IMPROVED CARDIAC REHABILIATION PROGRAMS THROUGH INNOVATION IN DIGITAL HEALTH

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Marlien Varnfield PhD; Mobile Health Systems Lead, Health & Biosecurity, CSIRO

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People	**5550**
Locations	**57**
Budget	**$1B+**
Partners	**1300+**
Infra	**$3.5bn**
Patents	**3000+**

Big ideas start here

Fast WLAN
Wireless Local Area Network

POLYMER BANKNOTES

AEROGARD

BARLEYmax™

RELENZA FLU TREATMENT

TOTAL WELLBEING DIET

HENDRA VACCINE

EXTENDED WEAR CONTACTS

SOFTLY WASHING LIQUID

SELF TWISTING YARN

RAFT POLYMERISATION

NOVACQ™ PRAWN FEED

Our business units and focus areas

- Agriculture and Food
- Energy
- Health and Biosecurity
- Land and Water
- Manufacturing
- Mineral Resources
- Oceans and Atmosphere
- Astronomy and Space Science
- Australian Animal Health Laboratory
- Data61
- Marine National Facility
- National Computing Infrastructure
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Science excellence

Nationally CSIRO produces

10%

of Australia's research publications

48%

more cited than the world average

61%

of our publications produced in collaboration

The Australian eHealth Research Centre

Our science

BIOMEDICAL INFORMATICS

Biostatistics, imaging and genomics based -clinical workflows

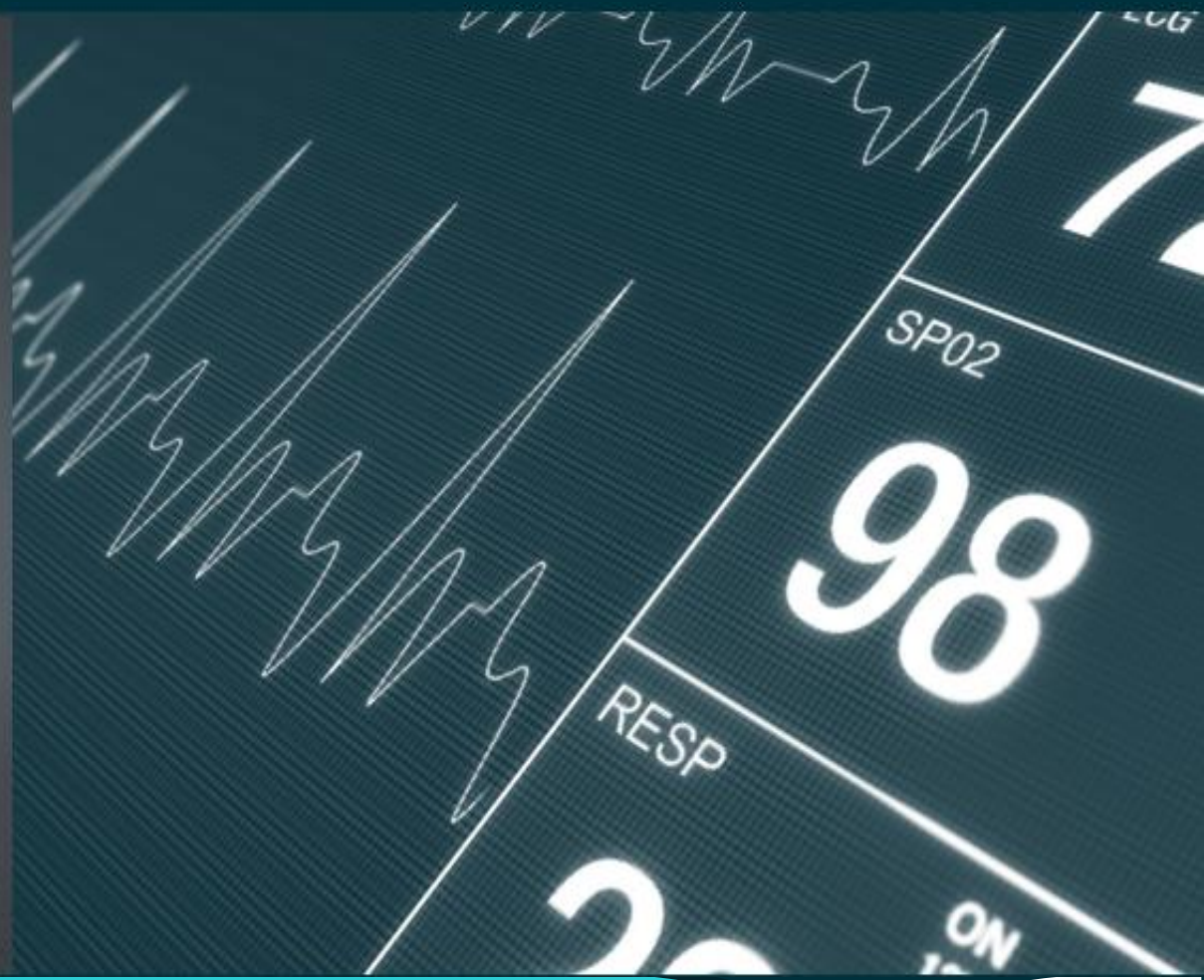
HEALTH INFORMATICS

Improving health system performance & productivity from electronic health data

HEALTH SERVICES

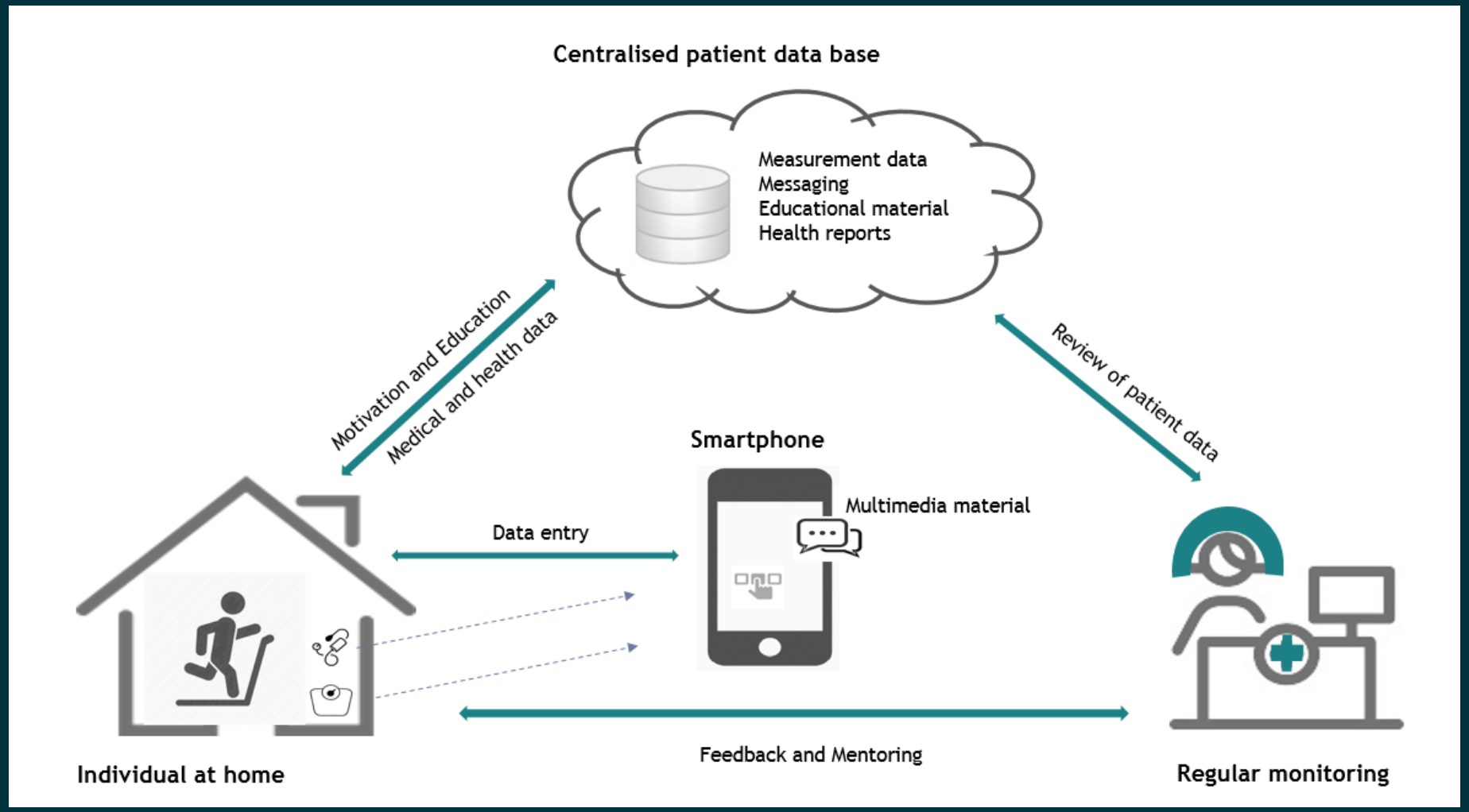
Improving access to services & management of chronic diseases

