$). Anxiety was measured using the General Anxiety Disorder-7 (GAD-7) and improved significantly between baseline and follow-up ($p=0.014$). Adherence was reported, with 92.9% (26/28) of patients able to exercise at the prescribed intensity for at least 20 min per day, and 67.9% (19/28) of the patients were able to exercise in the prescribed intensity for at least 3 days per week. Finally, exercise capacity was measured as the change in VO2peak [ml/(min × kg)] between baseline and 12 weeks, which improved significantly; 22.43 to 23.66 ml/kg/min (MD 0.6, 95% CI 0.1 to 2.4, $p=0.041$), peak metabolic equivalents increased from 6.35 to 7.04 METs (MD 0.3, 95%CI 0.1 to 1.2, $p=0.018$). All 28 people who completed the program had a daily effective exercise time of more than 10 min, with an average of 39.4 min (SD 17.8), of which 53.6% (15/28) had a daily effective exercise time of ≥30 min, 39.3% (11/28) were in 20–30 min, and 7.1% (2/28) were less than 20 min. The average effective exercise days per week was 4.6 days (SD 2.2), of which 50.0% (14/28) were ≥5 days, 17.9% (5/28) were between 3 and 5 days,

and 32.1% (9/28) were less than 3 days. No information on other scoped outcomes was available for this technology.

5.1.9. Subgroup results

The scope included subgroups on age, sex, socioeconomic status, ethnicity, cardiovascular condition, presence of comorbidities and previous involvement with cardiac rehabilitation. Generally, the identified evidence did not address these groupings. The only evidence identified to address scoped subgroups was that the feasibility RCT by Houchen-Wolloff et al (2018)[9] on Activate Your Heart only included people who had declined or dropped out of conventional cardiac rehabilitation.

5.1.10. Adverse events

General adverse events were not a scoped outcome for this appraisal. The scope included hospital readmissions and mortality as outcomes, which are discussed above.

5.2. Conclusions of the clinical, service and technological evidence

Relevant evidence was available for eight of the thirteen scoped technologies for this appraisal. No evidence meeting the scope was available for Beat Better, Get Ready – Solution, Luscii Vitals, Pumping Marvellous Cardiac Rehab Platform, and Sword Move.

For Activate Your Heart, there was RCT evidence of relatively low uptake and completion rates, a benefit versus usual care in exercise measures although only at the 6-week follow-up rather than the 6-month follow-up, limited evidence of benefit on cardiovascular markers (an effect only shown on weight at 6-weeks), as well as limited evidence of benefit on psychological and quality of life outcomes. Single-arm evidence[11] showed no evidence of benefit on exercise behaviour.

For Datos Health, noting that evidence was only available in an Israeli context,[40] there was relatively low dropout (noting the caveat of a small sample size), relatively good adherence to treatment, evidence of a benefit on exercise capacity, and high participant satisfaction, although most cardiovascular markers were unchanged.

For both D:REACH-HF[15,16] and the Digital Heart Manual,[17] there was evidence of relatively good usability and patient acceptability, although there was no evidence specifically on the clinical effectiveness of these digital versions as opposed to the originator paper manuals.

The only source of evidence[20] for Gro Health Heart Buddy in a cardiac rehabilitation context comes from an unpublished manuscript of a single-arm real-world service evaluation in the UK. Participant engagement with the technology was good and uptake and completion were noted to be particularly high. There was evidence of a benefit on most cardiovascular markers, as well as psychological measures and health-related quality of life [redacted] However, completion and uptake were much higher than other studies, potentially reflecting a situation where potential participants had already expressed interest in receiving digitally supported cardiac rehabilitation.

For KiActiv, RCT evidence[21] shows evidence of a benefit on physical activity as well as good engagement, although improvements in cardiorespiratory fitness were not statistically significant. Single-arm evidence[26] showed high completion rates as well as improvements in physical activity and health-related quality of life.

For myHeart, there was retrospective real-world evidence showing good uptake, engagement and usability, as well as RCT evidence from a conference abstract[31] showing improvements on exercise measures for the digitally supported cardiac rehabilitation, conventional cardiac rehabilitation and combined digital and conventional cardiac rehabilitation groups.

For R Plus Health, single-arm evidence from the USA[36] showed improvements especially in exercise and health-related quality of life, as well as overall high adherence and engagement, although 17% of participants dropped out due to loss of interest. The evidence from the USA was generally supported by single-arm evidence from China.[35] RCT evidence for R Plus Health in a Chinese setting[34] also showed evidence of benefits on exercise capacity and performance as well as health-related quality of life.

Overall, there is some evidence that digitally supported cardiac rehabilitation – using a range of different technologies – may have satisfactory uptake, adherence and completion, may be usable, acceptable and satisfactory to patients, and may offer benefits especially in terms of exercise capacity, psychological outcomes and health-related quality of life compared to usual care, i.e. GP monitoring with no cardiac rehabilitation. However, it should be noted that RCT evidence was only available for four of the scoped technologies, while single-arm and observational evidence is limited in the causal inference it can offer. As comparisons to conventional cardiac rehabilitation were seldom made in included studies, we know that digitally supported cardiac rehabilitation is likely to be more effective than no cardiac rehabilitation.

However, we do not know whether it is more or less effective than conventional face-to-face cardiac rehabilitation, and if so, by how much.

6. ECONOMIC EVIDENCE SEARCHES AND SELECTION

6.1. Evidence search strategy and study selection

A single search was conducted to identify clinical, technological and economic evidence. Please see Section 4.1 for details of the evidence searches.

6.2. Included and excluded studies

A total of 1382 records (after deduplication) of potentially relevant evidence on clinical and/or cost effectiveness were retrieved and uploaded to Rayyan for screening. The company submission references were also scanned for additional references—from which 43 new articles were identified.

137 of the articles screened at title and abstract were selected for full text screening. Of these, three studies were included in the review that informed health state costs and utilities: these are summarised in Table 6. Two of the studies are published[51-53] and relate to R Plus Health; one study is unpublished with a related model[53] and was submitted as confidential evidence by KiActiv.

A list of studies excluded along with the rationale for exclusion is provided in Appendix C. A PRISMA diagram of the search and screen process is provided in Appendix B.

Table 6: Key studies selected for the economic model

Study name, design and location	Intervention(s) and comparator	Participants and setting length of follow-up	Relevant outcomes and key findings	EAG comments
Liu 2023,[52] model-based cost-effectiveness analysis, China	DTx for home-based CR using the Shukang App (Recovery Plus Inc., China) vs conventional home-based CR (12 weeks) The intervention used is what is now called R Plus Health.	Treatment effect data taken from UK administrative data analysis[54] for telemonitoring assuming the same treatment effect for digital CR (authors consider this conservative)	Incremental QALYs: 0.09727 At a cost for DTx of 180 CNY/year the ICER was 39,664 CNY/QALY, below WTP threshold of 85,698 CNY	State transition model based upon disease progression (NYHA class), hospitalisation probability and mortality 10 year time horizon, monthly cycle Costs from electronic health records (exact costs included unclear)
Liu 2023, trial based economic evaluation, China (note this is the economic evaluation of the Cai et al trial)	DTx for home-based CR using the Recovery Plus app vs conventional home-based CR (12 weeks) This trial used what is now called R Plus Health.	Single-centre, prospective, blinded, randomized, parallel controlled trial of DTx-based HBCR for AF patients after catheter ablation (100 patients)	Incremental QALYs: 0.0324 ICER 33,572 CNY/QALY, below WTP threshold of 85,698 CNY	Chinese version of EQ-5D-5L used. States significant difference in QALYs between arms but this appears unlikely given mean and SD presented (0.119 ±0.09 vs 0.077±0.058)
KiActiv Cardiac Rehabilitation Economic Model	KiActiv vs usual care (not defined)	Economic model states based on rehabilitation data from an NHS trust, further information not provided. Source of EQ-5D data stated as “data across all our cardiac rehabilitation implementations”	QALYs gained: 0.05 Estimated cost saving per patient of £383 based on DTx cost of £199	Model based on completion rate for DTx and readmission rates for DTx versus current care Information used in model not adequately referenced

Abbreviations: CNY, Chinese Yuan; CR, cardiac rehab; DTx, digital therapeutics; ICER, incremental cost-effectiveness ratio; NYHA, New York Heart Association; QALY, quality-adjusted life year; WTP, willingness to pay

7. ECONOMIC EVALUATION

7.1. Quality appraisal of selected studies

Consistent with the methods for an EVA, no formal quality appraisal of included studies was undertaken.

7.2. Relevant economic models

None of the included studies directly addressed the decision problem in terms of setting or comparators and the quality of the assessments conducted was generally poor either in the level of information provided to check the source of model input data or the quality of results interpretation (Table 6). All 3 models predicted a net gain in QALYs for digital CR compared to either usual care or conventional CR[51-53]. The Liu[51,52] models which were based on the R Plus app which requires more intensive interaction predicted a cost increase associated with digital CR, whereas the KiActiv model estimated a cost reduction. It should be noted that the costs of personnel time to deliver cardiac rehabilitation were not included in the KiActiv model.

In general, it was clear that capture of the impact of digital CR would require both an assessment of short-term impacts on resource use and longer-term impacts on the disease either in terms of event rates and associated resource use or disease stage progression.

In addition to the models specifically addressing the impact of digital CR identified in the literature the NICE guideline model for conventional CR was reviewed.[1] Key learnings from this model included:

- High levels of variability in the cost of conventional CR**:** £50-£712 at the time [2013] dependent upon level of staffing, equipment used and intensity of the programme. Staff costs ranged between 64-80% of the total
- The importance of considering uptake and completion as key outcomes
- Longer term model structure based upon cardiovascular events (in this case MI and revascularisation were addressed separately although the treatment effect of CR on these was assumed to be similar) and death (here split into CV and non-CV mortality)

7.3. Economic model

We developed a *de novo* economic model to estimate the cost-effectiveness of digitally supported cardiac rehabilitation compared with conventional cardiac rehabilitation. The model adopts the perspective of the NHS and Personal Social Services (PSS) and considers a lifetime horizon.

Health outcomes are expressed in QALYs, and costs are presented in 2023/24 prices. Cost-effectiveness is assessed in terms of the incremental cost-effectiveness ratio (ICER) and incremental net monetary benefit at a willingness-to-pay (WTP) threshold of £20,000 per QALY gained. Probabilistic sensitivity analysis (PSA) was conducted to reflect parameter uncertainty, with 10,000 simulations drawn from distributions around key model inputs.

The model structure, parameters, and assumptions reflect current NHS practice and published evidence where available, supplemented by expert input and product-specific data submissions.

Costs and utilities were discounted at 3.5% per annum in line with the NICE reference case.[55]

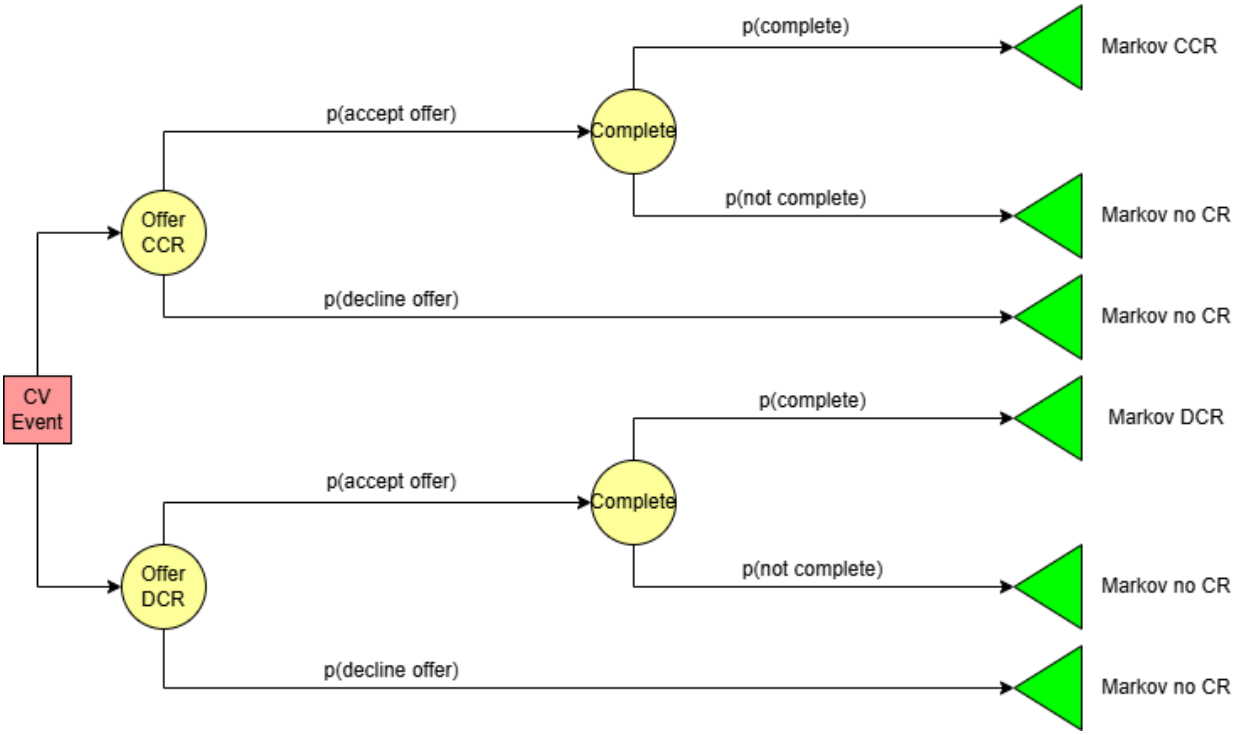
7.3.1. Model structure

The economic model consists of a short-term decision tree and a long-term state transition model. The decision tree (Figure 1) captures short-term costs and outcomes. It simulates the probability that a patient offered CR will:

- Accept the offer of cardiac rehabilitation (or not); and
- Complete the programme (or discontinue).

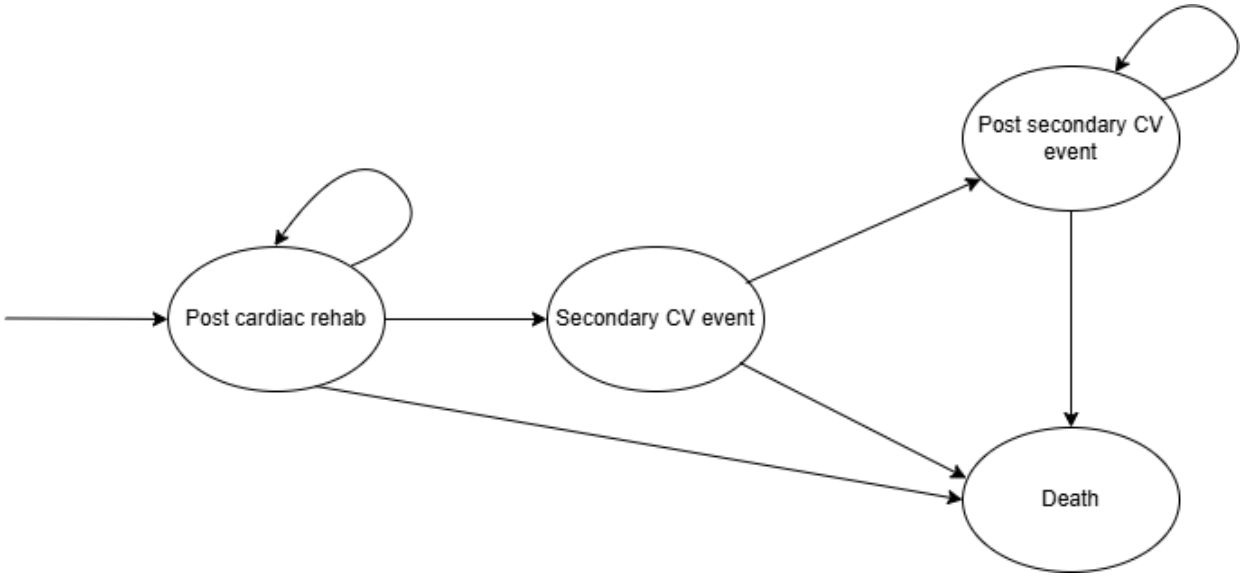
Each branch of the tree is associated with different costs for the length of a course of cardiac rehabilitation (6-12 weeks).

Figure 1: Decision tree model structure



Abbreviations: DCR = Digital cardiac rehabilitation, CCR = Conventional cardiac rehabilitation CV = cardiovascular event

Figure 2: State transition model structure



Abbreviations: CV = Cardiovascular

A four-state state transition model (Figure 2) captures long-term health outcomes following the initial rehabilitation period. The model is run over a lifetime (equivalent to a mean age of 100 years) time horizon using yearly cycles. A half cycle correction was implemented to reflect the timing of events within the cycle.

The model structure presented is broadly consistent with the model presented in NICE CG48[1,56] with two key differences. Firstly, the addition of the decision tree structure to present additional detail around uptake and completeness given this was expected to be a key differentiator between digital and conventional CR. Secondly, the state transition model presented here combines the cardiovascular event types into one health state. This simplification was made as no data were available to differentiate different types of cardiovascular events by the mechanism of CR and the treatment effect of conventional CR appeared broadly similar across the event types within the guideline model.

For the population that did not accept CR or complete CR, transition probabilities from the post cardiac rehabilitation state to the secondary CV event tunnel state were derived from the Dibben et al., 2023[57] cardiovascular event rates for adults who did not receive exercise-based CR. Dibben et al., 2023 is a meta-analysis of 85 RCTs (see Section 3.2 for more information). For the population that accepted and completed conventional CR, the risk ratio for MI was used from Dibben et al., 2023 to represent the impact on cardiovascular event rates from conventional CR. This was considered reasonable as NICE CG48[1] showed a similar treatment effect for MI and revascularisation. Digital CR technologies that did not have information on clinical biomarkers which would be expected to impact on secondary CV events were assumed to have the same impact as conventional CR as what limited evidence there was pointed to a similar treatment effect. The impact of this assumption is tested in sensitivity analysis. (This analysis also by definition explores whether the results are sensitive to different sub-populations where CR may be more or less effective, for example in heart failure, AF or MI). People who did not complete the course of treatment for either digital or conventional CR were assumed to have the same outcomes as people who did not take up CR. It is possible that those who complete part of a course may yield some benefit. The EAG explored this in sensitivity analysis (section 7.4.2.2).

R Plus Health and Gro Health Heartbuddy, provided evidence of impact on cardiovascular risk in a format suitable for inclusion in the SMART-RISK calculator, Xia et al,.2023[35] and Rai et al.[20], respectively. For these technologies, transition probabilities from the post cardiac

rehabilitation state to the secondary cardiovascular event state were computed using the SMART Risk Score. The risk score enables the modelling of the change in risk of having a recurrent cardiovascular event within 10 years due to the impact on clinical biomarkers of cardiac rehabilitation (Dorresteijn et al,. 2013[58]).

The secondary CV event state acts as a tunnel state for one cycle, where patients then transition into the post-secondary CV event survival state or the death state.

Mortality information from literature was used to model the mortality probability from the post cardiac rehabilitation state and from the recurrent cardiovascular event state.[59]

7.3.2. Model Inputs

The model incorporated clinical effectiveness, cost, and utility data drawn from product-specific submissions, published literature, publicly available datasets and expert assumptions. Key input parameters are described below.

7.3.2.1. Uptake and completion

The uptake and completion probabilities (7) for conventional cardiac rehabilitation were derived from the 2024 NACR.[5] The NACR compiles service level data from 90% of cardiac rehabilitation services in the UK.

Uptake and completion probabilities for the technologies were derived from uptake and completion information identified in the clinical review. For all technologies we assume the same uptake as conventional CR as no comparative uptake information was identified in the clinical review. In scenario analysis we test the impact of using naïve data for technologies where these are available, as well as two-way sensitivity analyses of uptake and completion.

Table 7: Uptake probability

Cardiac Rehabilitation Method	Naïve uptake %	Base case	Reference
Conventional CR	41% (n=66,882)	41%	NACR 2024[5]
Activate Your Heart	N/A	41%	
Beat Better	N/A	41%	
Datos Health - AI Driven Hybrid Care Platform	95% (n=22)	41%	Nabutovsky 2020[40]
D REACH-HF	N/A	41%	
Digital Heart Manual	60% (n=47)	41%	Deighan 2017[17]
Get Ready - Solution	N/A	41%	

Cardiac Rehabilitation Method	Naïve uptake %	Base case	Reference
Gro Health HeartBuddy	92% (n=72)	41%	Rai (unpublished)[20]
KiActiv	58% (130/225)	41%	Meenamkuzhy-Hariharan 2024[21]
Luscii vitals	N/A	41%	
myHeart	N/A	41%	
Pumping Marvellous Cardiac Rehab Platform	N/A	41%	
R Plus Health	46% (n=162)	41%	Bilbrey 2024*[36]
Sword Move	N/A	41%	

*EAG considered Bilbrey[36] to be a more appropriate source of uptake data than Cai et al.[34] although cautions that in all cases 'uptake' is based on willingness to enrol in a study rather than willingness to use a digital rehabilitation programme *per se*.

For the three technologies where enough information existed to generate the odds ratio versus the trial control for completion only one showed a significant difference from conventional CR: The completion odds ratio was calculated for Activate Your Heart from the total number of patients who completed in the intervention and control groups vs the total number of patients who did not complete in the intervention and control groups from Devi 2014 and Houchen-Wolloff 2018. Devi 2014 only reported completion rates as a total across both arms, so the completion figure that was used as part of the odds ratio calculation for Activate Your Heart comes from the consort diagram of 36 patients analysed at the 6 month follow up.

The other technologies demonstrated similar or somewhat improved completion rates.

Table 8: Completion probability

Cardiac Rehabilitation Method	Naïve complete%	Odds ratio	Base case	Reference
Conventional CR	55% (n=53,149)		55%	NACR 2024[5]
Activate Your Heart	78% (n=85)	0.87 p=0.72	52%	Devi 2014[8] Houchen-Wolloff 2018[9]
Beat Better	N/A		55%	
Datos Health - AI Driven Hybrid Care Platform	N/A		55%	
D REACH-HF	N/A		55%	
Digital Heart Manual	N/A		55%	
Get Ready - Solution	N/A		55%	
Gro Health HeartBuddy	92% (n=66)		55%	Rai (unpublished)[20]
KiActiv	86% (n=65)	2.03 p =0.12	71%	Meenamkuzhy-Hariharan 2024[21]

Cardiac Rehabilitation Method	Naïve complete%	Odds ratio	Base case	Reference
Luscii vitals	N/A		55%	
myHeart	N/A		55%	
Pumping Marvellous Cardiac Rehab Platform	N/A		55%	
R Plus Health	98% (n=50)	2.04 p =0.57	72%	Cai 2022[34]
Sword Move	N/A		55%	

*This was considered the most appropriate of the two sources due to the study being a controlled comparative RCT

7.3.2.2. Risk of secondary CV event

The risk of a secondary CV event was taken from the Dibben et al., 2023[57] a meta-analysis of 85 RCTs for no CR and conventional CR. A rate of 48 per 1,000 people was recorded for the no CR group, the events studied were fatal and/or non-fatal MI up to a 12 month follow up period. This was used to calculate the probability per person per annum of 6.3%. Conventional CR was assumed to reduce the chance of a secondary CV event with a relative risk of 0.82 applied (reported risk reduction for fatal and non-fatal MI).

Two DCR treatments showed a significant benefit in reducing parameters which would be expected to have an influence on the risk of a secondary event based upon the SMART risk equation.[58]

A = -0.085 * Age + 0.00105 * Age^2 + 0.156 * Male + 0.262 * CurrentSmoker + 0.00429 * SBP + 0.223 * Diabetes + 0.140 * CAD + 0.406 * CVD + 0.558 * AAA + 0.283 * PAD + 0.0229 * YearsSinceDiagnosis - 0.426 * HDL + 0.0959 * TotalChol + (-0.0532 * eGFR) + 0.000306 * eGFR^2 + 0.139 * LN(hsCRP)

10 year rate =(1-0.81066^EXP(A+2.099))*100

Abbreviations: SBP = systolic blood pressure, CAD = coronary artery disease CVD = cardiovascular disease, AAA = abdominal aortic aneurysm PAD = peripheral artery disease, HDL = high-density lipoprotein, eGFR = estimated glomerular filtration rate, hsCRP = high-sensitivity C-reactive protein

R Plus health showed a significant benefit to total cholesterol (mean change of 10%). This translates to a risk reduction of 0.14% per year (assuming full benefit is maintained over 10 years). [redacted]

[redacted]The EAG note that this is an optimistic assumption as much of the available evidence demonstrated loss of benefit over time. These were included in analysis as alternative scenarios for the effect of CR.

7.3.2.3. Mortality

The mortality rate for each of the long-term health states is provided in Table 9. Published literature relating to MI was chosen as the preferred source of inputs as a large proportion of patients using the CR service have had a prior MI.[60] Danese et al (2016)[60] was used in NICE Guideline NG238[61] as part of a cost utility analysis of lipid therapy escalation for secondary prevention.[59] Smolina et al (2012)[59] was found as part of a key word search on long term survival rates for patients in England post-acute myocardial infarction.

First the probability of mortality was calculated based upon published literature, then a relative risk to general population mortality was calculated based upon the age of participants reported in each paper. This was then applied to general population mortality data taken from ONS lifetables 2021-2023 (England)[62] assuming that the mean age of patients receiving CR in the UK was 66 for males and 70 for females and 46.2% of the starting population are female[63,64] based upon data from a previous observational study using the NACR.[5]

Table 9: Mortality

Health state	Annual probability of mortality	Relative risk to general population	Reference
Secondary CV event	16.7% (year one)* 6.2% (year two on)	7.89 (year one) 2.84 (year two on)	Danese 2016[60]
Post CR	N/A	Standardised mortality ratio = 2	Smolina 2012[59]

* Rate per 100 person years reported as 0.365 for the first 6 months and 0.062 for months 7 to 36. Assumed to apply for 10 years. The relative risk calculated for years 2 onwards is consistent with the relative risk reported in Smolina 2012[59] based upon 7 year data

7.3.3. Resource use and cost

7.3.3.1. Technology costs

Licence costs were provided by all companies either as a per patient cost or per Trust (Table 10). For those technologies priced at a Trust level, per patient licence costs per CR course were calculated using the average number of patients attending cardiac rehabilitation in England per NHS Trust, provided by NACR[5] data.

Where no VAT information was provided, it was assumed licence cost is exclusive of VAT. myHeart provided their licence cost of £80 per patient including VAT, for the model the EAG adjusted the licence cost to be exclusive of VAT as per NICE guidelines.[65]

R Plus Health provided a Trust level licence cost and an implied per patient cost of £55 per patient per programme, based on an average sized service. However, the EAG's calculations based on NACR data implied a per patient cost of £142.80. The EAG used this as the base case, noting that if R Plus Health is cost-effective at the higher price, then it will be more so at the lower per patient price.

Table 10: Licence costs

Technology	Licence cost provided by company	Source	Per patient licence cost used in model
Digital Heart Manual	£24.00 - £28.00	Heart Manual Price List (Digital and book)	£26.00
Activate Your Heart	£50.00	Activate your heart evidence and cost response	£50.00
Gro Health Heartbuddy	£250.00 excl VAT	DDM health evidence	£250.00
Datos Health – AI Driven Hybrid Care Platform	£44,000.00 per 150 patients	Datos technology costs	£293.33
myHeart	£80.00 incl VAT	Mymhealth evidence	£66.67
Luscii Vitals	£15.00 per patient	Luscii G-Cloud 14	£15.00

Technology	Licence cost provided by company	Source	Per patient licence cost used in model
		Pricing Summary	
Sword Move	£125.00 - £250.00 excl VAT	Sword health evidence	£187.50
Beat Better	£6.00 excl VAT	Avegen query response	£6.00
Get Ready - Solution	£18,200.00	Medtronic evidence response	£62.69
KiActiv	£199.00	Ki performance lifestyle limited evidence	£199.00
Pumping Marvellous	£0.00	Pumping marvellous foundation RFI	£0.00
D Reach-HF*	£5,000.00 - £8,000.00 (per NHS Trust)	HC&I query response	£22.39
R Plus Health*	£5,000.00 - £90,000.00 per NHS trust tiered by bed number. Typical cost of £55	R plus health evidence	£142.80

Technology	Licence cost provided by company	Source	Per patient licence cost used in model
	per patient per programme		

*per patient licence cost calculated using the average number of patients attending cardiac rehabilitation in England per NHS Trust, provided by NACR data. There were 53,419 patients offered CR in 2024 and 209 services resulting in a mean number of patients per service of 256

Table 11: Training costs

Technology	Training Cost	Source	Cost per patient per year
Activate Your Heart	£375.00 per trained staff member	Activate Your Heart cost response	£0.37
Beat Better	Not provided	Assumption, mean training cost of other technologies	£0.24
Datos Health	Not provided	Assumption, mean training cost of other technologies	£0.24
D Reach-HF	£350.00	HC&I query	£0.34
Digital Heart Manual	£225.00 per trained staff member	Heart Manual Price List	£0.22
Get Ready - Solution	Provided as part of implementation cost	Medtronic evidence request	£0.00
Gro Health HeartBuddy	£750.00 per cohort of 15 staff	DDM health evidence	£0.05
KiActiv	Training cost included as part of licence cost	Ki performance lifestyle limited evidence	£0.00
Luscii Vitals	Provided as part of implementation cost	Luscii G-Cloud14 Pricing Summary	£0.00
myHeart	Not provided	Assumption, mean training cost of other technologies	£0.24
Pumping Marvellous Cardiac Rehab Platform	Not provided	Assumption, mean training cost of other technologies	£0.24
R Plus Health	Training cost included as part of licence cost	R plus health evidence	£0.00

Sword Move	Not provided	Assumption, mean training cost of other technologies	£0.24

The training cost per patient per year used in the model was calculated by assuming that one trained staff member is required per service.[5] The number of patients per service was calculated by taking the uptake for CR in England in 2023 (53,419) (NACR, 2024[5]) divided by the number of CR services (209), giving the mean number of patients per service per year as 256. Using the NACR 2024 Quality and Outcomes Report an estimated 25% staff turnover rate per year was calculated. Using the 10-year time horizon this equates to training being required 2.5 times over a 10-year time horizon. For those companies that did not provide a training cost estimate, the EAG assumed the cost would be the mean of the estimates from other companies. Comments to the EAG from a clinical expert suggested that in some cases training of staff in digital CR takes no more than 60 minutes and is usually a one-off. The EAG explored the impact of this by assuming zero training and implementation costs in scenario analysis.

All digitally supported cardiac rehabilitation interventions require access to computing equipment and an internet connection. To address equity concerns around digital exclusion, the cost of a tablet computer and mobile internet connection for the duration of the interventions was included as a resource use item for all interventions. The impact of excluding this (assuming only patients who already have their own equipment are offered the technology) is tested in scenario analysis.

The costs of the required technology to access the interventions is detailed in Table 12.

Table 12: Technology and internet access costs

Item	Point estimate	Source
Tablet computer or smart phone[66]	£80.00	Representative cost from a large online retailer, 11" android tablet with simcard. Basic smart phone is a similar cost
Data sim card, per month[67]	£15.00	Cost from a data sim provider, June 2025. 2GB data-only plan 1 month contract

Implementation costs were provided by Datos Health, Gro Health HeartBuddy, Activate Your Heart, Luscii Vitals, Get Ready – Solution and KiActiv.

Table 13: Technology implementation costs

Technology	Implementation Cost	Source	Cost per patient per year
Activate Your Heart	£29,100.00	Activate Your Heart evidence and cost response	£25.82
Datos Health – AI Driven Hybrid Care Platform	US$60,000.00	Datos technology cost 2	£5.61
Luscii Vitals	£8,500.00	Luscii G-Cloud 14 Pricing Summary	£3.33
Gro Health HeartBuddy	£2,000.00 - £10,000.00	DDM Heath Evidence	£2.35
Get Ready - Solution	£21,000.00 for year 1, £2,000.00 per year for subsequent years	Medtronic evidence response	£13.45
KiActiv	£0.00	KiActiv evidence response	£0.00

The cost per patient per year for Activate Your Heart assumed a one-off implementation cost over the 10-year time horizon for an average of 256 patients per service per year. The implementation includes patient management, building a website and ongoing maintenance.

The cost per patient per year for Datos health assumed a one-off implementation cost over the 10-year time horizon for the SSO integration and device integration based on company supplied information. For the iHealth SDK license, Datos Cloud system and professional services elements of the implementation cost, the annual cost was used as per the company information provided.

It was assumed the costs provided are for a regional level. Using NACR 2020 data,[68] a mean of 17.25 CR services per region was calculated. From there the cost per CR service was calculated, and the cost per patient was calculated using a mean of 256 patients per service, derived from the national uptake of 53,419 from NACR 2024[5] across 209 CR services in England. The costs provided were in United States Dollar values which we converted to GBP using the Bank of England spot rate on 12/06/2025.

The cost per patient per year for Luscii vitals assumed a one-off implementation cost of the 10-year time horizon for an average of 256 patients per service per year. The cost provided by Luscii Vitals includes training, but the value for training could not be disaggregated from the implementation costs. The costs include care pathway re- design and optimisation, creation of

the specific customer requirements within the Luscii platform, full training, including on-site training when required and full user guide documentation.

The cost per patient per year for Gro Health HeartBuddy assumed a one-off implementation cost of the 10-year time horizon for an average of 256 patients per service per year. The costs provided are an estimate between £2,000 - £10,000 depending on the complexity of integration. The estimate used in the scenario analysis is £6,000.00 as the midpoint.

The cost per patient per year for Get Ready – Solution used an annual cost of £3,900.00. This represents £21,100.00 for year 1 and £2,000.00 per year for years 2 – 10 inclusive. Using an average of 256 patients per service per year the figure of £13.45 per patient per year is calculated over the time horizon. The cost provided by Get Ready - Solution includes training, but the value for training could not be disaggregated from the implementation costs.

KiActiv confirmed that there were no costs associated with requirements to integrate their technology into NHS systems.

7.3.3.2. Resource use for delivery of cardiac rehabilitation

The resource use associated with the delivery of digitally supported cardiac rehabilitation was calculated in the model using the weighted average cost of a cardiac rehab session across consultant vs non consultant led, and face to face vs non face to face, provided by the NHS Reference Costs.[69] We assumed in the base case that on-boarding and off-boarding visits would be consultant led and that other sessions would not be consultant led based upon clinical expert advice. This cost was calculated to be £94.64 per non-consultant led session and £147.18 per consultant led session giving a total of £862.17 for a complete 8 session conventional cardiac rehab per person. This compares to an estimated cost of £208 in NICE CG48[1] [2005 prices] which was produced prior to the publication of costs for the cardiac rehabilitation service within NHS reference costs. The EAG noted the large difference in price and that the guideline and other economic evaluations[1,70] have noted a large degree of variation in the price of conventional CR per patient (from £344 to £738 in the 2004 HTA for completers and between £50-£712 in NICE CG48[1], although it is unclear if this estimate is per completer or per enrolled participant). Whilst the Beswick microcosting is useful to understand cost implications at an individual centre level, the national reference costs give insight into overall means across NHS England. Given this uncertainty, the EAG tested the impact of assuming higher / lower costs in scenario analysis.

As per the NICE Scope, digitally supported cardiac rehab technology should not replace the first and last appointment as part of the cardiac rehabilitation process. For that reason, if a company stated no appointments are required for their technology, or the company did not provide any information related to the resource use of their technology, it was assumed that the technology used two cardiac rehab sessions derived from the NHS Reference Costs.

Resource use for conventional cardiac rehabilitation was calculated as eight appointments. This reflects NICE Guidelines for secondary prevention for cardiovascular disease[71] and clinical expert opinion. Resource use for conventional cardiac rehabilitation was calculated as 8 appointments. This reflects NICE Guidelines for secondary prevention for cardiovascular disease[71] and clinical expert opinion.

To model patients who do not complete digitally supported and conventional cardiac rehabilitation, a 50% reduction in resource use was used to reflect the reduced number of appointments used.

Table 14: Resource use costs for cardiac rehabilitation

Cardiac Rehabilitation	Cost per course (completers)	Cost per course (non-completers)
Conventional cardiac rehab	£862.17	£431.10
D REACH-HF	£620.35	£336.45
All other digital technologies	£294.36	£147.18

To calculate the cost of conventional cardiac rehab for a patient that completes the programme, the EAG assumed two consultant led appointments (the first and final appointments), and six non consultant led appointments (the six sessions of rehab). For a patient that does not complete conventional cardiac rehab, the EAG assumed one consultant led appointment (the first appointment) and three of the six sessions of rehab. D Reach-HF reported that their technology required one remote session per week for four weeks then fortnightly sessions post the initial four weeks is facilitated. For this reason, 6 appointments were used to model the resource use of D Reach-HF, one consultant led first session, followed by 5 non-consultant led appointments.

7.3.3.3. Resource use for secondary cardiovascular events

As part of the state transition model, we modelled the resource use of a patient having a secondary cardiovascular event and the associated costs. The cost of a cardiovascular event was derived from Danese et al (2016)[60] and inflated to 2023/2024 prices. This cost was used in

NICE Guideline CG181[61] as part of a cost utility analysis of lipid therapy escalation for secondary prevention. The in-year cost of a cardiovascular event was calculated to be £8,484.94, then £3,827.20 per year for the subsequent two years.

The EAG did not calculate the cost of drug treatment associated with the secondary prevention of cardiovascular disease, as these costs are relatively low and consistent across the population. They are unlikely to differ meaningfully between patients receiving digital or conventional cardiac rehabilitation, so will have minimal impact on the comparative analysis.

7.3.4. Health state utilities

Health state utilities were estimated by utilising the general population utilities from Hernandez Alava (2022)[72] weighted by utilities associated with cardiovascular events from NICE Guideline CG48, MI – Secondary Prevention (2013).[1,56]

For the post-CR uptake state a utility weight of 0.88 was used to adjust the general population utility reflecting the utility of patients in the medium- and long-term post cardiovascular event. For the secondary CV event tunnel state, the simple mean of revascularisation and MI (0.76, 0.80) was used to adjust the general population utility reflecting reduced quality of patients for patients experience these events in the short term. For the survival post-secondary CV event state the 0.88 weight was used to again reflect medium- and long-term post cardiovascular event quality of life. The impact of this was explored in the one-way sensitivity analysis.

7.3.5. Approach to analysis and assessing uncertainty

Whilst it is theoretically preferable to perform a fully incremental analysis, the EAG presented only pairwise comparisons of each technology versus conventional CR. This is because the data on effectiveness were insufficiently robust for head to head comparisons.

To account for parameter uncertainty, probabilistic sensitivity analysis (PSA) was conducted using 10,000 simulations. Model inputs were assigned appropriate probability distributions based on the type and nature of data available (Beta distributions for probabilities and utilities, Normal for costs, lognormal for odds ratios). Where data were not available to inform the parameters required to sample uncertainty a standard error of 20% of the mean was assumed. A list of all model parameters, their base case and PSA distributions is in Appendix F.

Deterministic scenario analyses were undertaken to explore the impact of key structural and parameter assumptions. In addition to one way sensitivity analyses, scenarios tested included:

- Alternative assumptions around uptake and completion rates:
  - Use of naïve data for DCR where available
  - 2-way sensitivity analysis for the impact of uptake and completion rates for digital CR holding uptake and completion rates for conventional CR constant
- The impact of DCR on secondary CV events: reduction in effectiveness in decrements of 10% from assuming equal to conventional CR to the same level as no CR. This was specifically to explore whether the results were sensitive to different populations (eg heart failure) where CR itself may be more or less effective than in the broader CVD population.
- The impact of the relative risk of conventional CR versus no CR (values from 0.5 to 1.0 tested in increments of 0.1)
- Excluding the cost of computing equipment
- Excluding implementation and training costs
- Sensitivity to the cost of an in-person session:
  - Micro-costing using the Beswick 2004[70] method and current prices (£589.69)
  - Inflating the NICE CG48 minimum,[1] estimation used in the model and maximum (£50, £208, £712) from 2005 prices to current
- Sensitivity to the modelled time horizon

Scenario analyses are reported in section 7.4.2 whilst tornado diagrams summarising the results of the one-way analyses are in section 7.4.3.

7.4. Results from the economic modelling

7.4.1. Base case results

The differences in both life years and QALYs between digital and conventional CR in the base case was minimal. Cost differences were also relatively small with the total cost of digital CR including licence costs being lower than the cost of conventional CR. This led to all technologies being considered cost-effective versus conventional CR (South-West quadrant ICERs should be interpreted such that an ICER higher than threshold is cost-effective). The EAG noted that the

definition used for completion in the main study for Activate Your Heart was much stricter than in the other studies for digital CR in that it measured whether patients had completed the entire four stage programme in 8 weeks, whereas in the other Activate Your Heart study, completion was measured as the number of the population who had completed the 4 stage programme in 6 month with a completion of 78% which is more in line with completion levels from the other technologies. Our scenario analysis (section 7.4.2.1) shows that under comparable completion rates (both using the naïve uptake and completion rates and assuming similar rates to other technologies,

Table 18 & **Error! Reference source not found.**), Activate Your Heart is comparable to other technologies, yielding cost savings and superior outcomes compared with conventional CR. .

For the purposes of model validation, the predicted ICER for conventional CR vs no CR was compared between this model and the NICE CG48 model. Here we found an ICER of £9,849 compared to an ICER of £7,859 in the 2013 NICE CG48 model (results not shown). These were considered suitably similar given the change in prices since 2013 (HRG not available for the cost of delivering CR at this time). The EAG noted that the incremental QALYs estimated in its analysis were lower than those in the NICE guideline model, even when assuming 100% uptake and completion. This is most likely driven by differences in estimates of CV event risk and mortality between the two models.

Table 15: Base Case Economic Results

Interventions	Total Cost	Total Cost (exc. Licence)	Total QALYs	Total Life Years	ICER vs CCR	Licence cost?	Uptake and completion data?	EJP
Conventional CR	£4,570.65	£4,570.65	6.275	11.537				-
Tech 1 Activate Your Heart	£4,455.67	£4,435.02	6.274	11.535	£109,966SW	Yes	No	£184.71
Tech 2 Beat Better	£4,432.30	£4,429.83	6.275	11.537	Dominant	Yes	No	£140.82
Tech 3 Datos Health - AI Driven Hybrid Care Platform	£4,548.64	£4,427.49	6.275	11.537	Dominant	Yes	No	£143.15
Tech 4 D REACH-HF	£4,549.68	£4,539.17	6.275	11.537	Dominant	Yes	No	£31.47
Tech 5 Digital Heart Manual	£4,440.55	£4,429.82	6.275	11.537	Dominant	Yes	No	£140.83
Tech 6 Get Ready - Solution	£4,460.04	£4,430.63	6.275	11.537	Dominant	Yes	No	£140.02
Tech 7 Gro Health HeartBuddy	£4,528.68	£4,425.43	6.275	11.537	Dominant	Yes	Yes	£147.03
Tech 8 KiActiv	£4,464.85	£4,405.87	6.279	11.548	Dominant	Yes	Yes	£261.70
Tech 9 Luscii vitals	£4,432.64	£4,426.45	6.275	11.537	Dominant	Yes	No	£144.20
Tech 10 myHeart	£4,457.36	£4,429.83	6.275	11.537	Dominant	Yes	No	£140.82
Tech 11 Pumping Marvellous Cardiac Rehab Platform	£4,429.83	£4,429.83	6.275	11.537	Dominant	Yes	No	£140.82
Tech 12 R Plus Health	£4,445.11	£4,386.13	6.282	11.555	Dominant	Yes	Yes	£338.40
Tech 13 Sword Move	£4,507.26	£4,429.83	6.275	11.537	Dominant	Yes	No	£140.82

Abbreviations: EJP, economically justifiable price; ICER, incremental cost-effectiveness ratio; QALY, Quality Adjusted Life Year; SW, southwest quadrant

Table 16 demonstrates that total costs were broadly similar between digital CR technologies, offering a small cost saving compared to conventional CR. Licence costs were a relatively small proportion of total costs for digital CR technologies (note these are expected costs based on uptake). Small differences in resource use costs and costs associated with longer-term events between treatments were observed due to differences in uptake and completion rates and, in the case of Gro Health HeartBuddy and R Plus Health, small differences in the risk of secondary CVD.