Mobile health solutions

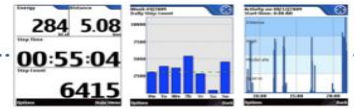
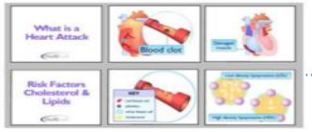


Barriers to cardiac rehabilitation

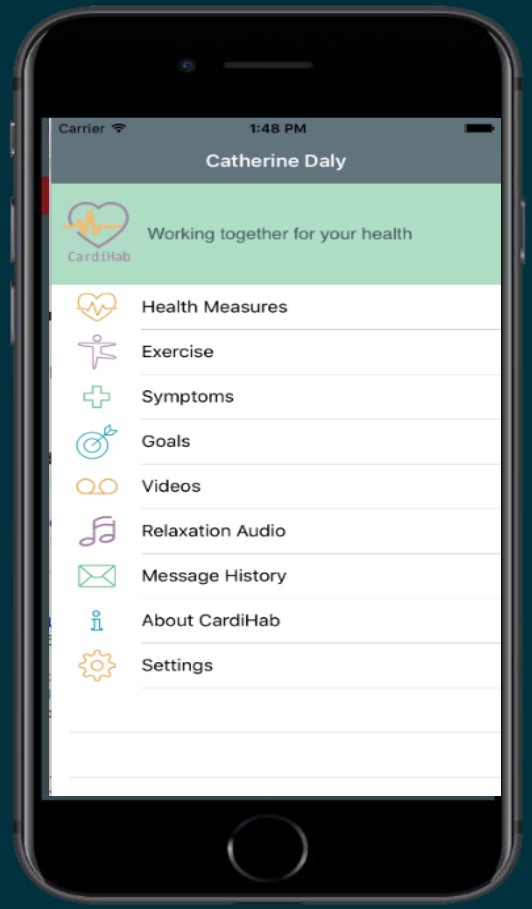
mHealth platform

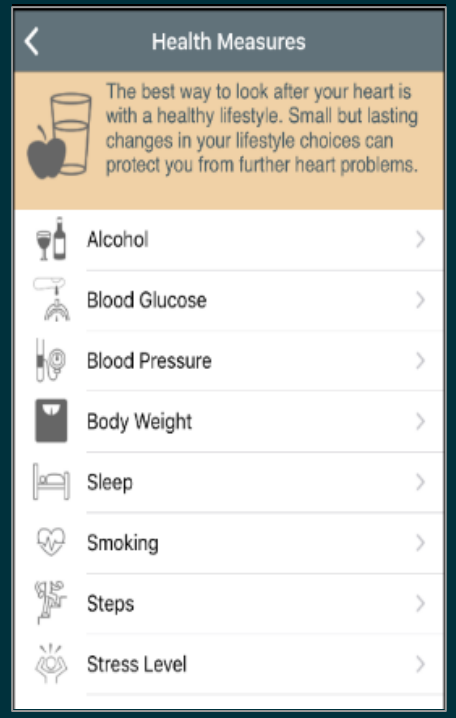


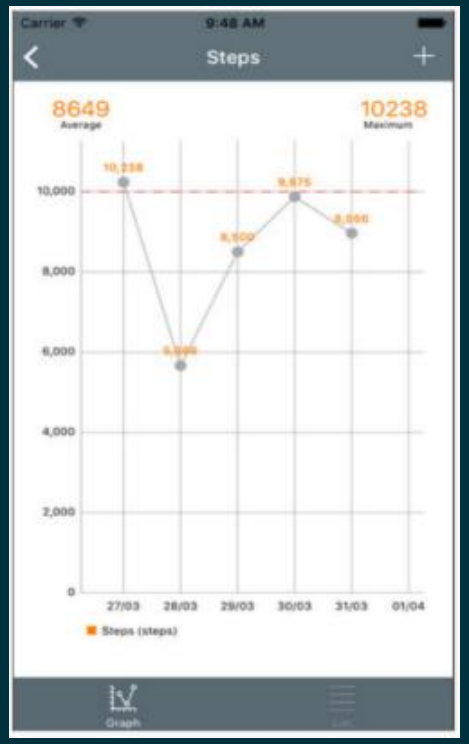
Cardiac rehabilitation program

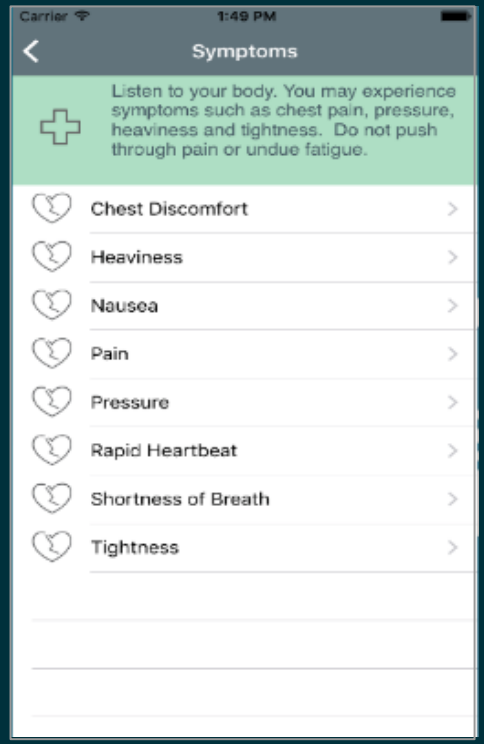
Cardiac Rehabilitation week	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
Mentoring sessions themes	Getting started Safety issues Chest Pain Medication Heart attack Goal setting	Activity Angina Smoking Worries Anxiety Relaxation	Sleep Relationship Family Sex Activity Depression	Weight issues Diet Exercise Smoking and medication	Cholesterol High blood pressure Diabetes Exercise Medication	Flu/Pneumonia Exercise CPR Alcohol
StepCounter	Continuous use 					
WellnessDiary	Daily entries 					
Tele & Video conference (Mentor) Goals and Plans	Once a week 					
SMS (text messages)	2/4 Per day 					
Video clips	1 to 2 Per week 					
Relaxation Audio	Every day 					