Table 16: Disaggregated costs

Interventions	Licence cost	Resource cost	Post-CR uptake/offer	Secondary CVD	Survival post-secondary CVD	Total
Conventional CR	£0.00	£276.21	£387.65	£2,973.95	£932.83	£4,570.65
Tech 1 Activate Your Heart	£20.65	£133.31	£387.27	£2,979.68	£934.76	£4,455.67
Tech 2 Beat Better	£2.48	£135.39	£387.65	£2,973.95	£932.83	£4,432.30
Tech 3 Datos Health - AI Driven Hybrid Care Platform	£121.15	£133.06	£387.65	£2,973.95	£932.83	£4,548.64
Tech 4 D REACH-HF	£10.50	£244.74	£387.65	£2,973.95	£932.83	£4,549.68
Tech 5 Digital Heart Manual	£10.74	£135.38	£387.65	£2,973.95	£932.83	£4,440.55
Tech 6 Get Ready - Solution	£29.41	£136.20	£387.65	£2,973.95	£932.83	£4,460.04
Tech 7 Gro Health HeartBuddy	£103.25	£131.63	£387.68	£2,973.45	£932.67	£4,528.68
Tech 8 KiActiv	£58.98	£145.18	£389.42	£2,947.37	£923.89	£4,464.85
Tech 9 Luscii vitals	£6.20	£132.02	£387.65	£2,973.95	£932.83	£4,432.64
Tech 10 myHeart	£27.53	£135.39	£387.65	£2,973.95	£932.83	£4,457.36
Tech 11 Pumping Marvellous Cardiac Rehab Platform	£0.00	£135.39	£387.65	£2,973.95	£932.83	£4,429.83
Tech 12 R Plus Health	£58.98	£145.24	£390.45	£2,931.73	£918.70	£4,445.11
Tech 13 Sword Move	£77.44	£135.39	£387.65	£2,973.95	£932.83	£4,507.26

Table 17 demonstrates that minor differences in QALYs between treatments were primarily driven by reduced time spent post CR relative to post secondary CVD for treatments with lower uptake and completion rates. Differences between treatments were very small (<0.1 QALYs in all cases).

Table 17: Disaggregated QALYs

Interventions	Post-CR uptake/offer	Secondary CVD	Survival post-secondary CVD	Total
Conventional CR	4.668	0.244	1.363	6.275
Tech 1 Activate Your Heart	4.663	0.245	1.366	6.274
Tech 2 Beat Better	4.668	0.244	1.363	6.275
Tech 3 Datos Health - AI Driven Hybrid Care Platform	4.668	0.244	1.363	6.275
Tech 4 D REACH-HF	4.668	0.244	1.363	6.275
Tech 5 Digital Heart Manual	4.668	0.244	1.363	6.275
Tech 6 Get Ready - Solution	4.668	0.244	1.363	6.275
Tech 7 Gro Health HeartBuddy	4.668	0.244	1.363	6.275
Tech 8 KiActiv	4.688	0.242	1.349	6.279
Tech 9 Luscii vitals	4.668	0.244	1.363	6.275
Tech 10 myHeart	4.668	0.244	1.363	6.275
Tech 11 Pumping Marvellous Cardiac Rehab Platform	4.668	0.244	1.363	6.275
Tech 12 R Plus Health	4.700	0.241	1.341	6.282
Tech 13 Sword Move	4.668	0.244	1.363	6.275

7.4.2. Scenario analysis results

7.4.2.1. Alternative assumptions around uptake and completion rates

Use of the naïve uptake and completion rates did not materially affect the results, with all technologies appearing cost-effective compared with conventional CR (Table 18).

Table 18: Scenario analysis: use of naïve uptake and completion rates

Interventions	Total Cost	Total Cost (exc. Licence)	Total QALYs	Total Life Years	ICER vs CCR	Licence cost?	Uptake and completion data?	EJP
Conventional CR	£4,570.65	£4,570.65	6.275	11.537				-
Tech 1 Activate Your Heart	£4,417.52	£4,396.87	6.281	11.552	Dominant	Yes	No	£307.86
Tech 2 Beat Better	£4,432.30	£4,429.83	6.275	11.537	Dominant	Yes	No	£140.82
Tech 3 Datos Health - AI Driven Hybrid Care Platform	£4,731.96	£4,451.96	6.296	11.586	£7,488	Yes	No	£549.53
Tech 4 D REACH-HF	£4,549.68	£4,539.17	6.275	11.537	Dominant	Yes	No	£31.47
Tech 5 Digital Heart Manual	£4,454.59	£4,439.10	6.282	11.554	Dominant	Yes	No	£276.94
Tech 6 Get Ready – Solution	£4,460.04	£4,430.63	6.275	11.537	Dominant	Yes	No	£140.02
Tech 7 Gro Health HeartBuddy	£4,552.61	£4,323.44	6.320	11.638	Dominant	Yes	Yes	£1,147.40
Tech 8 KiActiv	£4,456.94	£4,374.43	6.294	11.581	Dominant	Yes	Yes	£585.81
Tech 9 Luscii vitals	£4,432.64	£4,426.45	6.275	11.537	Dominant	Yes	No	£144.20
Tech 10 myHeart	£4,457.36	£4,429.83	6.275	11.537	Dominant	Yes	No	£140.82
Tech 11 Pumping Marvellous Cardiac Rehab Platform	£4,429.83	£4,429.83	6.275	11.537	Dominant	Yes	No	£140.82
Tech 12 R Plus Health	£4,397.81	£4,331.70	6.295	11.584	Dominant	Yes	Yes	£651.55
Tech 13 Sword Move	£4,507.26	£4,429.83	6.275	11.537	Dominant	Yes	No	£140.82

Abbreviations: EJP, economically justifiable price; ICER, incremental cost-effectiveness ratio; QALY, Quality Adjusted Life Year; SW, southwest quadrant

Appendix G presents the results of 2-way sensitivity analysis for the impact of uptake and completion rates for digital CR holding uptake and completion rates for conventional CR constant. The tables present net monetary benefit at the £20,000 per QALY willingness to pay threshold. Results for all technologies were sensitive to assumed uptake and completion rates with completion rates lower than 25% generally not proving cost-effective for the majority of technologies; similarly, uptake rates lower than 20% were generally not cost-effective.

7.4.2.2. The impact of DCR on secondary CV events

The majority of technologies remain cost-effective provided the 10-year risk of secondary CV events is below 5.3% to 5.5% (CCR reduces the risk to approximately 5.2%).

Table 19: Scenario analysis: impact of DCR on secondary CV events (INMB vs CCR at £20,000/QALY)

Secondary CV event risk	5.1%	5.2%	5.3%	5.3%	5.4%	5.4%	5.5%	5.5%	5.6%	5.6%	5.7%	5.8%	5.8%	5.9%	5.9%	6.0%	6.0%	6.1%	6.2%	6.2%	6.3%
Activate Your Heart	£94	£72	£50	£28	£7	-£15	-£36	-£57	-£78	-£99	-£120	-£141	-£161	-£182	-£202	-£222	-£242	-£262	-£282	-£301	-£321
Beat Better	£138	£115	£91	£68	£45	£22	-£1	-£23	-£46	-£68	-£90	-£112	-£134	-£156	-£178	-£199	-£221	-£242	-£263	-£284	-£305
Datos Health	£22	-£2	-£25	-£48	-£71	-£94	-£117	-£140	-£162	-£184	-£207	-£229	-£251	-£272	-£294	-£315	-£337	-£358	-£379	-£400	-£421
D REACH-HF	£21	-£3	-£26	-£49	-£72	-£95	-£118	-£141	-£163	-£185	-£208	-£230	-£252	-£273	-£295	-£317	-£338	-£359	-£380	-£401	-£422
Digital Heart Manual	£130	£107	£83	£60	£37	£14	-£9	-£31	-£54	-£76	-£98	-£121	-£142	-£164	-£186	-£207	-£229	-£250	-£271	-£292	-£313
Get Ready	£111	£87	£64	£40	£17	-£6	-£28	-£51	-£73	-£96	-£118	-£140	-£162	-£184	-£205	-£227	-£248	-£269	-£291	-£312	-£332
Gro Health HeartBuddy	£41	£18	-£6	-£29	-£52	-£75	-£98	-£120	-£143	-£165	-£187	-£209	-£231	-£253	-£275	-£296	-£318	-£339	-£360	-£381	-£402
KiActiv	£203	£172	£142	£112	£82	£52	£23	-£6	-£36	-£65	-£93	-£122	-£150	-£178	-£206	-£234	-£262	-£289	-£317	-£344	-£371
Luscii vitals	£138	£114	£91	£68	£45	£22	-£1	-£24	-£46	-£68	-£91	-£113	-£135	-£156	-£178	-£199	-£221	-£242	-£263	-£284	-£305
myHeart	£113	£90	£66	£43	£20	-£3	-£26	-£48	-£71	-£93	-£115	-£137	-£159	-£181	-£203	-£224	-£246	-£267	-£288	-£309	-£330
Pumping Marvellous	£141	£117	£94	£71	£48	£25	£2	-£21	-£43	-£66	-£88	-£110	-£132	-£154	-£175	-£197	-£218	-£239	-£260	-£281	-£302
R Plus Health	£203	£173	£143	£113	£83	£53	£23	-£6	-£35	-£64	-£93	-£122	-£150	-£178	-£206	-£234	-£262	-£289	-£317	-£344	-£371
Sword Move	£63	£40	£16	-£7	-£30	-£53	-£76	-£98	-£121	-£143	-£165	-£187	-£209	-£231	-£253	-£274	-£295	-£317	-£338	-£359	-£380

CV, Cardiovascular; DCR, Digital Cardiac Rehabilitation; INMB, Incremental Net Monetary Benefit vs CCR.

7.4.2.3. The impact of the benefit of conventional CR on secondary CV events

The results are mostly insensitive to the effectiveness of CR vs no CR. The adverse results for Activate Your Heart are driven by the stricter definition of completion used in the source study and should therefore be considered with caution.

As the results are mostly driven by the cost savings from avoided face to face contacts, all appear cost-effective compared with conventional CR. However, when there is no benefit of CR (relative risk of 1), conventional CR itself will not be cost-effective (it will be cost-increasing for no added benefit), and therefore DCR will also not be cost-effective compared with no CR: no form of CR should be recommended in this case. The EAG draws attention to the fact that this scenario is hypothetical: there is evidence supporting a statistically significant benefit.[73]

Table 20: Scenario analysis: impact of relative risk of conventional CR vs no CR on secondary CV events

Secondary CV event RR	0.5	0.6	0.7	0.8	0.9	1
Activate Your Heart	£34	£54	£73	£91	£107	£122
Beat Better	£138	£138	£138	£138	£138	£138
Datos Health	£22	£22	£22	£22	£22	£22
D REACH-HF	£21	£21	£21	£21	£21	£21
Digital Heart Manual	£130	£130	£130	£130	£130	£130
Get Ready	£111	£111	£111	£111	£111	£111
Gro Health HeartBuddy	£44	£44	£44	£44	£44	£43
KiActiv	£482	£387	£300	£218	£143	£72
Luscii vitals	£138	£138	£138	£138	£138	£138
myHeart	£113	£113	£113	£113	£113	£113
Pumping Marvellous	£141	£141	£141	£141	£141	£141
R Plus Health	£580	£478	£384	£296	£215	£139
Sword Move	£63	£63	£63	£63	£63	£63

7.4.2.4. Excluding the cost of computing equipment

The results are largely insensitive to the inclusion or exclusion of the cost of computing equipment, with all interventions being cost-effective vs conventional CR.

Table 21: Scenario analysis: Excluding the cost of computing equipment

Interventions	Total Cost	Total Cost (exc. Licence)	Total QALYs	Total Life Years	ICER vs CCR	Licence cost?	Uptake and completion data?	EJP
Conventional CR	£4,570.65	£4,570.65	6.275	11.537				-
Tech 1 Activate Your Heart	£4,419.33	£4,398.68	6.274	11.535	£144,724SW	Yes	No	£151.05
Tech 2 Beat Better	£4,395.96	£4,393.49	6.275	11.537	Dominant	Yes	No	£177.16
Tech 3 Datos Health - AI Driven Hybrid Care Platform	£4,512.30	£4,391.15	6.275	11.537	Dominant	Yes	No	£179.49
Tech 4 D REACH-HF	£4,513.34	£4,502.83	6.275	11.537	Dominant	Yes	No	£67.81
Tech 5 Digital Heart Manual	£4,404.21	£4,393.48	6.275	11.537	Dominant	Yes	No	£177.17
Tech 6 Get Ready – Solution	£4,423.70	£4,394.29	6.275	11.537	Dominant	Yes	No	£176.36
Tech 7 Gro Health HeartBuddy	£4,492.34	£4,389.09	6.275	11.537	Dominant	Yes	Yes	£183.37
Tech 8 KiActiv	£4,428.51	£4,369.53	6.279	11.548	Dominant	Yes	Yes	£298.04
Tech 9 Luscii vitals	£4,396.30	£4,390.11	6.275	11.537	Dominant	Yes	No	£180.54
Tech 10 myHeart	£4,421.02	£4,393.49	6.275	11.537	Dominant	Yes	No	£177.16
Tech 11 Pumping Marvellous Cardiac Rehab Platform	£4,393.49	£4,393.49	6.275	11.537	Dominant	Yes	No	£177.16
Tech 12 R Plus Health	£4,408.77	£4,349.79	6.282	11.555	Dominant	Yes	Yes	£374.74
Tech 13 Sword Move	£4,470.92	£4,393.49	6.275	11.537	Dominant	Yes	No	£177.16

Abbreviations: EJP, economically justifiable price; ICER, incremental cost-effectiveness ratio; QALY, Quality Adjusted Life Year; SW, southwest quadrant

7.4.2.5. Excluding implementation and training costs

The results are broadly insensitive to excluding the costs of implementation and training.

Table 22: Scenario analysis: Excluding the cost of implementation and training

Interventions	Total Cost	Total Cost (exc. Licence)	Total QALYs	Total Life Years	ICER vs CCR	Licence cost?	Uptake and completion data?	EJP
Conventional CR	£4,570.65	£4,570.65	6.275	11.537				-
Tech 1 Activate Your Heart	£4,450.87	£4,430.22	6.274	11.535	£114,560SW	Yes	No	£119.51
Tech 2 Beat Better	£4,427.55	£4,425.07	6.275	11.537	Dominant	Yes	No	£145.57
Tech 3 Datos Health - AI Driven Hybrid Care Platform	£4,546.22	£4,425.07	6.275	11.537	Dominant	Yes	No	£145.57
Tech 4 D REACH-HF	£4,544.89	£4,534.38	6.275	11.537	Dominant	Yes	No	£36.26
Tech 5 Digital Heart Manual	£4,435.81	£4,425.07	6.275	11.537	Dominant	Yes	No	£145.57
Tech 6 Get Ready – Solution	£4,454.48	£4,425.07	6.275	11.537	Dominant	Yes	No	£145.57
Tech 7 Gro Health HeartBuddy	£4,527.69	£4,424.44	6.275	11.537	Dominant	Yes	Yes	£148.02
Tech 8 KiActiv	£4,460.19	£4,401.22	6.279	11.548	Dominant	Yes	Yes	£266.35
Tech 9 Luscii vitals	£4,431.27	£4,425.07	6.275	11.537	Dominant	Yes	No	£145.57
Tech 10 myHeart	£4,452.61	£4,425.07	6.275	11.537	Dominant	Yes	No	£145.57
Tech 11 Pumping Marvellous Cardiac Rehab Platform	£4,425.07	£4,425.07	6.275	11.537	Dominant	Yes	No	£145.57
Tech 12 R Plus Health	£4,440.46	£4,381.48	6.282	11.555	Dominant	Yes	Yes	£343.05
Tech 13 Sword Move	£4,502.51	£4,425.07	6.275	11.537	Dominant	Yes	No	£145.57

Abbreviations: EJP, economically justifiable price; ICER, incremental cost-effectiveness ratio; QALY, Quality Adjusted Life Year; SW, southwest quadrant

7.4.2.6. Sensitivity to the cost of an in-person session

The results are highly sensitive to the cost of an in-person session. Use of the Beswick 2004 costs results in some of the technologies moving from dominant to dominated and/or yielding ICERs above conventionally accepted ranges, whilst use of the NICE CG48 minimum and maximum cost finds that none and all of the technologies are cost-effective respectively.

Table 23: Scenario analysis: Beswick 2004[68] costs for in person session

Interventions	Total Cost	Total Cost (exc. Licence)	Total QALYs	Total Life Years	ICER vs CCR	Licence cost?	Uptake and completion data?	EJP
Conventional CR	£4,483.35	£4,483.35	6.275	11.537				-
Tech 1 Activate Your Heart	£4,455.67	£4,435.02	6.274	11.535	£26,473SW	Yes	No	£27.42
Tech 2 Beat Better	£4,432.30	£4,429.83	6.275	11.537	Dominant	Yes	No	£53.53
Tech 3 Datos Health - AI Driven Hybrid Care Platform	£4,548.64	£4,427.49	6.275	11.537	Dominated	Yes	No	£55.86
Tech 4 D REACH-HF	£4,549.68	£4,539.17	6.275	11.537	Dominated	Yes	No	-£55.82
Tech 5 Digital Heart Manual	£4,440.55	£4,429.82	6.275	11.537	Dominant	Yes	No	£53.54
Tech 6 Get Ready – Solution	£4,460.04	£4,430.63	6.275	11.537	Dominant	Yes	No	£52.72
Tech 7 Gro Health HeartBuddy	£4,528.68	£4,425.43	6.275	11.537	£498,740	Yes	Yes	£59.74
Tech 8 KiActiv	£4,464.85	£4,405.87	6.279	11.548	Dominant	Yes	Yes	£174.41
Tech 9 Luscii vitals	£4,432.64	£4,426.45	6.275	11.537	Dominant	Yes	No	£56.90
Tech 10 myHeart	£4,457.36	£4,429.83	6.275	11.537	Dominant	Yes	No	£53.53
Tech 11 Pumping Marvellous Cardiac Rehab Platform	£4,429.83	£4,429.83	6.275	11.537	Dominant	Yes	No	£53.53
Tech 12 R Plus Health	£4,445.11	£4,386.13	6.282	11.555	Dominant	Yes	Yes	£251.10
Tech 13 Sword Move	£4,507.26	£4,429.83	6.275	11.537	Dominated	Yes	No	£53.53

Abbreviations: EJP, economically justifiable price; ICER, incremental cost-effectiveness ratio; QALY, Quality Adjusted Life Year; SW, southwest quadrant

Table 24: Scenario analysis: NICE CG48 inflated model base case estimate for an in-person session

Interventions	Total Cost	Total Cost (exc. Licence)	Total QALYs	Total Life Years	ICER vs CCR	Licence cost?	Uptake and completion data?	EJP
Conventional CR	£4,401.94	£4,401.94	6.275	11.537				-
Tech 1 Activate Your Heart	£4,455.67	£4,435.02	6.274	11.535	Dominated	Yes	No	-£53.99
Tech 2 Beat Better	£4,432.30	£4,429.83	6.275	11.537	Dominated	Yes	No	-£27.89
Tech 3 Datos Health - AI Driven Hybrid Care Platform	£4,548.64	£4,427.49	6.275	11.537	Dominated	Yes	No	-£25.55
Tech 4 D REACH-HF	£4,549.68	£4,539.17	6.275	11.537	Dominated	Yes	No	-£137.23
Tech 5 Digital Heart Manual	£4,440.55	£4,429.82	6.275	11.537	Dominated	Yes	No	-£27.88
Tech 6 Get Ready – Solution	£4,460.04	£4,430.63	6.275	11.537	Dominated	Yes	No	-£28.69
Tech 7 Gro Health HeartBuddy	£4,528.68	£4,425.43	6.275	11.537	£1,394,458	Yes	Yes	-£21.67
Tech 8 KiActiv	£4,464.85	£4,405.87	6.279	11.548	£12,980	Yes	Yes	£93.00
Tech 9 Luscii vitals	£4,432.64	£4,426.45	6.275	11.537	Dominated	Yes	No	-£24.51
Tech 10 myHeart	£4,457.36	£4,429.83	6.275	11.537	Dominated	Yes	No	-£27.89
Tech 11 Pumping Marvellous Cardiac Rehab Platform	£4,429.83	£4,429.83	6.275	11.537	Dominated	Yes	No	-£27.89
Tech 12 R Plus Health	£4,445.11	£4,386.13	6.282	11.555	£5,611	Yes	Yes	£169.69
Tech 13 Sword Move	£4,507.26	£4,429.83	6.275	11.537	Dominated	Yes	No	-£27.89

Abbreviations: EJP, economically justifiable price; ICER, incremental cost-effectiveness ratio; QALY, Quality Adjusted Life Year; SW, southwest quadrant

Table 25: Scenario analysis: NICE CG48 maximum for an in-person session

Interventions	Total Cost	Total Cost (exc. Licence)	Total QALYs	Total Life Years	ICER vs CCR	Licence cost?	Uptake and completion data?	EJP
Conventional CR	£4,662.44	£4,662.44	6.275	11.537				-
Tech 1 Activate Your Heart	£4,455.67	£4,435.02	6.274	11.535	£197,768SW	Yes	No	£206.51
Tech 2 Beat Better	£4,432.30	£4,429.83	6.275	11.537	Dominant	Yes	No	£232.62
Tech 3 Datos Health - AI Driven Hybrid Care Platform	£4,548.64	£4,427.49	6.275	11.537	Dominant	Yes	No	£234.95
Tech 4 D REACH-HF	£4,549.68	£4,539.17	6.275	11.537	Dominant	Yes	No	£123.27
Tech 5 Digital Heart Manual	£4,440.55	£4,429.82	6.275	11.537	Dominant	Yes	No	£232.63
Tech 6 Get Ready – Solution	£4,460.04	£4,430.63	6.275	11.537	Dominant	Yes	No	£231.81
Tech 7 Gro Health HeartBuddy	£4,528.68	£4,425.43	6.275	11.537	Dominant	Yes	Yes	£238.83
Tech 8 KiActiv	£4,464.85	£4,405.87	6.279	11.548	Dominant	Yes	Yes	£353.50
Tech 9 Luscii vitals	£4,432.64	£4,426.45	6.275	11.537	Dominant	Yes	No	£236.00
Tech 10 myHeart	£4,457.96	£4,429.83	6.275	11.537	Dominant	Yes	No	£232.62
Tech 11 Pumping Marvellous Cardiac Rehab Platform	£4,429.83	£4,429.83	6.275	11.537	Dominant	Yes	No	£232.62
Tech 12 R Plus Health	£4,445.11	£4,386.13	6.282	11.555	Dominant	Yes	Yes	£430.19
Tech 13 Sword Move	£4,507.26	£4,429.83	6.275	11.537	Dominant	Yes	No	£232.62

Abbreviations: EJP, economically justifiable price; ICER, incremental cost-effectiveness ratio; QALY, Quality Adjusted Life Year; SW, southwest quadrant

7.4.2.7. Sensitivity to the modelled time horizon

The results are insensitive to the model time horizon. Activate Your Heart appears cost-effective under this scenario. As noted before, the base case assumes the artificially high definition of completion.

Table 26. Scenario analysis: 10-year time horizon

Interventions	Total Cost	Total Cost (exc. Licence)	Total QALYs	Total Life Years	ICER vs CCR	Licence cost?	Uptake and completion data?	EJP
Conventional CR	£3,819.33	£3,819.33	4.885	8.132				-
Tech 1 Activate Your Heart	£3,704.02	£3,683.37	4.885	8.132	£303,192SW	Yes	No	£128.36
Tech 2 Beat Better	£3,680.99	£3,678.51	4.885	8.132	Dominant	Yes	No	£140.82
Tech 3 Datos Health - AI Driven Hybrid Care Platform	£3,797.32	£3,676.18	4.885	8.132	Dominant	Yes	No	£143.15
Tech 4 D REACH-HF	£3,798.36	£3,787.86	4.885	8.132	Dominant	Yes	No	£31.47
Tech 5 Digital Heart Manual	£3,689.24	£3,678.50	4.885	8.132	Dominant	Yes	No	£140.83
Tech 6 Get Ready – Solution	£3,708.72	£3,679.31	4.885	8.132	Dominant	Yes	No	£140.02
Tech 7 Gro Health HeartBuddy	£3,777.41	£3,674.16	4.885	8.132	Dominant	Yes	Yes	£145.81
Tech 8 KiActiv	£3,715.11	£3,656.13	4.887	8.135	Dominant	Yes	Yes	£198.46
Tech 9 Luscii vitals	£3,681.32	£3,675.13	4.885	8.132	Dominant	Yes	No	£144.20
Tech 10 myHeart	£3,706.04	£3,678.51	4.885	8.132	Dominant	Yes	No	£140.82
Tech 11 Pumping Marvellous Cardiac Rehab Platform	£3,678.51	£3,678.51	4.885	8.132	Dominant	Yes	No	£140.82
Tech 12 R Plus Health	£3,696.74	£3,637.76	4.888	8.137	Dominant	Yes	Yes	£236.77
Tech 13 Sword Move	£3,755.95	£3,678.51	4.885	8.132	Dominant	Yes	No	£140.82

Abbreviations: EJP, economically justifiable price; ICER, incremental cost-effectiveness ratio; QALY, Quality Adjusted Life Year; SW, southwest quadrant

Table 27: Scenario analysis: 5-year time horizon

Interventions	Total Cost	Total Cost (exc. Licence)	Total QALYs	Total Life Years	ICER vs CCR	Licence cost?	Uptake and completion data?	EJP
Conventional CR	£2,482.77	£2,482.77	2.989	4.587				-
Tech 1 Activate Your Heart	£2,365.40	£2,344.75	2.989	4.587	£1,038,461SW	Yes	No	£135.76
Tech 2 Beat Better	£2,344.43	£2,341.95	2.989	4.587	Dominant	Yes	No	£140.82
Tech 3 Datos Health - AI Driven Hybrid Care Platform	£2,460.76	£2,339.62	2.989	4.587	Dominant	Yes	No	£143.15
Tech 4 D REACH-HF	£2,461.80	£2,451.30	2.989	4.587	Dominant	Yes	No	£31.47
Tech 5 Digital Heart Manual	£2,352.68	£2,341.94	2.989	4.587	Dominant	Yes	No	£140.83
Tech 6 Get Ready – Solution	£2,372.16	£2,342.75	2.989	4.587	Dominant	Yes	No	£140.02
Tech 7 Gro Health HeartBuddy	£2,441.03	£2,337.78	2.989	4.587	Dominant	Yes	Yes	£145.17
Tech 8 KiActiv	£2,388.09	£2,329.12	2.989	4.588	Dominant	Yes	Yes	£164.13
Tech 9 Luscii vitals	£2,344.76	£2,338.57	2.989	4.587	Dominant	Yes	No	£144.20
Tech 10 myHeart	£2,369.48	£2,341.95	2.989	4.587	Dominant	Yes	No	£140.82
Tech 11 Pumping Marvellous Cardiac Rehab Platform	£2,341.95	£2,341.95	2.989	4.587	Dominant	Yes	No	£140.82
Tech 12 R Plus Health	£2,375.52	£2,316.54	2.990	4.588	Dominant	Yes	Yes	£182.52
Tech 13 Sword Move	£2,419.39	£2,341.95	2.989	4.587	Dominant	Yes	No	£140.82

Abbreviations: EJP, economically justifiable price; ICER, incremental cost-effectiveness ratio; QALY, Quality Adjusted Life Year; SW, southwest quadrant

7.4.3. One-way sensitivity analysis results

In general, the parameters with the biggest effect on pairwise ICERs were the cost of a complete session of CCR, and the health state utilities assigned to post CR and post second CV event. In general, for Activate your Heart, KiActiv and R Plus Health, the key drivers were health state utilities, whilst for the others the key drivers were costs of CCR sessions and related.