Smartphone app - iOS

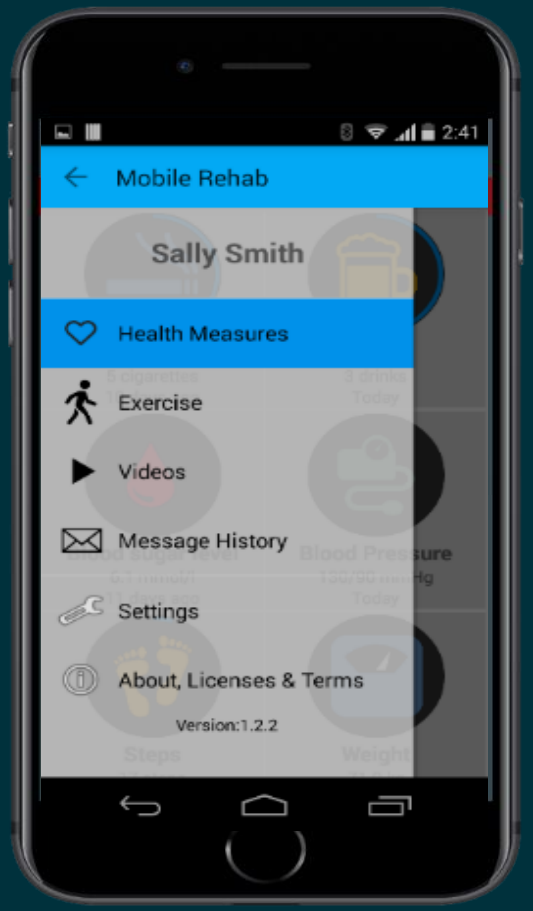


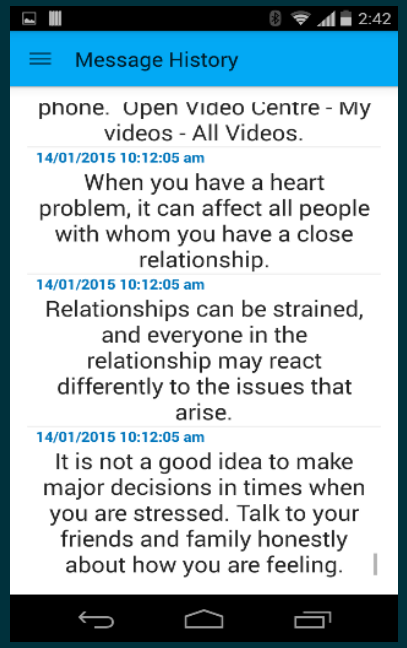


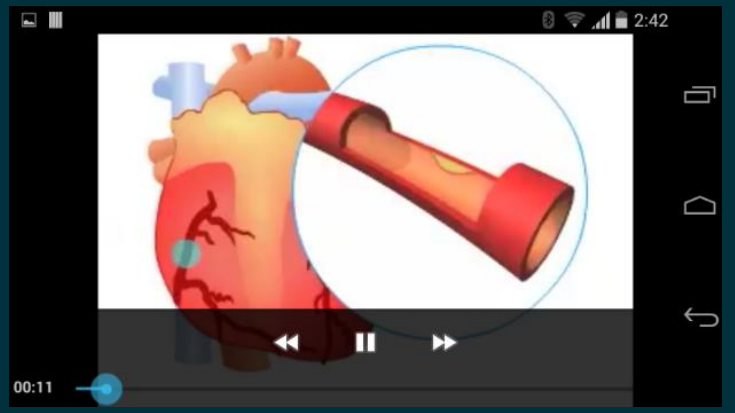




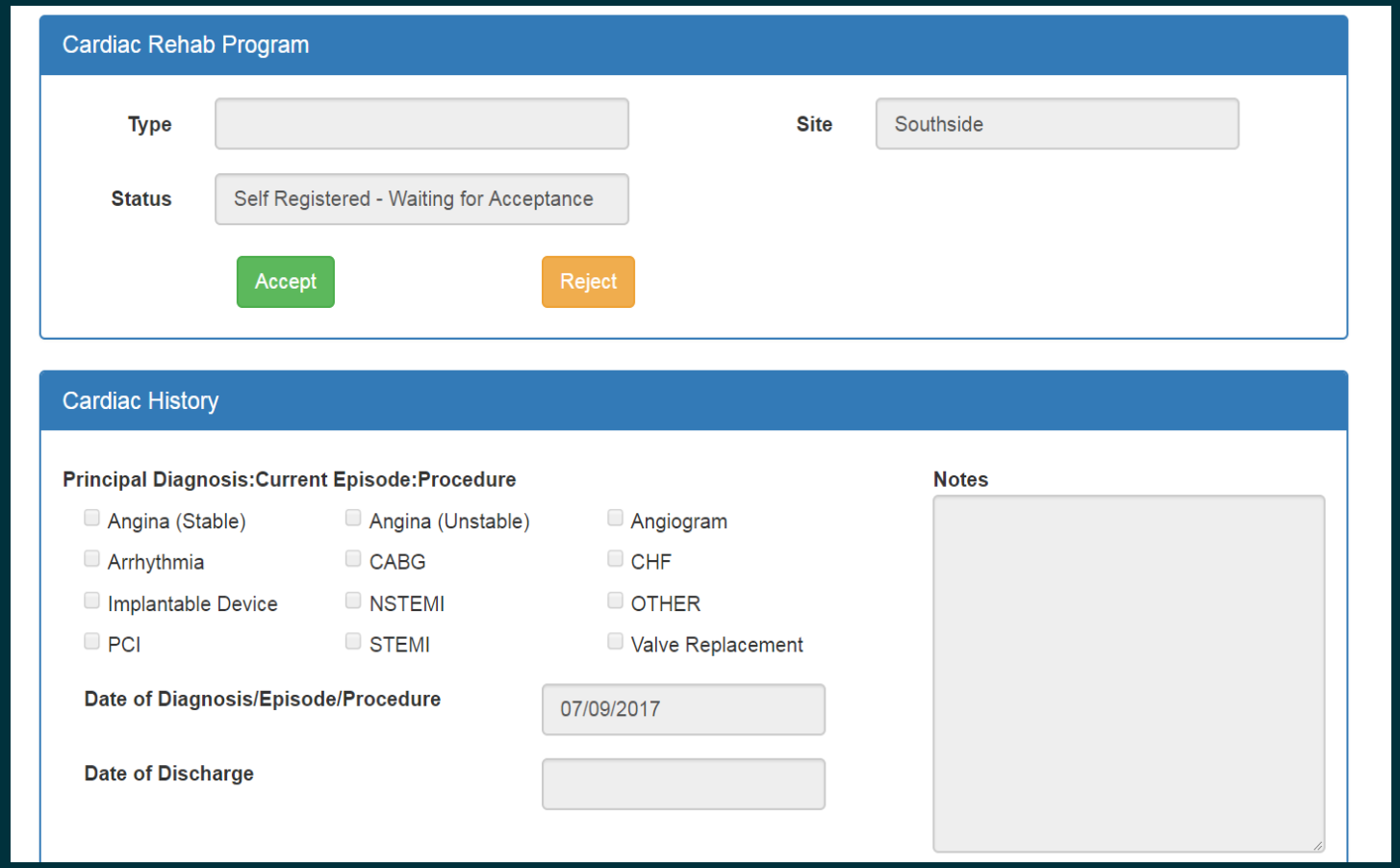
Smartphone app - Android

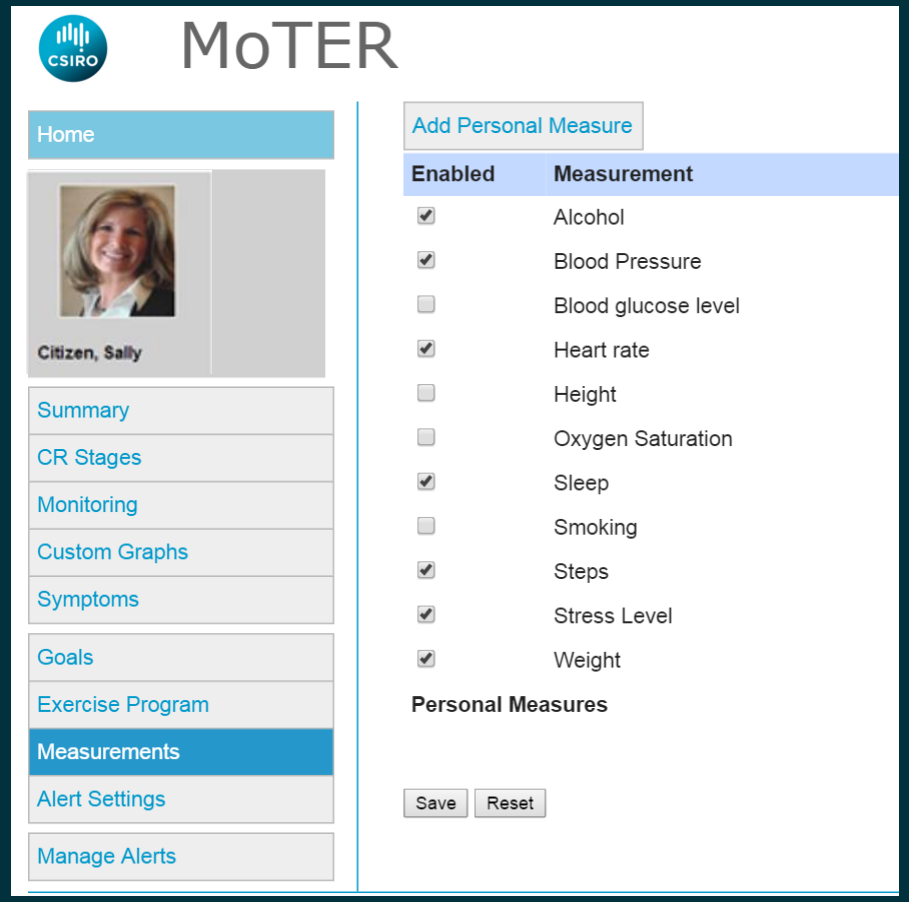




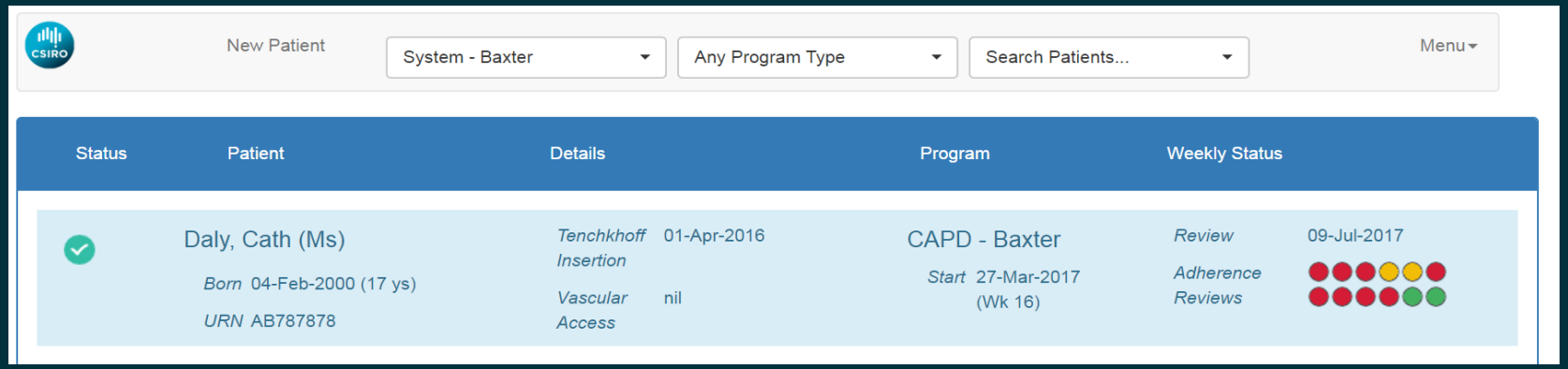


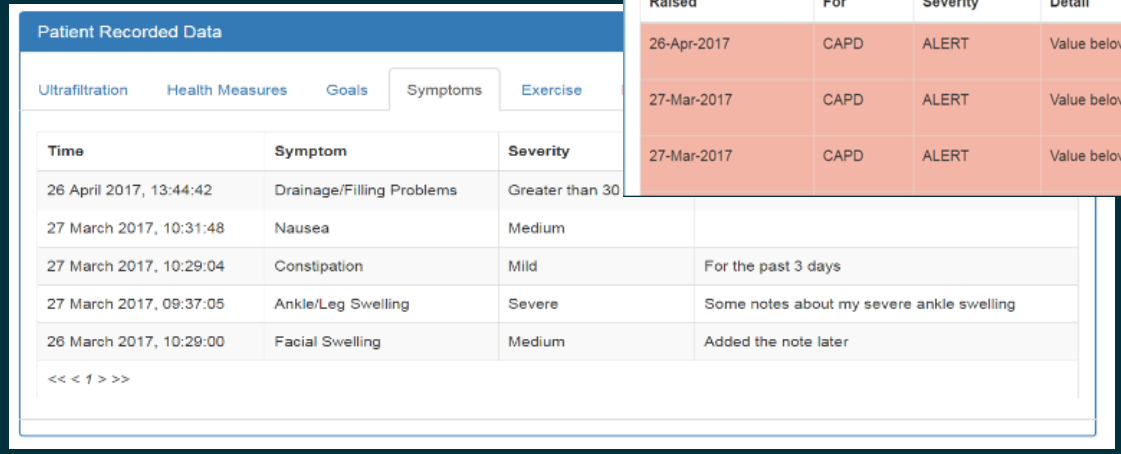
Clinician portal



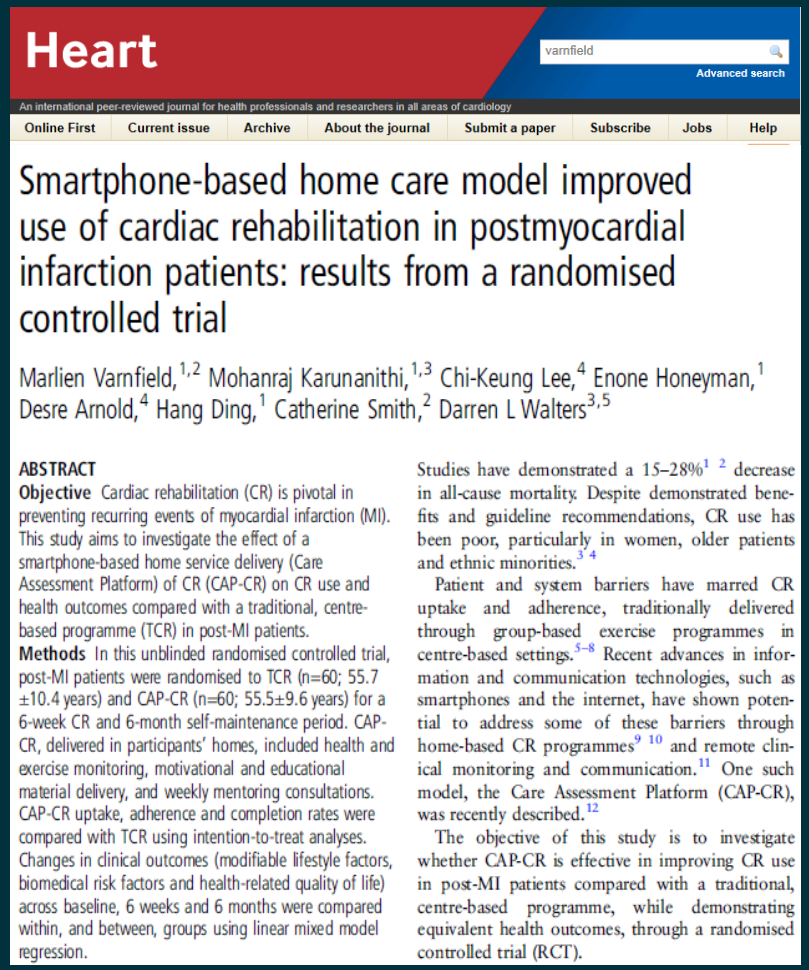


Patient progress





Impact



Heart

varnfield

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Smartphone-based home care model improved use of cardiac rehabilitation in postmyocardial infarction patients: results from a randomised controlled trial

Marlien Varnfield,[1,2] Mohanraj Karunanithi,[1,3] Chi-Keung Lee,[4] Enone Honeyman,[1] Desre Arnold,[4] Hang Ding,[1] Catherine Smith,[2] Darren L Walters[3,5]

ABSTRACT

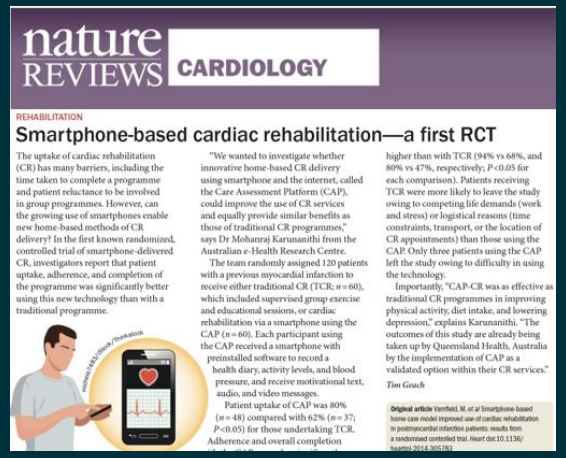
Objective Cardiac rehabilitation (CR) is pivotal in preventing recurring events of myocardial infarction (MI). This study aims to investigate the effect of a smartphone-based home service delivery (Care Assessment Platform) of CR (CAP-CR) on CR use and health outcomes compared with a traditional, centre-based programme (TCR) in post-MI patients.

Methods In this unblinded randomised controlled trial, post-MI patients were randomised to TCR (n=60; 55.7 ±10.4 years) and CAP-CR (n=60; 55.5±9.6 years) for a 6-week CR and 6-month self-maintenance period. CAP-CR, delivered in participants' homes, included health and exercise monitoring, motivational and educational material delivery, and weekly mentoring consultations. CAP-CR uptake, adherence and completion rates were compared with TCR using intention-to-treat analyses. Changes in clinical outcomes (modifiable lifestyle factors, biomedical risk factors and health-related quality of life) across baseline, 6 weeks and 6 months were compared within, and between, groups using linear mixed model regression.