Figure 3: Tornado Diagram: Activate Your Heart vs CCR

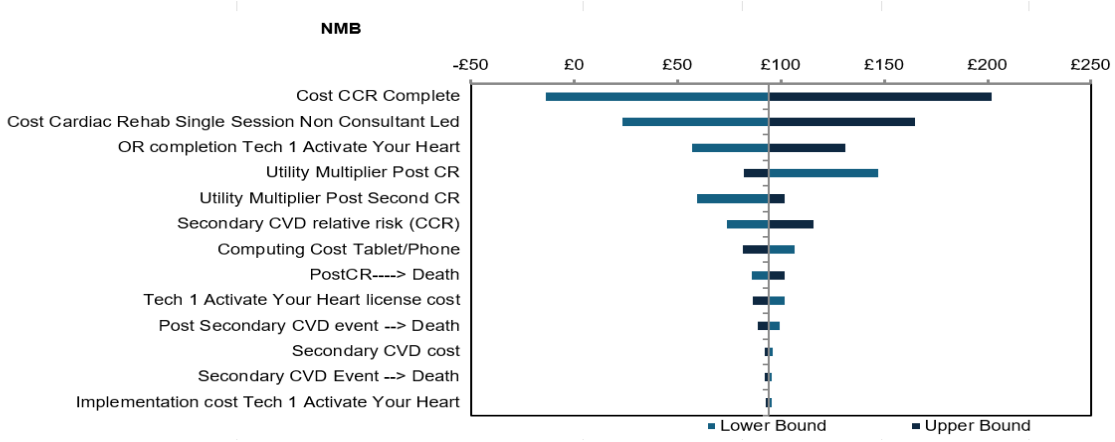


Figure 4: Tornado Diagram: Beat Better vs CCR

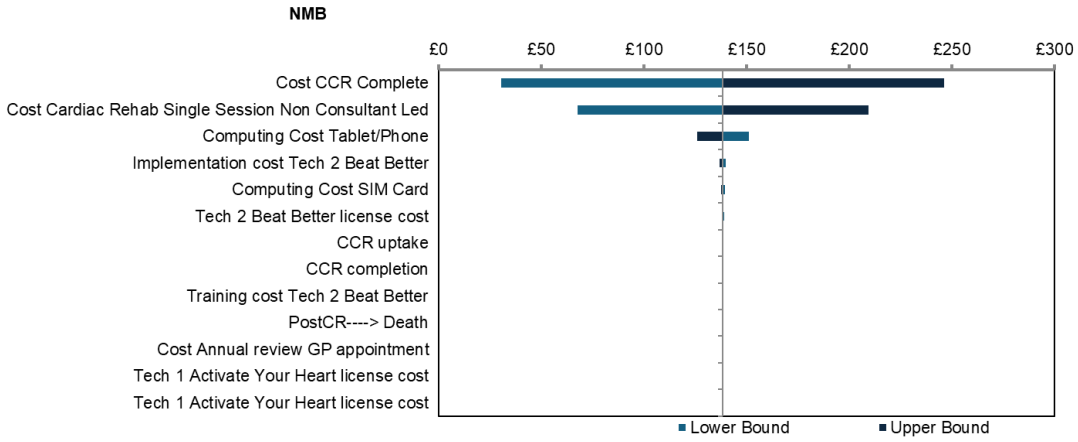


Figure 5: Tornado Diagram: Datos Health - AI Driven Hybrid Care Platform vs CCR

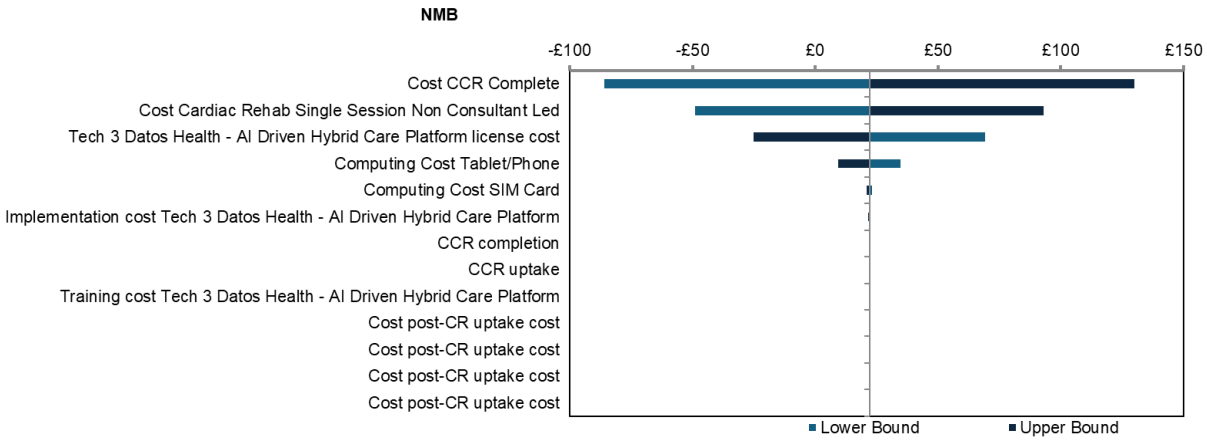


Figure 6: Tornado Diagram: D REACH-HF vs CCR

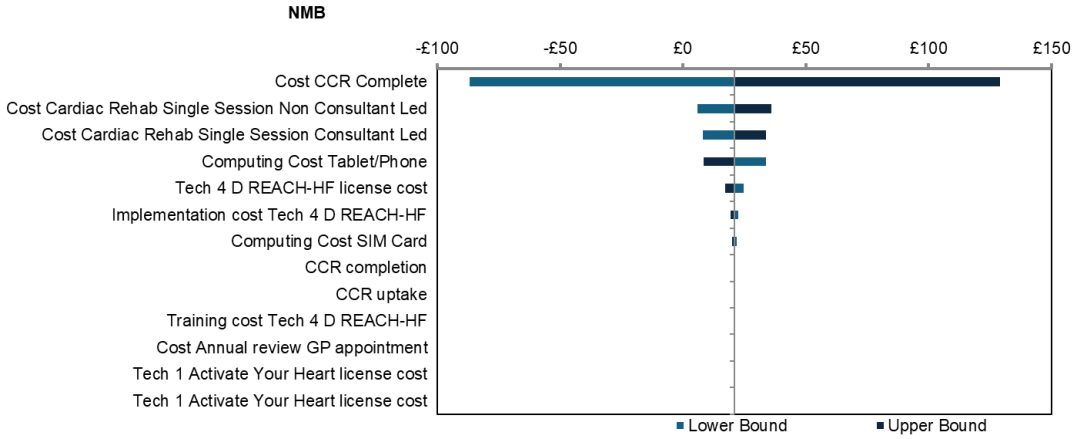


Figure 7: Tornado Diagram: Digital Heart Manual vs CCR

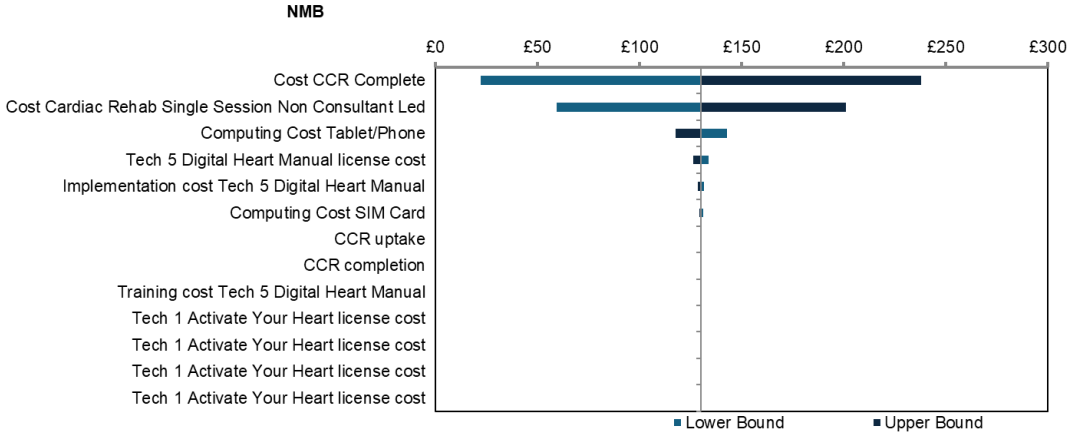


Figure 8: Tornado Diagram: Get Ready - Solution vs CCR

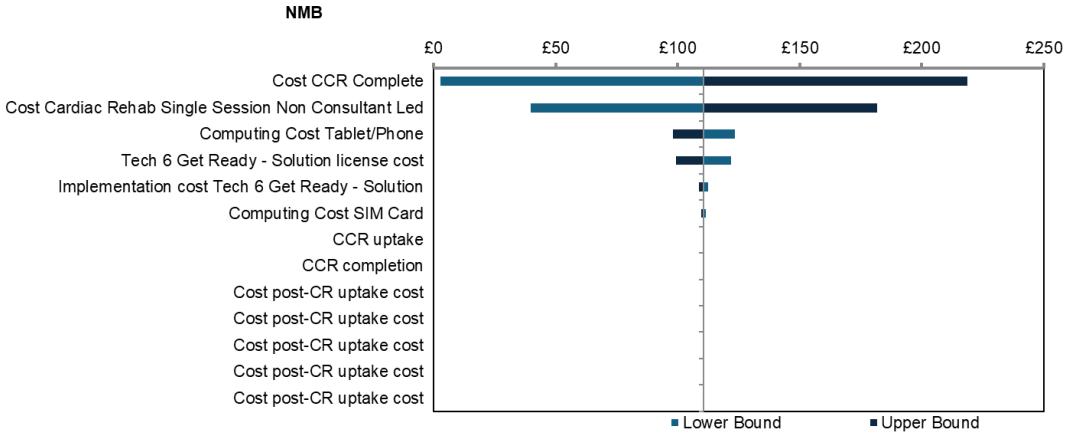


Figure 9: Tornado Diagram: Gro Health HeartBuddy vs CCR

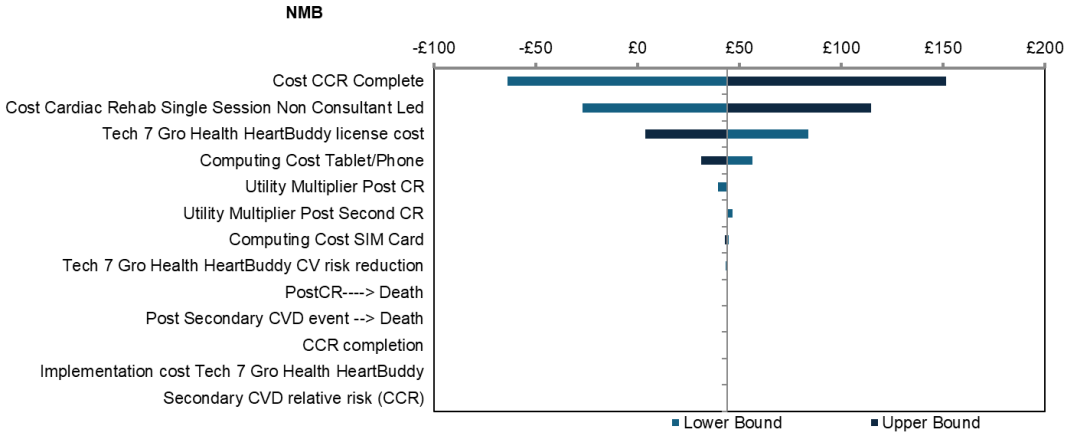


Figure 10: Tornado Diagram: KiActiv vs CCR

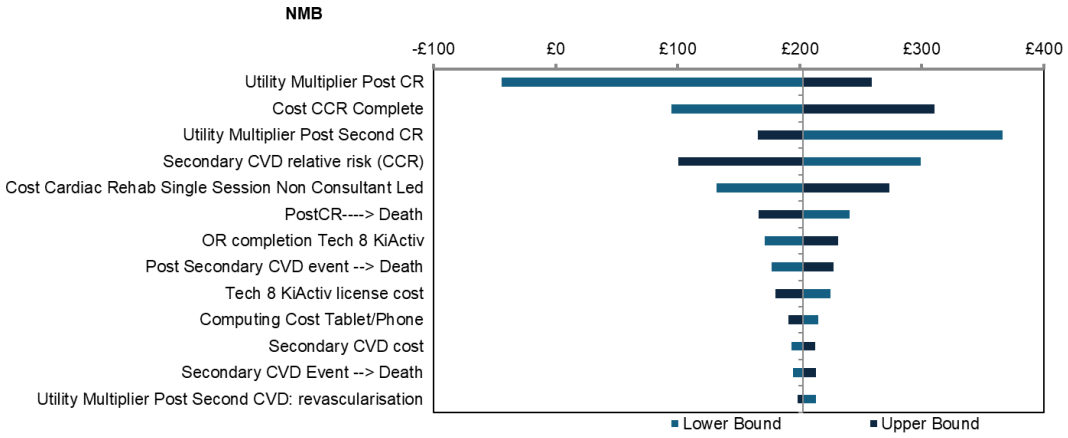


Figure 11: Tornado Diagram: Luscii vitals vs CCR

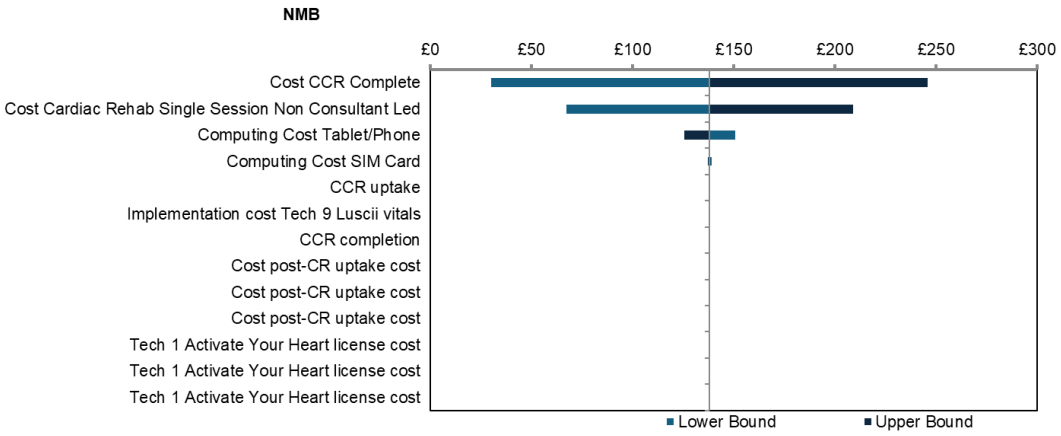


Figure 12: Tornado Diagram: myHeart vs CCR

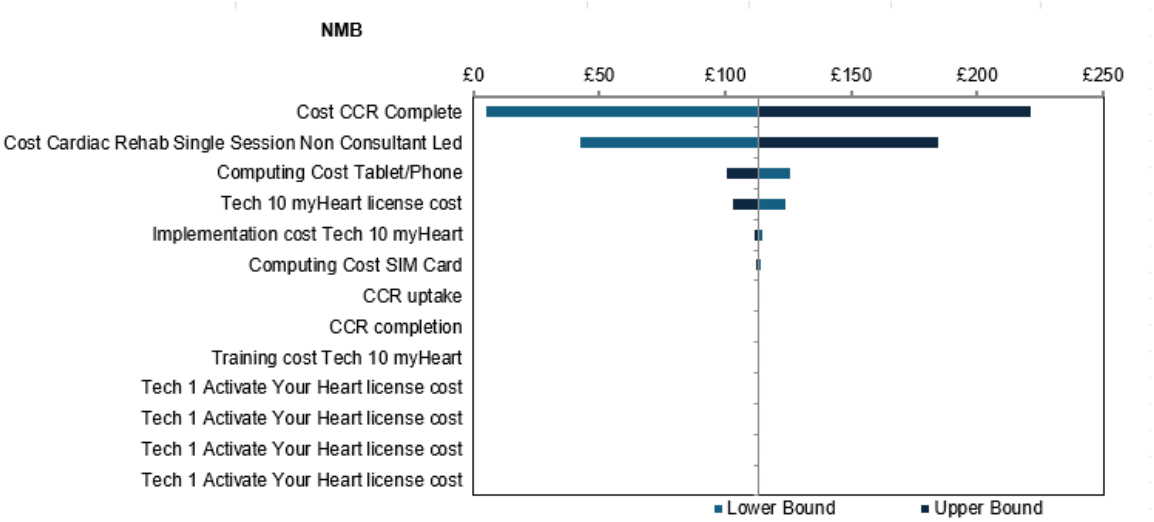


Figure 13: Tornado Diagram: Pumping Marvellous vs CCR

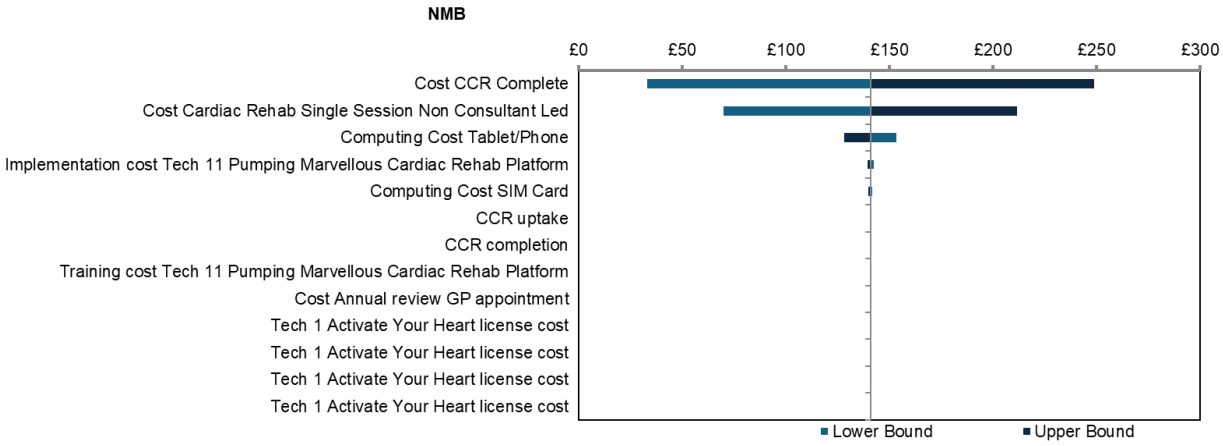


Figure 14: Tornado Diagram: R Plus Health vs CCR

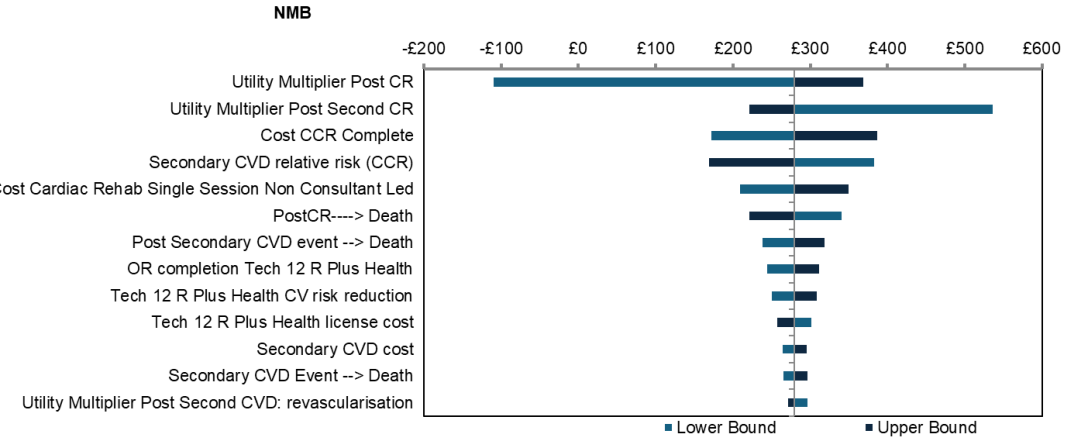
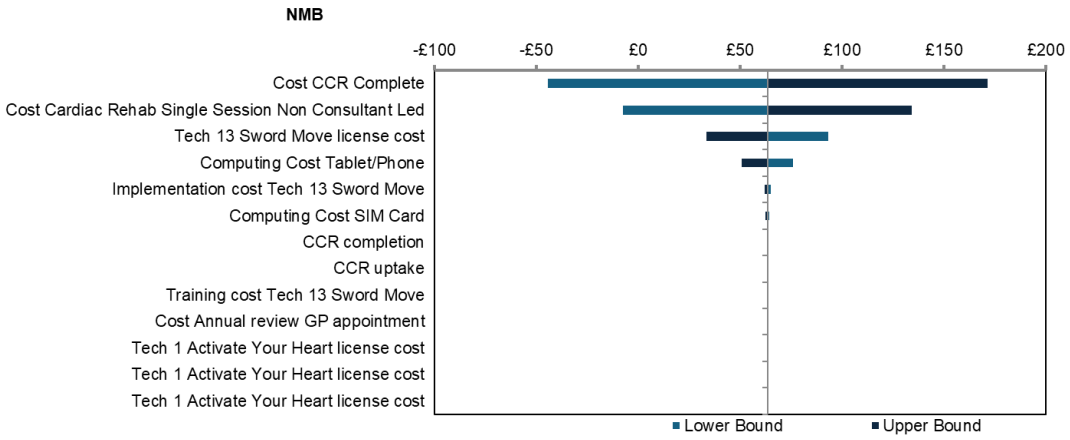


Figure 15: Tornado Diagram: Sword Move vs CCR



7.4.4. Probabilistic sensitivity analysis results

The probabilistic analyses are broadly consistent with the deterministic ones. The shapes of the scatterplots are reflective of the data available for each intervention.

Table 28: Probabilistic sensitivity analysis mean results (10,000 runs)

Interventions	Total Cost	Total QALYs	Total Life Years	ICER vs CCR	Licence cost?	Uptake and completion data?	% C/e at £20k	% C/e at £30k
Conventional CR*	£4,572	6.28	11.54					
Tech 1 Activate Your Heart	£4,464	6.26	11.54	£112,816SW	Yes	No	89.6%	84.6%
Tech 2 Beat Better	£4,432	6.27	11.54	Dominant	Yes	No	98.8%	98.8%
Tech 3 Datos Health - AI Driven Hybrid Care Platform	£4,547	6.27	11.53	Dominant	Yes	No	60.4%	60.4%
Tech 4 D REACH-HF	£4,547	6.25	11.53	Dominant	Yes	No	63.8%	63.8%
Tech 5 Digital Heart Manual	£4,430	6.28	11.54	Dominant	Yes	No	98.3%	98.3%
Tech 6 Get Ready - Solution	£4,457	6.28	11.53	Dominant	Yes	No	96.0%	96.0%
Tech 7 Gro Health HeartBuddy	£4,531	6.26	11.53	Dominant	Yes	Yes	73.2%	73.6%
Tech 8 KiActiv	£4,456	6.28	11.54	Dominant	Yes	Yes	93.0%	91.5%
Tech 9 Luscii vitals	£4,436	6.26	11.53	Dominant	Yes	No	98.9%	98.9%
Tech 10 myHeart	£4,468	6.28	11.54	Dominant	Yes	No	96.3%	96.3%
Tech 11 Pumping Marvellous Cardiac Rehab Platform	£4,431	6.26	11.53	Dominant	Yes	No	99.1%	99.1%
Tech 12 R Plus Health	£4,448	6.27	11.56	Dominant	Yes	Yes	93.0%	91.2%
Tech 13 Sword Move	£4,507	6.27	11.53	Dominant	Yes	No	81.8%	81.8%

Abbreviations: EJP, economically justifiable price; ICER, incremental cost-effectiveness ratio; QALY, Quality Adjusted Life Year; SW, southwest quadrant

Notes: *PSA runs were conducted individually for each digital CR technology; CR results presented are for the comparison to Activate Your Heart although it should be noted that CR predictions were reasonably consistent between runs

Figure 16: Cost-effectiveness plane: Activate Your Heart vs CCR

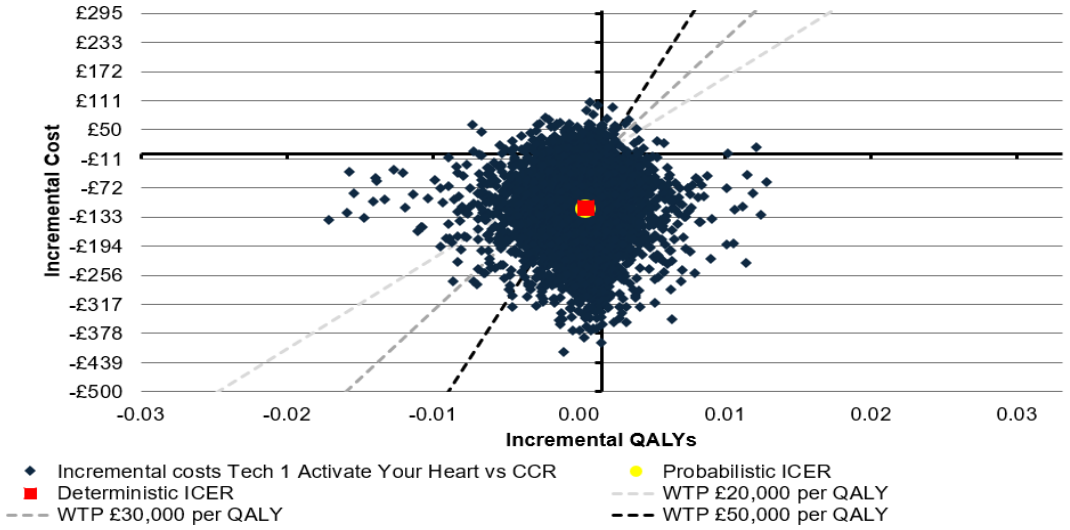


Figure 17: Cost-effectiveness plane: Beat Better vs CCR

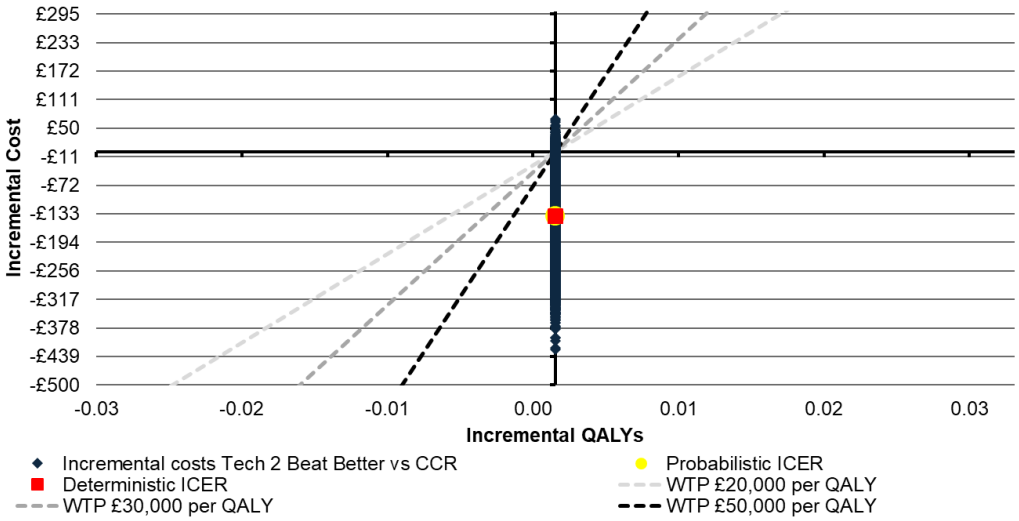


Figure 18: Cost-effectiveness plane: Datos vs CCR

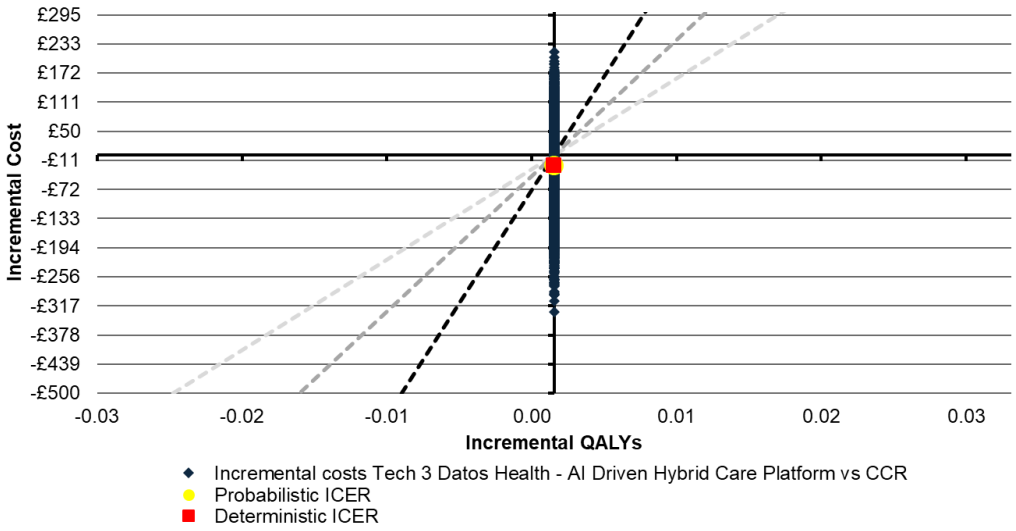


Figure 19: Cost-effectiveness plane: D REACH HF vs CCR

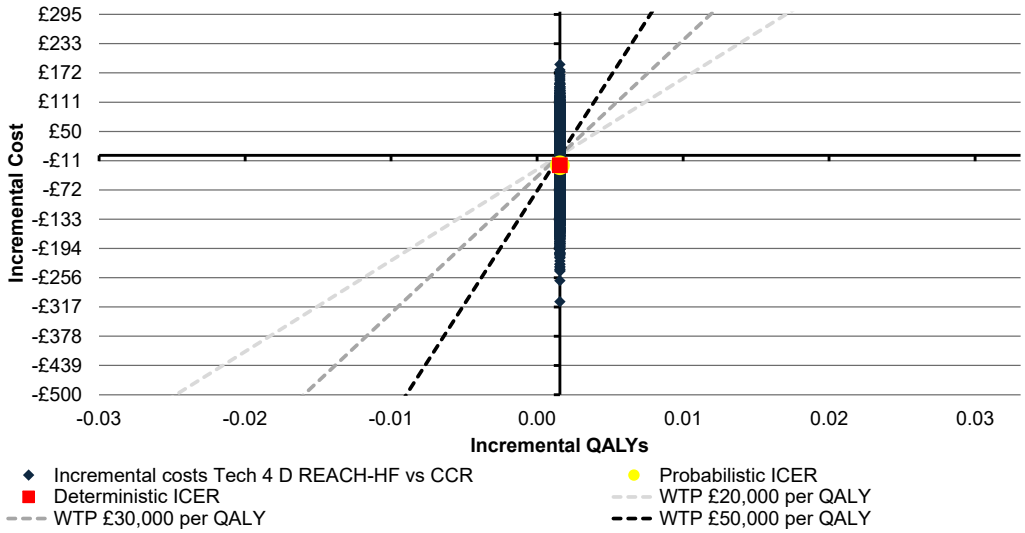


Figure 20: Cost-effectiveness plane: Digital Heart Manual vs CCR

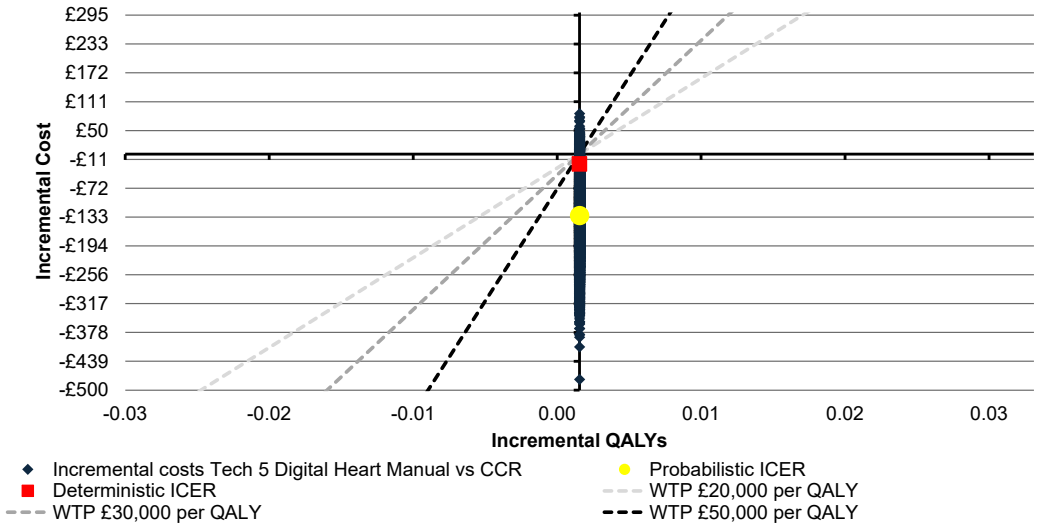


Figure 21: Cost-effectiveness plane: Get Ready - Solution vs CCR

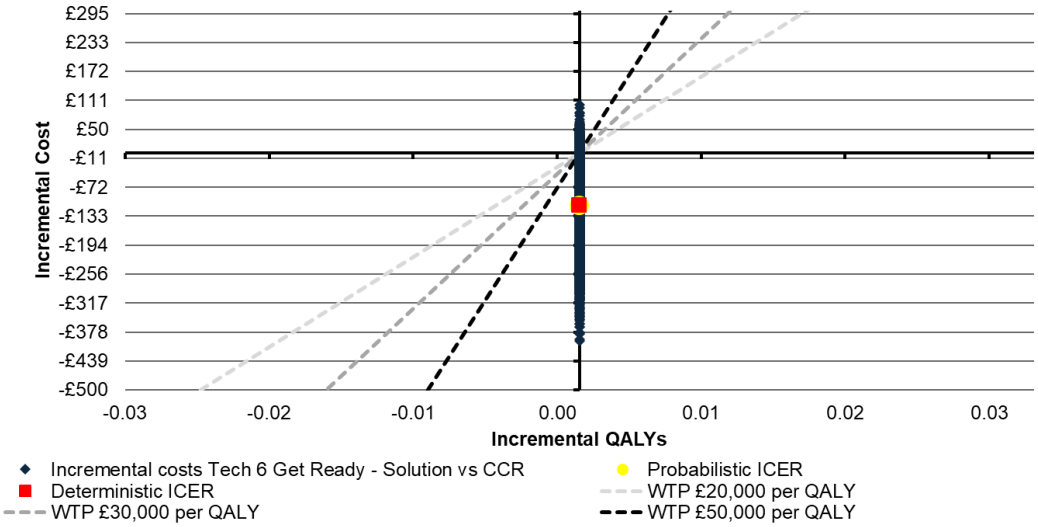


Figure 22: Cost-effectiveness plane: Gro Health HeartBuddy vs CCR

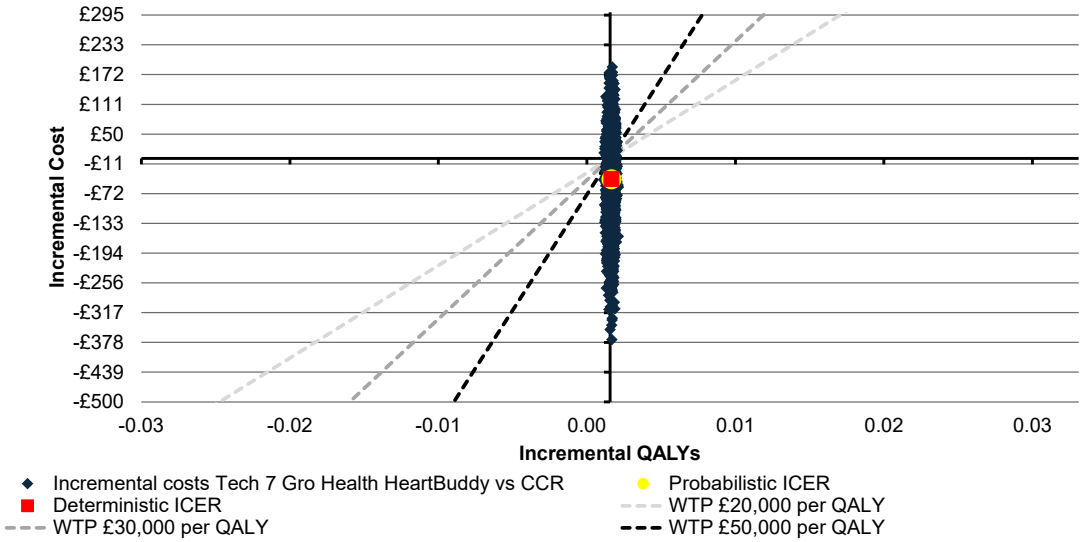


Figure 23: Cost-effectiveness plane: KiActiv vs CCR

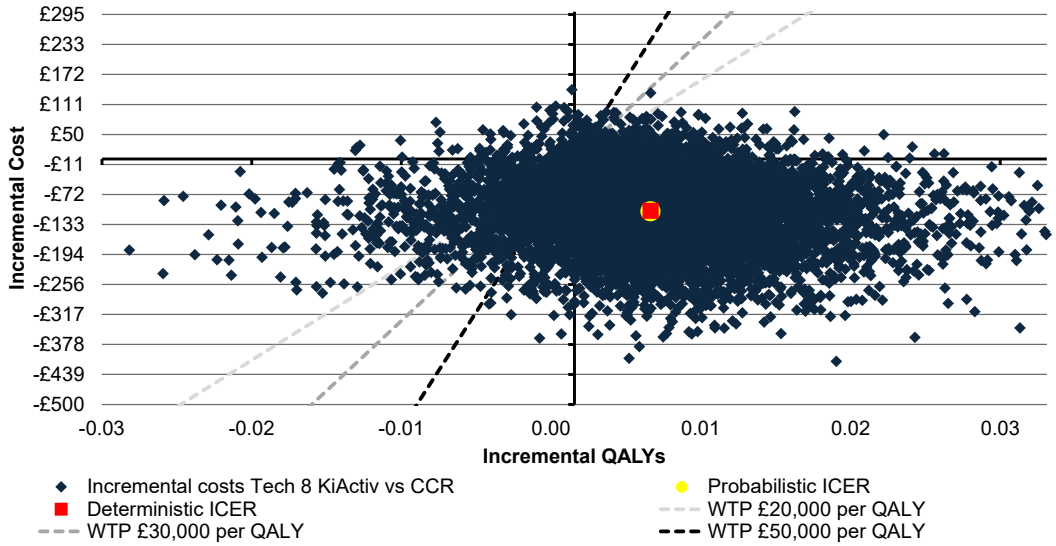


Figure 24: Cost-effectiveness plane: Luscii vitals vs CCR

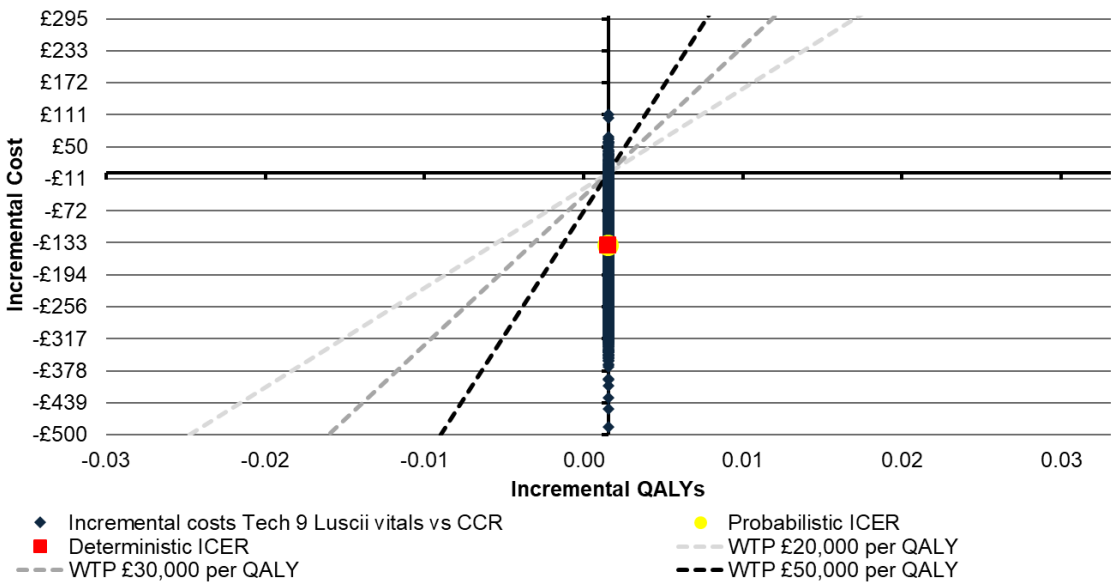


Figure 25: Cost-effectiveness plane: myHeart vs CCR

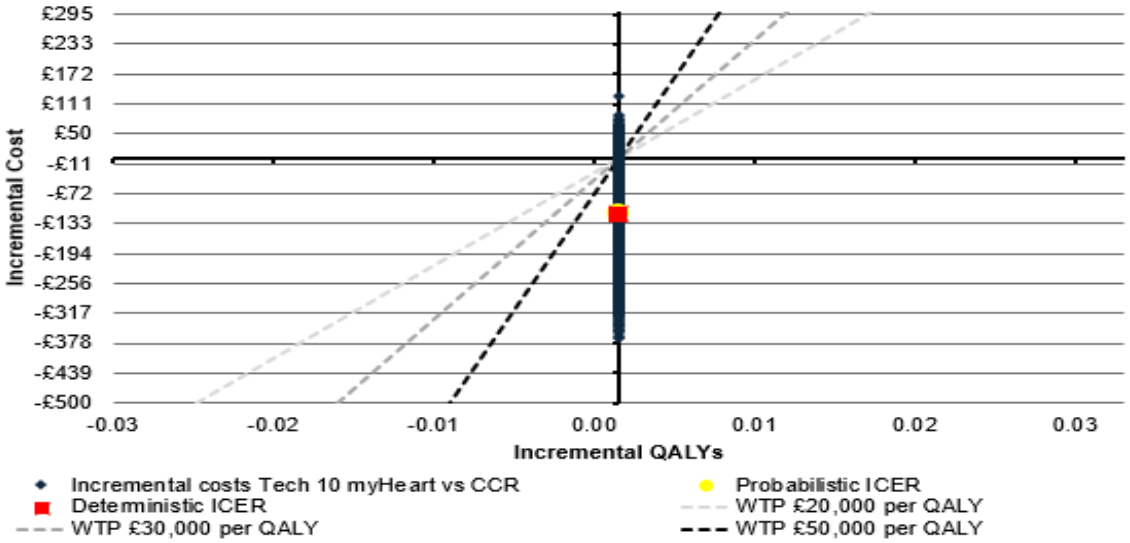


Figure 26: Cost-effectiveness plane: Pumping Marvellous vs CCR

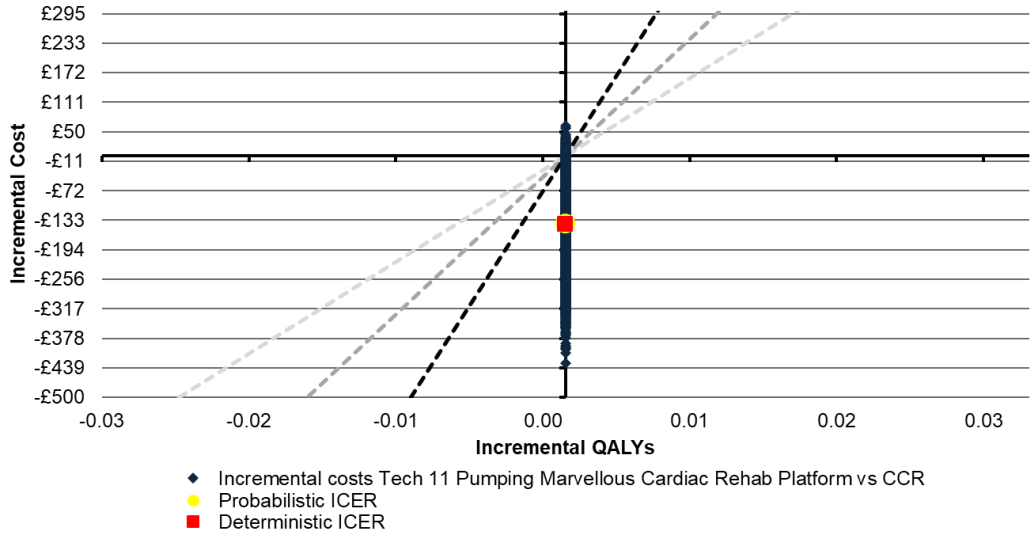


Figure 27: Cost-effectiveness plane: R Plus Health vs CCR

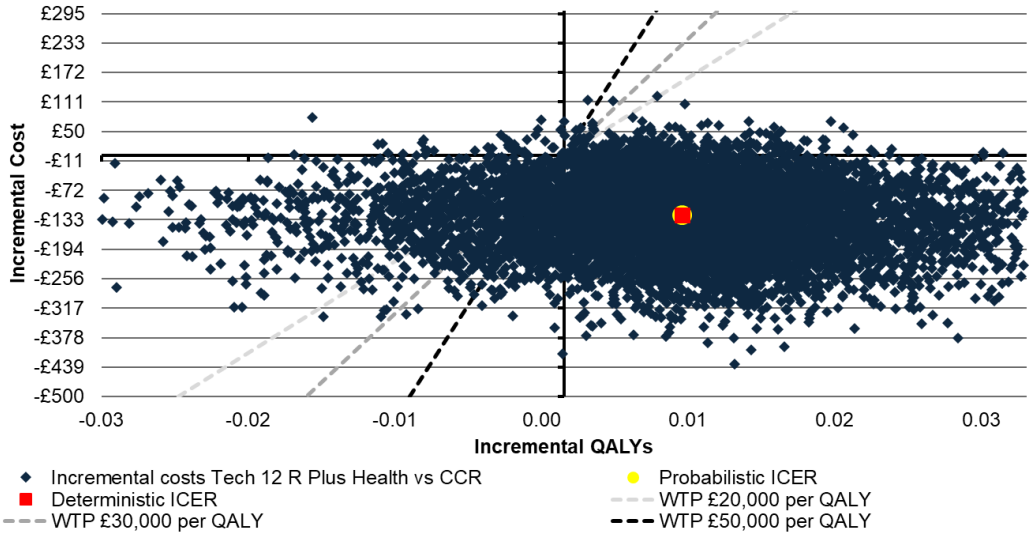
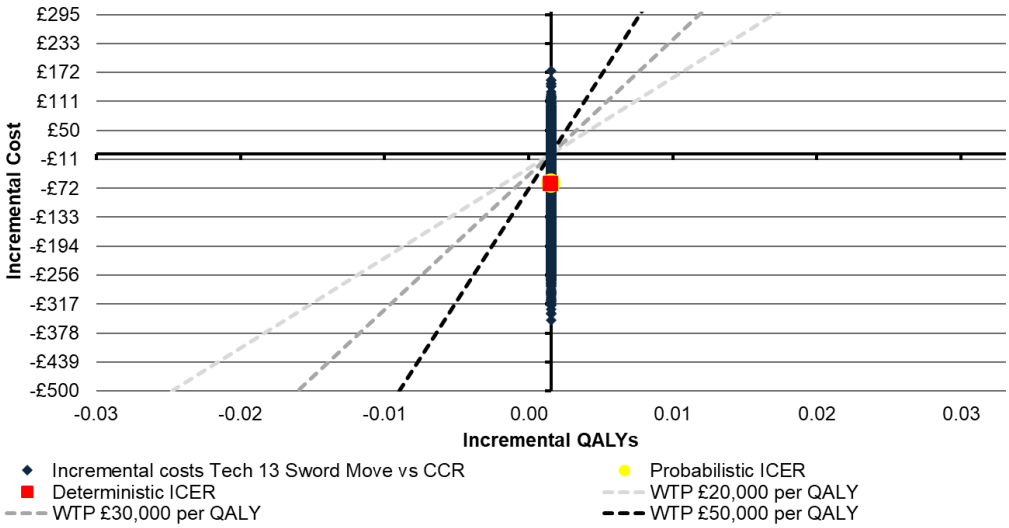


Figure 28: Cost-effectiveness plane: Sword Move vs CCR



7.5. Summary and interpretation of the economic evidence

The EAG's base case analysis suggests all digital CR technologies have the potential to be cost-effective. The results are largely driven by the reduction in face-to-face contacts that DCR enabled: the economic argument rests on reduction in costs rather than substantial improvements in outcomes, or indeed uptake and completion rate. Following on from this, the EAG's exploration of uncertainty suggested the results were most sensitive to the cost of a face-to-face CR session (and to a lesser extent health state utilities). When the cost was varied between the upper and lower bounds from NICE CG48, the results changed substantially: if the cost of face-to-face CR is at the lowest range, then there is less capacity for cost savings from digital CR, and at the prices charged for the technologies, they would not be cost effective. However, at the upper range, there is greater certainty that they are cost-effective. At the base case prices, all the technologies are likely to be cost-effective compared with conventional CR.

The EAG's analysis compared two states of the world where DCR is offered and where CCR is offered. In reality DCR may be offered as an alternative to CCR. In these situations, the mean cost and QALYs associated with offering both DCR and CCR will be a weighted average between the two modes, dependent on uptake. As both CCR and DCR are cost-effective, the weighted average will be too.

A key uncertainty in the one-way sensitivity analyses was the utility post second CV event. The EAG's base case assumed that it reverted to the same as post primary event. However, if post

CV event is lower then there is greater capacity to benefit from avoiding a second event and thus the cost-effectiveness of DCR improves.

Due to limitations in the data, the EAG did not conduct a fully incremental analysis. The EAG considers the evidence insufficient to determine whether one technology is more cost-effective than another.

Any study of a digital technology is at risk of selection bias in that participants volunteering to take part may be relatively digitally literate, and thus less representative of the general population referred for cardiac rehab. Furthermore, uptake and completion may differ between subgroups (for example those with heart failure, AF or MI). The EAG conducted several one- and two-way sensitivity analyses showing the combinations of uptake and completion required for each technology to be cost-effective. Whilst the individual results varied, in general as long as uptake *and* completion rates were each at least 45%, digital CR remained cost-effective.

8. EVIDENCE GAPS AND RESEARCH RECOMMENDATIONS

8.1. Ongoing studies

The EAG identified the following ongoing studies for included technologies. Not all companies provided ongoing study lists. The EAG did not identify any ongoing studies not mentioned by companies.

Table 29. Table of ongoing studies

Company	Technology	Ongoing studies
University Hospitals of Leicester NHS Trust	Activate Your Heart	None
Avegen Ltd	Beat Better	None
Datos Health Ltd	Datos Health - AI Driven Hybrid Care Platform	None
HCI Ltd	D REACH-HF	• Cultural adaptation of D:REACH-HF to increase usability, accessibility, and cultural sensitivity for people from British South Asian communities, co-design project, expected data availability May 2026
NHS Lothian	Digital Heart Manual	None
Medtronic	Get Ready - Solution	None
DDM Health	Gro Health HeartBuddy	[redacted]
Ki Performance Lifestyle Ltd	KiActiv	• Heart failure virtual ward – step down digital cardiac rehabilitation using KiActiv - service improvement & economic evaluation, vs for readmissions data control group propensity-score matched for heart failure severity who were discharged from heart failure virtual ward before implementation of KiActiv into the pathway, Liverpool, UK, full dataset expected September 2025 • [redacted] longitudinal analysis of readmissions dataset associated with original RCT, vs usual cardiac rehabilitation, [redacted] expected publication August 2025 • Heart failure cardiac rehabilitation using KiActiv - service improvement evaluation, vs standard cardiac rehabilitation (for uptake and completion rates only), Southampton, UK, full dataset expected September 2025
Luscii Healthtech B.V	Luscii vitals	None
my mhealth Ltd	myHeart	• Using myHeart to support delivery of hybrid cardiac rehabilitation (CR) for self-

Company	Technology	Ongoing studies
		management in secondary care CR team, mixed methods RCT, vs face-to-face or booklet, Bristol, UK, planned study pending funding • Royal Wolverhampton NHS Hospital cardiac rehabilitation, real-world evidence, no comparator, ongoing evaluation • Dorset County Hospital NHS Foundation Trust cardiac rehabilitation, real-world evidence, no comparator, ongoing evaluation • NHS CR Centre, real-world evidence, no comparator, ongoing evaluation
Pumping Marvellous Foundation	Pumping Marvellous Cardiac Rehab Platform	None
RPlusHealth Ltd	R Plus Health	None
Sword Health Ltd	Sword Move	• Sword Member Database, real-world evidence across all populations (not just cardiac rehabilitation) using the intervention, no comparator, currently available

8.2. Evidence gap analysis

Table 30 presents a summary of evidence gaps, focusing on outcomes. The table was populated based on prioritised evidence. Narrative commentary on other evidence gaps is provided below the table. Only technologies for which some eligible evidence was identified are included in this table.

Table 30 Evidence Gap Analysis (based on prioritised evidence only)

	Activate Your Heart	Datos Health	D:REACH-HF	Digital Heart Manual	Gro Health HeartBuddy	KiActiv	myHeart	R Plus Health
Key outcomes								
Adherence (concordance) rates for intervention and long-term strategies	Amber	Amber	Red	Red	[redacted]	Amber	Amber	Amber
Intervention uptake rates	Red	Red	Red	Red	[redacted]	Amber	Red	Red
Intervention completion rates	Amber	Amber	Red	Red	[redacted]	Amber	Red	Amber
Attrition (dropout) rates	Amber	Amber	Red	Red	[redacted]	Amber	Amber	Amber
Hospital readmissions, referrals to specialist services, clinic visits	Red	Red	Red	Red	[redacted]	Red	Red	Red
Mortality	Red	Red	Red	Red	[redacted]	Red	Red	Red
Exercise capacity or performance (e.g. 6 Minute Walk Test, incremental shuttle walking test)	Amber	Amber	Red	Red	[redacted]	Amber	Amber	Green
Cardiovascular risk profile (systolic blood pressure, body mass index, serum triglycerides, HDL	Amber	Amber	Red	Red	[redacted]	Red	Red	Green

cholesterol, total cholesterol, blood glucose, and peak oxygen uptake)								
Psychological wellbeing (e.g. anxiety or depression scores)	Amber	Red	Amber	Red	[redacted]	Red	Red	Amber
Health-related quality of life	Amber	Red	Red	Red	[redacted]	Amber	Red	Amber
Nutrition status (e.g. Mediterranean Diet Score Tool)	Red	Red	Red	Red	[redacted]	Red	Red	Red
Medication adherence	Red	Red	Red	Red	[redacted]	Red	Red	Red
Time from post-discharge referral to start of core cardiac rehabilitation programme	Red	Red	Red	Red	[redacted]	Red	Red	Amber
Usability and acceptability of the platform	Red	Amber	Red	Amber	[redacted]	Amber	Amber	Red
Modelling and economic outcomes								
Cost of the technologies including device, licence fees and staff training	Costs are available for all technologies. In some cases, it was necessary to convert from other currencies, which may not reflect UK market conditions							Amber
Cost of a face to face CR session / course	There was substantial uncertainty in the estimates of the cost of CR and the results were most sensitive to this parameter; the economic case for DCR rests on avoided costs from face to face sessions.							Red
Cost of other resource use (e.g. acute events, suspected acute events, hospital presentations, adverse events, or complications)	The resource use associated with the delivery of digitally supported cardiac rehabilitation was calculated in the model using the weighted average cost of a cardiac rehab session across consultant vs non consultant led, and face to face vs non face to face, provided by the NHS Reference Costs. Information was not available to reflect the specific resource use implications of individual technologies							Amber
Healthcare appointments in primary, secondary and community care	No specific resource use and costs information was available for these appointments associated with the individual technologies. Therefore, we modelled							Amber

	the resource use of a patient having a secondary cardiovascular event and the associated costs, based on Danese et al (2016)[55] (inflated to 2023/2024 prices).	
Medication use and adverse events	No specific information on medication use or medication adherence was available for the individual technologies. Limited adverse event data were available. Therefore, these could not be included in the model. However, it would be expected that medication use would be comparable across digitally supported and conventional CR arms and therefore unlikely to impact the results substantially.	Amber

Green reflects a situation where multiple studies consistently show a benefit on the listed outcome. Amber reflects a situation where only one study shows a benefit on the listed outcome, or findings across multiple studies are inconsistent. Red reflects a situation where there is no evidence to support a benefit on the listed outcome, either because it has not been assessed or because all available prioritised evidence shows no evidence of benefit.

There are a number of evidence gaps in respect of the clinical evidence base as it pertains to the decision problem. Key gaps include:

Population gaps

- There were no specific population gaps, as a wide range of eligible populations were considered, ranging from broad populations of people eligible for CR to specific population such as angina, heart failure, and atrial fibrillation. In some instances, this was because scoped technologies target a specific condition rather than the entirety of the scoped population. However, it should also be noted that several included studies excluded those with digital literacy and/or language barriers or significant comorbidities, which may limit generalisability.

Intervention gaps

- No eligible evidence was identified for Beat Better, Get Ready - Solution, Luscii Vitals, Pumping Marvellous Cardiac Rehab Platform and Sword Move.

Comparator gaps

- Included evidence was mainly either single-arm studies or compared to usual care, which is typically defined as GP management. Evidence explicitly against the scoped comparator of conventional CR is only available for Ki Activ, myHeart and R Plus Health.

Outcome gaps

- There was limited consistent evidence across multiple studies of benefit on the vast majority of intervention-outcome combinations.
- Evidence for the scoped digital versions of paper manuals (D:REACH-HF and Digital Heart Manual) was exclusively qualitative/mixed methods in nature and did not focus on clinical effectiveness, as opposed to measures of engagement and acceptability.

The key areas of clinical uncertainty in terms of evidence gaps from the EAG's viewpoint are:

- No relevant evidence for five of the scoped interventions.
- Lack of quantitative efficacy studies for the interventions developed from paper manuals (D:REACH-HF and Digital Heart Manual) to demonstrate that the change in delivery mode of the intervention does not impact efficacy.

- Only single-arm studies being available for some interventions.
- Only conference abstracts being available for some interventions, lacking sufficient detail for full critique.
- RCTs only available for four of the scoped technologies, while available RCTs were not all versus a scoped comparator, lacked blinding in many cases and had small sample sizes.
- Evidence for two technologies solely from non-European settings with very different healthcare systems than the UK, limiting generalisability of evidence to the UK healthcare decision-making context.
- Very limited evidence for impact on longer term outcomes related to the chance of prevention of future cardiac events.
- Large amount of variability in reference costs for technologies for which there are data which may in part be due to assumptions on level of uptake to which many of the costs are linked.
- Limited evidence (6 of 13 technologies) on the costs of implementation including training and integration into existing NHS systems and processes (different technologies offer different levels of inter-operability). The importance of this depends on who would pay for this (company or NHS).
- Uncertainty in the cost of conventional CR. Reductions in cost from reduced face to face contacts are the driver of cost-effectiveness for DCR.

8.3. Key areas for evidence generation

The EAG's recommendations for future research focusing on estimating cost-effectiveness include:

- Comparative RCTs or comparative prospective observational studies with appropriate propensity score matching in a UK context.
- Standardisation of outcomes and outcome measurement to facilitate a network meta-analysis, especially quality of life (using EQ-5D[49]), uptake, completion and impact on longer-term events such as secondary cardiac events, using longer-term follow-up to detect events that take longer to develop and to verify that observed benefits persist over a longer period.
- Clearer ascertainment of the cost of a face-to-face CR session.

Recommendations for implementation-focused research include:

- Consideration of how changing mode of delivery, for example paper manual to digital intervention, could impact on clinical effectiveness, even if the content itself is equivalent.
- Consideration of how these technologies would be implemented in practice including the impact on training needs (including capacity to carry out training), inter-operability with existing NHS systems and whether devices would be provided to patients to avoid digital exclusion. Research into patient barriers to digital intervention, for example digital competency issues, accessibility, and acceptability and effectiveness of digital interventions in hard-to-reach groups.

9. DISCUSSION

The EAG identified evidence for eight of the 13 scoped interventions. Generally, evidence came from a UK setting, which offers high generalisability to the UK decision-making context. However, evidence for Datos Health came entirely from an Israeli context [40] and evidence for R Plus Health came entirely from Chinese[34,35] and US[36] contexts.[36] Population differences as well as differences in healthcare systems mean that evidence from these countries is less likely to generalise to the UK healthcare decision-making context. Three technologies (Ki Activ, myHeart and R Plus Health) had evidence versus conventional in-person cardiac rehabilitation. The other comparative studies were versus usual care, which where information was available, was defined as referral back to GP for periodic monitoring without active cardiac rehabilitation. This was not a scoped comparator, so this evidence is likely to be of lower relevance for decision-making.

Overall, there is some evidence that digitally supported cardiac rehabilitation – using a range of different technologies – may have satisfactory uptake, adherence and completion, may be usable, acceptable and satisfactory to patients, and may offer benefits in especially in terms of exercise capacity, psychological outcomes and health-related Quality of life compared to usual care, i.e. GP monitoring with no cardiac rehabilitation. However, it should be noted that RCT evidence was only available for four of the scoped technologies, while single-arm and observational evidence is limited in the causal inference it can offer. As comparisons to conventional cardiac rehabilitation were seldom made in included studies, we know that digitally supported cardiac rehabilitation is likely to be more effective than no cardiac rehabilitation. However, we do not know whether it is less effective than conventional face-to-face cardiac rehabilitation, and if so, by how much.

The cost-effectiveness of DCR is driven overwhelmingly by avoided costs from reduced face to face contacts with conventional CR. Under the assumptions of the EAG's analysis, all technologies are cost-effective due to their being cost-saving. The most sensitive parameter in the analysis, therefore, is the cost of a face to face CR contact. If the cost is substantially lower than the EAG's base case, there is less capacity for cost savings and thus the cost-effective licence price for each technology will be correspondingly lower. The EAG chose the NHS reference costs for its base case assessment as this is the most representative of a national mean cost. The EAG identified a number of alternative sources which may be more specific to different settings and therefore explored this in sensitivity analysis.

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Appendix A – Search strategies

Date	Database Name	Searcher	Total
22/04/25	Medline ALL	SR	884
22/04/25	Embase	SR	1263
22/04/25	The Cochrane Library CDSR CENTRAL	SR	 1 310
22/04/25	INHATA	SR	45
24/04/25	company websites: Activate Your Heart (University Hospitals of Leicester NHS Trust) https://www.activateyourheart.org.uk/ Beat Better (Avegen Limited) https://www.avegenhealth.com/case-studies/beat-better Datos Health - AI Driven Hybrid Care Platform (Datos health Ltd) https://www.datos-health.com/ D REACH-HF (Health & Care Innovations Ltd) https://sites.exeter.ac.uk/reachhf/d-reach-hf-digital-rehabilitation-enablement-in-chronic-heart-failure/ Digital Heart Manual (NHS Lothian) https://services.nhslothian.scot/theheartmanual/ Get Ready – Solution (Medtronic) – https://www.medtronic.com/ca-en/e/ihs/integrated-health-solutions/get-ready.html Gro Health HeartBuddy (DDM health) https://ddm.health/products/gro	SR	 4 0 0 1 4 3 0 0 3

Date	Database Name	Searcher	Total
	KiActiv (Ki Performance Lifestyle Limited) https://kiactiv.com/ Luscii Vitals (Luscii healthtech B.V.) https://luscii.com/en/home myHeart (my mhealth Limited)https://mymhealth.com/myheart Pumping Marvellous Cardiac Rehab Platform (Pumping Marvellous Foundation) https://pumpingmarvellous.org/heart-failure-guide/heart-failure-rehabilitation/ R Plus Health (RPlusHealth Limited) https://www.rplushealth.com/ Sword Move (Sword Health)https://swordhealth.com/		5 0 0 0 **Total 20**
25/04/25	Guidelines NICE SIGN	SR	 7 3
25/04/25	MHRA– search MDA & FSN	SR	0
25/04/25	FDA MAUDE	SR	0
25/04/25	Clinical Trials.gov	SR	8
29/04/25	ICTRP	SR	3
25/04/25	HERC	SR	2
25/04/25	CEA Registry	SR	20
	Total	2586	
	Final no of records (after dedupe)	**1382**	

Search strategies

Ovid MEDLINE(R) ALL <1946 to April 21, 2025>

1 ("Activate Your Heart*" or "Datos Health" or "AI Driven Hybrid Care Platform*" or "Reach?HF*" or "Reach HF" or "Health and Care Innovation*" or "Digital Heart Manual*" or "Gro Health" or HeartBuddy* or "Heart Buddy*" or "DDM Health" or HealthMachine or "Health Machine" or "Beat Better" or Avegen or KiActiv* or "Ki Performance Lifestyle" or "Luscii Vital*" or "Luscii Healthtech" or myHeart* or "my Heart*" or "my mHealth" or "Pumping Marvellous" or "R Plus Health" or RPlusHealth or "Sword Move" or "Sword Health" or "Get Ready").tw. 1199

2 (rehab* or coronar* or cardia* or cardio* or heart*).tw. 2524510

3 1 and 2 537

4 (digital* or online or app or apps or web or website* or internet or electronic or ehealth or e-health or mhealth or m-health or ai or artificial intelligen*).ti. 293726

5 (coronar* or cardia* or cardio* or heart*).ti. 1184922

6 (rehab* or reabl* or re-abl* or recover*).ti,ab. 1100047

7 4 and 5 and 6 371

8 *Cardiac Rehabilitation/ 3795

9 4 and 8 127

10 3 or 7 or 9 915

11 limit 10 to english language 884

Embase <1974 to 2025 April 21>

1 ("Activate Your Heart*" or "Datos Health" or "AI Driven Hybrid Care Platform*" or "Reach?HF*" or "Reach HF" or "Health and Care Innovation*" or "Digital Heart Manual*" or "Gro Health" or HeartBuddy* or "Heart Buddy*" or "DDM Health" or HealthMachine or "Health Machine" or "Beat Better" or Avegen or KiActiv* or "Ki Performance Lifestyle" or "Luscii Vital*" or "Luscii Healthtech" or myHeart* or "my Heart*" or "my mHealth" or "Pumping Marvellous" or "R Plus Health" or RPlusHealth or "Sword Move" or "Sword Health" or "Get Ready").tw. 1632

2 (rehab* or coronar* or cardia* or cardio* or heart*).tw. 3565455

3 1 and 2 796

4 (digital* or online or app or apps or web or website* or internet or electronic or ehealth or e-health or mhealth or m-health or ai or artificial intelligen*).ti. 324980

5 (coronar* or cardia* or cardio* or heart*).ti. 1540454

6 (rehab* or reabl* or re-abl* or recover*).ti,ab. 1430721

7 4 and 5 and 6 507

8 *heart rehabilitation/ 10308

9 4 and 8 220

10 3 or 7 or 9 1308

11 limit 10 to english language 1263

Cochrane Library

Date Run: 22/04/2025

#1 ("Activate Your Heart" or "Datos Health" or "AI Driven Hybrid Care Platform" or "ReachHF" or "Reach HF" or "Health and Care Innovation" or "Digital Heart Manual" or "Gro Health" or HeartBuddy* or "Heart Buddy" or "DDM Health" or HealthMachine or "Health Machine" or "Beat Better" or Avegen or KiActiv* or "Ki Performance Lifestyle" or "Luscii Vital" or "Luscii Healthtech" or myHeart* or "my Heart" or "my mHealth" or "Pumping Marvellous" or "R Plus Health" or RPlusHealth or "Sword Move" or "Sword Health" or "Get Ready"):ti,ab,kw 123

#2 (rehab* or coronar* or cardia* or cardio* or heart*):ti,ab,kw 377290

#3 #1 and #2 91

#4 (digital* or online or app or apps or web or website* or internet or electronic or ehealth or e-health or mhealth or m-health or ai or artificial intelligen*):ti 31909

#5 (rehab* or reabl* or re-abl* or recover*):ti,ab,kw 159156

#6 (coronar* or cardia* or cardio* or heart*):ti 114126

#7 #4 and #5 and #6 223

#8 MeSH descriptor: [Cardiac Rehabilitation] this term only 641

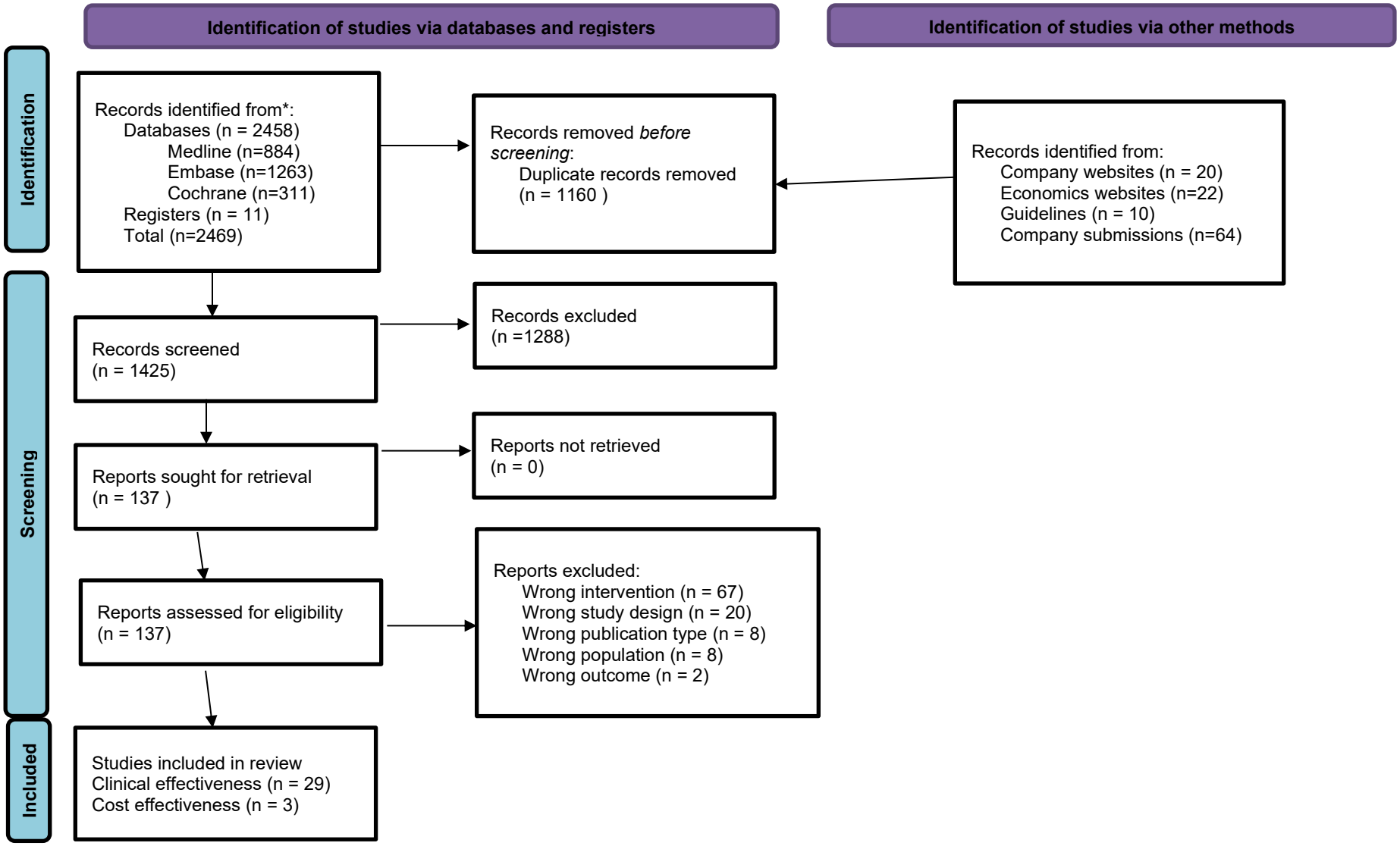
#9 #4 and #8 47

#10 #3 or #7 or #9 311

INAHTA

((digital* or online or app or apps or web or website* or internet or electronic or ehealth or e-health or mhealth or m-health or ai or artificial intelligen*) AND (coronar* or cardia* or cardio* or heart*) AND (rehab* or reabl* or re-abl* or recover*)) Limit to English Language = 45 hits

Appendix B – PRISMA flowchart



Source: Page MJ, et al. BMJ 2021;372:n71. doi: 10.1136/bmj.n71.

Appendix C – Excluded studies

Table 31: List of excluded English-language publications studies from company lists, with reasons

Excluded study	Reason for exclusion
Abdelhameed (2023)[74] – submitted by DDM Health	Wrong population – diabetes services not CR
Blair (2011)[75] – submitted by NHS Lothian	Wrong intervention – paper manual version rather than scoped digitally supported technology
Clark (2011)[76] – submitted by NHS Lothian	Wrong intervention – paper manual version rather than scoped digitally supported technology
Dalal (2019)[42] – submitted by Health & Care Innovations Ltd	Wrong intervention – paper manual version rather than scoped digitally supported technology
Dalal (2015)[77] – submitted by NHS Lothian	Wrong intervention – paper manual version rather than scoped digitally supported technology
Dalal (2010)[73] – submitted by NHS Lothian	Wrong intervention – paper manual version rather than scoped digitally supported technology
Dalal (2007)[78] – submitted by NHS Lothian	Wrong intervention – paper manual version rather than scoped digitally supported technology
Davies (2023)[79] – submitted by my mhealth Limited	Wrong population – COPD not CR.
Deighan (2021)[80] – submitted by NHS Lothian	Wrong intervention – paper manual version rather than scoped digitally supported technology
Elad (2023)[81]– submitted by Datos Health	Wrong outcome – outcomes only assessed as a function of background COVID-19 levels in the region rather than before and after intervention.
Hanson (2025)[82] – submitted by DDM Health	Wrong population – obesity services not CR
Hanson (2023)[83] – submitted by DDM Health	Wrong population – only a minority of participants were from a CR context
Hanson (2021)[84] – submitted by DDM Health	Wrong population – obesity services not CR
Li (2025)[85] – submitted by RPlusHealth Limited	Wrong population – lung cancer not CR

Excluded study	Reason for exclusion
Li (2022)[86] – submitted by RPlusHealth Limited	Wrong population – COVID-19 not CR
Li (2021)[87] – submitted by RPlusHealth Limited	Wrong population – diabetes services not CR.
Jolly (2007)[88] – submitted by NHS Lothian	Wrong intervention – paper manual version rather than scoped digitally supported technology
Lewin (1992)[89] – submitted by NHS Lothian	Wrong intervention – paper manual version rather than scoped digitally supported technology
McCartan (2017)[37] – submitted by Avegen Limited	Wrong intervention – company identified it as an example of digitally supported CR not a study on their specific technology
Morris (2022)[90] – submitted by NHS Lothian	Wrong intervention – paper manual version rather than scoped digitally supported technology
Porter (2021)[91] – submitted by my mhealth Limited	Wrong outcomes – not aligned to scope
Ranaldi (2018)[92] – submitted by NHS Lothian	Wrong intervention – paper manual version rather than scoped digitally supported technology
Ranaldi (2018)[93] – submitted by NHS Lothian	Publication type – abstract version of full-text paper already identified
Ranaldi (2018)[94] – submitted by NHS Lothian	Wrong intervention – paper manual version rather than scoped digitally supported technology
Ranaldi (2018)[95] – submitted by NHS Lothian	Publication type – abstract version of full-text paper already identified
Stark (2021)[96] – submitted by NHS Lothian	Wrong intervention – paper manual version rather than scoped digitally supported technology
Summers (2021)[97] – submitted by DDM Health	Wrong population – mental health services not CR
Sword Member Database 2023-2024[38] – submitted by Sword Health	Wrong population – all populations not just CR
Talty (2023)[98] – submitted by NHS Lothian	Wrong intervention – paper manual version rather than scoped digitally supported technology
Taylor (2007)[99] – submitted by NHS Lothian	Wrong intervention – paper manual version rather than scoped digitally supported technology

Excluded study	Reason for exclusion
Wang (2023)[100] – submitted by my mhealth Limited	Wrong population – meniscus injury not CR (also wrong publication type – protocol without results)
Yu (2025)[101] – submitted by RPlusHealth Limited	Wrong population – liver cancer not CR

Abbreviations: COPD, chronic obstructive pulmonary disease; CR, cardiac rehabilitation.

Table 32: List of excluded full-text publications from EAG evidence search, with reasons

Excluded study	Reason for exclusion
Abdelhameed (2023)[74]	Wrong population
Abdelhameed (2024)[65]	Wrong population
ACTRN12620000860965[102]	Wrong intervention
Akinosun (2021)[103]	Wrong study design
An (2022)[104]	Wrong study design
Ansari (2025)[105]	Wrong study design
Bourne (2017)[106]	Wrong population
Braver (2022)[107]	Wrong intervention
Bravo-Escobar (2021)[108]	Wrong intervention
Campagnolo Goncalves Toledo (2021)[109]	Wrong study design
Chen (2025)[110]	Wrong study design
ChiCTR1800020411[111]	Wrong intervention
ChiCTR2200056020[112]	Wrong intervention
Cruz-Cobo (2022)[113]	Wrong study design
Cui (2024)[114]	Wrong intervention
Dalal 2019[115]	Wrong intervention
De Kluiver (2019)[116]	Wrong intervention
Ding (2022)[117]	Wrong publication type
Dor-Haim (2019)[118]	Wrong intervention
Duan (2018)[119]	Wrong intervention
Eghoj (2024)[120]	Wrong intervention
Elad (2023)[81]	Wrong outcome

Excluded study	Reason for exclusion
Fortes (2021)[121]	Wrong intervention
Gibson (2024) [122]	Wrong intervention
Grant (2018)[123]	Wrong intervention
Hamborg (2024)[124]	Wrong intervention
Hanson (2021)[84]	Wrong population
Hanson (2023)[83]	Wrong population
Harbi (2024)[125]	Wrong study design
Harzand (2023)[126]	Wrong intervention
Hayn (2023)[127]	Wrong intervention
ISRCTN18022985[128]	Wrong intervention
Jay Widmer [129]	Wrong intervention
JingSu (2023)[130]	Wrong intervention
Jo (2024)[131]	Wrong intervention
JPRN-UMIN000009935[132]	Wrong intervention
KCT0009496 (2024)[133]	Wrong intervention
Kebapci (2020)[134]	Wrong study design
Kenny (2021)[135]	Wrong publication type
Kenny (2024)[136]	Wrong study design
Kizilkilic (2024)[137]	Wrong intervention
Lear (2015)[138]	Wrong intervention
Li (2023)[139]	Wrong intervention
Li (2025)[140]	Wrong study design
Liu (2022)[141]	Wrong publication type
Luijk (2024)[142]	Wrong study design
Lunde (2020)[143]	Wrong intervention
Lunde (2022)[144]	Wrong intervention
Lunde (2025)[145]	Wrong intervention
Mitropoulos (2024)[146]	Wrong intervention
Nabutovsky (2020)[40]	Wrong intervention
NCT04074057[147]	Wrong intervention
NCT04858503[148]	Wrong intervention
NCT05002075[149]	Wrong intervention

Excluded study	Reason for exclusion
NCT05326529 (2022)[150]	Wrong intervention
NCT05689385[151]	Wrong intervention
NCT05795036[152]	Wrong intervention
NCT06759805[153]	Wrong intervention
Nesbitt (2023)[154]	Wrong intervention
Ni (2022)[155]	Wrong study design
Nishio (2024)[156]	Wrong intervention
NL-OMON27680[157]	Wrong intervention
Ntovoli (2025)[158]	Wrong intervention
Oclaman (2023)[159]	Wrong intervention
Park (2019)[160]	Wrong intervention
Patel (2023)[161]	Wrong publication type
Pedersen (2017)[162]	Wrong intervention
Pedersen (2021)[163]	Wrong publication type
Peterson (2017)[164]	Wrong intervention
Pfaeffli (2012)[165]	Wrong intervention
Pierucci (2025)[166]	Wrong study design
Pirruccello (2017)[167]	Wrong intervention
Popovici (2023)[168]	Wrong study design
Porter (2021)[91]	Wrong outcome
Redfern (2019)[169]	Wrong publication type
Rivers (2023)[170]	Wrong intervention
Rosario (2018)[171]	Wrong intervention
Saadi (2020)[172]	Wrong intervention
Salarvand (2024)[173]	Wrong intervention
Schmitz (2023)[174]	Wrong intervention
Schnegg (2016)[175]	Wrong publication type
Su (2020)[176]	Wrong study design
Su (2021)[177]	Wrong intervention
Su (2023)[178]	Wrong intervention
Summers (2021)[97]	Wrong population
Sun (2024)[179]	Wrong intervention

Excluded study	Reason for exclusion
Sword Member Database 2023-2024[38]	Wrong population
Tomita (2008)[180]	Wrong intervention
Tsai (2024)[181]	Wrong intervention
Tuttle (2021)[182]	Wrong study design
Walsh (2018)[183]	Wrong intervention
Widmer (2014)[184]	Wrong intervention
Widmer (2014)[185]	Wrong intervention
Widmer (2015)[186]	Wrong intervention
Widmer (2015)[186]	Wrong intervention
Widmer (2016)[187]	Wrong intervention
Widmer (2017)[188]	Wrong intervention
Widmer 2016[189]	Wrong intervention
Wiesmuller (2025)[190]	Wrong intervention
Williams (2024)[191]	Wrong publication type
Wongvibulsin (2021)[192]	Wrong study design
Wu (2023)[193]	Wrong population
Xia (2023)[35]	Wrong intervention
Yu (2023)[194]	Wrong study design
Zhang (2022)[195]	Wrong study design

Note: This table reflects publications that were considered by the EAG not to meet the inclusion criteria for the systematic review. This is distinct from prioritisation, which is addressed in Section 4.2.

Appendix D – Further information on available outcomes

Table 33. Additional information on outcomes

Reference	Outcomes
*Activate Your Heart (*number of prioritised studies = 3)	
Devi et al, 2014[8]	Primary outcome: daily average step count at 6-week follow-up. Secondary outcomes: energy expenditure, duration of sedentary and moderate activity, weight, diastolic and systolic blood pressure, angina frequency, body fat percentage, fat and fibre intake, anxiety and depression (HADS), self-efficacy, and health-related quality of life (MacNew questionnaire and Seattle Angina Questionnaire).
Brough et al, 2014[11]	Anxiety and depression (HADS), quality of life (MacNew questionnaire), Incremental Shuttle Walk Test, smoking status, diet, and number of participants exercising for 30 minutes, 5 days per week.
Houchen-Wolloff et al, 2018[9]	Primary outcome: feasibility of recruiting and retaining people who have declined or dropped out of conventional cardiac rehabilitation. Secondary outcomes: safety, feasibility of randomisation process, willingness to be randomised, retention rate, feasibility of conducting outcome measures intended for a full trial (quality of life (MacNew questionnaire), exercise capacity, anxiety and depression (HADS), self-efficacy, resource use, web usage, and intervention completion rates.
Beat Better (number of prioritised studies = 0)	
Datos Health (number of prioritised studies = 1)	
Nabutovsky et al, 2020[40]	Primary: Safety, feasibility and adherence. Secondary: Change in exercise capacity.
D:REACH-HF (number of prioritised studies = 2)	
Cross et al, 2023[15]	Feasibility and acceptability.
Van Beurden et al, 2022[16]	Perceptions of various iterations of prototype designs of the D: REACH-HF platform.
Digital Heart Manual (number of prioritised studies = 1)	
Deighan et al, 2017[17]	Usability and Acceptability Questionnaire, user tracking, participant views on the digital adaptation of the Heart Manual.
Get Ready - Solution (number of prioritised studies = 0)	
Gro Health HeartBuddy (number of prioritised studies = 1)	
Rai et al, submitted[20]	Engagement (time spent on app [redacted] workouts [redacted] completed, [redacted] blood pressure, metabolic outcomes, anxiety (GAD-7), sleepiness, wellbeing and health-related quality of life (EQ-5D).
KiActiv (number of prioritised studies = 2)	
Meenamkuzhy-Hariharan et al, 2024[21]	Primary: change in objectively measured physical activity to achieve the ACPICR recommendations for “Daily Activity” and “At-home Training” between week 1 and week 8 of the intervention period.

	Secondary: Change in exercise test scores, adherence, change in cardiorespiratory fitness in METs.
Rayner et al, 2022[26]	Total and additional physical activity over multiple domains, quality of life and mental health.
Luscii Vitals (number of prioritised studies = 0)	
myHeart (number of prioritised studies = 2)	
Blythin et al, 2023[32]	Primary: Access to in-app exercise and education videos. Secondary: Activation, clinical contact to provide live support, demographics including smoking, patient satisfaction.
Smith and D'Angelo, 2023[31]	HRQoL, anxiety and depression (Dartmouth Co-op and HADS).
Pumping Marvellous Cardiac Rehab Platform (number of prioritised studies = 0)	
R Plus Health (number of prioritised studies = 3)	
Bilbrey et al, 2024[36]	Feasibility (initiation and participation) and efficacy (6-minute walk test, resting heart rate, and HRQoL).
Cai et al, 2022[34]	Primary: improvement in VO2peak. Secondary: adherence, physical activity, beliefs related to cardiovascular disease and exercise self-efficacy.
Xia et al, 2023[35]	Cardiorespiratory endurance, blood pressure, blood glucose, cholesterol, blood uric acid, left ventricular ejection fraction and quality of life (QoL) were assessed at the beginning and end of the intervention. Compliance and safety events were recorded as well.
Sword Move (number of prioritised studies = 0)	

* For some studies, uptake, completion and attrition measures were not listed as outcomes, but data were available.

Appendix E – Results data extraction sheet for prioritised evidence

Table 34: Results data extraction for prioritised evidence

Reference	Adherence (concordance) rates for intervention and long-term strategies	Intervention uptake rates (number of people meeting inclusion criteria vs number recruited)	Intervention completion rates	Attrition (dropout) rates	Hospital readmissions, referrals to specialist services, clinic visits	Mortality	Exercise capacity or performance
*Activate Your Heart (*number of prioritised studies = 3)							
Devi et al, 2014[8]	Mean (SD) number of logins 18.68 (13.13) – i.e. an average of 3 logins per participant per week.	Expressed interest: 21.4%. Consented: 15.5%.	Intervention completion: 40% (60% did not progress past stage 3).	Completion of baseline measures: 99%. Completion of 6-week follow-up: 89%. Completion of 6-month follow-up: 75% (i.e. 25% attrition).	Not assessed.	Not assessed.	6-week follow-up Intervention effect on daily steps walked: intervention +497 (SD 2171), control -861 (SD 2534), 95% CI 263 to 245, p=0.02). Intervention effect on energy expenditure: +43.94 kcal, 95% CI 43.93 to 309.98, p=.01. Intervention effect on duration of sedentary activity: -7.79 minutes, 95% CI -55.01 to -7.01, p=.01.

Reference	Adherence (concordance) rates for intervention and long-term strategies	Intervention uptake rates (number of people meeting inclusion criteria vs number recruited)	Intervention completion rates	Attrition (dropout) rates	Hospital readmissions, referrals to specialist services, clinic visits	Mortality	Exercise capacity or performance
							Intervention effect on duration of moderate activity: +6.31 minutes, 95% CI 6.01 to 51.20, p=.01. <u>6-month follow-up</u> No significant effect on daily steps walked: ES=0.24, 95% CI -358 to 2324, p=.15. No significant effect on energy expenditure: ES=0.38, 95% CI -35.17 to 250.47, p=.14. No significant effect on duration of sedentary activity: ES=0.55, 95% CI 0.190 to 0.205, p=.20. No significant effect on duration of moderate activity: ES=0.55, 95% CI

Reference	Adherence (concordance) rates for intervention and long-term strategies	Intervention uptake rates (number of people meeting inclusion criteria vs number recruited)	Intervention completion rates	Attrition (dropout) rates	Hospital readmissions, referrals to specialist services, clinic visits	Mortality	Exercise capacity or performance
							0.244 to 0.261, p=.24.
Brough et al, 2014[11]	Participants logged on between 5 and 42 times, with an average of 10 times per participant.	Not assessed.	Not assessed.	Completion of follow-up: 80%	Not assessed.	Not assessed.	No significant effect on exercise behaviour: 82% pre- vs 79% post-intervention (p=1.0). Intervention effect on Incremental Shuttle Walk Test: mean change 49.7 (95% CI 25.3 to 74.1), p<0.001.
Houchen-Wolloff et al, 2018[9]	The average number of logins was three times per week at 8-weeks and twice a week at 6 months. Phone calls and emails from participants to staff were low, and participants	Consented: 7.51%. Of those excluded (reasons not mutually exclusive): Did not met criteria: 85.7%. Declined/did not reply: 43.2%.	Completion of programme at 6-months: 78% (some others were still working their way through the programme).	Completion of 8-week follow-up: 90%. Completion of 6-month follow-up: 82%. Loss to follow-up at 6-months: 19%. intervention	Resource use was assessed; however, this was to determine the feasibility of collecting these data, and results were not presented in the paper.	Not assessed.	Participants were able to double their exercise time from baseline to 8 weeks and this was maintained at 6 months. Incremental shuttle walk test mean change (SD) at 8 weeks: intervention 45.5 (57.0) metres, control 50.0 (76.9)

Reference	Adherence (concordance) rates for intervention and long-term strategies	Intervention uptake rates (number of people meeting inclusion criteria vs number recruited)	Intervention completion rates	Attrition (dropout) rates	Hospital readmissions, referrals to specialist services, clinic visits	Mortality	Exercise capacity or performance
	did not use the group forum.	Unlikely to comply with protocol: 11.2%. Insufficient data to screen: 1.4%. Other:1.7%		vs 17% control. Resource use questionnaire completion: 90%.			metres, significance not assessed. Incremental shuttle walk test mean change (SD) at 6 months: intervention 52.9 (76.8) metres, control 85.9 (115.2) metres, significance not assessed.
Beat Better (number of prioritised studies = 0)							
Datos Health (number of prioritised studies = 1)							
Nabutovsky et al, 2020[40]	"More than 63%" of participants took part in a moderate intensity exercise program for 150 minutes per week. Adherence was consistent across the six months of the programme. Average use 4	One participant (5%) dropped out before starting the programme due to finding the technology too complex.	Not assessed.	Not assessed.	Two emergency department visits due to abdominal pain and chest pain, both of which were discharged following evaluation.	Not assessed.	Exercise capacity, assessed by estimated metabolic equivalents on pre- and post-stress tests increased from 0.6 (SD 0.5) to 12.3 (SD 0.5), p = 0.002. Average heart rate during aerobic exercise was 108.5 (SD

Reference	Adherence (concordance) rates for intervention and long-term strategies	Intervention uptake rates (number of people meeting inclusion criteria vs number recruited)	Intervention completion rates	Attrition (dropout) rates	Hospital readmissions, referrals to specialist services, clinic visits	Mortality	Exercise capacity or performance
	days a week. Average minutes per week for remote patient management 186.5 first month, 37 third month, 17.75 sixth month. Average minutes per week aerobic exercise 182.5 (SD 19.7), average minutes at or above target heart rate 66.4 (SD 9.7). More than 63% attained the goal of 150 minutes of aerobic exercise per week. Adherence to two resistance training sessions per week was poor (18% of patients). Resistance training was reported (via the						3.3), which did not change significantly across the 6 months. Average heart recovery rate was 73.2 (SD 1.7) %, with significant improvement from the second month ($p = 0.001$) with no significant changes thereafter. Activity type recorded was mainly treadmill and outdoor walking or light jogging.

Reference	Adherence (concordance) rates for intervention and long-term strategies	Intervention uptake rates (number of people meeting inclusion criteria vs number recruited)	Intervention completion rates	Attrition (dropout) rates	Hospital readmissions, referrals to specialist services, clinic visits	Mortality	Exercise capacity or performance
	Polar watch) at an average of one session per week. Session duration training at or above target heart rate was 36% (less than target). The average perceived exertion reported using the Borg scale was 11.9 (SD 1.5). Number of resistance training sessions per week was 0.9 (SD 0.1). Average daily steps were 11344.1 (SD 1029.4). Average mobile application usage was 3.7 (SD 0.3).						
D:REACH-HF (number of prioritised studies = 2)							

Reference	Adherence (concordance) rates for intervention and long-term strategies	Intervention uptake rates (number of people meeting inclusion criteria vs number recruited)	Intervention completion rates	Attrition (dropout) rates	Hospital readmissions, referrals to specialist services, clinic visits	Mortality	Exercise capacity or performance
Cross et al, 2023[15]	Not assessed.	Not assessed.	Not assessed.	Not assessed.	Not assessed.	Not assessed.	Not assessed.
Van Beurden et al, 2022[16]	Not assessed.	Not assessed.	Not assessed.	Not assessed.	Not assessed.	Not assessed.	Not assessed.
Digital Heart Manual (number of prioritised studies = 1)							
Deighan et al, 2017[17]	Not assessed.	Not assessed.	Not assessed.	Not assessed.	Not assessed.	Not assessed.	Not assessed.
Get Ready – Solution (number of prioritised studies = 0)							
Gro Health HeartBuddy (number of prioritised studies = 1)							
Rai et al, submitted[20]	Median of 208.0 [redacted] minutes/week spent on the app. Over the 6-month period, [redacted] Weekly activity included [redacted] completing 6.5 workouts [redacted]	91.7% (calculated by EAG) of patients referred enrolled [redacted]	[redacted]	Completion of follow-up: 92.4%. [redacted]	[redacted]	[redacted]	[redacted]

Reference	Adherence (concordance) rates for intervention and long-term strategies	Intervention uptake rates (number of people meeting inclusion criteria vs number recruited)	Intervention completion rates	Attrition (dropout) rates	Hospital readmissions, referrals to specialist services, clinic visits	Mortality	Exercise capacity or performance
	[redacted]						
KiActiv (number of prioritised studies = 2)							
Meenamkuzhy-Hariharan et al, 2024[21]	Adherence to the intervention was good, with 93% of participants in the intervention group collecting sufficient PA data for analysis via accelerometer data from the wrist-worn device. Average complete days of data (i.e., monitor worn for >80% waking day) across both groups was 38 d/person out of a possible 56. Non-valid days were	Of 225 people invited to join the study, 130 were randomised (65 of which to KiActiv)	Of the 65 participants in the intervention group, 51% attended no face-to-face CR classes. Of this subgroup, 88% completed the KiActiv intervention. Of those randomised, 4 did not have sufficient data for analysis.	65 intervention at baseline, 5 did not attend initial or first feedback session with mentor (excluded) & 4 did not have sufficient data for inclusion (n = 56 intervention) 65 control at baseline, 8 did not attend initial or first feedback session with mentor (excluded) & 8 did not have sufficient data	Not assessed.	Not assessed.	Cardiorespiratory fitness was measured using the incremental shuttle walk test. Intervention (n=33) baseline mean +/- SD 487 +/- 265 (metres) Follow up 572 +/- 326 Δ 89 +/- 116m Control (n=36) baseline mean +/- SD 494 +/- 276 (metres) Follow up 538 +/- 320 Δ 44 +/- 124m

Reference	Adherence (concordance) rates for intervention and long-term strategies	Intervention uptake rates (number of people meeting inclusion criteria vs number recruited)	Intervention completion rates	Attrition (dropout) rates	Hospital readmissions, referrals to specialist services, clinic visits	Mortality	Exercise capacity or performance
	excluded from analysis.			for inclusion (n = 49 intervention)			Between group difference not statistically significant . The primary outcome was change in PA to achieve the Association of Certified Physiotherapists in Cardiac Rehabilitation (ACPICR) recommendations The probability of meeting ACPICR "Daily Activity" recommendation was statistically significantly greater in the intervention group versus control at week 8 (P<0.05)
Rayner et al, 2022[26]	Clients wore the PA monitor and	Not assessed.	Eighty-two percent of	3. Reasons not given.	Not assessed.	Not assessed.	Area under the curve (AUC) and

Reference	Adherence (concordance) rates for intervention and long-term strategies	Intervention uptake rates (number of people meeting inclusion criteria vs number recruited)	Intervention completion rates	Attrition (dropout) rates	Hospital readmissions, referrals to specialist services, clinic visits	Mortality	Exercise capacity or performance
	visited the online platform on 95% and 31% of days during the programme, respectively.		patients completed the programme (n=14)				incremental AUC calculations determined average total PA and additional PA achieved over multiple domains. Improvements in PA were seen in one or more, three or more and four or more domains for 92.9%, 78.6% and 64.3% of participants, respectively. There were increases in non-sedentary time, moderate activity, calorie burn and moderate bouts in patients on the programme.
Luscii Vitals (number of prioritised studies = 0)							
myHeart(number of prioritised studies = 2)							
Blythin et al, 2023[32]	The 350 activated users accessed	A total of 434 patients were registered to	Twelve weeks of app data was captured to	A total of 434 patients were registered to	The CR healthcare teams provided	Not assessed.	Not assessed.

Reference	Adherence (concordance) rates for intervention and long-term strategies	Intervention uptake rates (number of people meeting inclusion criteria vs number recruited)	Intervention completion rates	Attrition (dropout) rates	Hospital readmissions, referrals to specialist services, clinic visits	Mortality	Exercise capacity or performance
	myHeart a median 3 (IQR 2-7) different days, with the median time between first and last day of app access being 17 (IQR 2–46) days. The median number of events recorded by a patient was 5 (IQR 1 - 17). The overall median times the app was accessed was 12 (IQR 1-47) times.	myHeart, of which 350 (80.6%) activated the app	align as much as possible with the traditional in-person CR length of 8 to 12 weeks (2-hour session, once a week) depending on site. A total of 5,469 CR videos were viewed by 314 (89.7%) users. Education videos were accessed a median 6 (IQR1-7, range 1 to 20) times and exercise videos a median 9 (IQR 1-18, range 1 to 66) times. Within the first 6 weeks following	myHeart, of which 350 (80.6%) activated the app	ongoing clinical support remotely to assess patient health status and any app usage concerns using the myHeart clinician dashboard, enabling them to observe patient CR activity within the app. Contact was made either by telephone or using in-app notifications for those who had activated. Of the 434 patients offered myHeart, clinicians made contact with 237 (54.6%), attempts were made for the remaining 197 (45.6%). On average patients		

Reference	Adherence (concordance) rates for intervention and long-term strategies	Intervention uptake rates (number of people meeting inclusion criteria vs number recruited)	Intervention completion rates	Attrition (dropout) rates	Hospital readmissions, referrals to specialist services, clinic visits	Mortality	Exercise capacity or performance
			activation 313 (99.7%) users viewed 3,606 CR videos.		were contacted a mean 2.7 (SD 2.1, range 0 to 20) times and sent in-app notifications a mean 6.2 (SD 3.1, range 1 to 8) times during their respective 12-week CR Programme. Of those who did not complete app activation, contact was made with 31 patients via telephone 2.3 (SD 1.8, mean difference 3.9, range 0 to 20) times. This was significantly lower than those who had activated (P=.007).		

Reference	Adherence (concordance) rates for intervention and long-term strategies	Intervention uptake rates (number of people meeting inclusion criteria vs number recruited)	Intervention completion rates	Attrition (dropout) rates	Hospital readmissions, referrals to specialist services, clinic visits	Mortality	Exercise capacity or performance
Smith and D'Angelo, 2023[31]	Not assessed.	Not assessed.	Fifty four patients completed the study out of 57.	3 drop-outs	Not assessed.	Not assessed.	Exercise capacity (Metabolic equivalent [METs] and heart rate walking speed index [HRWSI]) were recorded from the incremental shuttle walk test (ISWT) at baseline, and 8 weeks. Statistically significant improvements were observed for METs across all three groups after 8 weeks of Cardiac Rehab based on the pre and post ISWT results: Traditional Cardiac Rehab +1.5 METs Traditional CR + myHEART platform (COMBI-CR) +1.4METs

Reference	Adherence (concordance) rates for intervention and long-term strategies	Intervention uptake rates (number of people meeting inclusion criteria vs number recruited)	Intervention completion rates	Attrition (dropout) rates	Hospital readmissions, referrals to specialist services, clinic visits	Mortality	Exercise capacity or performance
							myHEART platform WB-CR +0.9 METs (P<.001). heart rate walking speed index: demonstrated a significant decrease across all groups after intervention TCR -1.1(P=.003), COMBI-CR -1.2(P=.005), WB-CR -1.4(P=.005) which equates to a reduction in heartbeats for every 100m walked of 11, 12, and 14 respectively.
Pumping Marvellous Cardiac Rehab Platform (number of prioritised studies = 0)							
R Plus Health(number of prioritised studies = 3)							
Bilbrey et al, 2024[36]	App log data were used to extract platform engagement data	162 met the inclusion criteria and 75 (46.3%)	62/75 (83%) participants completed the 12-week study and used the telehealth	13 withdrew from the study (lost interest)	Not assessed.	Not assessed.	6-minute walk test: 50/62 (81%) participants' performance in the 6-minute walk test

Reference	Adherence (concordance) rates for intervention and long-term strategies	Intervention uptake rates (number of people meeting inclusion criteria vs number recruited)	Intervention completion rates	Attrition (dropout) rates	Hospital readmissions, referrals to specialist services, clinic visits	Mortality	Exercise capacity or performance
	Out of 62 participants, 50 (81%) completed at least 50% of CR sessions. Adherence to both modalities was high, although there were substantial variations in adherence to the mHealth exercise sessions.	consented and were enrolled	modality with 9.63 (SD 3.33) sessions completed, and 59/75 (79%) used the mHealth modality with 10.97 (SD 11.70) sessions completed. Among those who completed the study, all participants used the telehealth modality and all but 3 participants used the mHealth modality. Participants completed an average of 654.1 (SD 113.6) minutes of telehealth				had improved, with an average improvement of 40 (SD 63.39) meters (95% CI 25.6 to 57.1) There was a small nonsignificant improvement in average resting heart rates (mean -1.1, SD 9.05, 95% CI -3.4 to 1.1).