Studies have demonstrated a 15–28%[1 2] decrease in all-cause mortality. Despite demonstrated benefits and guideline recommendations, CR use has been poor, particularly in women, older patients and ethnic minorities.[3 4]

Patient and system barriers have marred CR uptake and adherence, traditionally delivered through group-based exercise programmes in centre-based settings.[5–8] Recent advances in information and communication technologies, such as smartphones and the internet, have shown potential to address some of these barriers through home-based CR programmes[9 10] and remote clinical monitoring and communication.[11] One such model, the Care Assessment Platform (CAP-CR), was recently described.[12]

The objective of this study is to investigate whether CAP-CR is effective in improving CR use in post-MI patients compared with a traditional, centre-based programme, while demonstrating equivalent health outcomes, through a randomised controlled trial (RCT).



nature REVIEWS CARDIOLOGY

REHABILITATION

Smartphone-based cardiac rehabilitation—a first RCT

The uptake of cardiac rehabilitation (CR) has many barriers, including the time taken to complete a programme and patient reluctance to be involved in group programmes. However, can the growing use of smartphones enable new home-based methods of CR delivery? In the first known randomized, controlled trial of smartphone-delivered CR, investigators report that patient uptake, adherence, and completion of the programme was significantly better using this new technology than with a traditional programme.