Reference	Adherence (concordance) rates for intervention and long-term strategies	Intervention uptake rates (number of people meeting inclusion criteria vs number recruited)	Intervention completion rates	Attrition (dropout) rates	Hospital readmissions, referrals to specialist services, clinic visits	Mortality	Exercise capacity or performance
			sessions and 421 minutes (SD 306) of mHealth sessions				
Cai et al, 2022[34]	Adherence was calculated as the percentage of the 12 weeks during which the patient completed 150 or more minutes of exercise. For the control group, the number of minutes of therapy completed at each session was determined based on the patients' exercise diaries; for the intervention group, adherence was calculated	100 of 138	100 underwent randomisation. 49 completed 3-month follow up in intervention arm. 48 in control arm.	1 in intervention arm. 2 in control arm.	At the three-month follow-up, 6.1% (3 of 49) of the patients in the intervention group and 6.5% (3 of 46) of the patients in the control group experienced the recurrence of atrial arrhythmia after ablation, with no significant difference between the two groups. Injuries or the need for hospitalisation due to recurrent atrial fibrillation		The primary outcome was defined as the change in VO2peak between baseline and 12 weeks, as measured by CPET (Jaeger MS-CPX) with a breath-by-breath analysis. **WITHIN:** VO2peak [ml/(min × kg)] mean ± SD Control pre: 18.7 ± 4.9 post: 22.9 ± 6.3 p<0.001 Intervention pre:

Reference	Adherence (concordance) rates for intervention and long-term strategies	Intervention uptake rates (number of people meeting inclusion criteria vs number recruited)	Intervention completion rates	Attrition (dropout) rates	Hospital readmissions, referrals to specialist services, clinic visits	Mortality	Exercise capacity or performance
	according to the records provided by the wearable electrocardio-gram recording device. Among patients who were included in the final analysis, those in the intervention group were adherent during 9.6 ± 3.1 of the 12 weeks (80.4% ± 26.1%), while those in the control group were adherent during 5.0 ± 3.8 of the 12 weeks (42.0% ± 31.6%). Adherence differed significantly between the study groups.				episodes did not occur in either group as a result of participation in the rehabilitation program		19.1 ± 4.7 post: 27.3 ± 5.6 p<0.001 **BETWEEN:** VO2peak [ml/(min × kg)] mean ± SD change. Control: 4.9 ± 6.6. Intervention: 9.3 ± 8.0 p=0.003 Physical activity is reported as the percentage of the number of patients classified into the groups performing moderate and high levels of physical activity according to the International Physical Activity Questionnaire (IPAQ): **WITHIN:**

Reference	Adherence (concordance) rates for intervention and long-term strategies	Intervention uptake rates (number of people meeting inclusion criteria vs number recruited)	Intervention completion rates	Attrition (dropout) rates	Hospital readmissions, referrals to specialist services, clinic visits	Mortality	Exercise capacity or performance
							Control pre: 16 (33.3%) post: 27 (56.3%) p=0.024. Intervention pre: 12 (24.5%) post: 42 (85.7%) p<0.001 There was no significant difference between the intervention group and the control group at baseline (p = 0.461).
Xia et al, 2023[35]	92.9% (26/28) patients were able to exercise in the prescribed intensity for at least 20 min per day, and 67.9% (19/28) of the patients were able to exercise in the prescribed intensity for at	A total of 31 subjects met inclusion criteria and all subjects successfully started the program. 100%	A total of 28 patients (90.3%) completed all interventions and follow-up.	Three people (9.7%) withdrew; the reason for the withdrawal including one went abroad, one moved to another city, and one refused to use it for webless.	Not assessed.	No serious adverse events occurred during the 3-month course. The patient reported a total of three muscle	After 12-week significantly improved, peak VO2: 22.43 to 23.66 ml/kg/min (MD 0.6, 95% CI 0.1 to 2.4, p= 0.041), peak metabolic equivalents increased from 6.35 to 7.04 METs (MD 0.3, 95%CI

Reference	Adherence (concordance) rates for intervention and long-term strategies	Intervention uptake rates (number of people meeting inclusion criteria vs number recruited)	Intervention completion rates	Attrition (dropout) rates	Hospital readmissions, referrals to specialist services, clinic visits	Mortality	Exercise capacity or performance
	least 3 days per week.					weakness and three muscle pain.	0.1 to 1.2, p = 0.018). All 28 people who completed the program had a daily effective exercise time of more than 10 min, with an average of 39.4 min (SD 17.8), of which 53.6% (15/28) had a daily effective exercise time of ≥30 min, 39.3% (11/28) were in 20–30 min, and 7.1% (2/28) were less than 20 min. The average effective exercise days per week was 4.6 days (SD 2.2), of which 50.0% (14/28) were ≥5 days, 17.9% (5/28) were between 3 and 5 days, and 32.1% (9/28) were less than 3 days.

Reference	Adherence (concordance) rates for intervention and long-term strategies	Intervention uptake rates (number of people meeting inclusion criteria vs number recruited)	Intervention completion rates	Attrition (dropout) rates	Hospital readmissions, referrals to specialist services, clinic visits	Mortality	Exercise capacity or performance
Sword Move (number of prioritised studies = 0)							

Reference	Cardiovascular risk profile	Psychological wellbeing	Health-related quality of life	Nutrition status	Medication adherence	Time from post-discharge referral to start of core cardiac rehabilitation programme	Usability and acceptability of the platform
*Activate Your Heart (*number of prioritised studies = 3)							
Devi et al, 2014[8]	6-week follow-up Intervention effect on weight: -0.56 kg, 95% CI	6-week follow-up No significant effect on anxiety: ES=0.30, 95%	6-week follow-up Intervention effect on emotional QoL MacNew score:	6-week follow-up No significant effect on fat score (ES=0.17, 95% CI -6.72 to 3.29, p=0.50).	Not assessed.	Not assessed.	Not assessed.

	-1.78 to -0.15, p=.02. No significant effect on body fat %: ES=0.16, 95% CI -4.23 to 2.04, p=0.49. Control effect on systolic blood pressure: ES=0.68, 95% CI 2.99 to 13.91, p=.001 (note this favours control). No significant effect on diastolic blood pressure: ES=0.01, 95% CI -3.69 to 3.84, p=0.97. <u>6-month follow-up</u> No significant effect on weight: ES=0.35, 95% CI -2.46 to 0.34, p=.14). No significant effect on body fat %: ES=0.00, 95% CI -3.81 to 3.81, p>.99.	CI -2.10 to 0.44, p-0.20. No significant effect on depression: ES=0.24, 95% CI -1.53 to 0.48, p=0.30. Intervention effect on self-efficacy: ES=0.52, 95% CI 0.30 to 4.79, p=.03. <u>6-month follow-up</u> No significant effect on anxiety ES=0.47, 95% CI –2.60 to 0.04, p=.06. No significant effect on depression: ES=0.35, 95% CI -2.11 to 0.34, p=.15. No significant effect on self-efficacy: ES=0.09, 95% CI -2.32 to 3.34, p=.72.	ES=0.48, 95% CI 0.01 to 0.54, p=.04. No significant effect on physical QoL MacNew score: ES=0.11, 95% CI -0.37 to 0.22, p=0.62. No significant effect on social QoL MacNew score: ES=0.23, 95% CI -0.15 to 0.42, p=0.34. No significant effect on SAQ physical limitations score: ES=0.13, 95% CI -9.94 to 5.49, p=0.57. No significant effect on SAQ angina stability score: ES=0.01, 95% CI -17.29 to 17.53, p=0.98. Intervention effect on SAQ angina frequency score: ES=0.77, 95%	No significant effect on fibre score (ES=0.14, 95% CI -3.33 to 6.16, p=0.55). <u>6-month follow-up</u> No significant effect on fat score (ES=0.30, 95% CI -6.12 to 1.80, p=.28). No significant effect on fibre score (ES=0.29, 95% CI -2.23 to 8.53, p=.25).			

	No significant effect on systolic blood pressure: ES=0.15, 95% CI -4.84 to 9.29, p=.53. No significant effect on diastolic blood pressure: ES=0.03, 95% CI -4.80 to 4.29, p=.91.		CI 8.57 to 35.05, p=0.002. No significant effect on SAQ treatment satisfaction score: ES=0.22, 95% CI -6.97 to 18.83, p=0.36. No significant effect on SAQ disease perception score: ES=0.16, 95% CI -5.52 to 11.71, p=0.48. <u>6-month follow-up</u> No significant effect on emotional QoL MacNew score: ES=0.46, 95% CI -0.02 to 0.62, p=.06. No significant effect on physical QoL MacNew score: ES=0.08, 95% CI -7.20 to 10.50, p=.71. Intervention effect on social				

			QoL MacNew score: ES=0.60, 95% CI 0.05 to 0.54, p=.02. No significant effect on SAQ angina stability score: ES=0.13, 95% CI -13.72 to 24.18, p=.58. Intervention effect on SAQ angina frequency score: ES=0.63, 95% CI 1.89 to 29.41, p=.03. No significant effect on SAQ treatment satisfaction score: ES=0.08, 95% CI -15.31 to 10.69, p=.72. No significant effect on SAQ disease perception score: ES=0.17, 95% CI -8.41 to 14.99, p=.58.				

Brough et al, 2014[11]	No significant effect on weight: mean change 0.2 (95% CI -1.3 to 1.8), p=0.77. No significant effect on BMI: mean change -1.2 (-3.3 to 1.0), p=0.29. No significant effect on smoking: 0% post vs 3% pre, p=1.0.	No significant effect on HADS anxiety: mean change 0.4 (95% CI -0.5 to 1.2), p=0.41. No significant effect on HADS depression: mean change 0.1 (-0.5 to -0.7), p=0.84.	Intervention effect on MacNew total: mean change 0.3 (95% CI 0.1 to 0.4), p<0.001.	Intervention effect on fruit and vegetables: 94% post vs 71% pre, p=0.01. Intervention effect on oily fish: 68% post vs 45% pre, p=0.01.	Not assessed.	Not assessed.	54% would not have attended conventional outpatient cardiac rehabilitation.
Houchen-Wolloff et al, 2018[9]	Not assessed.	HADS anxiety mean change (SD) at 8 weeks intervention -0.3 (3.0), control 0.7 (3.1), significance not assessed. HADS depression mean change (SD) at 8 weeks intervention -0.3 (3.0), control 0.7 (3.1), significance not assessed.	MacNew total mean change (SD) at 8 weeks intervention 0.3 (1.0), control 0.2 (0.8), significance not assessed. MacNew total mean change (SD) at 6 months intervention 0.5 (1.1), control 0.2 (0.7), significance not assessed.	Not assessed.	Not assessed.	Not assessed.	Administration of intervention and assessments found to be feasible.

		Self-efficacy mean change (SD) at 8 weeks intervention 1.5 (4.1), control -0.1 (2.9), significance not assessed. HADS anxiety mean change (SD) at 6 months intervention -0.4 (3.3), control -0.2 (2.8), significance not assessed. HADS depression mean change (SD) at 6 months intervention -0.8 (2.6), control 0.1 (1.6), significance not assessed. Self-efficacy mean change (SD) at 6 months intervention 2.1 (5.1), control -0.3					

		(1.6), significance not assessed.					
Beat Better (number of prioritised studies = 0)							
Datos Health (number of prioritised studies = 1)							
Nabutovsky et al, 2020[40]	High-density lipoproteins levels significantly improved from 41 (S D2.4 to 44.5 (SD2.6), p = 0.016, whereas other clinical variables including heart rate, systolic and diastolic blood pressure, low-density lipoproteins, triglyceride fasting glucose and haemoglobin A1c were not significantly changed (numbers NR).	Not assessed.	Not assessed.	Not assessed.	Not assessed.	Not assessed.	Participant satisfaction with the programme was 4.05 out of 5.
D:REACH-HF (number of prioritised studies = 2)							
Cross et al, 2023[15]	Not assessed.	Not assessed.	Not assessed.	Not assessed.	Not assessed.	Not assessed.	Patients and caregivers reported improvements in physical and mental health,

							better self-management of heart failure symptoms and perceived independence. However, health, technological and support barriers to engaging in D:REACH-HF were also reported. Healthcare professionals reported that programme delivery was impacted by both patient and healthcare professional digital competence and the engagement of the patient in use of the digital platform. Participants reported that D:REACH-HF enabled remote access to patient's data by the healthcare professional,

							allowing tailoring and more efficient and effective consultation.
Van Beurden et al, 2022[16]	Not assessed.	Not assessed.	Not assessed.	Not assessed.	Not assessed.	Not assessed.	The think aloud interviews focused on design, navigational, functional and content. Participants talked about barriers to navigation where links or buttons were not present, or clearly visible. Other barriers to accessibility were of font sizes, colour scheme, and ambiguous use of icons. Design issues were often accompanied by mentions of potential. For example, the ability to change text size, image contrast, as well as more complex functionality

							like sharing self-monitoring tools (progress trackers) with family and friends and setting medication reminders. Although, presentation of the content required breaking up in smaller chunks to be less overwhelming in places, persuasiveness of the content was less often highlighted as requiring change.
Digital Heart Manual (number of prioritised studies = 1)							
Deighan et al, 2017[17]	Not assessed.	Not assessed.	Not assessed.	Not assessed.	Not assessed.	Not assessed.	Rich data revealed the perceived user-friendliness of the digital format and its effectiveness at communicating the programme's key messages. It flagged areas requiring development,

							such as more flexible and intuitive navigation pathways. These suggestions informed the refinement of the resource.
Get Ready – Solution (number of prioritised studies = 0)							
Gro Health HeartBuddy (number of prioritised studies = 1)							
Rai et al, submitted[20]	6-month follow-up Intervention effect on systolic blood pressure: mean reduction 13.0 mmHg [redacted] p<0.001. Intervention effect on diastolic blood pressure: mean reduction 6.0 mmHg [redacted] p < 0.001. Intervention effect on weight: mean reduction 2.3 kg [redacted] p < 0.001).	6-month follow-up Intervention effect on GAD-7 anxiety: median reduction 3.5 points [redacted] p < 0.001. Intervention effect on excessive daytime sleepiness: mean reduction 1 point [redacted] p < 0.001). Intervention effect on wellbeing (SWEMWBS):	6-month follow-up Intervention effect on EQ-5D index score: improvement by 10 points [redacted], p < 0.001.	[redacted]	[redacted]	[redacted]	[redacted]

	No significant effect on HbA1c: reduction of 0.1% [redacted] p=0.07.	median increase 3.0 points [redacted] p < 0.001).					
KiActiv (number of prioritised studies = 2)							
Meenamkuzhy-Hariharan et al, 2024[21]	BMI kg/m^2 Total (n=130): 30.3 +/- 6.1 mean +/- SD Intervention (n=65): 30.3 +/- 6.4 Control (n=65): 30.3 +/- 5.7	Not assessed.	Not assessed.	Not assessed.	Not assessed.	Not assessed.	Not assessed.
Rayner et al, 2022[26]	Not assessed.	Not assessed.	All patients reported an improvement in at least one domain of QoL, with statistically significant improvements in physical fitness and overall health ($p<0.05$).	Not assessed.	Not assessed.	Not assessed.	All (100%) of those who provided information on usability and acceptability (57% response rate) indicated that they would recommend KiActiv to others and rated KiActiv 8+ out of 10 on a Likert scale.

Luscii Vitals (number of prioritised studies = 0)							
myHeart(number of prioritised studies = 2)							
Blythin et al, 2023[32]	Not assessed.	Not assessed.	Not assessed.	Not assessed.	Not assessed.	Not assessed.	Both clinicians and app users were invited to answer anonymised myHeart user questionnaires. From the 350 patient users 55 (15.7%) responded to one or more of the questions. There was a statistically significant difference observed between before and after having access to the app in terms of an increase in self-management confidence. Analysis showed that n=18/50 (36%) reported they had more confidence after having access to the app, P=<.001

							(95%CI 0.23-0.57). 25 clinicians were also asked to provide feedback on the app's functionality and suitability for service delivery, of which 20 (80%) responded.
Smith and D'Angelo, 2023[31]	Not assessed.	Not assessed.	Not assessed.	Not assessed.	Not assessed.	Not assessed.	Not assessed.
Pumping Marvellous Cardiac Rehab Platform (number of prioritised studies = 0)							
R Plus Health(number of prioritised studies = 3)							
Bilbrey et al, 2024[36]	BMI kg/m^2 **Total (n=62)** mean (SD): 29.3 (6.8) <50% completion (n=12) 30.4 (8.2) >=50% completion (n=50) 29 (6.5)	Not assessed.	The average 12-Item Short-Form Health Survey's physical and mental summary scores improved by 2.7 (SD 6.47) points (95% CI 1.1 to 4.3) and 2.2 (SD 9.09) points (95% CI 0.1 to 4.5), respectively	Not assessed.	Not assessed.	Received referral to CR from a provider within 60 days	Not assessed.
Cai et al, 2022[34]	VO2 peak is reported in	**WITHIN:**	Not assessed.	Not assessed.	Not assessed.	Not assessed.	Not assessed.

	exercise capacity.	Health beliefs related to cardiovascular disease mean ± SD. Control pre: 69.9 ± 2.1 post: 74.7 ± 6.6 p<0.001 Intervention pre: 70.4 ± 2.5 post: 79.7 ± 8.4 p<0.001 Exercise self-efficacy mean ± SD. Control pre: 50.3 ± 14.5 post: 52.8 ± 17.4 p = 0.417. Intervention pre: 50.6 ± 15.2 post: 61.7 ± 15.6 p<0.001 **BETWEEN:** Health beliefs related to cardiovascular disease mean ± SD. Control: 2.5 ± 15.2 Intervention: 11.1 ± 10.5 p=0.002					

		Exercise self-efficacy mean ± SD. Control: 4.2 ± 5.3 Intervention: 8.3 ± 4.8 p<0.001					
Xia et al, 2023[35]	Mean BMI was 26.2 kg/m^2 (SD 2.9) (n=31) The mean DBP at rest decreased significantly, from 72.29 to 67.36 mmHg (MD 2.3, 95%CI −9.7 to −0.1, p = 0.044). LDL (mmol/l) mean +/- SD Baseline 2.35 (1.01) Follow up 1.91 (0.63) (MD 0.2, 95%CI 0.0 to 0.8, p = 0.036) HDL (mmol/l) mean +/- SD	Patient Health Questionnaire-9 and improved significantly between baseline and follow-up (p=0.013). General Anxiety Disorder-7 (GAD-7) consists of seven items measuring worry and anxiety symptoms. GAD-7 (95%CI -3.5 to 0.0, p = 0.014) scores were significantly lower than those before intervention.	A 12-Item Short Form Survey (SF-12) was used to measure the quality of life of patients. Median (IQR): Baseline 32.00 (30.00 to 33.00) 12 weeks 32.00 (29.25 to 33.00) (p=0.656)	Not assessed.	Not assessed.	Not assessed.	Not assessed.

	Baseline 1.05 (0.22) Follow-up 1.09 (0.20) p = 0.256 Total cholesterol (mmol/l) mean +/- Baseline 3.77 (1.32) Follow up 3.39 (0.93) p= 0.132 Blood glucose mmol/l mean (SD) Baseline 5.77 (1.15) Follow up 5.90 (1.08) p= 0.685 Triglycerides (mmol/l) mean (SD) Baseline 1.47 (0.57) Follow up 1.34 (0.42) p= 0.286 Peak VO2 (ml/kg/min) mean (SD)						

	Baseline 22.43 (4.20) Follow up 23.66 (4.34) p = 0.041						
Sword Move (number of prioritised studies = 0)							

Appendix F – List of Model Inputs

Table 35: List of model inputs

Parameter	Base case	Distribution	SE	Alpha	Beta	Source / reference
Discount rate (costs)	3.50%					National Institute for Health and Care Excellence, 2022[55]
Discount rate (LYs)	0.00%					National Institute for Health and Care Excellence, 2022[55]
Discount rate (HRQoL)	3.50%					National Institute for Health and Care Excellence, 2022[55]
Baseline age male	66	Normal	12	-	-	
Baseline age female	70	Normal	12.7	-	-	
Baseline % female	0.462	Beta	0.0924	12.988	15.12455411	
Willingness-To-Pay (WTP) threshold	£20,000					-
Cycle length (weeks)	52					-
Time horizon (Years)	32					-
Tech 1 Activate Your Heart licence cost	£50.00	Normal	£10.00	-	-	Activate your heart evidence and cost response
Tech 2 Beat Better licence cost	£6.00	Normal	£1.20	-	-	Avegen query response

Parameter	Base case	Distribution	SE	Alpha	Beta	Source / reference
Tech 3 Datos Health - AI Driven Hybrid Care Platform licence cost	£293.33	Normal	£58.67	-	-	Datos technology costs
Tech 4 D REACH-HF licence cost	£22.39	Normal	£4.48	-	-	HC&I query response
Tech 5 Digital Heart Manual licence cost	£26.00	Normal	£5.20	-	-	Heart Manual Price List (Digital and book)
Tech 6 Get Ready - Solution licence cost	£62.69	Normal	£12.54	-	-	Medtronic evidence response
Tech 7 Gro Health HeartBuddy licence cost	£250.00	Normal	£50.00	-	-	DDM health evidence
Tech 8 KiActiv licence cost	£199.00	Normal	£39.80	-	-	Ki performance lifestyle limited evidence
Tech 9 Luscii vitals licence cost	£15.00					Luscii G-Cloud 14 Pricing Summary
Tech 10 myHeart licence cost	£66.67	Normal	£13.33	-	-	Mymhealth evidence
Tech 11 Pumping Marvellous Cardiac Rehab Platform licence cost	£0.00					Pumping marvellous foundation RFI
Tech 12 R Plus Health licence cost	£142.80					R Plus per centre cost estimated per patient.

Parameter	Base case	Distribution	SE	Alpha	Beta	Source / reference
Tech 13 Sword Move licence cost	£187.50	Normal	£37.50	-	-	Sword health evidence
Tech 1 Activate Your Heart resource cost complete	£287.84					NHS Cost Collection Costs, 2023/24[196]
Tech 2 Beat Better resource cost complete	£287.84					NHS Cost Collection Costs, 2023/24[196]
Tech 3 Datos Health - AI Driven Hybrid Care Platform resource cost complete	£287.84					NHS Cost Collection Costs, 2023/24[196]
Tech 4 D REACH-HF resource cost complete	£633.95					NHS Cost Collection Costs, 2023/24[196]
Tech 5 Digital Heart Manual resource cost complete	£287.84					NHS Cost Collection Costs, 2023/24[196]
Tech 6 Get Ready - Solution resource cost complete	£287.84					NHS Cost Collection Costs, 2023/24[196]
Tech 7 Gro Health HeartBuddy resource cost complete	£287.84					NHS Cost Collection Costs, 2023/24[196]
Tech 8 KiActiv resource cost complete	£287.84					NHS Cost Collection

Parameter	Base case	Distribution	SE	Alpha	Beta	Source / reference
						Costs, 2023/24[196]
Tech 9 Luscii vitals resource cost complete	£287.84					NHS Cost Collection Costs, 2023/24[196]
Tech 10 myHeart resource cost complete	£287.84					NHS Cost Collection Costs, 2023/24[196]
Tech 11 Pumping Marvellous Cardiac Rehab Platform resource cost complete	£287.84					NHS Cost Collection Costs, 2023/24[196]
Tech 12 R Plus Health resource cost complete	£287.84					NHS Cost Collection Costs, 2023/24[196]
Tech 13 Sword Move resource cost complete	£287.84					NHS Cost Collection Costs, 2023/24[196]
Tech 1 Activate Your Heart resource cost incomplete	£143.92					NHS Cost Collection Costs, 2023/24[196]
Tech 2 Beat Better resource cost incomplete	£143.92					NHS Cost Collection Costs, 2023/24[196]

Parameter	Base case	Distribution	SE	Alpha	Beta	Source / reference
Tech 3 Datos Health - AI Driven Hybrid Care Platform resource cost incomplete	£143.92					NHS Cost Collection Costs, 2023/24[196]
Tech 4 D REACH-HF resource cost incomplete	£339.93					NHS Cost Collection Costs, 2023/24[196]
Tech 5 Digital Heart Manual resource cost incomplete	£143.92					NHS Cost Collection Costs, 2023/24[196]
Tech 6 Get Ready - Solution resource cost incomplete	£143.92					NHS Cost Collection Costs, 2023/24[196]
Tech 7 Gro Health HeartBuddy resource cost incomplete	£143.92					NHS Cost Collection Costs, 2023/24[196]
Tech 8 KiActiv resource cost incomplete	£143.92					NHS Cost Collection Costs, 2023/24[196]
Tech 9 Luscii vitals resource cost incomplete	£143.92					NHS Cost Collection Costs, 2023/24[196]
Tech 10 myHeart resource cost incomplete	£143.92					NHS Cost Collection Costs, 2023/24[196]

Parameter	Base case	Distribution	SE	Alpha	Beta	Source / reference
Tech 11 Pumping Marvellous Cardiac Rehab Platform resource cost incomplete	£143.92					NHS Cost Collection Costs, 2023/24[196]
Tech 12 R Plus Health resource cost incomplete	£143.92					NHS Cost Collection Costs, 2023/24[196]
Tech 13 Sword Move resource cost incomplete	£143.92					NHS Cost Collection Costs, 2023/24[196]
Cost post-CR uptake cost	£87.14	Normal	£17.43	-	-	NHS Cost Collection Costs, 2023/24[196]
Secondary CVD cost	£7,393.78	Normal	£1,478.76	-	-	NHS Cost Collection Costs, 2023/24[196]
Survival post secondary CVD cost	£3,118.76	Normal	£623.75	-	-	NHS Cost Collection Costs, 2023/24[196]
Death_state_cost	£0.00					NHS Cost Collection Costs, 2023/24[196]
Utility Multiplier Post Second CVD: revascularisation	0.8	Beta	0.16	4.2	1.05	DSU Report, 2014[197]
Utility Multiplier Post CR	0.88	Beta	0.176	2.12	0.289090909	DSU Report, 2014[197]

Parameter	Base case	Distribution	SE	Alpha	Beta	Source / reference
Utility Multiplier Post Second CVD: MI	0.76	Beta	0.152	5.24	1.654736842	DSU Report, 2014[197]
Utility Multiplier Post Second CR	0.88	Beta	0.176	2.12	0.289090909	DSU Report, 2014[197]
Secondary CVD risk (no CR)	0.062697274	Beta		437	6533	Dibben et al (2023)[57]
Secondary CVD relative risk (CCR)	0.82	Lognormal	0.080574732	-	-	Dibben et al (2023)[57]
Tech 1 Activate Your Heart CV risk reduction	0	Normal	0	-	-	
Tech 2 Beat Better CV risk reduction	0	Normal	0	-	-	
Tech 3 Datos Health - AI Driven Hybrid Care Platform CV risk reduction	0	Normal	0	-	-	
Tech 4 D REACH-HF CV risk reduction	0	Normal	0	-	-	
Tech 5 Digital Heart Manual CV risk reduction	0	Normal	0	-	-	
Tech 6 Get Ready - Solution CV risk reduction	0	Normal	0	-	-	
Tech 7 Gro Health HeartBuddy CV risk reduction	[redacted]	Normal	[redacted]	-	-	
Tech 8 KiActiv CV risk reduction	0	Normal	0	-	-	
Tech 9 Luscii vitals CV risk reduction	0	Normal	0	-	-	
Tech 10 myHeart CV risk reduction	0	Normal	0	-	-	
Tech 11 Pumping Marvellous Cardiac Rehab Platform CV risk reduction	0	Normal	0	-	-	

Parameter	Base case	Distribution	SE	Alpha	Beta	Source / reference
Tech 12 R Plus Health CV risk reduction	0.001389191	Normal	0.000277838	-	-	
Tech 13 Sword Move CV risk reduction	0	Normal	0	-	-	
Secondary CVD Event --> Death	7.887168017	Lognormal	0.455799225	-	-	Danese et al (2016)[60] and Office for National Statistics (2025)[62]
Post Secondary CVD event --> Death	2.835869541	Lognormal	-0.567089306	-	-	Danese et al (2016)[60] and Office for National Statistics (2025)[62]
PostCR----> Death	2	Lognormal	-0.916290732	-	-	Smolina et al (2012)[59]
Cost Cardiac Rehab Single Session	£115.39	Normal	£23.08	-	-	NHS Cost Collection Costs, 2023/24[196]
Cost Cardiac Rehab Single Session Consultant Led	£147.18	Normal	£29.44	-	-	NHS Cost Collection Costs, 2023/24[196]
Cost Cardiac Rehab Single Session Non Consultant Led	£94.64	Normal	£18.93	-	-	NHS Cost Collection Costs, 2023/24[196]
Cost Annual review GP appointment	45	Normal	£9.00	-	-	

Parameter	Base case	Distribution	SE	Alpha	Beta	Source / reference
Cost Quarterly blood test	3	Normal	0.6	-	-	
CCR uptake	0.413	Beta		96382	136988.46	NACR. 2024[5]
CCR completion	0.55144114	Beta		53149	43233	NACR. 2024[5]
Uptake Tech 1 Activate Your Heart		Beta				
Uptake Tech 2 Beat Better		Beta	0			
Uptake Tech 3 Datos Health - AI Driven Hybrid Care Platform	0.954545455	Beta	0.190909091	21	1	Nabutovsky et al. 2020[40]
Uptake Tech 4 D REACH-HF		Beta	0			
Uptake Tech 5 Digital Heart Manual	0.595744681	Beta	0.119148936	28	19	Deighan et al. 2017[17]
Uptake Tech 6 Get Ready - Solution		Beta	0			
Uptake Tech 7 Gro Health HeartBuddy	0.916666667	Beta	0.183333333	1.166666667	0.106060606	Rai et al. [20]
Uptake Tech 8 KiActiv		Beta	0			
Uptake Tech 9 Luscii vitals		Beta	0			
Uptake Tech 10 myHeart		Beta				
Uptake Tech 11 Pumping Marvellous Cardiac Rehab Platform		Beta	0			
Uptake Tech 12 R Plus Health	0.462962963	Beta	0.092592593	75	87	Bilbrey et al. 2024[36]
Uptake Tech 13 Sword Move		Beta				
OR Uptake Tech 1 Activate Your Heart				-	-	
OR Uptake Tech 10 myHeart				-	-	
Completion Tech 1 Activate Your Heart	0.564705882	Beta		48	37	Devi et al. 2014[8]
Completion Tech 2 Beat Better		Beta	0			Houchen-Wolloff. 2018[9]

Parameter	Base case	Distribution	SE	Alpha	Beta	Source / reference
Completion Tech 3 Datos Health - AI Driven Hybrid Care Platform		Beta	0			
Completion Tech 4 D REACH-HF		Beta	0			
Completion Tech 5 Digital Heart Manual		Beta	0			
Completion Tech 6 Get Ready - Solution		Beta	0			
Completion Tech 7 Gro Health HeartBuddy	0.924	Beta	0.1848			Rai et al. [20]
Completion Tech 8 KiActiv	0.861538462	Beta	0.172307692	56	9	Meenamkuzhy-Hariharan et al., 2023[21]
Completion Tech 9 Luscii vitals		Beta	0			
Completion Tech 10 myHeart						
Completion Tech 11 Pumping Marvellous Cardiac Rehab Platform		Beta	0			
Completion Tech 12 R Plus Health	0.98	Beta	0.196	49	1	Cai et al. 2022[34]
Completion Tech 13 Sword Move		Beta	0			
OR completion Tech 1 Activate Your Heart	0.33022113	Lognormal	0.33022113	-	-	Devi et al. 2014[8]
OR completion Tech 8 KiActiv	2.031746032	Lognormal	2.031746032	-	-	Meenamkuzhy-Hariharan et al., 2023[21]
OR completion Tech 10 myHeart				-	-	
OR completion Tech 12 R Plus Health	2.041666667	Lognormal	2.041666667	-	-	Cai et al. 2022[34]
Implementation cost Tech 1 Activate Your Heart	£9.88	Normal	1.976489264	-	-	Activate Your Heart evidence and cost response

Parameter	Base case	Distribution	SE	Alpha	Beta	Source / reference
Implementation cost Tech 2 Beat Better	£10	Normal	1.976489264	-	-	
Implementation cost Tech 3 Datos Health - AI Driven Hybrid Care Platform	£4.85	Normal	0.969434845	-	-	Datos technology cost 2
Implementation cost Tech 4 D REACH-HF	£9.88	Normal	1.976489264	-	-	
Implementation cost Tech 5 Digital Heart Manual	£9.88	Normal	1.976489264	-	-	
Implementation cost Tech 6 Get Ready - Solution	£13.45	Normal	2.689655172	-	-	Medtronic evidence response
Implementation cost Tech 7 Gro Health HeartBuddy	£2.07	Normal	0.413336079	-	-	DDM Heath Evidence
Implementation cost Tech 8 KiActiv	£9.88	Normal	1.976489264	-	-	
Implementation cost Tech 9 Luscii vitals	£2.93	Normal	0.585559445	-	-	Luscii G-Cloud 14 Pricing Summary
Implementation cost Tech 10 myHeart	£9.88	Normal	1.976489264	-	-	
Implementation cost Tech 11 Pumping Marvellous Cardiac Rehab Platform	£9.88	Normal	1.976489264	-	-	
Implementation cost Tech 12 R Plus Health	£9.88	Normal	1.976489264	-	-	
Implementation cost Tech 13 Sword Move	£9.88	Normal	1.976489264	-	-	
Training cost Tech 1 Activate Your Heart	£0.32	Normal	0.064583762	-	-	Activate Your Heart evidence and cost response
Training cost Tech 2 Beat Better	£0.22	Normal	0.043055842	-	-	

Parameter	Base case	Distribution	SE	Alpha	Beta	Source / reference
Training cost Tech 3 Datos Health - AI Driven Hybrid Care Platform	£0.22	Normal	0.043055842	-	-	
Training cost Tech 4 D REACH-HF	£0.30	Normal	0.060278178	-	-	HC&I query
Training cost Tech 5 Digital Heart Manual	£0.19	Normal	0.038750257	-	-	Heart Manual Price List
Training cost Tech 6 Get Ready - Solution	£0.00	Normal	0	-	-	Medtronic evidence response
Training cost Tech 7 Gro Health HeartBuddy	£0.04	Normal	0.008611168	-	-	DDM Heath Evidence
Training cost Tech 8 KiActiv	£0.00	Normal	0	-	-	Ki performance lifestyle
Training cost Tech 9 Luscii vitals	£0.00	Normal	0	-	-	Luscii G-Cloud 14 Pricing Summary
Training cost Tech 10 myHeart	£0.22	Normal	0.043055842	-	-	
Training cost Tech 11 Pumping Marvellous Cardiac Rehab Platform	£0.22	Normal	0.043055842	-	-	
Training cost Tech 12 R Plus Health	£0.22	Normal	0.043055842	-	-	
Training cost Tech 13 Sword Move	£0.22	Normal	0.043055842	-	-	
Scenario Alternative Costing CCR (Beswick)	£519.15	Normal	103.8305824	-	-	
Cost CCR Complete	£875.88	Normal	175.1755206	-	-	
Scenario Alternative Costing CG48	£80.67	Normal	£16.13	-	-	
Scenario Alternative Costing CG48	£335.58	Normal	£67.12	-	-	
Scenario Alternative Costing CG48	£1,148.70	Normal	£229.74	-	-	
Computing Cost Tablet/Phone	£79.99	Normal	£16.00	-	-	

Parameter	Base case	Distribution	SE	Alpha	Beta	Source / reference
Computing Cost SIM Card	£8.00	Normal	£1.60	-	-	

Appendix G – 2-way sensitivity analyses, uptake and completion rates

Table 36: 2-way sensitivity analysis impact of uptake and completion rates: Activate Your Heart

Uptake / Completion	0%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
0%	-£167	-£182	-£196	-£211	-£226	-£241	-£256	-£271	-£285	-£300	-£315	-£330	-£345	-£360	-£375	-£389	-£404	-£419	-£434	-£449	-£464
5%	-£167	-£177	-£187	-£198	-£208	-£218	-£229	-£239	-£250	-£260	-£270	-£281	-£291	-£301	-£312	-£322	-£332	-£343	-£353	-£363	-£374
10%	-£167	-£173	-£178	-£184	-£190	-£196	-£202	-£208	-£214	-£219	-£225	-£231	-£237	-£243	-£249	-£255	-£260	-£266	-£272	-£278	-£284
15%	-£167	-£168	-£169	-£171	-£172	-£174	-£175	-£176	-£178	-£179	-£180	-£182	-£183	-£184	-£186	-£187	-£188	-£190	-£191	-£193	-£194
20%	-£167	-£164	-£160	-£157	-£154	-£151	-£148	-£145	-£142	-£139	-£135	-£132	-£129	-£126	-£123	-£120	-£117	-£113	-£110	-£107	-£104
25%	-£167	-£159	-£152	-£144	-£136	-£129	-£121	-£113	-£106	-£98	-£90	-£83	-£75	-£68	-£60	-£52	-£45	-£37	-£29	-£22	-£14
30%	-£167	-£155	-£143	-£130	-£118	-£106	-£94	-£82	-£70	-£58	-£45	-£33	-£21	-£9	£3	£15	£27	£39	£52	£64	£76
35%	-£167	-£150	-£134	-£117	-£100	-£84	-£67	-£50	-£34	-£17	-£1	£16	£33	£49	£66	£83	£99	£116	£132	£149	£166
40%	-£167	-£146	-£125	-£103	-£82	-£61	-£40	-£19	£2	£23	£44	£66	£87	£108	£129	£150	£171	£192	£213	£234	£256
45%	-£167	-£141	-£116	-£90	-£64	-£39	-£13	£13	£38	£64	£89	£115	£141	£166	£192	£217	£243	£269	£294	£320	£345
50%	-£167	-£137	-£107	-£76	-£46	-£16	£14	£44	£74	£104	£134	£164	£195	£225	£255	£285	£315	£345	£375	£405	£435
55%	-£167	-£132	-£98	-£63	-£28	£6	£41	£75	£110	£145	£179	£214	£248	£283	£318	£352	£387	£421	£456	£491	£525
60%	-£167	-£128	-£89	-£49	-£10	£29	£68	£107	£146	£185	£224	£263	£302	£341	£381	£420	£459	£498	£537	£576	£615
65%	-£167	-£123	-£80	-£36	£8	£51	£95	£138	£182	£226	£269	£313	£356	£400	£444	£487	£531	£574	£618	£661	£705
70%	-£167	-£119	-£71	-£23	£26	£74	£122	£170	£218	£266	£314	£362	£410	£458	£506	£555	£603	£651	£699	£747	£795
75%	-£167	-£114	-£62	-£9	£44	£96	£149	£201	£254	£306	£359	£412	£464	£517	£569	£622	£675	£727	£780	£832	£885
80%	-£167	-£110	-£53	£4	£62	£119	£176	£233	£290	£347	£404	£461	£518	£575	£632	£689	£746	£804	£861	£918	£975
85%	-£167	-£105	-£44	£18	£80	£141	£203	£264	£326	£387	£449	£511	£572	£634	£695	£757	£818	£880	£942	£1,003	£1,065
90%	-£167	-£101	-£35	£31	£97	£164	£230	£296	£362	£428	£494	£560	£626	£692	£758	£824	£890	£956	£1,022	£1,088	£1,155
95%	-£167	-£96	-£26	£45	£115	£186	£257	£327	£398	£468	£539	£609	£680	£751	£821	£892	£962	£1,033	£1,103	£1,174	£1,244
100%	-£167	-£92	-£17	£58	£133	£209	£284	£359	£434	£509	£584	£659	£734	£809	£884	£959	£1,034	£1,109	£1,184	£1,259	£1,334

Table 37: 2-way sensitivity analysis impact of uptake and completion rates: Beat Better

Uptake / Completion	0%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
0%	-£167	-£179	-£192	-£205	-£217	-£230	-£243	-£255	-£268	-£280	-£293	-£306	-£318	-£331	-£344	-£356	-£369	-£382	-£394	-£407	-£419
5%	-£167	-£175	-£183	-£191	-£199	-£207	-£216	-£224	-£232	-£240	-£248	-£256	-£264	-£273	-£281	-£289	-£297	-£305	-£313	-£321	-£330
10%	-£167	-£170	-£174	-£178	-£181	-£185	-£189	-£192	-£196	-£200	-£203	-£207	-£210	-£214	-£218	-£221	-£225	-£229	-£232	-£236	-£240
15%	-£167	-£166	-£165	-£164	-£163	-£163	-£162	-£161	-£160	-£159	-£158	-£157	-£157	-£156	-£155	-£154	-£153	-£152	-£151	-£151	-£150
20%	-£167	-£161	-£156	-£151	-£145	-£140	-£135	-£129	-£124	-£119	-£113	-£108	-£103	-£97	-£92	-£87	-£81	-£76	-£71	-£65	-£60
25%	-£167	-£157	-£147	-£137	-£127	-£118	-£108	-£98	-£88	-£78	-£68	-£59	-£49	-£39	-£29	-£19	-£9	£1	£10	£20	£30
30%	-£167	-£152	-£138	-£124	-£109	-£95	-£81	-£66	-£52	-£38	-£23	-£9	£5	£20	£34	£48	£63	£77	£91	£106	£120
35%	-£167	-£148	-£129	-£110	-£91	-£73	-£54	-£35	-£16	£3	£22	£40	£59	£78	£97	£116	£135	£153	£172	£191	£210
40%	-£167	-£143	-£120	-£97	-£73	-£50	-£27	-£3	£20	£43	£66	£90	£113	£136	£160	£183	£206	£230	£253	£276	£300
45%	-£167	-£139	-£111	-£83	-£55	-£28	£0	£28	£56	£84	£111	£139	£167	£195	£223	£251	£278	£306	£334	£362	£390
50%	-£167	-£134	-£102	-£70	-£38	-£5	£27	£59	£92	£124	£156	£189	£221	£253	£286	£318	£350	£383	£415	£447	£480
55%	-£167	-£130	-£93	-£56	-£20	£17	£54	£91	£128	£165	£201	£238	£275	£312	£349	£385	£422	£459	£496	£533	£569
60%	-£167	-£125	-£84	-£43	-£2	£40	£81	£122	£164	£205	£246	£288	£329	£370	£411	£453	£494	£535	£577	£618	£659
65%	-£167	-£121	-£75	-£29	£16	£62	£108	£154	£200	£245	£291	£337	£383	£429	£474	£520	£566	£612	£658	£703	£749
70%	-£167	-£116	-£66	-£16	£34	£85	£135	£185	£236	£286	£336	£386	£437	£487	£537	£588	£638	£688	£739	£789	£839
75%	-£167	-£112	-£57	-£2	£52	£107	£162	£217	£272	£326	£381	£436	£491	£545	£600	£655	£710	£765	£819	£874	£929
80%	-£167	-£107	-£48	£11	£70	£130	£189	£248	£307	£367	£426	£485	£545	£604	£663	£722	£782	£841	£900	£960	£1,019
85%	-£167	-£103	-£39	£25	£88	£152	£216	£280	£343	£407	£471	£535	£599	£662	£726	£790	£854	£917	£981	£1,045	£1,109
90%	-£167	-£98	-£30	£38	£106	£175	£243	£311	£379	£448	£516	£584	£652	£721	£789	£857	£926	£994	£1,062	£1,130	£1,199
95%	-£167	-£94	-£21	£52	£124	£197	£270	£343	£415	£488	£561	£634	£706	£779	£852	£925	£997	£1,070	£1,143	£1,216	£1,289
100%	-£167	-£90	-£12	£65	£142	£220	£297	£374	£451	£529	£606	£683	£760	£838	£915	£992	£1,069	£1,147	£1,224	£1,301	£1,378

Table 38: 2-way sensitivity analysis impact of uptake and completion rates: Datos Health

Uptake / Completion	0%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
0%	-£167	-£193	-£220	-£247	-£274	-£300	-£327	-£354	-£381	-£407	-£434	-£461	-£487	-£514	-£541	-£568	-£594	-£621	-£648	-£674	-£701
5%	-£167	-£189	-£211	-£233	-£256	-£278	-£300	-£322	-£345	-£367	-£389	-£411	-£433	-£456	-£478	-£500	-£522	-£545	-£567	-£589	-£611
10%	-£167	-£184	-£202	-£220	-£238	-£255	-£273	-£291	-£309	-£326	-£344	-£362	-£380	-£397	-£415	-£433	-£450	-£468	-£486	-£504	-£521
15%	-£167	-£180	-£193	-£206	-£220	-£233	-£246	-£259	-£273	-£286	-£299	-£312	-£326	-£339	-£352	-£365	-£379	-£392	-£405	-£418	-£431
20%	-£167	-£176	-£184	-£193	-£202	-£210	-£219	-£228	-£237	-£245	-£254	-£263	-£272	-£280	-£289	-£298	-£307	-£315	-£324	-£333	-£342
25%	-£167	-£171	-£175	-£180	-£184	-£188	-£192	-£196	-£201	-£205	-£209	-£213	-£218	-£222	-£226	-£230	-£235	-£239	-£243	-£247	-£252
30%	-£167	-£167	-£166	-£166	-£166	-£166	-£165	-£165	-£165	-£165	-£164	-£164	-£164	-£164	-£163	-£163	-£163	-£163	-£162	-£162	-£162
35%	-£167	-£162	-£157	-£153	-£148	-£143	-£138	-£134	-£129	-£124	-£119	-£115	-£110	-£105	-£100	-£96	-£91	-£86	-£81	-£77	-£72
40%	-£167	-£158	-£148	-£139	-£130	-£121	-£111	-£102	-£93	-£84	-£74	-£65	-£56	-£47	-£37	-£28	-£19	-£10	£0	£9	£18
45%	-£167	-£153	-£139	-£126	-£112	-£98	-£84	-£71	-£57	-£43	-£29	-£16	-£2	£12	£26	£39	£53	£67	£80	£94	£108
50%	-£167	-£149	-£130	-£112	-£94	-£76	-£57	-£39	-£21	-£3	£16	£34	£52	£70	£88	£107	£125	£143	£161	£180	£198
55%	-£167	-£144	-£121	-£99	-£76	-£53	-£30	-£8	£15	£38	£60	£83	£106	£129	£151	£174	£197	£220	£242	£265	£288
60%	-£167	-£140	-£112	-£85	-£58	-£31	-£3	£24	£51	£78	£105	£133	£160	£187	£214	£242	£269	£296	£323	£350	£378
65%	-£167	-£135	-£103	-£72	-£40	-£8	£24	£55	£87	£119	£150	£182	£214	£246	£277	£309	£341	£372	£404	£436	£468
70%	-£167	-£131	-£94	-£58	-£22	£14	£50	£87	£123	£159	£195	£232	£268	£304	£340	£376	£413	£449	£485	£521	£557
75%	-£167	-£126	-£85	-£45	-£4	£37	£77	£118	£159	£200	£240	£281	£322	£362	£403	£444	£484	£525	£566	£607	£647
80%	-£167	-£122	-£76	-£31	£14	£59	£104	£150	£195	£240	£285	£330	£376	£421	£466	£511	£556	£602	£647	£692	£737
85%	-£167	-£117	-£67	-£18	£32	£82	£131	£181	£231	£280	£330	£380	£430	£479	£529	£579	£628	£678	£728	£777	£827
90%	-£167	-£113	-£58	-£4	£50	£104	£158	£213	£267	£321	£375	£429	£483	£538	£592	£646	£700	£754	£809	£863	£917
95%	-£167	-£108	-£49	£9	£68	£127	£185	£244	£303	£361	£420	£479	£537	£596	£655	£713	£772	£831	£890	£948	£1,007
100%	-£167	-£104	-£40	£23	£86	£149	£212	£275	£339	£402	£465	£528	£591	£655	£718	£781	£844	£907	£970	£1,034	£1,097

Table 39: 2-way sensitivity analysis impact of uptake and completion rates: D REACH-HF

Uptake / Completion	0%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
0%	-£167	-£190	-£213	-£236	-£259	-£282	-£305	-£328	-£351	-£374	-£398	-£421	-£444	-£467	-£490	-£513	-£536	-£559	-£582	-£605	-£628
5%	-£167	-£186	-£205	-£224	-£242	-£261	-£280	-£299	-£318	-£337	-£356	-£375	-£394	-£413	-£432	-£451	-£469	-£488	-£507	-£526	-£545
10%	-£167	-£182	-£196	-£211	-£226	-£241	-£255	-£270	-£285	-£300	-£314	-£329	-£344	-£359	-£374	-£388	-£403	-£418	-£433	-£447	-£462
15%	-£167	-£177	-£188	-£199	-£209	-£220	-£230	-£241	-£252	-£262	-£273	-£284	-£294	-£305	-£315	-£326	-£337	-£347	-£358	-£368	-£379
20%	-£167	-£173	-£180	-£186	-£193	-£199	-£206	-£212	-£218	-£225	-£231	-£238	-£244	-£251	-£257	-£264	-£270	-£277	-£283	-£290	-£296
25%	-£167	-£169	-£171	-£174	-£176	-£178	-£181	-£183	-£185	-£188	-£190	-£192	-£194	-£197	-£199	-£201	-£204	-£206	-£208	-£211	-£213
30%	-£167	-£165	-£163	-£161	-£159	-£158	-£156	-£154	-£152	-£150	-£148	-£146	-£145	-£143	-£141	-£139	-£137	-£135	-£134	-£132	-£130
35%	-£167	-£161	-£155	-£149	-£143	-£137	-£131	-£125	-£119	-£113	-£107	-£101	-£95	-£89	-£83	-£77	-£71	-£65	-£59	-£53	-£47
40%	-£167	-£157	-£146	-£136	-£126	-£116	-£106	-£96	-£86	-£75	-£65	-£55	-£45	-£35	-£25	-£15	-£4	£6	£16	£26	£36
45%	-£167	-£152	-£138	-£124	-£110	-£95	-£81	-£67	-£52	-£38	-£24	-£9	£5	£19	£33	£48	£62	£76	£91	£105	£119
50%	-£167	-£148	-£130	-£111	-£93	-£74	-£56	-£38	-£19	-£1	£18	£36	£55	£73	£92	£110	£129	£147	£165	£184	£202
55%	-£167	-£144	-£122	-£99	-£76	-£54	-£31	-£9	£14	£37	£59	£82	£105	£127	£150	£172	£195	£218	£240	£263	£285
60%	-£167	-£140	-£113	-£86	-£60	-£33	-£6	£21	£47	£74	£101	£128	£154	£181	£208	£235	£261	£288	£315	£342	£368
65%	-£167	-£136	-£105	-£74	-£43	-£12	£19	£50	£81	£111	£142	£173	£204	£235	£266	£297	£328	£359	£390	£421	£452
70%	-£167	-£132	-£97	-£62	-£26	£9	£44	£79	£114	£149	£184	£219	£254	£289	£324	£359	£394	£429	£464	£500	£535
75%	-£167	-£128	-£88	-£49	-£10	£29	£69	£108	£147	£186	£225	£265	£304	£343	£382	£422	£461	£500	£539	£578	£618
80%	-£167	-£123	-£80	-£37	£7	£50	£93	£137	£180	£224	£267	£310	£354	£397	£440	£484	£527	£571	£614	£657	£701
85%	-£167	-£119	-£72	-£24	£23	£71	£118	£166	£213	£261	£308	£356	£404	£451	£499	£546	£594	£641	£689	£736	£784
90%	-£167	-£115	-£63	-£12	£40	£92	£143	£195	£247	£298	£350	£402	£453	£505	£557	£608	£660	£712	£763	£815	£867
95%	-£167	-£111	-£55	£1	£57	£112	£168	£224	£280	£336	£392	£447	£503	£559	£615	£671	£727	£782	£838	£894	£950
100%	-£167	-£107	-£47	£13	£73	£133	£193	£253	£313	£373	£433	£493	£553	£613	£673	£733	£793	£853	£913	£973	£1,033

Table 40: 2-way sensitivity analysis impact of uptake and completion rates: Digital Heart Manual

Uptake / Completion	0%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
0%	-£167	-£180	-£194	-£208	-£221	-£235	-£249	-£262	-£276	-£289	-£303	-£317	-£330	-£344	-£358	-£371	-£385	-£399	-£412	-£426	-£439
5%	-£167	-£176	-£185	-£194	-£203	-£212	-£222	-£231	-£240	-£249	-£258	-£267	-£276	-£286	-£295	-£304	-£313	-£322	-£331	-£340	-£350
10%	-£167	-£171	-£176	-£181	-£185	-£190	-£195	-£199	-£204	-£209	-£213	-£218	-£222	-£227	-£232	-£236	-£241	-£246	-£250	-£255	-£260
15%	-£167	-£167	-£167	-£167	-£167	-£168	-£168	-£168	-£168	-£168	-£168	-£168	-£169	-£169	-£169	-£169	-£169	-£169	-£169	-£170	-£170
20%	-£167	-£162	-£158	-£154	-£149	-£145	-£141	-£136	-£132	-£128	-£123	-£119	-£115	-£110	-£106	-£102	-£97	-£93	-£89	-£84	-£80
25%	-£167	-£158	-£149	-£140	-£131	-£123	-£114	-£105	-£96	-£87	-£78	-£70	-£61	-£52	-£43	-£34	-£25	-£16	-£8	£1	£10
30%	-£167	-£153	-£140	-£127	-£113	-£100	-£87	-£73	-£60	-£47	-£33	-£20	-£7	£7	£20	£33	£47	£60	£73	£87	£100
35%	-£167	-£149	-£131	-£113	-£95	-£78	-£60	-£42	-£24	-£6	£12	£29	£47	£65	£83	£101	£119	£136	£154	£172	£190
40%	-£167	-£144	-£122	-£100	-£77	-£55	-£33	-£10	£12	£34	£56	£79	£101	£123	£146	£168	£190	£213	£235	£257	£280
45%	-£167	-£140	-£113	-£86	-£59	-£33	-£6	£21	£48	£75	£101	£128	£155	£182	£209	£236	£262	£289	£316	£343	£370
50%	-£167	-£135	-£104	-£73	-£42	-£10	£21	£52	£84	£115	£146	£178	£209	£240	£272	£303	£334	£366	£397	£428	£460
55%	-£167	-£131	-£95	-£59	-£24	£12	£48	£84	£120	£156	£191	£227	£263	£299	£335	£370	£406	£442	£478	£514	£549
60%	-£167	-£126	-£86	-£46	-£6	£35	£75	£115	£156	£196	£236	£277	£317	£357	£397	£438	£478	£518	£559	£599	£639
65%	-£167	-£122	-£77	-£32	£12	£57	£102	£147	£192	£236	£281	£326	£371	£416	£460	£505	£550	£595	£640	£684	£729
70%	-£167	-£117	-£68	-£19	£30	£80	£129	£178	£228	£277	£326	£375	£425	£474	£523	£573	£622	£671	£721	£770	£819
75%	-£167	-£113	-£59	-£5	£48	£102	£156	£210	£264	£317	£371	£425	£479	£532	£586	£640	£694	£748	£801	£855	£909
80%	-£167	-£108	-£50	£8	£66	£125	£183	£241	£300	£358	£416	£474	£533	£591	£649	£707	£766	£824	£882	£941	£999
85%	-£167	-£104	-£41	£22	£84	£147	£210	£273	£335	£398	£461	£524	£587	£649	£712	£775	£838	£900	£963	£1,026	£1,089
90%	-£167	-£99	-£32	£35	£102	£170	£237	£304	£371	£439	£506	£573	£641	£708	£775	£842	£910	£977	£1,044	£1,111	£1,179
95%	-£167	-£95	-£23	£49	£120	£192	£264	£336	£407	£479	£551	£623	£694	£766	£838	£910	£982	£1,053	£1,125	£1,197	£1,269
100%	-£167	-£91	-£14	£62	£138	£215	£291	£367	£443	£520	£596	£672	£748	£825	£901	£977	£1,053	£1,130	£1,206	£1,282	£1,358

Table 41: 2-way sensitivity analysis impact of uptake and completion rates: Get Ready - Solution

Uptake / Completion	0%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
0%	-£167	-£183	-£199	-£215	-£231	-£247	-£263	-£279	-£295	-£311	-£327	-£343	-£359	-£375	-£391	-£407	-£423	-£439	-£455	-£471	-£487
5%	-£167	-£178	-£190	-£201	-£213	-£224	-£236	-£247	-£259	-£270	-£282	-£293	-£305	-£316	-£328	-£339	-£351	-£362	-£374	-£385	-£397
10%	-£167	-£174	-£181	-£188	-£195	-£202	-£209	-£216	-£223	-£230	-£237	-£244	-£251	-£258	-£265	-£272	-£279	-£286	-£293	-£300	-£307
15%	-£167	-£169	-£172	-£174	-£177	-£179	-£182	-£184	-£187	-£189	-£192	-£194	-£197	-£199	-£202	-£204	-£207	-£209	-£212	-£214	-£217
20%	-£167	-£165	-£163	-£161	-£159	-£157	-£155	-£153	-£151	-£149	-£147	-£145	-£143	-£141	-£139	-£137	-£135	-£133	-£131	-£129	-£127
25%	-£167	-£160	-£154	-£147	-£141	-£134	-£128	-£121	-£115	-£108	-£102	-£95	-£89	-£82	-£76	-£70	-£63	-£57	-£50	-£44	-£37
30%	-£167	-£156	-£145	-£134	-£123	-£112	-£101	-£90	-£79	-£68	-£57	-£46	-£35	-£24	-£13	-£2	£9	£20	£31	£42	£53
35%	-£167	-£151	-£136	-£120	-£105	-£89	-£74	-£58	-£43	-£28	-£12	£3	£19	£34	£50	£65	£81	£96	£112	£127	£143
40%	-£167	-£147	-£127	-£107	-£87	-£67	-£47	-£27	-£7	£13	£33	£53	£73	£93	£113	£133	£153	£173	£193	£213	£233
45%	-£167	-£142	-£118	-£93	-£69	-£44	-£20	£4	£29	£53	£78	£102	£127	£151	£176	£200	£225	£249	£274	£298	£322
50%	-£167	-£138	-£109	-£80	-£51	-£22	£7	£36	£65	£94	£123	£152	£181	£210	£239	£268	£297	£325	£354	£383	£412
55%	-£167	-£133	-£100	-£66	-£33	£0	£34	£67	£101	£134	£168	£201	£235	£268	£302	£335	£368	£402	£435	£469	£502
60%	-£167	-£129	-£91	-£53	-£15	£23	£61	£99	£137	£175	£213	£251	£289	£327	£364	£402	£440	£478	£516	£554	£592
65%	-£167	-£124	-£82	-£39	£3	£45	£88	£130	£173	£215	£258	£300	£343	£385	£427	£470	£512	£555	£597	£640	£682
70%	-£167	-£120	-£73	-£26	£21	£68	£115	£162	£209	£256	£303	£350	£396	£443	£490	£537	£584	£631	£678	£725	£772
75%	-£167	-£115	-£64	-£12	£39	£90	£142	£193	£245	£296	£348	£399	£450	£502	£553	£605	£656	£708	£759	£810	£862
80%	-£167	-£111	-£55	£1	£57	£113	£169	£225	£281	£337	£392	£448	£504	£560	£616	£672	£728	£784	£840	£896	£952
85%	-£167	-£106	-£46	£14	£75	£135	£196	£256	£317	£377	£437	£498	£558	£619	£679	£740	£800	£860	£921	£981	£1,042
90%	-£167	-£102	-£37	£28	£93	£158	£223	£288	£353	£417	£482	£547	£612	£677	£742	£807	£872	£937	£1,002	£1,067	£1,132
95%	-£167	-£97	-£28	£41	£111	£180	£250	£319	£389	£458	£527	£597	£666	£736	£805	£874	£944	£1,013	£1,083	£1,152	£1,221
100%	-£167	-£93	-£19	£55	£129	£203	£277	£351	£424	£498	£572	£646	£720	£794	£868	£942	£1,016	£1,090	£1,164	£1,237	£1,311

Table 42: 2-way sensitivity analysis impact of uptake and completion rates: Gro Health Heart Buddy

Uptake / Completion	0%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
0%	-£167	-£191	-£216	-£240	-£264	-£289	-£313	-£337	-£362	-£386	-£411	-£435	-£459	-£484	-£508	-£532	-£557	-£581	-£606	-£630	-£654
5%	-£167	-£187	-£206	-£226	-£246	-£266	-£286	-£306	-£326	-£345	-£365	-£385	-£405	-£425	-£445	-£465	-£484	-£504	-£524	-£544	-£564
10%	-£167	-£182	-£197	-£213	-£228	-£243	-£259	-£274	-£289	-£305	-£320	-£335	-£351	-£366	-£381	-£397	-£412	-£427	-£443	-£458	-£473
15%	-£167	-£178	-£188	-£199	-£210	-£221	-£232	-£242	-£253	-£264	-£275	-£286	-£297	-£307	-£318	-£329	-£340	-£351	-£361	-£372	-£383
20%	-£167	-£173	-£179	-£186	-£192	-£198	-£205	-£211	-£217	-£223	-£230	-£236	-£242	-£249	-£255	-£261	-£267	-£274	-£280	-£286	-£293
25%	-£167	-£169	-£170	-£172	-£174	-£176	-£177	-£179	-£181	-£183	-£184	-£186	-£188	-£190	-£192	-£193	-£195	-£197	-£199	-£200	-£202
30%	-£167	-£164	-£161	-£159	-£156	-£153	-£150	-£148	-£145	-£142	-£139	-£136	-£134	-£131	-£128	-£125	-£123	-£120	-£117	-£114	-£112
35%	-£167	-£159	-£152	-£145	-£138	-£130	-£123	-£116	-£109	-£101	-£94	-£87	-£79	-£72	-£65	-£58	-£50	-£43	-£36	-£29	-£21
40%	-£167	-£155	-£143	-£131	-£120	-£108	-£96	-£84	-£72	-£61	-£49	-£37	-£25	-£13	-£2	£10	£22	£34	£46	£57	£69
45%	-£167	-£150	-£134	-£118	-£102	-£85	-£69	-£53	-£36	-£20	-£4	£13	£29	£45	£62	£78	£94	£111	£127	£143	£160
50%	-£167	-£146	-£125	-£104	-£83	-£63	-£42	-£21	£0	£21	£42	£62	£83	£104	£125	£146	£167	£187	£208	£229	£250
55%	-£167	-£141	-£116	-£91	-£65	-£40	-£15	£11	£36	£61	£87	£112	£138	£163	£188	£214	£239	£264	£290	£315	£340
60%	-£167	-£137	-£107	-£77	-£47	-£17	£13	£42	£72	£102	£132	£162	£192	£222	£252	£281	£311	£341	£371	£401	£431
65%	-£167	-£132	-£98	-£64	-£29	£5	£40	£74	£108	£143	£177	£212	£246	£280	£315	£349	£384	£418	£452	£487	£521
70%	-£167	-£128	-£89	-£50	-£11	£28	£67	£106	£145	£184	£222	£261	£300	£339	£378	£417	£456	£495	£534	£573	£612
75%	-£167	-£123	-£80	-£36	£7	£50	£94	£137	£181	£224	£268	£311	£355	£398	£441	£485	£528	£572	£615	£659	£702
80%	-£167	-£119	-£71	-£23	£25	£73	£121	£169	£217	£265	£313	£361	£409	£457	£505	£553	£601	£649	£697	£745	£793
85%	-£167	-£114	-£62	-£9	£43	£96	£148	£201	£253	£306	£358	£411	£463	£516	£568	£621	£673	£726	£778	£831	£883
90%	-£167	-£110	-£53	£4	£61	£118	£175	£232	£289	£346	£403	£460	£517	£574	£631	£688	£745	£802	£859	£916	£973
95%	-£167	-£105	-£44	£18	£79	£141	£202	£264	£325	£387	£449	£510	£572	£633	£695	£756	£818	£879	£941	£1,002	£1,064
100%	-£167	-£101	-£35	£31	£97	£164	£230	£296	£362	£428	£494	£560	£626	£692	£758	£824	£890	£956	£1,022	£1,088	£1,154

Table 43: 2-way sensitivity analysis impact of uptake and completion rates: Ki Activ

Uptake / Completion	0%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
0%	-£167	-£186	-£206	-£225	-£245	-£264	-£284	-£303	-£322	-£342	-£361	-£381	-£400	-£420	-£439	-£459	-£478	-£498	-£517	-£537	-£556
5%	-£167	-£182	-£197	-£212	-£227	-£242	-£257	-£272	-£287	-£301	-£316	-£331	-£346	-£361	-£376	-£391	-£406	-£421	-£436	-£451	-£466
10%	-£167	-£177	-£188	-£198	-£209	-£219	-£230	-£240	-£251	-£261	-£271	-£282	-£292	-£303	-£313	-£324	-£334	-£345	-£355	-£366	-£376
15%	-£167	-£173	-£179	-£185	-£191	-£197	-£203	-£209	-£215	-£221	-£227	-£233	-£238	-£244	-£250	-£256	-£262	-£268	-£274	-£280	-£286
20%	-£167	-£168	-£170	-£171	-£173	-£174	-£176	-£177	-£179	-£180	-£182	-£183	-£185	-£186	-£188	-£189	-£190	-£192	-£193	-£195	-£196
25%	-£167	-£164	-£161	-£158	-£155	-£152	-£149	-£146	-£143	-£140	-£137	-£134	-£131	-£128	-£125	-£122	-£119	-£116	-£113	-£110	-£107
30%	-£167	-£159	-£152	-£144	-£137	-£129	-£122	-£114	-£107	-£99	-£92	-£84	-£77	-£69	-£62	-£54	-£47	-£39	-£32	-£24	-£17
35%	-£167	-£155	-£143	-£131	-£119	-£107	-£95	-£83	-£71	-£59	-£47	-£35	-£23	-£11	£1	£13	£25	£37	£49	£61	£73
40%	-£167	-£150	-£134	-£117	-£101	-£84	-£68	-£51	-£35	-£18	-£2	£15	£31	£48	£64	£81	£97	£114	£130	£147	£163
45%	-£167	-£146	-£125	-£104	-£83	-£62	-£41	-£20	£1	£22	£43	£64	£85	£106	£127	£148	£169	£190	£211	£232	£253
50%	-£167	-£141	-£116	-£90	-£65	-£39	-£14	£12	£37	£63	£88	£114	£139	£165	£190	£216	£241	£266	£292	£317	£343
55%	-£167	-£137	-£107	-£77	-£47	-£17	£13	£43	£73	£103	£133	£163	£193	£223	£253	£283	£313	£343	£373	£403	£433
60%	-£167	-£132	-£98	-£63	-£29	£6	£40	£75	£109	£144	£178	£212	£247	£281	£316	£350	£385	£419	£454	£488	£523
65%	-£167	-£128	-£89	-£50	-£11	£28	£67	£106	£145	£184	£223	£262	£301	£340	£379	£418	£457	£496	£535	£574	£613
70%	-£167	-£123	-£80	-£36	£7	£51	£94	£137	£181	£224	£268	£311	£355	£398	£442	£485	£529	£572	£616	£659	£703
75%	-£167	-£119	-£71	-£23	£25	£73	£121	£169	£217	£265	£313	£361	£409	£457	£505	£553	£601	£649	£697	£744	£792
80%	-£167	-£114	-£62	-£9	£43	£96	£148	£200	£253	£305	£358	£410	£463	£515	£568	£620	£673	£725	£777	£830	£882
85%	-£167	-£110	-£53	£4	£61	£118	£175	£232	£289	£346	£403	£460	£517	£574	£631	£687	£744	£801	£858	£915	£972
90%	-£167	-£105	-£44	£18	£79	£140	£202	£263	£325	£386	£448	£509	£571	£632	£693	£755	£816	£878	£939	£1,001	£1,062
95%	-£167	-£101	-£35	£31	£97	£163	£229	£295	£361	£427	£493	£559	£624	£690	£756	£822	£888	£954	£1,020	£1,086	£1,152
100%	-£167	-£96	-£26	£45	£115	£185	£256	£326	£397	£467	£538	£608	£678	£749	£819	£890	£960	£1,031	£1,101	£1,171	£1,242

Table 44: 2-way sensitivity analysis impact of uptake and completion rates: Luscii vitals

Uptake / Completion	0%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
0%	-£167	-£179	-£192	-£205	-£217	-£230	-£243	-£255	-£268	-£281	-£294	-£306	-£319	-£332	-£344	-£357	-£370	-£382	-£395	-£408	-£420
5%	-£167	-£175	-£183	-£191	-£199	-£208	-£216	-£224	-£232	-£240	-£249	-£257	-£265	-£273	-£281	-£289	-£298	-£306	-£314	-£322	-£330
10%	-£167	-£170	-£174	-£178	-£182	-£185	-£189	-£193	-£196	-£200	-£204	-£207	-£211	-£215	-£218	-£222	-£226	-£229	-£233	-£237	-£240
15%	-£167	-£166	-£165	-£164	-£164	-£163	-£162	-£161	-£160	-£159	-£159	-£158	-£157	-£156	-£155	-£155	-£154	-£153	-£152	-£151	-£151
20%	-£167	-£161	-£156	-£151	-£146	-£140	-£135	-£130	-£124	-£119	-£114	-£108	-£103	-£98	-£93	-£87	-£82	-£77	-£71	-£66	-£61
25%	-£167	-£157	-£147	-£137	-£128	-£118	-£108	-£98	-£88	-£79	-£69	-£59	-£49	-£39	-£30	-£20	-£10	£0	£10	£19	£29
30%	-£167	-£152	-£138	-£124	-£110	-£95	-£81	-£67	-£52	-£38	-£24	-£10	£5	£19	£33	£48	£62	£76	£91	£105	£119
35%	-£167	-£148	-£129	-£110	-£92	-£73	-£54	-£35	-£16	£2	£21	£40	£59	£77	£96	£115	£134	£153	£171	£190	£209
40%	-£167	-£143	-£120	-£97	-£74	-£50	-£27	-£4	£19	£43	£66	£89	£113	£136	£159	£182	£206	£229	£252	£276	£299
45%	-£167	-£139	-£111	-£83	-£56	-£28	£0	£28	£55	£83	£111	£139	£167	£194	£222	£250	£278	£305	£333	£361	£389
50%	-£167	-£134	-£102	-£70	-£38	-£5	£27	£59	£91	£124	£156	£188	£221	£253	£285	£317	£350	£382	£414	£446	£479
55%	-£167	-£130	-£93	-£56	-£20	£17	£54	£91	£127	£164	£201	£238	£274	£311	£348	£385	£422	£458	£495	£532	£569
60%	-£167	-£126	-£84	-£43	-£2	£40	£81	£122	£163	£205	£246	£287	£328	£370	£411	£452	£493	£535	£576	£617	£658
65%	-£167	-£121	-£75	-£29	£16	£62	£108	£154	£199	£245	£291	£337	£382	£428	£474	£520	£565	£611	£657	£703	£748
70%	-£167	-£117	-£66	-£16	£34	£84	£135	£185	£235	£285	£336	£386	£436	£487	£537	£587	£637	£688	£738	£788	£838
75%	-£167	-£112	-£57	-£3	£52	£107	£162	£216	£271	£326	£381	£435	£490	£545	£600	£654	£709	£764	£819	£873	£928
80%	-£167	-£108	-£48	£11	£70	£129	£189	£248	£307	£366	£426	£485	£544	£603	£663	£722	£781	£840	£900	£959	£1,018
85%	-£167	-£103	-£39	£24	£88	£152	£216	£279	£343	£407	£471	£534	£598	£662	£726	£789	£853	£917	£980	£1,044	£1,108
90%	-£167	-£99	-£30	£38	£106	£174	£243	£311	£379	£447	£516	£584	£652	£720	£788	£857	£925	£993	£1,061	£1,130	£1,198
95%	-£167	-£94	-£21	£51	£124	£197	£270	£342	£415	£488	£560	£633	£706	£779	£851	£924	£997	£1,070	£1,142	£1,215	£1,288
100%	-£167	-£90	-£12	£65	£142	£219	£297	£374	£451	£528	£605	£683	£760	£837	£914	£992	£1,069	£1,146	£1,223	£1,300	£1,378

Table 45: 2-way sensitivity analysis impact of uptake and completion rates: myHeart

Uptake / Completion	0%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
0%	-£167	-£182	-£198	-£214	-£229	-£245	-£261	-£276	-£292	-£308	-£323	-£339	-£355	-£370	-£386	-£402	-£417	-£433	-£449	-£464	-£480
5%	-£167	-£178	-£189	-£200	-£211	-£223	-£234	-£245	-£256	-£267	-£278	-£290	-£301	-£312	-£323	-£334	-£346	-£357	-£368	-£379	-£390
10%	-£167	-£173	-£180	-£187	-£193	-£200	-£207	-£214	-£220	-£227	-£234	-£240	-£247	-£254	-£260	-£267	-£274	-£280	-£287	-£294	-£300
15%	-£167	-£169	-£171	-£173	-£175	-£178	-£180	-£182	-£184	-£186	-£189	-£191	-£193	-£195	-£197	-£200	-£202	-£204	-£206	-£208	-£210
20%	-£167	-£164	-£162	-£160	-£158	-£155	-£153	-£151	-£148	-£146	-£144	-£141	-£139	-£137	-£134	-£132	-£130	-£127	-£125	-£123	-£121
25%	-£167	-£160	-£153	-£146	-£140	-£133	-£126	-£119	-£112	-£106	-£99	-£92	-£85	-£78	-£71	-£65	-£58	-£51	-£44	-£37	-£31
30%	-£167	-£155	-£144	-£133	-£122	-£110	-£99	-£88	-£76	-£65	-£54	-£42	-£31	-£20	-£9	£3	£14	£25	£37	£48	£59
35%	-£167	-£151	-£135	-£119	-£104	-£88	-£72	-£56	-£40	-£25	-£9	£7	£23	£39	£54	£70	£86	£102	£118	£133	£149
40%	-£167	-£146	-£126	-£106	-£86	-£65	-£45	-£25	-£4	£16	£36	£56	£77	£97	£117	£138	£158	£178	£198	£219	£239
45%	-£167	-£142	-£117	-£92	-£68	-£43	-£18	£7	£32	£56	£81	£106	£131	£155	£180	£205	£230	£255	£279	£304	£329
50%	-£167	-£137	-£108	-£79	-£50	-£20	£9	£38	£67	£97	£126	£155	£185	£214	£243	£272	£302	£331	£360	£390	£419
55%	-£167	-£133	-£99	-£65	-£32	£2	£36	£70	£103	£137	£171	£205	£239	£272	£306	£340	£374	£407	£441	£475	£509
60%	-£167	-£128	-£90	-£52	-£14	£25	£63	£101	£139	£178	£216	£254	£292	£331	£369	£407	£446	£484	£522	£560	£599
65%	-£167	-£124	-£81	-£38	£4	£47	£90	£133	£175	£218	£261	£304	£346	£389	£432	£475	£517	£560	£603	£646	£689
70%	-£167	-£120	-£72	-£25	£22	£70	£117	£164	£211	£259	£306	£353	£400	£448	£495	£542	£589	£637	£684	£731	£778
75%	-£167	-£115	-£63	-£12	£40	£92	£144	£196	£247	£299	£351	£403	£454	£506	£558	£610	£661	£713	£765	£817	£868
80%	-£167	-£111	-£54	£2	£58	£114	£171	£227	£283	£339	£396	£452	£508	£564	£621	£677	£733	£789	£846	£902	£958
85%	-£167	-£106	-£45	£15	£76	£137	£198	£258	£319	£380	£441	£501	£562	£623	£684	£744	£805	£866	£927	£987	£1,048
90%	-£167	-£102	-£36	£29	£94	£159	£225	£290	£355	£420	£486	£551	£616	£681	£747	£812	£877	£942	£1,008	£1,073	£1,138
95%	-£167	-£97	-£27	£42	£112	£182	£252	£321	£391	£461	£531	£600	£670	£740	£809	£879	£949	£1,019	£1,088	£1,158	£1,228
100%	-£167	-£93	-£18	£56	£130	£204	£279	£353	£427	£501	£576	£650	£724	£798	£872	£947	£1,021	£1,095	£1,169	£1,244	£1,318

Table 46: 2-way sensitivity analysis impact of uptake and completion rates: Pumping Marvellous

Uptake / Completion	0%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
0%	-£167	-£179	-£191	-£204	-£216	-£228	-£241	-£253	-£265	-£278	-£290	-£302	-£315	-£327	-£339	-£352	-£364	-£376	-£389	-£401	-£413
5%	-£167	-£175	-£182	-£190	-£198	-£206	-£214	-£222	-£229	-£237	-£245	-£253	-£261	-£269	-£277	-£284	-£292	-£300	-£308	-£316	-£324
10%	-£167	-£170	-£173	-£177	-£180	-£183	-£187	-£190	-£194	-£197	-£200	-£204	-£207	-£210	-£214	-£217	-£220	-£224	-£227	-£230	-£234
15%	-£167	-£166	-£164	-£163	-£162	-£161	-£160	-£159	-£158	-£156	-£155	-£154	-£153	-£152	-£151	-£150	-£148	-£147	-£146	-£145	-£144
20%	-£167	-£161	-£155	-£150	-£144	-£139	-£133	-£127	-£122	-£116	-£110	-£105	-£99	-£93	-£88	-£82	-£76	-£71	-£65	-£60	-£54
25%	-£167	-£157	-£146	-£136	-£126	-£116	-£106	-£96	-£86	-£76	-£65	-£55	-£45	-£35	-£25	-£15	-£5	£6	£16	£26	£36
30%	-£167	-£152	-£137	-£123	-£108	-£94	-£79	-£64	-£50	-£35	-£20	-£6	£9	£23	£38	£53	£67	£82	£97	£111	£126
35%	-£167	-£148	-£129	-£109	-£90	-£71	-£52	-£33	-£14	£5	£25	£44	£63	£82	£101	£120	£139	£158	£178	£197	£216
40%	-£167	-£143	-£120	-£96	-£72	-£49	-£25	-£1	£22	£46	£69	£93	£117	£140	£164	£188	£211	£235	£258	£282	£306
45%	-£167	-£139	-£111	-£82	-£54	-£26	£2	£30	£58	£86	£114	£143	£171	£199	£227	£255	£283	£311	£339	£367	£396
50%	-£167	-£134	-£102	-£69	-£36	-£4	£29	£62	£94	£127	£159	£192	£225	£257	£290	£322	£355	£388	£420	£453	£486
55%	-£167	-£130	-£93	-£55	-£18	£19	£56	£93	£130	£167	£204	£241	£279	£316	£353	£390	£427	£464	£501	£538	£575
60%	-£167	-£125	-£84	-£42	£0	£41	£83	£124	£166	£208	£249	£291	£332	£374	£416	£457	£499	£540	£582	£624	£665
65%	-£167	-£121	-£75	-£28	£18	£64	£110	£156	£202	£248	£294	£340	£386	£433	£479	£525	£571	£617	£663	£709	£755
70%	-£167	-£116	-£66	-£15	£36	£86	£137	£187	£238	£289	£339	£390	£440	£491	£542	£592	£643	£693	£744	£794	£845
75%	-£167	-£112	-£57	-£2	£54	£109	£164	£219	£274	£329	£384	£439	£494	£549	£604	£660	£715	£770	£825	£880	£935
80%	-£167	-£107	-£48	£12	£72	£131	£191	£250	£310	£369	£429	£489	£548	£608	£667	£727	£787	£846	£906	£965	£1,025
85%	-£167	-£103	-£39	£25	£90	£154	£218	£282	£346	£410	£474	£538	£602	£666	£730	£794	£858	£923	£987	£1,051	£1,115
90%	-£167	-£98	-£30	£39	£108	£176	£245	£313	£382	£450	£519	£588	£656	£725	£793	£862	£930	£999	£1,068	£1,136	£1,205
95%	-£167	-£94	-£21	£52	£125	£199	£272	£345	£418	£491	£564	£637	£710	£783	£856	£929	£1,002	£1,075	£1,148	£1,221	£1,295
100%	-£167	-£89	-£12	£66	£143	£221	£299	£376	£454	£531	£609	£686	£764	£842	£919	£997	£1,074	£1,152	£1,229	£1,307	£1,384

Table 47: 2-way sensitivity analysis impact of uptake and completion rates: R Plus Health

Uptake / Completion	0%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
0%	-£167	-£186	-£206	-£225	-£245	-£264	-£284	-£303	-£322	-£342	-£361	-£381	-£400	-£420	-£439	-£459	-£478	-£498	-£517	-£537	-£556
5%	-£167	-£181	-£195	-£210	-£224	-£238	-£253	-£267	-£281	-£296	-£310	-£324	-£339	-£353	-£367	-£382	-£396	-£410	-£425	-£439	-£453
10%	-£167	-£176	-£185	-£194	-£204	-£213	-£222	-£231	-£240	-£249	-£259	-£268	-£277	-£286	-£295	-£305	-£314	-£323	-£332	-£341	-£350
15%	-£167	-£171	-£175	-£179	-£183	-£187	-£191	-£195	-£199	-£203	-£207	-£211	-£215	-£219	-£223	-£227	-£232	-£236	-£240	-£244	-£248
20%	-£167	-£166	-£165	-£164	-£162	-£161	-£160	-£159	-£158	-£157	-£156	-£155	-£154	-£153	-£152	-£150	-£149	-£148	-£147	-£146	-£145
25%	-£167	-£161	-£154	-£148	-£142	-£136	-£129	-£123	-£117	-£111	-£104	-£98	-£92	-£86	-£80	-£73	-£67	-£61	-£55	-£48	-£42
30%	-£167	-£155	-£144	-£133	-£121	-£110	-£99	-£87	-£76	-£64	-£53	-£42	-£30	-£19	-£8	£4	£15	£26	£38	£49	£61
35%	-£167	-£150	-£134	-£117	-£101	-£84	-£68	-£51	-£35	-£18	-£2	£15	£31	£48	£64	£81	£97	£114	£130	£147	£163
40%	-£167	-£145	-£123	-£102	-£80	-£59	-£37	-£15	£6	£28	£50	£71	£93	£115	£136	£158	£179	£201	£223	£244	£266
45%	-£167	-£140	-£113	-£86	-£60	-£33	-£6	£21	£47	£74	£101	£128	£155	£181	£208	£235	£262	£288	£315	£342	£369
50%	-£167	-£135	-£103	-£71	-£39	-£7	£25	£57	£89	£120	£152	£184	£216	£248	£280	£312	£344	£376	£408	£440	£472
55%	-£167	-£130	-£93	-£56	-£19	£18	£56	£93	£130	£167	£204	£241	£278	£315	£352	£389	£426	£463	£500	£537	£574
60%	-£167	-£125	-£82	-£40	£2	£44	£86	£129	£171	£213	£255	£297	£340	£382	£424	£466	£508	£550	£593	£635	£677
65%	-£167	-£119	-£72	-£25	£23	£70	£117	£165	£212	£259	£307	£354	£401	£449	£496	£543	£590	£638	£685	£732	£780
70%	-£167	-£114	-£62	-£9	£43	£96	£148	£200	£253	£305	£358	£410	£463	£515	£568	£620	£673	£725	£778	£830	£883
75%	-£167	-£109	-£52	£6	£64	£121	£179	£236	£294	£352	£409	£467	£524	£582	£640	£697	£755	£813	£870	£928	£985
80%	-£167	-£104	-£41	£21	£84	£147	£210	£272	£335	£398	£461	£523	£586	£649	£712	£774	£837	£900	£963	£1,025	£1,088
85%	-£167	-£99	-£31	£37	£105	£173	£241	£308	£376	£444	£512	£580	£648	£716	£784	£851	£919	£987	£1,055	£1,123	£1,191
90%	-£167	-£94	-£21	£52	£125	£198	£271	£344	£417	£490	£563	£636	£709	£782	£855	£928	£1,002	£1,075	£1,148	£1,221	£1,294
95%	-£167	-£89	-£10	£68	£146	£224	£302	£380	£458	£537	£615	£693	£771	£849	£927	£1,006	£1,084	£1,162	£1,240	£1,318	£1,396
100%	-£167	-£83	£0	£83	£166	£250	£333	£416	£500	£583	£666	£749	£833	£916	£999	£1,083	£1,166	£1,249	£1,333	£1,416	£1,499

Table 48: 2-way sensitivity analysis impact of uptake and completion rates: Sword Move