"We wanted to investigate whether innovative home-based CR delivery using smartphone and the internet, called the Care Assessment Platform (CAP), could improve the use of CR services and equally provide similar benefits as those of traditional CR programmes," says Dr Mohanraj Karunanithi from the Australian e-Health Research Centre.

The team randomly assigned 120 patients with a previous myocardial infarction to receive either traditional CR (TCR; $n=60$), which included supervised group exercise and educational sessions, or cardiac rehabilitation via a smartphone using the CAP ($n=60$). Each participant using the CAP received a smartphone with preinstalled software to record a health diary, activity levels, and blood pressure, and receive motivational text, audio, and video messages.

Patient uptake of CAP was 80% ($n=48$) compared with 62% ($n=37$; $P<0.05$) for those undertaking TCR. Adherence and overall completion higher than with TCR (94% vs 68%, and 80% vs 47%, respectively; $P<0.05$ for each comparison). Patients receiving TCR were more likely to leave the study owing to competing life demands (work and stress) or logistical reasons (time constraints, transport, or the location of CR appointments) than those using the CAP. Only three patients using the CAP left the study owing to difficulty in using the technology.

Importantly, "CAP-CR was as effective as traditional CR programmes in improving physical activity, diet intake, and lowering depression," explains Karunanithi. "The outcomes of this study are already being taken up by Queensland Health, Australia by the implementation of CAP as a validated option within their CR services."

Tim Geach

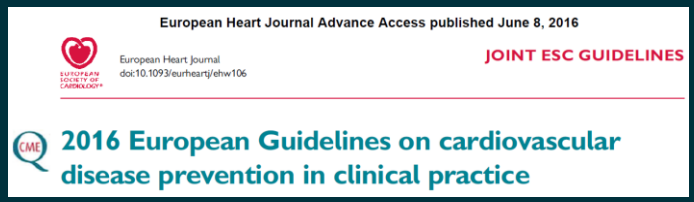
Original article Varnfield, M. *et al* Smartphone-based home care model improved use of cardiac rehabilitation in postmyocardial infarction patients: results from a randomised controlled trial. *Heart* doi:10.1136/heartjnl-2014-305781

Winners:

- e-Health
- e-Inclusions & e-community

Cited by 139

JACC | Circulation | JMIR Publications | AHJ | JAMA Internal Medicine



European Heart Journal Advance Access published June 8, 2016

European Heart Journal
doi:10.1093/eurheartj/ehw106

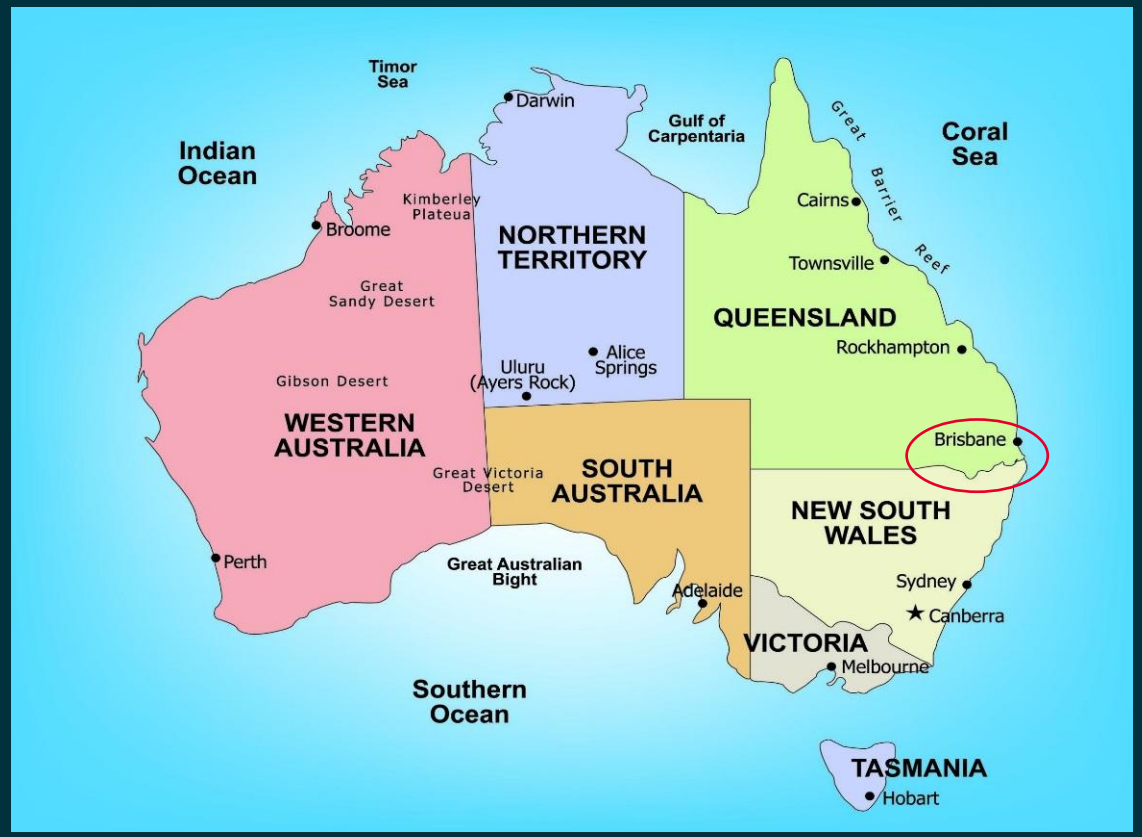
JOINT ESC GUIDELINES

2016 European Guidelines on cardiovascular disease prevention in clinical practice

International recognition:

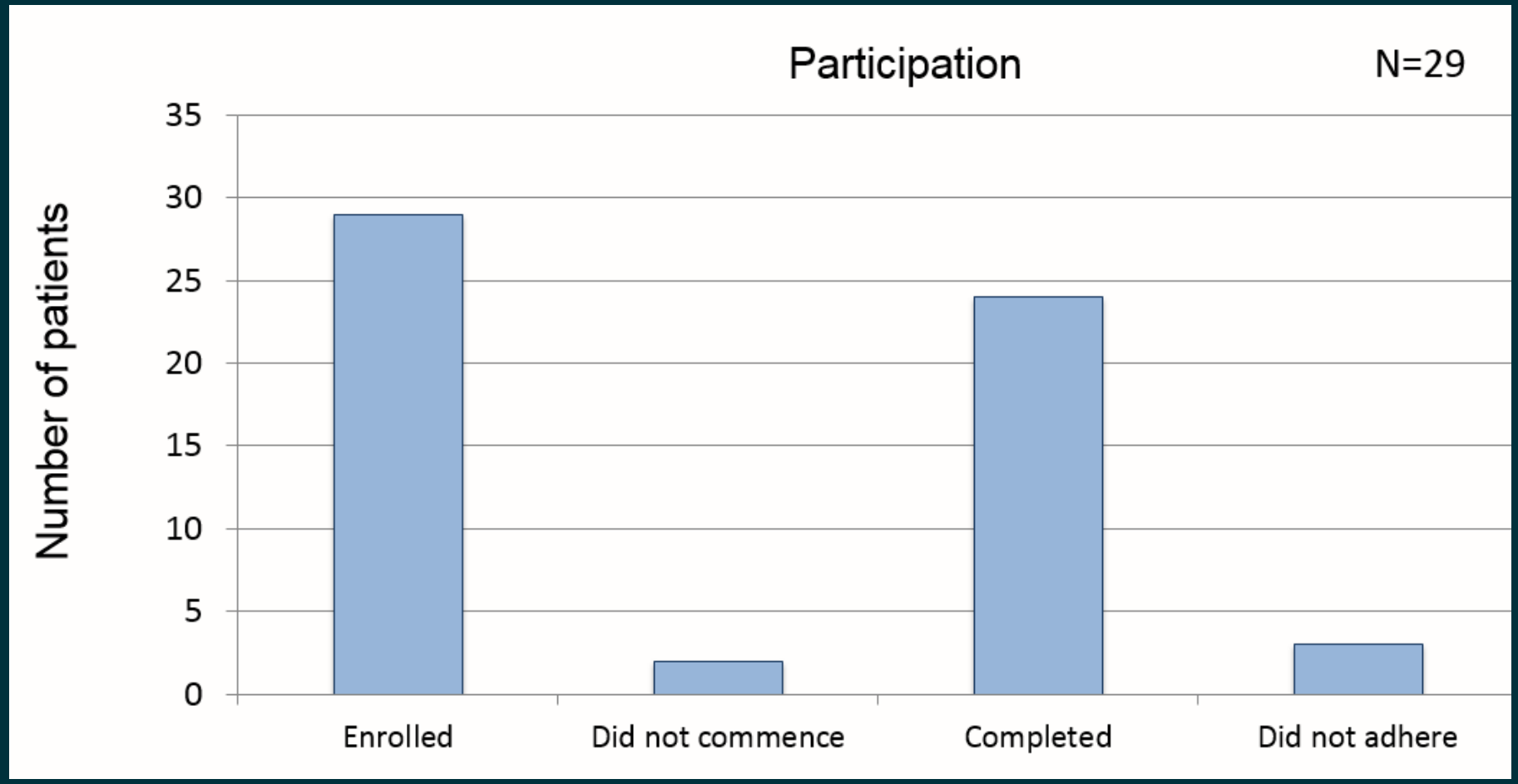
- ESC – Working Group on eCardiology
- Diversity study
- Czech Republic Cardiac Society