Uptake / Completion	0%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
0%	-£167	-£188	-£210	-£232	-£254	-£275	-£297	-£319	-£340	-£362	-£384	-£406	-£427	-£449	-£471	-£492	-£514	-£536	-£558	-£579	-£601
5%	-£167	-£184	-£201	-£218	-£236	-£253	-£270	-£287	-£304	-£322	-£339	-£356	-£373	-£391	-£408	-£425	-£442	-£459	-£477	-£494	-£511
10%	-£167	-£179	-£192	-£205	-£218	-£230	-£243	-£256	-£269	-£281	-£294	-£307	-£319	-£332	-£345	-£358	-£370	-£383	-£396	-£408	-£421
15%	-£167	-£175	-£183	-£191	-£200	-£208	-£216	-£224	-£233	-£241	-£249	-£257	-£265	-£274	-£282	-£290	-£298	-£307	-£315	-£323	-£331
20%	-£167	-£170	-£174	-£178	-£182	-£185	-£189	-£193	-£197	-£200	-£204	-£208	-£212	-£215	-£219	-£223	-£226	-£230	-£234	-£238	-£241
25%	-£167	-£166	-£165	-£164	-£164	-£163	-£162	-£161	-£161	-£160	-£159	-£158	-£158	-£157	-£156	-£155	-£155	-£154	-£153	-£152	-£151
30%	-£167	-£162	-£156	-£151	-£146	-£140	-£135	-£130	-£125	-£119	-£114	-£109	-£104	-£98	-£93	-£88	-£83	-£77	-£72	-£67	-£62
35%	-£167	-£157	-£147	-£138	-£128	-£118	-£108	-£98	-£89	-£79	-£69	-£59	-£50	-£40	-£30	-£20	-£11	-£1	£9	£19	£28
40%	-£167	-£153	-£138	-£124	-£110	-£96	-£81	-£67	-£53	-£39	-£24	-£10	£4	£18	£33	£47	£61	£75	£90	£104	£118
45%	-£167	-£148	-£129	-£111	-£92	-£73	-£54	-£36	-£17	£2	£21	£39	£58	£77	£96	£114	£133	£152	£171	£189	£208
50%	-£167	-£144	-£120	-£97	-£74	-£51	-£27	-£4	£19	£42	£66	£89	£112	£135	£159	£182	£205	£228	£252	£275	£298
55%	-£167	-£139	-£111	-£84	-£56	-£28	£0	£27	£55	£83	£111	£138	£166	£194	£222	£249	£277	£305	£332	£360	£388
60%	-£167	-£135	-£102	-£70	-£38	-£6	£27	£59	£91	£123	£156	£188	£220	£252	£284	£317	£349	£381	£413	£446	£478
65%	-£167	-£130	-£93	-£57	-£20	£17	£54	£90	£127	£164	£200	£237	£274	£311	£347	£384	£421	£458	£494	£531	£568
70%	-£167	-£126	-£84	-£43	-£2	£39	£81	£122	£163	£204	£245	£287	£328	£369	£410	£452	£493	£534	£575	£616	£658
75%	-£167	-£121	-£75	-£30	£16	£62	£108	£153	£199	£245	£290	£336	£382	£427	£473	£519	£565	£610	£656	£702	£747
80%	-£167	-£117	-£66	-£16	£34	£84	£134	£185	£235	£285	£335	£386	£436	£486	£536	£586	£637	£687	£737	£787	£837
85%	-£167	-£112	-£57	-£3	£52	£107	£161	£216	£271	£326	£380	£435	£490	£544	£599	£654	£708	£763	£818	£873	£927
90%	-£167	-£108	-£48	£11	£70	£129	£188	£248	£307	£366	£425	£484	£544	£603	£662	£721	£780	£840	£899	£958	£1,017
95%	-£167	-£103	-£39	£24	£88	£152	£215	£279	£343	£406	£470	£534	£598	£661	£725	£789	£852	£916	£980	£1,043	£1,107
100%	-£167	-£99	-£30	£38	£106	£174	£242	£311	£379	£447	£515	£583	£651	£720	£788	£856	£924	£992	£1,061	£1,129	£1,197

NICE Health Tech Programme

GID-HTE10060 Digital platforms to support cardiac rehabilitation: Early Value Assessment

Economic model

Collated comments table

Any confidential sections of the information provided should be underlined and highlighted. Please underline all confidential information, and separately highlight information that is 'commercial in confidence' in blue and all that is 'academic in confidence' in yellow

Economic model – Collated comments table:

Issue	Stakeholder	Description of problem	Description of proposed amendment	Result of amended model or expected impact on the result (if applicable)	EAG Response

1.	R Plus health	On age 66, section 7.3.3.1, we noted the statement in the assessment documentation: "R Plus Health did not provide any information on the cost to the NHS of a licence for their technology." For clarity, our initial submission did include a pricing structure based on tiered annual subscription fees per NHS Trust, determined by bed capacity. We understand now that this format may not have provided the direct per-patient cost metric preferred for your economic models.	Our revised submission will therefore present a per-patient fee structure, which we trust will directly address this requirement and facilitate your evaluation. Please refer to the information below: Section 2.1: Technology Cost - R Plus Health R Plus Health's primary commercial offering to NHS Trusts is Model B: a Tiered Annual Subscription Fee per NHS Trust (Based on Bed Capacity). This model is designed to provide budget predictability and administrative simplicity for NHS Trusts, with a fixed annual cost allowing for unlimited eligible patient use within the licensed Trust for the specified tier over a 12-month period. To facilitate NICE's health economic modelling, which often utilizes a per-patient program cost metric, we also provide Model A: an equivalent Per-Patient Programme Fee structure. This model calculates an effective cost per patient per cardiac rehabilitation programme cycle. Core Technology Cost: **MODEL A**: Per-Patient Programme Fee (Equivalent Cost for NICE Economic Modelling) The core cost of our technology, R Plus Health, is based on a per-patient program	We have not re-run the EAG's economic model. However, we can describe our expectation of how using our newly provided UK cost data would impact the results. The EAG's analysis calculated an EJP that was noted to be "higher than the licence costs for the majority of technologies with known costs." This suggests that the clinical effectiveness data for R Plus Health (e.g., QALY gains of 0.09727 and 0.0324 as seen in our studies) is robust enough to justify a relatively high price within the UK's cost-effectiveness framework. Our newly submitted representative cost for an average-sized service is £55	We thank the company for the information. This was not initially provided to the EAG due to an oversight. We have now re-run the analysis incorporating the information and updated our report accordingly.

			fee. The estimated per-patient program fee (excluding VAT) is in the range of **£30 - £80 per patient**. The specific price point within this range for an NHS Trust or service would typically depend on factors such as the anticipated volume of enrolled patients, with higher volumes generally attracting a per-patient cost towards the lower end of this range. For NICE economic modelling purposes, considering an average UK cardiac rehabilitation service size (approx. 290 patients/year per NACR data), **a representative per-patient fee of £55 can be considered**. **MODEL B**: Tiered Annual Subscription Fee per NHS Trust (Primary Commercial Model) Our primary pricing model is an annual subscription fee (excluding VAT) based on the NHS Trust's total bed capacity, granting a 12-month licence for unlimited eligible patient use: The proposed annual subscription fees are tiered as follows: Tier 1: Trusts with less than 100 beds: £5,000-12,000 per annum Tier 2: Trusts with 101 - 300 beds: £15,000-30,000 per annum Tier 3: Trusts with 301 - 500 beds: £35,000-50,000 per annum	per patient per programme (Model A). This commercially intended price is demonstrably low. Our own health economic studies, although in a different currency, have already shown favourable ICERs based on our technology's effectiveness. Therefore, we expect that when our low UK-specific cost of £55 per patient is combined with the strong clinical effectiveness data already assessed by the EAG, the resulting UK-based ICER will be highly favourable and fall well below the standard NICE cost-effectiveness threshold of £20,000 per QALY gained.	

			Tier 4: Trusts with 501 - 800 beds: £55,000 - 90,000 per annum * Trusts exceeding 800 beds: Price to be determined following detailed discussion of specific needs and scale. 2. Additional Costs (Applicable irrespective of the model chosen by the Trust, unless otherwise specified): Capital Costs: None. Our solution is SaaS-based. Hardware Costs (Patient-Side): Not included. Patients use their own compatible devices or these are procured separately by the patient or Trust. A heart rate monitor with Bluetooth is needed for them to fully benefit from the heart rate monitored CR exercise features, which is NOT included in both models. We do not sell or supply hardware devices, but we can provide a list of recommended compatible devices from various third-party manufacturers to guide procurement. Bespoke Development: Scoped and priced separately if required. Not included in standard fees. Training Costs: A fee of £100.00 per staff member trained (excluding VAT) applies for both initial and subsequent training. Service Delivery Costs (beyond standard): Standard remote setup included. Extensive on-site support priced separately if required. 3. Ongoing Costs:		

			Potential additional ongoing costs for both approaches include fees for training additional staff members or for bespoke development with ongoing service agreements. 4. Currency: All costs are in Great British Pounds (GBP). 5. VAT Status: All costs exclude Value Added Tax (VAT).		

2.	R Plus health	On page 76, section 7.41, we noted the statement in the assessment documentation: "There was one technology where no licence costs were available, R Plus Health; for that technology the EJP rather than the ICER is likely most informative. In this case, the EJP indicated a justifiable price higher than the licence costs for the majority of technologies with known costs." The current statement presents two core issues: It inaccurately states that "no licence costs were available." Our initial submission did provided a pricing structure (Model B: Tiered Annual Subscription). We now understand this format was not optimally suited for direct modelling, which led to this conclusion. 2. It results in an analysis based on a theoretical price (EJP) rather than our actual commercial offer. While we note the positive finding that the EJP was high, an analysis based on our actual pricing is required for a fair and accurate assessment of cost-effectiveness.	To resolve this, we have provided a new submission with a direct per-patient programme fee [Model A, The estimated per-patient program fee (excluding VAT) is in the range of £30 - £80 per patient. For NICE economic modelling purposes, considering an average UK cardiac rehabilitation service size (approx. 290 patients/year per NACR data), a representative per-patient fee of £55 can be considered.], offering the precise unit cost needed for a standard ICER calculation. As clear and applicable licence costs are now available, we believe the ICER, calculated using our revised cost data, is now the most informative and appropriate measure for assessing the cost-effectiveness of R Plus Health, rather than the EJP. We request that the analysis be updated accordingly.	We have not re-run the EAG's economic model. However, we can describe our expectation of how using our newly provided UK cost data would impact the results. The EAG's analysis calculated an EJP that was noted to be "higher than the licence costs for the majority of technologies with known costs." This suggests that the clinical effectiveness data for R Plus Health (e.g., QALY gains of 0.09727 and 0.0324 as seen in our studies) is robust enough to justify a relatively high price within the UK's cost-effectiveness framework. Our newly submitted representative cost for an average-sized service is £55	As per our response above, we have now updated our report.

				per patient per programme (Model A). This commercially intended price is demonstrably low. Our own health economic studies, although in a different currency, have already shown favourable ICERs based on our technology's effectiveness. Therefore, we expect that when our low UK-specific cost of £55 per patient is combined with the strong clinical effectiveness data already assessed by the EAG, the resulting UK-based ICER will be highly favourable and fall well below the standard NICE cost-effectiveness threshold of £20,000 per QALY gained.	

3.	Ki performance lifestyle Ltd.	Having selected the technology on the 'Model_settings' tab, it seems to change after having run an analysis. This requires it to be checked after every simulation to ensure target technology is selected.	It would be good to check the functionality to avoid any confusion with analyses run.	No impact on model results, but improved usability.	This is due to the model running through each tech sequentially to generate the full results. Unfortunately we are not able to change this behaviour for this model but will bear the comment in mind for future analyses.
4.	Ki performance lifestyle Ltd.	In the 'Parameters' tab, where input data for analyses is detailed, updating the information in column I does not update all relevant columns. This is important for where data has been incorrectly omitted, for example the uptake data for KiActiv.	Enable input values to the model analyses to be updated such that they can be included in new results and simulations.	When just updating KiActiv's uptake in column I of 'Parameters' the new EJP for Scenario analysis: use of naïve uptake and completion rates is £586.60 (versus £371.75 in the EAR)	Uptake rate for Ki Active is now calculated in the model file sheet Uptake Input, row 73.

NICE Health Tech Programme

GID-HTE10060 Digital platforms to support cardiac rehabilitation: Early Value Assessment

External Assessment Report (EAR)

Collated comments table

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Redacted External Assessment Report – Collated comments table:

Comment no.	Stakeholder	Page no.	Section no.	Comment	EAG Response
1	Alison Blythin, my mhealth Ltd	102-106	7.4.3	Missing figure for myHeart	Our apologies. We have now included myHeart.
2	Dr Katie Rhiannon Burrell	39	4.2.3	Formatting comment – the paragraph appears to have been duplicated- sentence cuts out around line 9/10 and the previous sentences repeated.	This has been resolved
3	Dr Katie Rhiannon Burrell	45	5.1.1	Formatting comment – 2nd paragraph line 12 repeated/duplicated	This has been resolved
4	Dr Katie Rhiannon Burrell	45	5.1.3	Formatting comment – 1st paragraph 1st line appears to be repeated/duplicated	This has been resolved
5	Dr Katie Rhiannon Burrell	122	8.3	Very relevant and well thought out suggestions for further evidence. Could also consider expanding on point 4 even further with research into patient barriers to digital intervention (e.g digital competency issues,	Added as requested

Comment no.	Stakeholder	Page no.	Section no.	Comment	EAG Response
				accessibility – how acceptable or effective is this intervention to hard-to-reach groups?) Are there clear reasons for poor uptake in some studies and if so, do they relate to these barriers or are there other issues influencing patient uptake?	
6	Dr Katie Rhiannon Burrell	120	8.2	Population gaps – several studies excluded those with digital literacy/language barriers or significant co-morbidities. May be potentially useful to reflect on this regarding generalisability. A key/outline of what red/amber/green represent in table 42 may be helpful, especially to those not as familiar with this type of analysis.	A key to the gap analysis table has been added. We have added a comment on this generalisability issue as requested.
7	Arjuna Paseer, DDM Health	46	5.1.5.Gro Health HeartBuddy	Thank you for circulating the assessment report. The manuscript (Rai A, et al. 2025) relating to our app has since been updated in response to reviewer comments from the Heart journal, with improvements made to clarify the onboarding process, programme engagement, and completion rates. These updates may be relevant to your assessment. In particular, the following paragraph was revised to make it clearer that onboarding occurred during the index hospital stay, that patients had immediate access to educational content, and that the exercise component was activated at 4–6 weeks post-discharge, once deemed safe by the cardiac rehabilitation team. Additionally, the programme completion rate was previously not clearly stated. This has now been explicitly included to ensure transparency regarding participant retention and adherence. The revised paragraph reads: “Of the 72 patients referred to the D-CR programme, 66 (91.7%) were successfully onboarded with the HeartBuddy app during their index hospital stay. As part of this process, patients were introduced to the app and given immediate access to educational content prior to discharge. The exercise component was unlocked at 4–6 weeks post-discharge, once deemed safe by the cardiac rehabilitation team. Of the 66 onboarded patients, 63 initiated the programme, and 61 completed the full 12-week intervention and provided both baseline and follow-up data. This corresponds to a programme initiation	Thank you for this information. We have added what we consider relevant to the point we are making in the appropriate text and Appendix E. We have retained the text taken from the abstract of the paper where possible, noting that the abstract is non-confidential, while information from the full manuscript has to be marked AIC. Accordingly, we have marked AIC information from your response

Comment no.	Stakeholder	Page no.	Section no.	Comment	EAG Response
				rate of 95.5%, an intervention completion rate of 96.8%, and an overall attrition rate of 7.6%, reflecting high engagement and adherence throughout the programme." These revisions may be relevant to your overall assessment, particularly in clarifying the structure and delivery of the intervention as well as participant engagement.	where you quote the full paper.
8	R Plus Health	16	2	We would like to politely suggest a clarification to this sentence, "Get Ready – Solution and Sword Move offer a programme of flexible duration.", to ensure consistency within the report. While the statement is correct for the mentioned technologies, it omits R Plus Health, which also offers a programme of flexible duration. This omission in the text is inconsistent with the data presented later in Table [2], where R Plus Health's programme duration is correctly listed as 'Flexible'. To ensure accuracy and consistency, we recommend the sentence is amended to include R Plus Health. Thank you!	We have amended this as requested.
9	R Plus Health	16	2	We would like to politely suggest a clarification to this sentence, "An SCM noted that R Plus Health required telemonitoring as part of its delivery – it is unclear to the EAG whether any other apps require non-digital forms of monitoring." We believe the phrasing of the second clause in this sentence could be refined for greater clarity and to avoid potential ambiguity. The current text contrasts the telemonitoring required by R Plus Health with uncertainty about "non-digital" forms of monitoring for other apps. This may unintentionally narrow the scope of the committee's uncertainty. We propose a minor amendment to reflect that the uncertainty likely pertains to all forms of monitoring (both digital and non-digital) for the other technologies. This would create a more accurate and logical statement. Proposed Amended Text (with addition in bold): "An SCM noted that R Plus Health required telemonitoring as part of its delivery – it is unclear to the EAG whether any other apps require any digital or non-digital forms of monitoring."	The lack of clarity we refer to here is specifically regarding non-digital forms of monitoring (i.e. telemonitoring), as raised by the SCM, as opposed to in-app remote digital monitoring. Therefore, we do not consider it appropriate to make the requested revision.

Comment no.	Stakeholder	Page no.	Section no.	Comment	EAG Response
10	R Plus Health	29	4.2	We would like to politely point out a significant omission in this section of the report. The document provides descriptive summaries for the technologies under assessment in sequence. Following the established order, a description of R Plus Health would be expected after the content on 'myHeart' and before the introduction of Table 4. However, no such descriptive summary for R Plus Health is present. To ensure R Plus Health is represented accurately and with parity to the other technologies assessed, we would like to request that a summary description be inserted in its appropriate place.	There is no omission, as the text you refer to is specifically reflecting on prioritisation decisions. As such, we only discuss technologies here where we could not include all eligible evidence (due to volume) and had to prioritise. In this section, we provide rationale for our prioritisation decisions. No prioritisation was required for R Plus Health, as all eligible studies (n=3) could be included. Therefore, it is appropriate that R Plus Health does not feature in this paragraph.
11	R Plus Health	36-37	4 [Table 4]	We would like to politely correct a factual inaccuracy in [Table 4] in the summary of the Xia et al. 2023 [34] study ”Based in a Chinese healthcare context. Limited by single-arm design. Planned to recruit 30 participants but	We have deleted the sentence as noted.

Comment no.	Stakeholder	Page no.	Section no.	Comment	EAG Response
				only recruited 18.". The description in the report does not accurately reflect the study's outcomes as published. The statement that "only recruited 18" is incorrect. The study's sample size calculation determined a minimum of 18 participants was required. To account for potential dropouts, the recruitment target was set at 30. In fact, the study successfully recruited 31 participants, exceeding the target. A total of 28 out of 31 participants (90.3%) completed the full intervention and follow-up, which demonstrates a high rate of adherence.	
12	R Plus Health	54	5.2	Original: For R Plus Health, single-arm evidence from the USA[35] showed improvements especially in exercise and health-related quality of life, as well as overall high adherence and engagement, although 17% of participants dropped out due to loss of interest. These findings were generally supported by single-arm evidence from China.[34].[34] RCT evidence for R Plus Health in a Chinese setting[1] also showed evidence of benefits on exercise capacity and performance as well as health-related quality of life. We believe the current phrasing of this paragraph could be misinterpreted. The structure inadvertently links the 17% dropout rate observed in the USA study [35] to the supporting evidence from the Chinese studies [1, 34]. This is factually incorrect, as the Chinese studies reported significantly lower dropout rates. To prevent this misinterpretation, we suggest explicitly stating the significantly lower dropout rate observed in the Chinese single-arm study [34]. Proposed Amended Text (with addition in bold): For R Plus Health, single-arm evidence from the USA 35 showed improvements especially in exercise and health-related quality of life, as well as overall high adherence and engagement, although 17% of participants dropped out due to loss of interest. These findings were generally supported by single-arm evidence from China, which notably reported a much lower dropout rate of 9.7%.34.34 RCT evidence for R Plus Health in a Chinese setting1 also showed evidence of	The sentence you have put in purple relates to the whole of the previous sentence rather than solely the 17%. We believe this is a reasonable interpretation. However, for greater clarity, we have changed 'the findings' to 'the evidence from the USA'.

Comment no.	Stakeholder	Page no.	Section no.	Comment	EAG Response
				benefits on exercise capacity and performance as well as health-related quality of life.	
13	R Plus Health	66	7.3.3.1	We noted the statement in the assessment documentation: "R Plus Health did not provide any information on the cost to the NHS of a licence for their technology." For clarity, our initial submission did include a pricing structure based on tiered annual subscription fees per NHS Trust, determined by bed capacity. We understand now that this format may not have provided the direct per-patient cost metric preferred for your economic models. Our revised submission will therefore present a per-patient fee structure, which we trust will directly address this requirement and facilitate your evaluation. Please refer to the information below: Section 2.1: Technology Cost - R Plus Health R Plus Health's primary commercial offering to NHS Trusts is Model B: a Tiered Annual Subscription Fee per NHS Trust (Based on Bed Capacity). This model is designed to provide budget predictability and administrative simplicity for NHS Trusts, with a fixed annual cost allowing for unlimited eligible patient use within the licensed Trust for the specified tier over a 12-month period. To facilitate NICE's health economic modelling, which often utilizes a per-patient program cost metric, we also provide Model A: an equivalent Per-Patient Programme Fee structure. This model calculates an effective cost per patient per cardiac rehabilitation programme cycle 1. Core Technology Cost: MODEL A: Per-Patient Programme Fee (Equivalent Cost for NICE Economic Modelling)	We thank the company for the information. This was not initially provided to the EAG due to an oversight. We have now re-run the analysis incorporating the information and updated our report accordingly.

Comment no.	Stakeholder	Page no.	Section no.	Comment	EAG Response
				The core cost of our technology, R Plus Health, is based on a per-patient program fee. The estimated per-patient program fee (excluding VAT) is in the range of £30 - £80 per patient. The specific price point within this range for an NHS Trust or service would typically depend on factors such as the anticipated volume of enrolled patients, with higher volumes generally attracting a per-patient cost towards the lower end of this range. For NICE economic modelling purposes, considering an average UK cardiac rehabilitation service size (approx. 290 patients/year per NACR data), a representative per-patient fee of £55 can be considered. MODEL B: Tiered Annual Subscription Fee per NHS Trust (Primary Commercial Model) Our primary pricing model is an annual subscription fee (excluding VAT) based on the NHS Trust's total bed capacity, granting a 12-month licence for unlimited eligible patient use: The proposed annual subscription fees are tiered as follows: Tier 1: Trusts with less than 100 beds: £5,000-12,000 per annum Tier 2: Trusts with 101 - 300 beds: £15,000-30,000 per annum Tier 3: Trusts with 301 - 500 beds: £35,000-50,000 per annum Tier 4: Trusts with 501 - 800 beds: £55,000 - 90,000 per annum * Trusts exceeding 800 beds: Price to be determined following detailed discussion of specific needs and scale. 2. Additional Costs (Applicable irrespective of the model chosen by the Trust, unless otherwise specified): Capital Costs: None. Our solution is SaaS-based. Hardware Costs (Patient-Side): Not included. Patients use their own compatible devices or these are procured separately by the patient or Trust. A heart rate monitor with Bluetooth is needed for them to fully benefit from the heart rate monitored CR exercise features, which is NOT included in both	

Comment no.	Stakeholder	Page no.	Section no.	Comment	EAG Response
				models. We do not sell or supply hardware devices, but we can provide a list of recommended compatible devices from various third-party manufacturers to guide procurement. Bespoke Development: Scoped and priced separately if required. Not included in standard fees. Training Costs: A fee of £100.00 per staff member trained (excluding VAT) applies for both initial and subsequent training. Service Delivery Costs (beyond standard): Standard remote setup included. Extensive on-site support priced separately if required. 3. Basis for Ongoing Costs: Potential additional ongoing costs for both approaches include fees for training additional staff members or for bespoke development with ongoing service agreements. 4. Currency: All costs are in Great British Pounds (GBP). 5. VAT Status: All costs exclude Value Added Tax (VAT).	
14	R Plus Health	76	7.41	We would like to formally request that this statement “There was one technology where no licence costs were available, R Plus Health; for that technology the EJP rather than the ICER is likely most informative. In this case, the EJP indicated a justifiable price higher than the licence costs for the majority of technologies with known costs.” and the reliance on the Economically Justifiable Price (EJP) be reconsidered in light of our revised submission. We want to clarify that our initial submission did provide a cost structure (Model B: a tiered annual subscription fee per NHS Trust). We acknowledge, however, that the format, which included price ranges and a 'to be	As per our response above, we have now updated the report.

Comment no.	Stakeholder	Page no.	Section no.	Comment	EAG Response
				determined' tier, may have been considered insufficiently specific for direct use in the economic model. To resolve this and to facilitate a direct ICER calculation, we have submitted a fully revised and detailed cost submission. This new submission includes Model A, a direct per-patient programme fee, which provides the precise unit cost data required for economic modelling. For an average-sized service (290 patients/year), this equates to a representative cost of £55 per patient per programme. Therefore, as clear and applicable licence costs are now available, we believe the ICER, calculated using our revised cost data, is now the most informative and appropriate measure for assessing the cost-effectiveness of R Plus Health, rather than the EJP. We request that the analysis be updated accordingly. Thank you!	
15	R Plus Health	100	7.4.2.6	Original: “(Note that R Plus Health appears cost-effective under the minimum cost scenario, but this excludes the licence cost).” We agree with the committee's observation. The analysis rightly notes that in a scenario considering only the downstream cost savings versus the health benefits, R Plus Health is cost-effective even before its own cost is factored in. The report's statement that this "excludes the licence cost" was based on the premise that a specific licence cost for the NHS was unavailable at the time of the initial analysis. We now submitted a revised and explicit cost for R Plus Health. Our representative cost for an average-sized service is £55 per patient per programme (Model A).	As per our response above, we have now updated the report.

Comment no.	Stakeholder	Page no.	Section no.	Comment	EAG Response
16	R Plus Health	122	8.2 [table 42]	We would like to request a correction to a “Red” rating for R Plus Health in row of Cardiovascular risk profile (systolic blood pressure, body mass index, serum triglycerides, HDL cholesterol, total cholesterol, blood glucose, and peak oxygen uptake). The 'red' rating, suggesting no evidence of benefit, is factually incorrect and inconsistent with the statistically significant positive outcomes for several key cardiovascular risk profile markers presented across multiple studies in our submitted clinical evidence. Our evidence base demonstrates clear, statistically significant improvements in core cardiovascular risk factors: peak oxygen uptake (peak VO2): This primary marker of cardiorespiratory fitness showed substantial and significant improvement in both the RCT and single-arm studies. In Cai et al. [1] (RCT), peak VO2 in the intervention group increased from 19.1±4.7 to 27.3±5.6 ml/kg/min ($p<0.001$). In Xia et al. [34] (single-arm), peak VO2 increased from 22.43 to 23.66 ml/kg/min ($p=0.041$). Blood Pressure & Lipids: The Xia et al. [34] study also demonstrated statistically significant improvements in other key markers: Diastolic Blood Pressure (DBP): Decreased significantly ($p=0.044$). LDL Cholesterol: Decreased significantly ($p=0.036$). Furthermore, the study also reported positive trends (though not statistically significant) in other key markers, including Systolic Blood Pressure (SBP) and total cholesterol. Given the clear, statistically significant evidence of benefit across multiple core components of the cardiovascular risk profile, a 'red' rating is not appropriate Proposed Correction:We request that the rating for R Plus Health on this outcome be amended from 'red' to equivalent positive indicator to accurately reflect the statistically significant improvements demonstrated in our clinical evidence for key markers such as peak VO2, DBP, and LDL cholesterol.	This has been corrected.

Comment no.	Stakeholder	Page no.	Section no.	Comment	EAG Response
17	Ki performance lifestyle Ltd	11 para. 2	Executive summary	Evidence review – clinical and service use outcomes states that: "Two technologies (myHeart and R Plus Health) had evidence versus conventional in-person cardiac rehabilitation. The other comparative studies were versus usual care, which where information was available, was defined as referral back to GP for periodic monitoring without active cardiac rehabilitation. Only myHeart and R Plus Health had evidence compared to the scoped comparator, so the evidence for these technologies may have greater relevance for consideration, although the uncertainty in generalisability of the evidence for R Plus Health from the Chinese and US health systems to the UK should be noted." We believe that this is incorrect. Our evidence in Meenamkuzhy-Hariharan et al., a comparative RCT, had a control group undergoing conventional in-person CR, as stated throughout the published manuscript. This aligns with the scoped comparator. KiActiv should be recognised as one of three technologies with RCT evidence versus the scoped comparator, which is conventional in-person CR and should be included in the statement "the evidence for these technologies may have greater relevance for consideration". We would also highlight that our RCT is based in a UK population in the NHS and has been published as a full manuscript in a peer-reviewed international journal (the Journal of Cardiopulmonary Rehabilitation and Prevention). We would like this evidence to be acknowledged and rectified in the review.	Having reviewed the cardiac rehabilitation literature and discussed with clinical experts, it was evident that the standard use of 'usual care' in this field is to mean treatment without active access to cardiac rehabilitation services, for example while on waiting lists. This typically comprises GP-led monitoring. This contrasts with conventional cardiac rehabilitation, also sometimes called 'standard' or 'traditional' cardiac rehabilitation. The term 'usual care' is also not included as a comparator on the NICE scope for this appraisal. Thank you for pointing out that this particular

Comment no.	Stakeholder	Page no.	Section no.	Comment	EAG Response
					study did not define usual care in the same way, which has led to confusion. We agree that the comparator in Meenamkuzhy-Hariharan et al meets the criteria for conventional cardiac rehabilitation, i.e. the scoped comparator. Apologies for the oversight. We have revised the text of our report accordingly in response to this clarification.
18	Ki performance lifestyle Ltd	12 para. 3	Executive summary	Economic evidence and analysis states that: "The economic analysis conducted was broadly based upon the NICE guideline model.[2] There were only three technologies where information was available for licence costs, uptake and completion rates: Gro Health HeartBuddy and myHeart. This is incorrect. KiActiv provided information for licence costs, uptake and completion rates. The EAG have failed to recognise the evidence provided for uptake data in Meenamkuzhy-Hariharan et al. The uptake data can be found in the accompanying CONSORT diagram (column 1, middle of page 3 within the Results Section of the PDF version previously shared) For the avoidance of doubt here is the link to the study:	Meenamkuzhy-Hariharan uptake added. Duvva et al. was unpublished at the time of analysis and therefore excluded from analysis.

Comment no.	Stakeholder	Page no.	Section no.	Comment	EAG Response
				https://journals.lww.com/jcrjournal/abstract/2024/05000/effect_of_adding_a_program_of_contextualized,.6.aspx and directly to the CONSORT diagram: http://links.lww.com/JCRP/A510 Other evidence supplied as part of our response to the Company Evidence Request (CER), such as Duvva et al., provides additional data on uptake rates. We would like this evidence to be acknowledged and rectified in the review.	
19	Ki performance lifestyle Ltd	12 para. 4	Executive summary	Economic evidence and analysis states that: "Implementation costs were provided by five companies and included in the analysis". This is incorrect. The information provided by KiActiv has been overlooked by the EAG, as KiActiv explicitly stated (pg 25 of CER response) that "There are no costs associated with requirements to integrate the technology" within the clinical pathway. This has not been included or referenced. Six companies should be included in the statement and the analysis. We would like this to be acknowledged and rectified.	Correction made.
20	Ki performance lifestyle Ltd	13 point .1	Executive summary	Key points for decision makers: the key clinical effectiveness points for decision makers states that: "Only 2 technologies had evidence compared to the scoped comparator." This is incorrect for the reasons referenced in comment 1, whereby KiActiv's RCT had a control group undergoing conventional-in person CR, which is the scoped comparator. We would like this to be acknowledged and rectified in the review.	Revised as above.

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21	Ki performance lifestyle Ltd	13 point. 4	Executive summary	Key points for decision makers: the key clinical effectiveness points for decision makers states that: "The largest RCT (n=100) against the scoped comparator was for R Plus Health." This is incorrect, as KiActiv's RCT, as described in Meenamkuzhy-Hariharan et al., was against the scoped comparator and was larger (n=130), and also in a UK NHS setting. We would like this to be acknowledged and rectified in the review.	This sentence has been removed.
22	Ki performance lifestyle Ltd	13 point. 8	Executive summary	Key points for decision makers: the key cost effectiveness points for decision makers states that: "Costs of implementation, however, not addressed in company RFIs and a key area of uncertainty" This is incorrect, as KiActiv confirmed on page 25 of CER response that "There are no costs associated with requirements to integrate our technology". Please refer to comment 3 above. We would like this to be acknowledged and rectified in the review. In section 2.1 of the CER, NICE describe that technology costs include: "resource requirements to integrate the technology (such as consultancy fees)" and "costs associated with training for healthcare professionals and patients (where applicable)" and both of these elements were included in our response.	Note we only received such info from six companies (including KiActiv). Clarification made and KiActiv added to Table 13.
23	Ki performance lifestyle Ltd	14 point. 3	Plain Language Summary	Plain Language Summary states states that: "Two of the technologies compared the online tools to standard in-person cardiac rehabilitation treatment." This is incorrect, as it fails to reflect KiActiv's evidence, as referred to in comments 1 & 4 above. KiActiv's RCT, as described in Meenamkuzhy-Hariharan et al., had a control group meeting the definition of the scoped comparator, which was	Revised as above.

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				conventional in-person CR, and this was explained in detail in the methods section, as well as being highlighted in the CONSORT diagram. We would like this oversight to be acknowledged rectified in the review.	
24	Ki performance lifestyle Ltd	15 para. 3	1. Decision Problem	The Decision Problem states that: "Evidence compared to the scoped comparator was only available for myHeart and R Plus Health." This is incorrect. The EAG fail to recognise that KiActiv's RCT, described in Meenamkuzhy-Hariharan et al., was compared to the scoped comparator (conventional in-person CR). The EAG concluded that in KiActiv's RCT, the comparator was "usual care", which the review later defined in the document as GP monitoring with no active intervention. This is incorrect. Meenamkuzhy-Hariharan et al., describes the comparator group as traditional, in-person CR in detail in the methods section, as well as being highlighted in the study title, the CONSORT diagram and the discussion section. For reference, please see the following extract from the methods section of the published RCT: "During periods of national lockdown, UC included a face-to-face assessment and a home-based exercise program until face-to-face classes resumed. When classes resumed, only 4 wk of face-to-face classes were offered, increasing to 8 wk as restrictions eased". It is clear that in our RCT study "usual care" is defined as in-person phase 3 cardiac rehabilitation and not GP-led monitoring with no active intervention. It appears that this difference in terminology has contributed to the EAG's statement.	Revised as above – and meaning of usual care clarified

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				It is important that our evidence is recognised because “the EAG considered that studies compared to the scoped comparator would likely be the most relevant for decision-making.” Please also see comments in 1, 4 & 7 above. We would like this oversight to be acknowledged and rectified in the review.	
25	Ki performance lifestyle Ltd	16, para. 21 18, Table 1	2.Technologies	Technologies states that: “Where information on length of programme was available, this ranged from six to twelve weeks, although Get Ready – Solution and Sword Move offer a programme of flexible duration.” The EAG has overlooked KiActiv’s evidence. Table 1, notes that the length of programme for KiActiv is 12-weeks, however, it is flexible and configured to meet the needs of local NHS services. This was described and made clear in our Company Information Request (CIR) and CER responses. Please see the below relevant excerpts: “KiActiv® can be flexible to the local care pathway. At the outset of any project, we will work closely with the clinical team to effectively map their pathway to best fit our technology to their requirements.” [page 11 CIR] “There is local flexibility within our Mentor session delivery model. The frequency and cadence of Mentor support calls can be adapted to fit specific care pathways.” [page 25 CER] We would request this is updated to either “6 weeks minimum” or “Flexible” in the review to align with other technology descriptions.	Amended as requested
26	Ki performance lifestyle Ltd	25	4.2 Table 3	The Evidence landscape for studies inclusion criteria (Table3): references one Del Angel Martinez et al. study. This is incorrect.	We have added the other Del Angel Martinez reference to the table. We

Comment no.	Stakeholder	Page no.	Section no.	Comment	EAG Response
				Two studies by Del Angel Martinez et al. were included in the CER. On page 6 of 30, an abstract from Del Angel Martinez et al., which was presented at the 2024 BACPR conference and published in BMJ Heart is described. On page 21 of 30, we provide the abstract for a full manuscript by Del Angel Martinez et al., which is being submitted to the American Journal of Preventive Medicine. Furthermore, no evidence from our CER was included in the list of excluded studies in Appendix C We would like this oversight to be acknowledged and rectified in the review.	reviewed all evidence submitted ahead of the submission of the External Assessment Report for potential inclusion.
27	Ki performance lifestyle Ltd	25	4.2 Table 3	The Evidence landscape for studies inclusion criteria (Table3): includes Del Angel Martinez et al. in the column for 'Single-arm studies'. This is incorrect. Both evidence submissions from Del Angel Martinez et al. reflect a new and unique analysis of the RCT dataset from Meenamkuzhy-Hariharan et al., and Fisher et al. As referenced above in comment 10, one is a published abstract (BMJ Heart) and one is a full manuscript in submission (American Journal of Preventive Medicine) We would like it to be moved to the RCTs column of Table 3 for good order.	Amended as requested.
28	Ki Performance lifestyle Ltd	27 para. 2	4.2	The review of KiActiv evidence has only prioritised Meenamkuzhy-Hariharan et al., and Rayner et al.,	Prioritisation is an integral part of the EVA methods. Prioritisation decisions taken by

Comment no.	Stakeholder	Page no.	Section no.	Comment	EAG Response
				Duvva et al., which has been accepted for presentation at the European Society of Cardiology Congress and will be published in the European Heart Journal should be prioritised. Importantly, Duvva et al., provides data regarding uptake, completion, dropout, hospital readmissions, physical activity and exercise capacity, HRQoL and mental wellbeing in a heart failure cardiac rehabilitation cohort, and is directly relevant to the decision problem. For the avoidance of doubt, please see the below abstract from Duvva et al. OBJECTIVES: Heart Failure (HF) Virtual Wards (HFVW) enable patients with acute HF to be managed in their own homes with digital health technology enabled care by HF specialist teams instead of hospitalisation. Cardiac rehabilitation (CR) improves clinical outcomes, however, UK HF audit data indicates that only 5-10% HF patients undergo CR. We conducted a real-world service improvement evaluation to examine the feasibility and outcomes of KiActiv®'s digital CR service as a step-down from acute HFVW. METHODS: Patients on the Acute HFVW received a pre-discharge visit from a specialist HF nurse during which suitable patients were consented for KiActiv® digital CR to be started 2 weeks following discharge. Other than standard clinical exclusion criteria for CR, an additional exclusion criterion was lack of access to a smartphone/tablet. Patients received a proprietary, wrist-worn physical activity (PA) monitor to assess minute-level energy expenditure, access to a personalised, access to the KiActiv® interactive online dashboard, and 6x20 minute phone calls across a 12-week period from a trained KiActiv® Mentor to support self-care. Readmissions were assessed at 30-day, 90-day timepoints, and compared to standard care. Further quantitative measures included uptake and adherence, change in objective PA dose, and change in patient reported outcome measures (PROMs) for Quality of Life (QoL), Mental Wellbeing, Self-Efficacy and Work and Social Adjustment Scale (WSAS) domains. Readmission rates were compared using non-parametric statistics (Chi squared test). RESULTS: From May 2024, 185 patients (median age 70, range 34-90y, 63% men) were referred to KiActiv® digital CR from the acute HFVW and 116/185	the EAG followed the principles set out in the protocol. Differences of opinion regarding prioritisation are not factual errors. We acknowledge that these two additional studies do contain relevant information, however it is not possible to include everything in an EVA due to the nature of the work. It is essential to prioritise what the EAG consider to be the pivotal papers in a way that is as fair as possible across the different technologies.

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				patients (63%) took up the offer. Programme drop-out rate was 30%. Readmission rates were statistically significantly ($p<0.001$) lower in the home digital CR service at 30-day, 90-day timepoints in comparison to standard care (5% vs. 21%; and 9% versus 30% respectively). 78% of patients improved their everyday physical activity. On average, patients improved their daily PA dose by +31 minutes per day compared to week-1 blinded baseline, equating to an average additional PA dose of +32 hrs 32 mins per patient across the CR period. Furthermore, 58% of patients improved their QoL, 74% improved their Mental Wellbeing, and 69% improved their Self-Efficacy. With regards to the WSAS domains, 71% of patients improved their ability to work and 86% improved their overall score. CONCLUSION: This is the first study to demonstrate feasibility of any at-home digital CR following step-down from the acute HFVW. Lower readmission rates at 30-day and 90-day timepoints vs. standard care highlight potential for large healthcare cost-savings, which future economic analysis should validate. Uptake rates were six times greater than that for standard HF CR, with increased PA dose and other validated PROMs demonstrating patient impact and the potential benefits of the KiActiv® as a unique digital CR innovation, following management in a specialist HFVW. Furthermore, Del Angel Martinez et al., was published in BMJ Heart and we believe this should also be prioritised. Del Angel Martinez et al., represents an alternative analysis of the RCT dataset and focuses on specific physical activity and behaviour change outcomes, which have relevance to exercise capacity and CVD risk and please see the following link to Del Angel Martinez et al. - https://heart.bmj.com/content/110/Suppl_5/A18	
29	Ki performance lifestyle Ltd	33	4.2 Table 4	The intervention for Meenamkuzhy-Hariharan et al., is described as “8-week usual care plus contextualized data feedback via KiActiv Heart.” In this context, it is incorrect, due to the definition by the EAG of ‘usual care’ in the document, being GP-led monitoring with no active intervention. Our understanding of ‘usual care’ for cardiac rehabilitation is in-person,	Revised as above.

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				conventional phase 3 CR, as was the case in our study. The comparator that is described in the methods section of our RCT publication represents the conventional CR on offer in Liverpool at the time of the RCT, however this been overlooked. The description of the comparator used for KiActiv in Table 4 has been taken from the introduction section of our study manuscript and not the definition of usual care control group described in the methods, which clearly and explicitly described conventional CR. Please see below the relevant excerpt from the methods section of the paper. “During periods of national lockdown, UC included a face-to-face assessment and a home-based exercise program until face-to-face classes resumed. When classes resumed, only 4 wk of face-to-face classes were offered, increasing to 8 wk as restrictions eased.” Reference to conventional CR, phase 3 CR and all patients being from a CR population are made throughout the manuscript. We would like this oversight to be acknowledged and rectified.	
30	Ki performance lifestyle Ltd	37 para. 2	4.2.1	Study design, intervention and comparator states that: “Two technologies (myHeart and R Plus Health) had evidence versus the scoped comparator of cardiac rehabilitation where digital platforms are not offered as an option. In both cases, this took the form of conventional in-person cardiac rehabilitation. All other comparative studies were compared to usual care.” This is incorrect. Our evidence in Meenamkuzhy-Hariharan et al., a comparative RCT, had a control group undergoing conventional in-person CR, as stated throughout the published manuscript.	Revised as above.

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				Please see comments 1, 4, 7, 8 and 13. We would like this oversight to be acknowledged and rectified.	
31	Ki performance lifestyle Ltd	38	4.2.1	Study design, intervention and comparator: "The prioritised comparative evidence was: Meenamkuzhy-Hariharan et al,[22] RCT, KiActiv vs usual care, UK." This is incorrect because of how the EAG have defined usual care. As highlighted in comments 1, 4, 7, 8, 13 and 14 the comparator in our RCT was the conventional CR pathway in Liverpool at the time of the study, and is detailed in the title, methods, results and discussion sections of the published manuscript.	Revised as above.
32	Ki performance lifestyle Ltd	38	4.2.2	Participants and setting: We would highlight the socioeconomic deprivation profile of Liverpool, as the setting for KiActiv's RCT, as this is relevant in the context of health inequalities. This is available in Table 1 of Meenamkuzhy-Hariharan et al., with the mean index of multiple deprivation (IMD) being 3.6 for the whole cohort. This is also relevant to a comment made later in this section which states "the exclusion of people based on digital literacy or device access could be problematic, as people from lower socioeconomic backgrounds are more likely to face these challenges and have a lower completion rate for cardiac rehabilitation. As such, the clinical expert advised that if digital platforms are to address inequalities, they should target specifically groups who currently benefit less, rather than excluding them, and that if studies focus only on the most digitally literature patients, there will be a large research-practice gap."	We have added this useful information as requested.
33	Ki performan	40	4.2.3 Table 5	The table states that there is no uptake data available for Meenamkuzhy-Hariharan et al.	We have addressed prioritisation above.