Implementation at West Moreton HHS

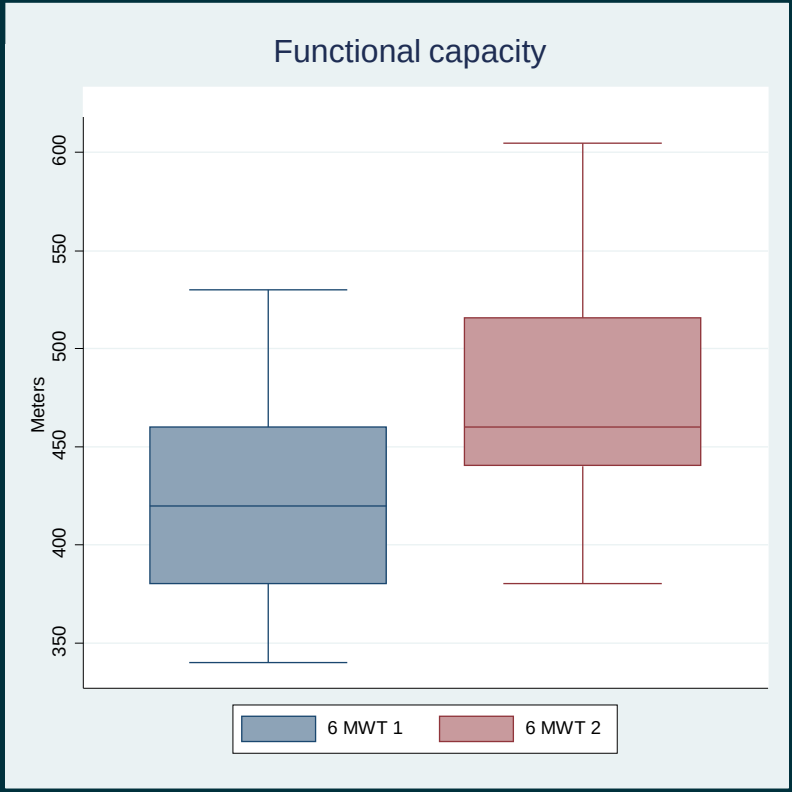


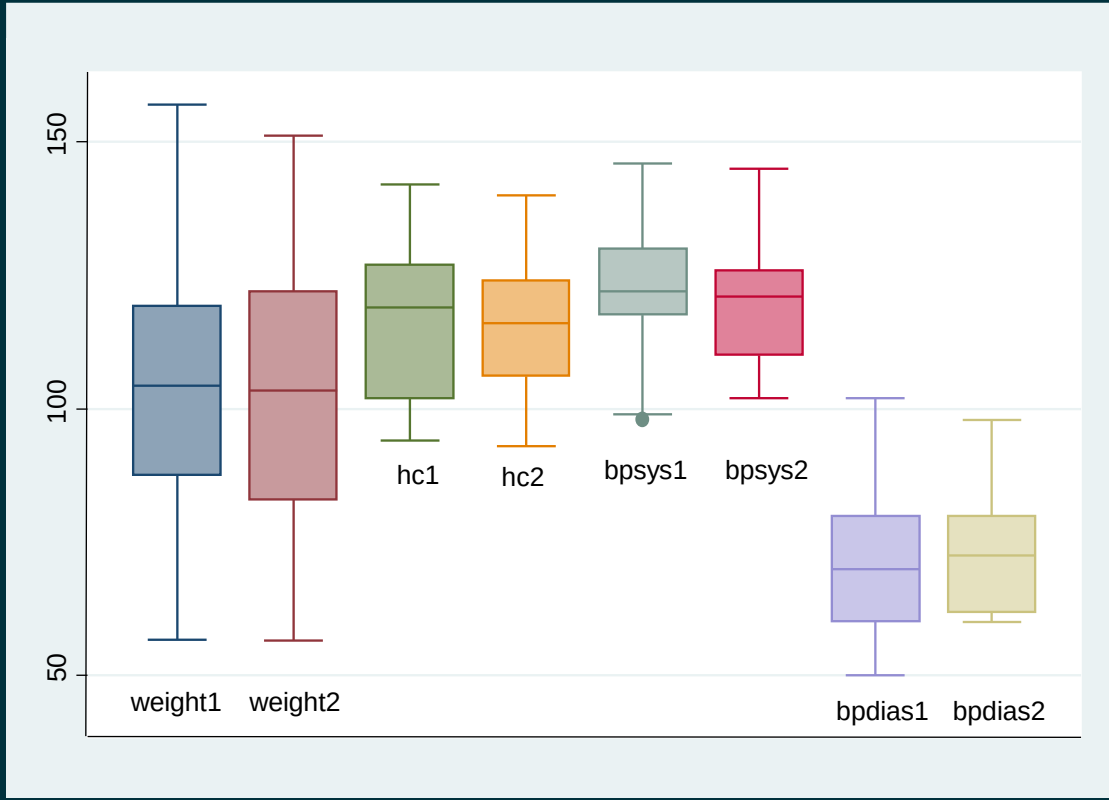
- Business as usual (12 months)
- Ipswich + small regional and rural towns
- Smartphone and devices provided

Results


Participation
N=29
Number of patients
35
30
25
20
15
10
5
0
Enrolled
Did not commence
Completed
Did not adhere

Results


Functional capacity
Meters
350
400
450
500
550
600
6 MWT 1
6 MWT 2


50
100
150
weight1
weight2
hc1
hc2
bpsys1
bpsys2
bpdias1
bpdias2

Self assessment of health and wellbeing

ITEM	Yes	Partly	No	NA	% Y/Partly if applicable
Ability to return to work	11	1	1	7	**92**
Stop smoking / stay quit	6	4	1	8	**91**
Improve energy levels	10	8	1	0	**95**
Gain confidence with physical activity	13	7	0	0	**100**
Become fitter	10	7	2	0	**89**
Understand heart disease better	14	6	0	0	**100**
Fewer angina attacks	9	3	4	3	**75**
Improve dietary habits	14	4	2	1	**90**
Decrease cholesterol levels	11	4	1	2	**94**
Lose weight / improve body weight	8	9	1	0	**94**
Decrease stress levels	9	7	1	2	**94**
Manage stress better	9	7	1	1	**94**

Lessons learned

- Slow uptake – structural changes
- Providing smartphones and devices
- Services were not structured /staffed for the deployment
- Infrastructure not suitable

- Bring your own device policy
- Ensure buy in from staff and adequate staffing structure
- Train the trainers
- Provide tablet/computers

Implementation at Metro South HHS

Centre-based CR programme (access to the smartphone application optional)

Supervised exercise and education sessions over six weeks as per usual care.

Smartphone app optional

CR staff monitor patients' measurements before and after each exercise session (NOT monitored outside the group setting).

Home-based CR programme supported by smartphone and Internet technologies

Smartphone app for data entry

Patients' measurements are remotely monitored (six weeks) during which they receive a call/week to discuss their progress