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	ce lifestyle Ltd			This is incorrect. The evidence contained in the CONSORT diagram demonstrates uptake and we would like this oversight to be acknowledged and rectified. Furthermore, we would also suggest that this evidence provides a conservative view of uptake, as participation in a research study is likely to reduce uptake. This is confirmed by the uptake data in the other evidence that we provided, which is higher than the RCT. The table further states that we have no evidence for the usability and acceptability in both studies. However, the engagement, outcomes and low dropout rate suggest that it is both usable and acceptable, and further patient testimony is available to provide evidence. In the wider dataset for Rayner et al., questionnaire responses (response rate = 57%) showed that 100% of people would recommend KiActiv to others and 100% rated KiActiv 8+ out of 10 on a Likert scale measure. The inclusion of Duvva et al., as a prioritised study would substantially improve the available outcome data for KiActiv in the context of this table, providing evidence for adherence, uptake, completion, attrition, hospital readmissions, exercise, CV risk, mental wellbeing, HRQoL, time to rehab and usability and acceptability. For the avoidance of doubt, this evidence is available on pages 11 and 12 of the CER, and has been accepted for presentation at the European Society of Cardiology Congress 2025 and publication in the European Heart Journal.	Meenamkuzhy-Hariharan et al updated. We have corrected usability and acceptability data availability for Rayner. It is, however, important to focus on information that is directly observed in the studies according to the scoped categories rather than what can be potentially inferred about other outcome categories.
34	Ki performance lifestyle Ltd	43 para. 1	4.3	Quality appraisal of studies states that; “the methodologically most robust and largest RCT to directly inform this decision problem (i.e. against the scoped comparator) is also the RCT with the lowest expected generalisability to a UK decision-making context.”	Sentence removed.

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				This is incorrect. When the comparator group for KiActiv's RCT is correctly considered (i.e., compared to conventional CR and not GP-led monitoring with no active intervention) the largest RCT is KiActiv with n=130. Please refer to our previous comment 5.	
35	Ki performance lifestyle Ltd	47	5.1.6	"The intervention included 8-weeks of usual care plus contextualized data feedback via KiActiv Heart; the control group included usual care only, as defined in Table 4." This is incorrect, due to the definition by the EAG of 'usual care' in the document, being GP-led monitoring with no active intervention. Our understanding of 'usual care' for cardiac rehabilitation is in-person, conventional phase 3 CR, as was the case in our study. The comparator that is described in the methods section of the RCT publication represents the conventional CR on offer in Liverpool at the time of the RCT, however this has not been acknowledged. The description of the comparator used for KiActiv in Table 4 has been taken from the introduction section of the study manuscript and not the definition of usual care control group described in the methods, which clearly and explicitly described conventional CR. Please see below the relevant excerpt from the methods section of the paper. "During periods of national lockdown, UC included a face-to-face assessment and a home-based exercise program until face-to-face classes resumed. When classes resumed, only 4 wk of face-to-face classes were offered, increasing to 8 wk as restrictions eased." Reference to conventional CR, phase 3 CR and all patients being from a CR population are made throughout the manuscript.	Revised as above.

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				Please see comments 1, 4, 7, 8, 13, 14 and 15. We would like this oversight to be acknowledged and rectified.	
36	Ki performance lifestyle Ltd	47 para. 2	5.1.6	Clinical, Service and technological evidence results states that; "The primary outcome was change in objectively measured physical activity via wrist worn accelerometer." This is not correct. The primary outcome in Meenamkuzhy-Hariharan et al., as described in the published manuscript is "a change in objectively assessed PA to achieve the ACPICR recommendations for "Daily Activity" and "At-home Training" between wk 1 and wk 8 of the intervention period." This is an important distinction as the primary outcome when correctly described, relates to the comparative effectiveness of achieving the cardiac rehabilitation specific guidelines for physical activity and not just changes in physical activity. This is stated in the 'Key Perspectives' section of the published manuscript that highlights we "used objective assessment of continuous physical activity (PA) data to determine the primary outcome in relation to cardiac rehabilitation (CR)-specific recommendations" which is a novel feature of our research. We would like this oversight acknowledged and rectified.	Clarified as requested.
37	Ki performance lifestyle Ltd	47 para. 1	5.1.6	Clinical, Service and technological evidence results states that: ''The paper describes "good data" for physical activity monitoring". This is incorrect and misrepresents the published manuscript, as the terminology "good data" is not used in the manuscript. We would request that this oversight be acknowledged and rectified.	"Good" is removed as requested.

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				For the avoidance of doubt please see the following relevant excerpt from the methods section of the published manuscript: "Triaxial accelerometer data from the wrist-worn device is converted to MET using validated algorithms. This is used to calculate personal min-by-min energy expenditure (kcal). In this study, we have used these data to assess PA as a binary variable in the context of ACPICR recommendations, as this is a criterion frequently used to judge the outcome of exercise programs in CR and also having a numerical definition, is subject to less bias. However, the continuous data captured can be used to measure PA in a number of different dimensions (nonsedentary minutes, moderate-intensity minutes, vigorous-intensity minutes, moderate-intensity bouts, vigorous-intensity bouts). We intend to analyze the continuous PA data set in further studies."	
38	Ki performance lifestyle Ltd	47 para. 1	5.1.6	Clinical, Service and technological evidence results states that: "Patients reported improvements in cardiorespiratory fitness in both groups, although this was not statistically significant". This statement is incorrect in two ways. Firstly, the CRF was objectively measured by the clinical team at the NHS Trust and patients did not 'report' improvements in CRF. Secondly, it is incorrect to state the measured improvements in cardiorespiratory fitness were not statistically significant, and this was not a finding of the RCT. The published manuscript describes that "no statistically significant difference between groups was evident for change in ISWT result" not that the improvements in ISWT outcome for each group were not statistically significant. In fact, both groups made statistically significant improvements (within group), between pre and post ISWT, but this was not reported as this would defeat the purpose of a comparative RCT. For the avoidance of doubt,	We have replaced "reported" by "had". We have clarified that it is the difference between groups (rather than the change within groups) that is not statistically significant.

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				it was the difference between group, in terms of ISWT change, that was not statistically significantly different. We also wish to highlight the authors' comments in the discussion section: "Although no statistically significant difference between groups was evident for change in ISWT result, the mean change in ISWT result for the intervention group (89 m) was 2-fold greater than the control group (44 m), exceeding the MCID (70 m) in the intervention but not the control group. It is likely to be the case that applying the KiActiv intervention for a greater length of time would provide greater benefit, but the intervention period was chosen to match that of a typical CR program as this study was designed to evaluate the effect of adding the intervention to conventional CR. Also, we believe a larger sample would have found a statistically significant difference between groups for CRF test change." We would request that these oversights are acknowledged and rectified.	
39	Ki performance lifestyle Ltd	47 para. 1	5.1.6	Clinical, Service and technological evidence results states that: "No information on other scoped outcomes was available in this study". This is incorrect. We provide evidence for uptake, behaviour change and usability and acceptability of the platform, and this data is in the scope, but this has been overlooked and please see our previous comments 3 & 18. We would like this oversight to be acknowledged and rectified.	Acceptability data from Rayner added to text and appendix table. Uptake data from Meenamkuzhy-Hariharan et al. have also been added – this was in a supplementary file that had been flagged as an 'insecure download' so could not previously be accessed.

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40	Ki performance lifestyle Ltd	48 para. 1	5.1.6	Clinical, Service and technological evidence results states that: "No information on other scoped outcomes was available for this technology." Information on other scoped outcome data was provided in the accepted evidence, however this was not prioritised. We refer you to our comments 2, 12 and 17 and the importance of prioritising Duvva et al., to add further value to the review.	Clarified that this relates to prioritised evidence.
41	Ki performance lifestyle Ltd	56	6.2 Table 2	Table 6: Key studies selected for the economic model highlights the KiActiv Cardiac Rehabilitation Economic Model as being confidential. It was confirmed in an email to the NICE Technical Lead of this EVA (Chidera Mark-Uchendu) on the 9th June, that the economic model was not confidential. The model leverages outcome data from our NHS Cardiac Rehabilitation implementations, which includes Duvva et al., and Cranwell et al.	Edited.
42	Ki performance lifestyle Ltd	57 para. 1	7.2	Relevant economic models states that: "It should be noted that neither the costs of personnel time to deliver cardiac rehabilitation nor any costs of implementation or training were included in the KiActiv model". This is incorrect. KiActiv's costs for the implementation (described by NICE in the CER as "resource requirements to integrate the technology (such as consultancy fees)") and "costs associated with training for healthcare professionals and patients (where applicable)" are all included in the per patient technology cost of £199. We would like this oversight to be acknowledged and rectified.	Sentence edited to remove reference to implementation and training.
43	Ki performan	60 para. 4	7.3.1	Model structure states that: "R Plus Health and Gro Health Heartbuddy provided evidence of impact on cardiovascular risk".	We were restricted in the data required for the SMART-

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	ce lifestyle Ltd			The review has failed to recognise KiActiv's published data on physical activity improvement and cardiorespiratory fitness, which should be included as evidence of impact on cardiovascular risk. 'Peak oxygen uptake' is specifically referenced within this section as important to cardiovascular risk evidence. The evidence we have from Meenamkuzhy-Hariharan et al., regarding the ISWT, can be mapped onto peak oxygen uptake to demonstrate the improvement in cardiovascular risk. Furthermore, physical activity level is also a proxy for peak oxygen uptake, and our evidence includes objective, continuously measured physical activity at minute-level, to provide a fully comprehensive analysis of physical activity in the context of health and future risk. We would like this oversight to be acknowledged and rectified.	RISK calculator. We have clarified the text.
44	Ki performance lifestyle Ltd	62	7.3.2.1 Table 7	Table 7: Uptake probability states that the 'Naïve uptake %' is N/A for KiActiv. This is incorrect, as uptake data is included in both Meenamkuzhy-Hariharan et al., and Duvva et al., which should be included in this table and subsequent scenario analyses. For Meenamkuzhy-Hariharan et al., the uptake data can be found in the accompanying CONSORT diagram (column 1, middle of page 3 within the Results Section of the PDF version previously shared) For the avoidance of doubt here is the link to the study: https://journals.lww.com/jcrjournal/abstract/2024/05000/effect_of_adding_a_program_of_contextualized,.6.aspx and directly to the CONSORT diagram: http://links.lww.com/JCRP/A510 For Duvva et al., uptake data is clearly described in the 'Results' section. Based on the importance of this data for the scenario analysis and the two-way sensitivity analyses, we would like this evidence to be acknowledged and	Table corrected. Note Duvva et al was excluded as unpublished.

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				rectified in the review, especially given the nature of the evidence for other technologies that have been included.	
45	Ki performance lifestyle Ltd	68	7.3.3.1	Resource use and cost states that: "Implementation costs were provided by Datos Health, Gro Health HeartBuddy, Activate Your Heart, Luscii Vitals and Get Ready - Solution." KiActiv included implementation costs in the CER response, describing on page 25 that "There are no costs associated with requirements to integrate the technology." Please also see comments 3, 6, 26. We would like this to be acknowledged and rectified due to its implications for the scenario analysis.	Updated.
46	Ki performance lifestyle Ltd	74	7.4.1	Base case results states that: "There were only three technologies where information was available on the three key inputs of licence cost, uptake and completion rates: Activate Your Heart, Gro Health HeartBuddy and myHeart." This is incorrect KiActiv provided information for licence costs, uptake and completion rates. The EAG have failed to recognise the evidence provided for uptake data in Meenamkuzhy-Hariharan et al. The uptake data can be found in the accompanying CONSORT diagram (column 1, middle of page 3 within the Results Section of the PDF version previously shared) For the avoidance of doubt here is the link to the study: https://journals.lww.com/jcrjournal/abstract/2024/05000/effect_of_adding_a_program_of_contextualized,.6.aspx and directly to the CONSORT diagram: http://links.lww.com/JCRP/A510 Other evidence supplied as part of our response to the Company Evidence Request, such as Duvva et al., provides additional data on uptake rates.	Corrected.

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				We would like this evidence to be acknowledged and rectified in the review.	
47	Ki performance lifestyle Ltd	76	7.4.1 Table 15	Base Case Economic Results: The table states that uptake and completion data is not available for KiActiv. This is incorrect. Our completion data has been recognised but our uptake data has been overlooked by the EAG. Uptake data is available for Meenamkuzhy-Hariharan et al. in the accompanying CONSORT diagram (column 1, middle of page 3 within the Results Section of the PDF version previously shared). For the avoidance of doubt here is the link to the study: https://journals.lww.com/jcrjournal/abstract/2024/05000/effect_of_adding_a_program_of_contextualized,.6.aspx and directly to the CONSORT diagram: http://links.lww.com/JCRP/A510 Other evidence supplied as part of our response to the Company Evidence Request, such as Duvva et al., also provide data on uptake rates. We would like this to be acknowledged and rectified.	Corrected.
48	Ki performance lifestyle Ltd	77	7.4.1 Table 16	Table 16: Disaggregated costs It is unclear where these costs come from and how they are calculated.	These are expected costs generated from the output of the model. Licence costs are expected costs and driven by uptake. Clarification added.

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49	Ki performance lifestyle Ltd	78	7.4.1 Table 17	Table 17: Disaggregated QALYS It is unclear where these data come from and how they are calculated	These are output from the model disaggregated by health state. No edit made to text.
50	Ki performance lifestyle Ltd	79	7.4.2.1 Table 18	Table 18: Scenario Analysis: use of naïve uptake and completion rates. We know from prior sections, Table 7 and comments 2, 17, 28, 30, and 31 that our uptake data has not been recognised. The scenario analysis in Table 18 would be different, and positively impacted if our uptake data from Meenamkuzhy-Hariharan et al. (58%), and Duvva et al. (63%), was included as naïve uptake data, instead of the assumed 41% from conventional CR.	Corrected and recalculated.
51	Ki performance lifestyle Ltd	88	7.4.2.1 Table 27	Table 27: 2-way sensitivity analysis impact of uptake and completion rates: Ki Activ We assume that the scenario analysis in Table 18 would also be positively impacted by the inclusion of our uptake data from Meenamkuzhy-Hariharan et al., and Duvva et al.	Table 27 would not be affected, however Table 18 has been recalculated.
52	Ki performance lifestyle Ltd	95	7.4.2.5 Table 34	Table 34: Scenario analysis: Excluding the cost of implementation and training We know from prior sections, Table 13 and comments 3, 6, 26, and 29 that our implementation costs provided in the CER response have not been recognised. The scenario analysis in Table 34 would be different, and positively impacted if our implementation costs, described in the CER and comments 3, 6, 26, and 29 were included.	Corrected and recalculated.
53	Ki performan	107	7.4.4 Table 40	"The probabilistic analyses are broadly consistent with the deterministic ones. The shapes of the scatterplots are reflective of the data available for each	This is an error from a previous iteration

Comment no.	Stakeholder	Page no.	Section no.	Comment	EAG Response
	ce lifestyle Ltd			intervention. The key difference in results is KiActiv, which is estimated as not cost-effective compared with conventional CR in the probabilistic analysis." Based on the data in Table 40 and Figure 20, this statement appears to be incorrect and not supported by the data. The table data described that there is a high probability of cost effectiveness at both £20k and £30k willingness-to-pay thresholds. We would like this to be acknowledged and rectified.	of the model. Sentence deleted.
54	Ki performance lifestyle Ltd	107	7.4.4 Table 40	Table 40: Probabilistic sensitivity analysis mean results (10,000 runs) displays the probability of being cost effective at £20k as 90.2% and £30k as 89.1%. The reported drop in cost-effectiveness probability from 90.2% at £20,000/QALY to 89.1% at £30,000/QALY is inconsistent with the expected behaviour of a cost-effectiveness acceptability curve, which should be non-decreasing. This suggests a potential issue with the PSA implementation or NMB computation, and we recommend that this be reviewed and clarified.	CEACs only monotonically increase when the entirety of the joint distribution of costs and QALYs lies in the NE quadrant. Where there is overlap into >1, particularly in the SW and NE, CEACs can either rise or fall, or exhibit fluctuations.
55	Ki performance lifestyle Ltd	111	7.4.4 Figure 20	Figure 20: Cost-effectiveness plane: KiActiv vs CCR The cost-effectiveness plane provides strong visual confirmation that KiActiv is dominant in most simulations and cost-effective under conventional thresholds. Both deterministic and probabilistic ICERs lie within the dominant quadrant. This makes the earlier reported decline in cost-effectiveness probability at higher WTP (£30,000) inconsistent with this figure, and it warrants clarification.	Please see response above.

Comment no.	Stakeholder	Page no.	Section no.	Comment	EAG Response
56	Ki performance lifestyle Ltd	117	8.2 Table 42	Table 42 Evidence Gap Analysis (based on prioritised evidence only) The gap analysis for KiActiv highlights the negative impact of not prioritising Duvva et al., and Del Angel Martinez et al. Their inclusion in prioritised evidence would substantially improve the gap analysis table outputs. Whilst the subjective nature of the traffic light grading of the evidence gap, we have provided specific comments where we believe evidence has been overlooked or misinterpreted.	The EAG report makes it clear that evidence gap analysis has to be conducted based on prioritised evidence. We also clearly state the prioritisation principles in the protocol and comment in the report on the studies selected for prioritisation.
57	Ki performance lifestyle Ltd	118	8.2 Table 42	Table 42 Evidence Gap Analysis (based on prioritised evidence only) - Intervention Uptake Rates – Red The EAG have failed to recognise the evidence provided for uptake data in Meenamkuzhy-Hariharan et al. The uptake data can be found in the accompanying CONSORT diagram (column 1, middle of page 3 within the Results Section of the PDF version previously shared) For the avoidance of doubt here is the link to the study: https://journals.lww.com/jcrjournal/abstract/2024/05000/effect_of_adding_a_program_of_contextualized,.6.aspx and directly to the CONSORT diagram: http://links.lww.com/JCRP/A510 Other evidence supplied as part of our response to the CER, such as Duvva et al., provides additional data on uptake rates. We would like this evidence to be acknowledged and rectified in the review.	Amended to amber as evidence from one prioritised study is available to inform this outcome.

Comment no.	Stakeholder	Page no.	Section no.	Comment	EAG Response
58	Ki performance lifestyle Ltd	118	8.2 Table 42	Table 42 Evidence Gap Analysis (based on prioritised evidence only) - Hospital readmissions, referrals to specialist services, clinic visits – Red As stated in comment 12, we believe that Duvva et al., which has been accepted for presentation at the European Society of Cardiology Congress and will be published in the European Heart Journal should be prioritised. Importantly, Duvva et al., provides data regarding hospital readmissions in a heart failure cardiac rehabilitation cohort. For the avoidance of doubt, please see the below abstract from Duvva et al. OBJECTIVES: Heart Failure (HF) Virtual Wards (HFVW) enable patients with acute HF to be managed in their own homes with digital health technology enabled care by HF specialist teams instead of hospitalisation. Cardiac rehabilitation (CR) improves clinical outcomes, however, UK HF audit data indicates that only 5-10% HF patients undergo CR. We conducted a real-world service improvement evaluation to examine the feasibility and outcomes of KiActiv®'s digital CR service as a step-down from acute HFVW. METHODS: Patients on the Acute HFVW received a pre-discharge visit from a specialist HF nurse during which suitable patients were consented for KiActiv® digital CR to be started 2 weeks following discharge. Other than standard clinical exclusion criteria for CR, an additional exclusion criterion was lack of access to a smartphone/tablet. Patients received a proprietary, wrist-worn physical activity (PA) monitor to assess minute-level energy expenditure, access to a personalised, access to the KiActiv® interactive online dashboard, and 6x20 minute phone calls across a 12-week period from a trained KiActiv® Mentor to support self-care. Readmissions were assessed at 30-day, 90-day timepoints, and compared to standard care. Further quantitative measures included uptake and adherence, change in objective PA dose, and change in patient reported outcome measures (PROMs) for Quality of Life (QoL), Mental Wellbeing, Self-Efficacy and Work and Social Adjustment Scale (WSAS) domains. Readmission rates were compared using non-parametric statistics (Chi squared test).	We have discussed our approach to prioritisation above.

Comment no.	Stakeholder	Page no.	Section no.	Comment	EAG Response
				RESULTS: From May 2024, 185 patients (median age 70, range 34-90y, 63% men) were referred to KiActiv® digital CR from the acute HFVW and 116/185 patients (63%) took up the offer. Programme drop-out rate was 30%. Readmission rates were statistically significantly ($p<0.001$) lower in the home digital CR service at 30-day, 90-day timepoints in comparison to standard care (5% vs. 21%; and 9% versus 30% respectively). 78% of patients improved their everyday physical activity. On average, patients improved their daily PA dose by +31 minutes per day compared to week-1 blinded baseline, equating to an average additional PA dose of +32 hrs 32 mins per patient across the CR period. Furthermore, 58% of patients improved their QoL, 74% improved their Mental Wellbeing, and 69% improved their Self-Efficacy. With regards to the WSAS domains, 71% of patients improved their ability to work and 86% improved their overall score. CONCLUSION: This is the first study to demonstrate feasibility of any at-home digital CR following step-down from the acute HFVW. Lower readmission rates at 30-day and 90-day timepoints vs. standard care highlight potential for large healthcare cost-savings, which future economic analysis should validate. Uptake rates were six times greater than that for standard HF CR, with increased PA dose and other validated PROMs demonstrating patient impact and the potential benefits of the KiActiv® as a unique digital CR innovation, following management in a specialist HFVW.	
59	Ki performance lifestyle Ltd	118	8.2 Table 42	Table 42 Evidence Gap Analysis (based on prioritised evidence only) - Exercise Capacity or Performance (e.g. 6 Minute Walk Test, incremental shuttle walk test) – Amber Given the failure to correctly interpret and report our incremental shuttle walk test results in section 5.1.6 (comment 22), we have reason to believe that this is also reflected in the assessment of this evidence gap. For the avoidance of doubt, here is an excerpt from the 'Conclusion' section of the prioritised evidence Meenamkuzhy-Hariharan et al. "Both groups experienced increases in CRF, with the average change in ISWT in the intervention group double that of the control group. Although no	We have reviewed and consider Amber appropriate, given the difference between groups in Meenamkuzhy-Hariharan et al. is not statistically significant.

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				statistically significant difference between groups was evident, the average change in the intervention group did exceed the MCID for the ISWT, which did not occur in the control group."	
60	Ki performance lifestyle Ltd	118	8.2 Table 42	Table 42 Evidence Gap Analysis (based on prioritised evidence only) - Cardiovascular Risk (systolic blood pressure, body mass index, serum triglycerides, HDL cholesterol, total cholesterol, blood glucose, and peak oxygen uptake) – Red 'Peak oxygen uptake' is specifically referenced within this section as important to cardiovascular risk evidence. The evidence we have from Meenamkuzhy-Hariharan et al., regarding the ISWT, can be mapped onto peak oxygen uptake to demonstrate the improvement in cardiovascular risk. Furthermore, physical activity level is also a proxy for peak oxygen uptake, and our evidence includes objective, continuously measured physical activity at minute-level, to provide a fully comprehensive analysis of physical activity in the context of health and future risk.	It is important to assess each outcome domain separately in the gap analysis. As such, information from exercise capacity measures should not be mapped across to cardiovascular risk in our tables and text.
61	Ki performance lifestyle Ltd	118	8.2 Table 42	Table 42 Evidence Gap Analysis (based on prioritised evidence only) - Psychological Wellbeing (e.g. anxiety or depression scores) – Red As stated in comment 12, we believe that Duvva et al., which has been accepted for presentation at the European Society of Cardiology Congress and will be published in the European Heart Journal should be prioritised. Importantly, Duvva et al., provides data regarding psychological wellbeing in a heart failure cardiac rehabilitation cohort. For the avoidance of doubt, please see the below abstract from Duvva et al. OBJECTIVES: Heart Failure (HF) Virtual Wards (HFVW) enable patients with acute HF to be managed in their own homes with digital health technology enabled care by HF specialist teams instead of hospitalisation. Cardiac rehabilitation (CR) improves clinical outcomes, however, UK HF audit data indicates that only 5-10% HF patients undergo CR. We conducted a real-	As above, we have discussed our approach to clarification and state clearly in our report that evidence gap analysis in an EVA context has to be conducted based on prioritised evidence.

Comment no.	Stakeholder	Page no.	Section no.	Comment	EAG Response
				world service improvement evaluation to examine the feasibility and outcomes of KiActiv®'s digital CR service as a step-down from acute HFVW. METHODS: Patients on the Acute HFVW received a pre-discharge visit from a specialist HF nurse during which suitable patients were consented for KiActiv® digital CR to be started 2 weeks following discharge. Other than standard clinical exclusion criteria for CR, an additional exclusion criterion was lack of access to a smartphone/tablet. Patients received a proprietary, wrist-worn physical activity (PA) monitor to assess minute-level energy expenditure, access to a personalised, access to the KiActiv® interactive online dashboard, and 6x20 minute phone calls across a 12-week period from a trained KiActiv® Mentor to support self-care. Readmissions were assessed at 30-day, 90-day timepoints, and compared to standard care. Further quantitative measures included uptake and adherence, change in objective PA dose, and change in patient reported outcome measures (PROMs) for Quality of Life (QoL), Mental Wellbeing, Self-Efficacy and Work and Social Adjustment Scale (WSAS) domains. Readmission rates were compared using non-parametric statistics (Chi squared test). RESULTS: From May 2024, 185 patients (median age 70, range 34-90y, 63% men) were referred to KiActiv® digital CR from the acute HFVW and 116/185 patients (63%) took up the offer. Programme drop-out rate was 30%. Readmission rates were statistically significantly ($p<0.001$) lower in the home digital CR service at 30-day, 90-day timepoints in comparison to standard care (5% vs. 21%; and 9% versus 30% respectively). 78% of patients improved their everyday physical activity. On average, patients improved their daily PA dose by +31 minutes per day compared to week-1 blinded baseline, equating to an average additional PA dose of +32 hrs 32 mins per patient across the CR period. Furthermore, 58% of patients improved their QoL, 74% improved their Mental Wellbeing, and 69% improved their Self-Efficacy. With regards to the WSAS domains, 71% of patients improved their ability to work and 86% improved their overall score. CONCLUSION: This is the first study to demonstrate feasibility of any at-home digital CR following step-down from the acute HFVW. Lower readmission rates at 30-day and 90-day timepoints vs. standard care highlight	

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				potential for large healthcare cost-savings, which future economic analysis should validate. Uptake rates were six times greater than that for standard HF CR, with increased PA dose and other validated PROMs demonstrating patient impact and the potential benefits of the KiActiv® as a unique digital CR innovation, following management in a specialist HFVW.	
62	Ki performance lifestyle Ltd	118	8.2 Table 42	Table 42 Evidence Gap Analysis (based on prioritised evidence only) - Usability and acceptability of the platform – Red No detail is provided in the final scope or other documentation about what evidence would be deemed appropriate for demonstrating usability and acceptability of the platform. As such, we would consider the strong engagement, positive outcomes and low dropout rate suggest that it is both usable and acceptable, and further patient testimony is available to provide evidence. In the wider dataset for Rayner et al., questionnaire responses (response rate = 57%) showed that 100% of people would recommend KiActiv to others and 100% rated KiActiv 8+ out of 10 on a Likert scale measure.	Following review of usability and acceptability evidence from Meenamkuzhy-Hariharan et al., as pointed out above, we have changed this to Amber.
63	Ki performance lifestyle Ltd	118	8.2 Table 42	Table 42 Evidence Gap Analysis (based on prioritised evidence only) - Behavioural Change – Red No detail is provided in the final scope or other documentation about what evidence would be deemed appropriate for demonstrating behaviour change. Physical activity is a cornerstone of cardiac rehabilitation and is a behaviour that can be objectively and continuously measured, rather than self-reported, which is notoriously poor for the assessment of physical activity. In the prioritised evidence (Meenamkuzhy-Hariharan et al., and Rayner et al.) and the evidence we believe should be prioritised (Duvva et al., and Del Angel Martinez et al.), we have objective measurement of physical activity behaviour change.	We have removed the row for behavioural change from this table as it is a multi-faceted concept that is already covered by several outcome domain in the report, including in the ways you say. This approach is now consistent to

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				In Meenamkuzhy-Hariharan et al., we demonstrate physical activity behaviour change resulting in the intervention group participants having a statistically greater probability of meeting the ACPICR "Daily Activity" recommendation across the 8-wk intervention in comparison with control group participants. In Rayner et al., we demonstrate increases in non-sedentary time, moderate activity, calorie burn and moderate bouts in patients on the programme, which are visualised in figure 1 of the abstract. In Duvva et al., we demonstrate that patients improved their daily physical activity dose by +31 minutes per day compared to week-1 blinded baseline, equating to an average additional physical activity dose of +32 hrs 32 mins per patient across the cardiac rehabilitation period. In Del Angel Martinez et al., we demonstrate reduction in sedentary time behaviours across the intervention period that was significantly better than the control group.	our approach to data extraction, where we didn't have a separate behavioural change category for this reason.
64	Kiperformance lifestyle Ltd	120	8.2	Comparator Gaps: "Evidence explicitly against the scoped comparator of conventional CR is only available for myHeart and R Plus Health." This is incorrect, as the EAG fail to recognise that KiActiv's RCT, described in Meenamkuzhy-Hariharan et al., was compared to the scoped comparator as detailed in comments 1, 4, 7, 8, 13, 14, 15, and 19.	Revised as above.
65	Kiperformance lifestyle Ltd	121	8.2	Outcome Gap: "Limited evidence on the costs of implementation including training and integration into existing NHS systems and processes (different technologies offer different levels of inter-operability)." As highlighted in comments 3, 6, 26, 29 and 36, and for the avoidance of doubt, KiActiv confirmed on page 25 of Company Evidence Request response	Clarified that data were available for only 6 of 13 technologies.

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				that “There are no costs associated with requirements to integrate our technology”.	
66	Ki performance lifestyle Ltd	122	8.3	Key areas for evidence generation: The EAG’s recommendation for future research include: “Standardisation of outcomes and outcome measurement to facilitate a network meta-analysis, especially quality of life (using EQ-5D[48]), uptake, completion and impact on longer-term events such as secondary cardiac events, using longer-term follow-up to detect events that take longer to develop and to verify that observed benefits persist over a longer period.” Along with the standardisation of the outcome measurement mentioned specifically, we also believe it is important to standardise physical activity outcomes. There appear to be a range of measures used across the technologies’ evidence submissions. These range from self-reported measures (which are notoriously poor), to pre-post step count (which do not include a measure of intensity) and continuous, objectively measured minute-level physical activity. The robustness, accuracy and clinical relevance of these outcome measures are not equal.	We do not consider this to be a factual error. Rather, it is a difference of opinion regarding prioritisation of outcomes for future evidence generation.
67	Ki performance lifestyle Ltd	123	9	Discussion: “Two technologies (myHeart and R Plus Health) had evidence versus conventional in-person cardiac rehabilitation. The other comparative studies were versus usual care, which where information was available, was defined as referral back to GP for periodic monitoring without active cardiac rehabilitation. This was not a scoped comparator, so this evidence is likely to be of lower relevance for decision-making.” This is incorrect, as it overlooks our evidence in Meenamkuzhy-Hariharan et al., a comparative RCT, which had a control group undergoing conventional in-person CR, as stated throughout the published manuscript. As such, KiActiv should be included in the technologies mentioned as having evidence versus conventional in-person cardiac rehabilitation, and not grouped into the statement that “evidence is likely to be of lower relevance for decision-making.”	Revised as above.

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68	Ki performance lifestyle Ltd	123	9	Discussion: "The largest, blinded, most methodologically robust, RCT[1] against the scoped comparator was conducted exclusively in a Chinese setting." This is incorrect as KiActiv's RCT Meenamkuzhy-Hariharan et al., was larger (n=130) and also in a UK NHS setting. We would like this to be acknowledged and rectified in the review.	Sentence removed.
69	Ki performance lifestyle Ltd	124	9	Discussion: "Limited evidence on the costs of implementation including training and integration into existing NHS systems and processes (different technologies offer different levels of inter-operability). The importance of this depends on who would pay for this (company or NHS)." As highlighted in comments 3, 6, 26, 29, 36 and 49, and for the avoidance of doubt, KiActiv confirmed on page 25 of Company Evidence Request response that "There are no costs associated with requirements to integrate our technology".	The EAG has incorporated evidence of implementation costs elsewhere. No edit made.
70	Ki performance lifestyle Ltd	126	References	Reference 29: Del Angel Martinez M, et al. Modelling Temporal Dynamics of Device-Measured Physical Activity in Cardiac Rehabilitation. Unpublished.KiActiv. This confirms the point made in comment 10, as only one Del Angel Martinez et al. paper is referenced. This overlooks the abstract from Del Angel Martinez et al., which has been published in the BMJ Heart.	We have corrected the bibliography.
71	Ki performance lifestyle Ltd	150	Appendix D Table 45	Table 45. Additional information on outcomes: Meenamkuzhy-Hariharan et al. "Primary: change in objectively measured physical activity" The primary outcome for Meenamkuzhy-Hariharan et al., is incorrectly stated. The primary outcome in Meenamkuzhy-Hariharan et al., as described in the published manuscript is "a change in objectively assessed PA to achieve the	We do not consider this a factual error, as we stated that the outcome is objectively measured PA,

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				ACPICR recommendations for “Daily Activity” and “At-home Training” between wk 1 and wk 8 of the intervention period.” This is an important distinction as the primary outcome when correctly described, relates to the comparative effectiveness of achieving the cardiac rehabilitation specific guidelines for physical activity and not just changes in physical activity. This is stated in the ‘Key Perspectives’ section of the published manuscript that highlights we “used objective assessment of continuous physical activity (PA) data to determine the primary outcome in relation to cardiac rehabilitation (CR)-specific recommendations” which is a novel feature of our research. We would like this oversight acknowledged and rectified.	however we have added the additional detail as requested.
72	Ki performance lifestyle Ltd	150	Appendix D Table 45	Table 45. Additional information on outcomes: Meenamkuzhy-Hariharan et al. “Secondary: Change in exercise test scores, adherence.” No reference is made of the uptake data included in the accompanying CONSORT diagram (column 1, middle of page 3 within the Results Section of the PDF version previously shared) For the avoidance of doubt here is the link to the study: https://journals.lww.com/jcrjournal/abstract/2024/05000/effect_of_adding_a_program_of_contextualized,.6.aspx and directly to the CONSORT diagram: http://links.lww.com/JCRP/A510	Table now updated with the uptake data now that we can access the CONSORT diagram that had been flagged as an ‘insecure download’ from the journal site.
73	Ki performance lifestyle Ltd	150	Appendix D Table 45	Table 45. Additional information on outcomes: Meenamkuzhy-Hariharan et al. “Secondary: Change in exercise test scores, adherence.” As well as displaying and describing the change in exercise test scores, Meenamkuzhy-Hariharan et al., also displays and describes change in cardiorespiratory fitness in METs.	Added as requested.

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74	Ki performance lifestyle Ltd	160	Appendix E Table 46	Table 46. Results data extraction for prioritised evidence: Meenamkuzhy-Hariharan et al. Intervention uptake rates (number of people meeting inclusion criteria vs number recruited): "Not assessed." This is incorrect and the EAG have failed to recognise the evidence provided for uptake data in Meenamkuzhy-Hariharan et al. The uptake was assessed and data can be found in the accompanying CONSORT diagram (column 1, middle of page 3 within the Results Section of the PDF version previously shared) For the avoidance of doubt here is the link to the study: https://journals.lww.com/jcrjournal/abstract/2024/05000/effect_of_adding_a_program_of_contextualized,.6.aspx and directly to the CONSORT diagram: http://links.lww.com/JCRP/A510	Amended as requested.
75	Ki performance lifestyle Ltd	160	Appendix E Table 46	Table 46. Results data extraction for prioritised evidence: Meenamkuzhy-Hariharan et al. Intervention completion rates: "Partially reported: Of the 65 participants in the intervention group, 51% attended no face-to-face CR classes. Of this subgroup, 88% completed the KiActiv intervention." Whilst the statement "Of the 65 participants in the intervention group, 51% attended no face-to-face CR classes. Of this subgroup, 88% completed the KiActiv intervention" is made in the 'Strengths and Limitations' section of the 'Discussion' in the published manuscript, the assertion that intervention completion rates were "partially reported" is incorrect. The EAG have failed to recognise the evidence provided for completion in Meenamkuzhy-Hariharan et al. The data can be found in the accompanying CONSORT diagram (column 1, middle of page 3 within the Results Section of the PDF version previously shared) For the avoidance of doubt here is the link to the study: https://journals.lww.com/jcrjournal/abstract/2024/05000/effect_of_adding_a_program_of_contextualized,.6.aspx and directly to the CONSORT diagram: http://links.lww.com/JCRP/A510	Added as requested.
76	Ki performan	160	Appendix E Table 46	Table 46. Results data extraction for prioritised evidence: Meenamkuzhy-Hariharan et al. Exercise capacity or performance: "Not significant in either group."	Clarified that it is the between-group difference that is not

Comment no.	Stakeholder	Page no.	Section no.	Comment	EAG Response
	ce lifestyle Ltd			It is incorrect to state the measured improvements in cardiorespiratory fitness were “not significant in either group”, and this was not a finding of the RCT. The published manuscript describes that “no statistically significant difference between groups was evident for change in ISWT result” not that the improvements in ISWT outcome for each group were not statistically significant. In fact, both groups made statistically significant improvements (within group), between pre and post ISWT, but this was not reported as this would defeat the purpose of a comparative RCT. For the avoidance of doubt, it was the difference between group, in terms of ISWT change, that was not statistically significantly different. We also wish to highlight the authors’ comments in the discussion section: “Although no statistically significant difference between groups was evident for change in ISWT result, the mean change in ISWT result for the intervention group (89 m) was 2-fold greater than the control group (44 m), exceeding the MCID (70 m) in the intervention but not the control group. It is likely to be the case that applying the KiActiv intervention for a greater length of time would provide greater benefit, but the intervention period was chosen to match that of a typical CR program as this study was designed to evaluate the effect of adding the intervention to conventional CR.”	statistically significant.
77	Ki performance lifestyle Ltd	190	Appendix E Table 46	KiActiv (number of prioritised studies = 3) Only 2 studies are included in the table for KiActiv.	Typographical error corrected.
78	Ki performance lifestyle Ltd	190	Appendix E Table 46	Table 46. Results data extraction for prioritised evidence: Meenamkuzhy-Hariharan et al. Cardiovascular risk profile: “BMI kg/m^2:Total (n=130):30.3 +/- 6.1 mean +/- SD; Intervention (n=65): 30.3 +/- 6.4; Control (n=65): 30.3 +/- 5.7”	It is important to consider the observed evidence within each category on the scope for the

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				'Peak oxygen uptake' is specifically referenced as important to cardiovascular risk evidence. The evidence we have from Meenamkuzhy-Hariharan et al., regarding the ISWT, can be mapped onto peak oxygen uptake to demonstrate the improvement in cardiovascular risk. Furthermore, physical activity level is also a proxy for peak oxygen uptake, and our evidence includes objective, continuously measured physical activity at minute-level, to provide a fully comprehensive analysis of physical activity in the context of health and future risk.	EVA rather than how evidence could be mapped to other categories

NICE National Institute for Health and Care Excellence

Medical Technology Advisory Committee Interests Register

Topic: Digital platforms to support cardiac rehabilitation: early value assessment

NICE's declaration of interest policy can be accessed here

Name	Role with NICE	Type of interest	Description of interest	Interest arose	Interest declared	Interest ceased	Comments
Michael Kolovetsios	Standing Committee Member	Financial	Medtronic employee	11.2019	02.04.2025	Ongoing	*Conflicted, no papers, no Part 2, no decision making*
Jennie Walker	Standing Committee Member	Nil	N/A	N/A	09.04.2025	N/A	*No further action*
Katherine Boylan	Standing Committee Member	Non-Financial Professional	I have led on the negotiation of a research, development and innovation master agreement between my employing organisation (MFT) and Medtronic. It was signed off in March 2025, but no projects have been initiated as a result yet. Technologies for cardiac surgery including valves might be a topic which we explore for collaboration in the future, although the fact this is an LSA probably means this is less relevant. I will not have any personal financial	01.03.2025	01.07.2025	Ongoing	*No further action*

			benefit as a result, but the success of future collaboration could benefit my organisation, either through paid research contracts or joint adoption projects. This is ongoing. Additionally, at some point MFT will be going to market for their cath lab procurement, which Medtronic will likely bid for - however, this activity does not sit within my remit.				
Katherine Boylan	Standing Committee Member	Non-Financial Professional	I have previously been paid by Medtronic for participating in an advisory panel around their remote monitoring technology (not related to this evaluation). I did not benefit financially personally - the money went back into my employing organisation. April 2023 - no related panels/ advisory work pending	01.04.2023	01.07.2025	2023	*No further action*
PenTAG	External Academic Group	Indirect Interests	Professor Rod Taylor, who is a company representative/stakeholder in this appraisal, used to be at the University of Exeter and a	Date of Rod Taylor's appointme	08.04.2025	2020	*No further action*

			member of PenTAG. The REACH-HF programme that Health & Care Innovations Ltd (HCI) have digitised was originally developed at the University of Exeter by Prof Taylor under an NIHR grant. PenTAG hasn't had any known collaborations with Prof Taylor since his departure in early 2020. Prof Taylor remains an Honorary Professor at the University.	nt– early 2000s			
Saul Stevens	EAG representative	Financial	Completed an evaluation of a podiatry training tool deployed in Torbay and South Devon NHS Foundation Trust as part of a research consultancy (Apollo Health Innovations, for Health & Care Innovations Ltd).	10/01/2021	08.04.2025	20/05/2021	*No further action*
Matthew Annals	EAG representative	Non-financial professional and personal interests	Yes, while I was not involved in the development of the "Activate Your Heart" programme, I do work at the trust (University Hospitals of Leicester NHS Trust) and in the service where it was used with patients.	11.2021	12.05.2025	Ongoing	*No further action*

Devavrata Joshi	Standing Committee Member	Nil	N/A	N/A	N/A	N/A	*No further action*
Elizabeth-Ann Schroeder	Standing Committee Member	Nil	N/A	N/A	N/A	N/A	*No further action*
Tom Butler	Specialist Committee Member	Non-financial professional and personal interests	Chair of the British Dietetic Association Cardiovascular Specialist Group	01/01/2025	March 2025	Ongoing	*No further action*
Tom Butler	Specialist Committee Member	Non-financial professional and personal interests	Member of Heart UK Medical,Scientific and Research Committee	11/10/2024	March 2025	Ongoing	*No further action*
Heather Probert	Specialist Committee Member	Non-financial professional and personal interests	President of BACPR	05/10/2023	March 2025	Ongoing	*No further action*