Web portal for clinician review prior to weekly phone call

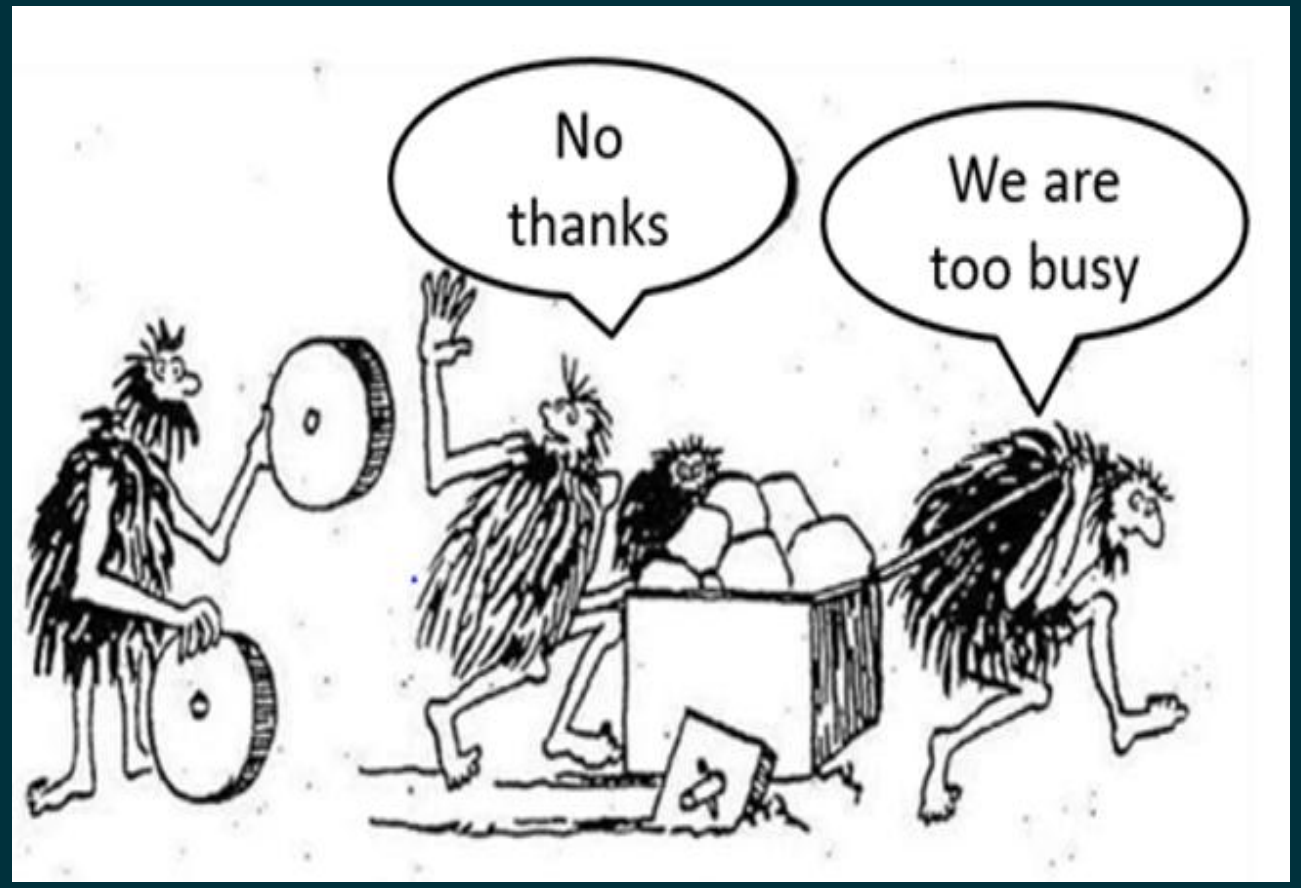
Home

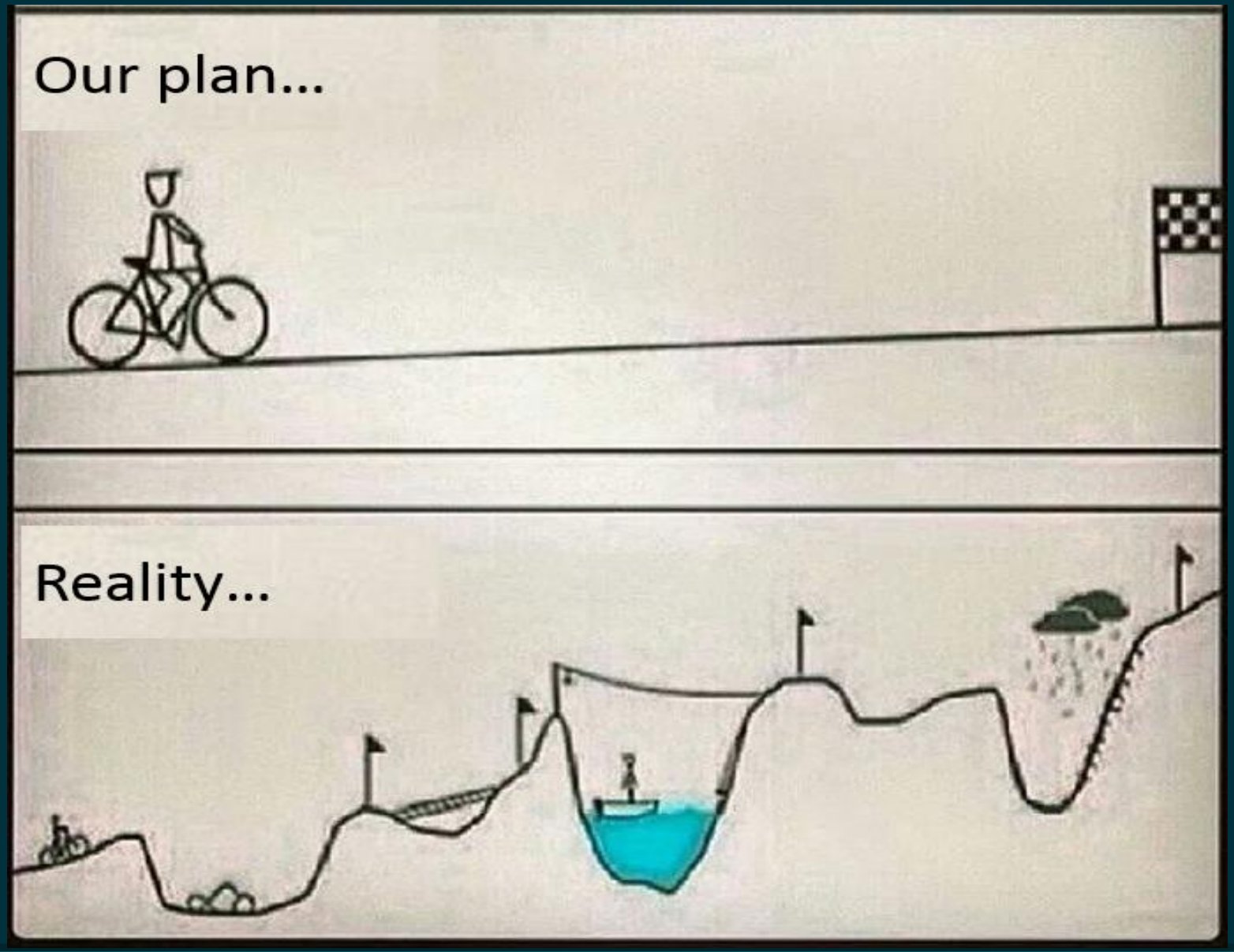
Flexible (switch-over) CR programme with access to smartphone application

Patients commence in centre-based programme (with access to smartphone app) and switch over to home-based programme dependent on personal circumstances.

Results

- Two of the services reporting > 10% participation in the home-based programme respectively, none at the 3rd service.
- Few patients selected to partake in the hybrid CR offering.
- Home-based patients were generally younger (58±9 years) vs (64±11 years).
- Improvement in functional capacity and Heart QoL in all programs





CARDIHAB

So where to now?

- Patient outcomes priority
- All patients deserve equal care
- One size does not fit all
- Cost effective?
- Change management

New m-Health trials underway

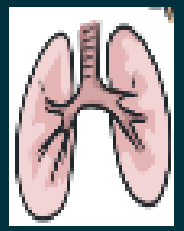
M♡THer

Support women with GDM

Improves multidisciplinary care co-ordination

Adherence to blood glucose testing

M-COPD



Management of patients with COPD

Improves low concordance with COPD guidelines

Better self-management

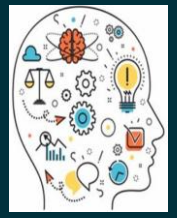
PD BUDDy

Support for home-based peritoneal dialysis

Reduce patient time spent at clinic

Reduction in PD related peritonitis

Health-e Minds



Support for patients with mental illness

monitoring and intervention for metabolic syndrome

Reduction in the rate of death and disability in those who are medicated

The future

Gamification

Provides motivation, rewards and reinforces commitment

Clinical decision support

Risk stratification based on algorithms to support healthcare providers in managing patients

Connect with us

Thank you

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CSIRO

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We collaborate
We innovate