

Effectiveness of Optimized Exercise Prescriptions in Patients with AMI Using Mobile Health Care App

Hyun-Seok Jo, M.D.¹, Ki-Hong Kim, M.D.¹, Min-Keun Song, M.D.PhD.¹, Hyeng-Kyu Park, M.D.PhD.¹, In-Sung Choi, M.D.PhD.¹, Jae-Young Han, M.D.PhD.¹

Department of Physical and Rehabilitation Medicine, Regional CardioCerebroVascular Center, Chonnam National University Medical School & Hospital, Gwangju City, Republic of Korea¹

INTRODUCTION

Cardiac rehabilitation (CR) has been proven to decreased cardiovascular mortality and hospital readmissions. And utilizing mobile health care application (app) may be an effective strategy for patients with acute myocardial infarction (AMI), as it can help in setting appropriate exercise time, intensity. So, additional benefits are expected with more personalized and optimized exercise prescriptions. The overall aim of the study is to assess whether **6 weeks home based cardiac rehabilitation with exercise readjustment using mobile app (CR-Mobile)** is an effective therapy for patients with AMI.

METHODS

Study Design (Fig. 1)

- Inclusion : post AMI patients eligible for home-based CR
 - Intervention group, home based CR **using mobile app (CR-Mobile, n=24)**
 - Control group, usual home-based CR **(CR-Usual, n=24)**
- Both groups participated in 6-week of home-based CR

- Exercise prescription (**Fig. 2**)
 - CR-Mobile** : received an exercise prescription utilizing a mobile app during their first visit
 - CR-Usual** : received a prescription without any explanation related to the mobile app.
- Every 2 weeks, exercise readjustment was carried out
 - CR-Mobile** : supervised through the data recorded in the mobile app (**Harufit Cardio, L&H Labs Inc., Republic of Korea**)
 - CR-Usual** : supervised by questioning the patients over the phone
- Primary outcome was **maximal oxygen consumption (VO₂max)**.

Figure 1. flow chart of study.

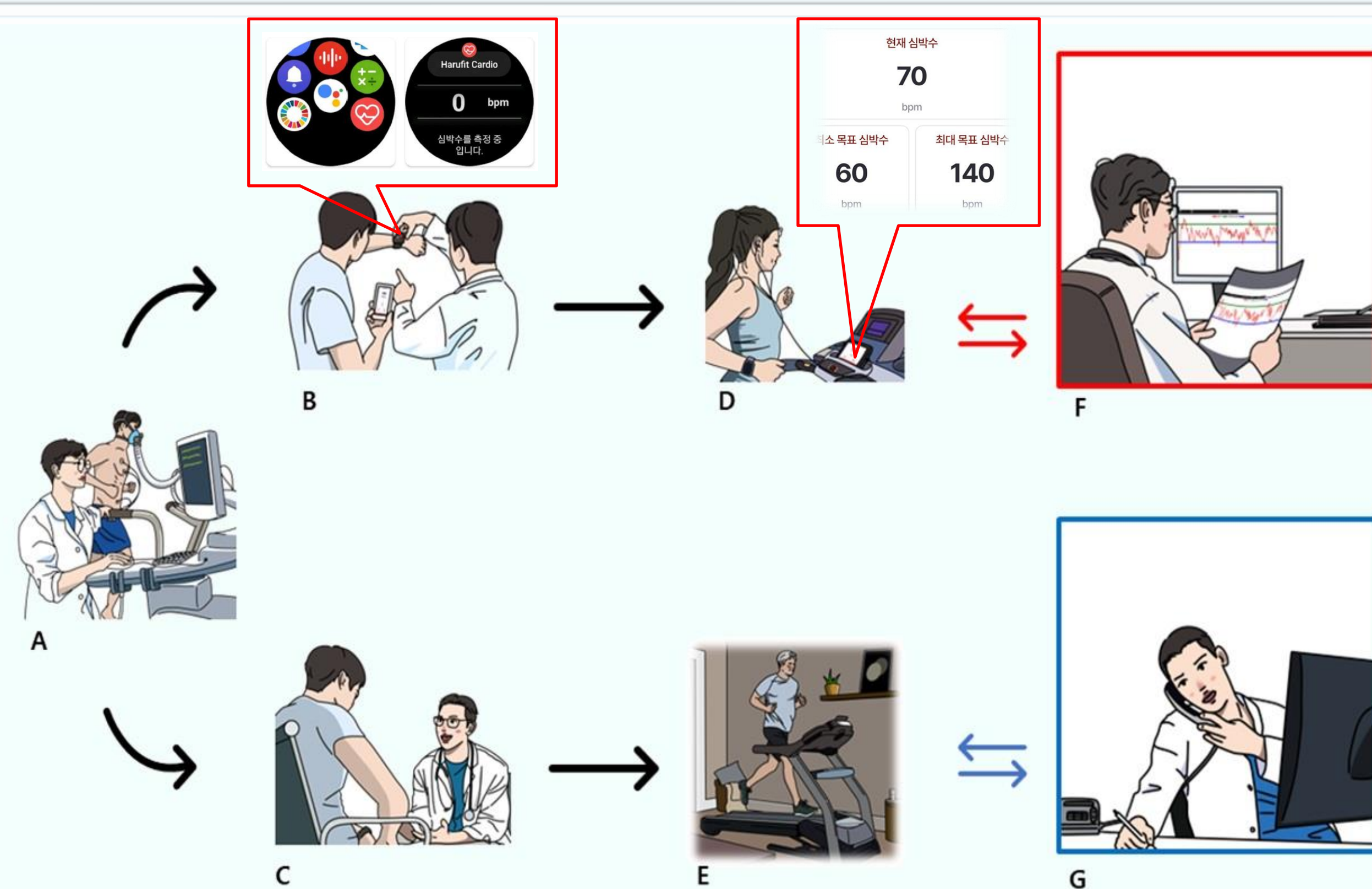
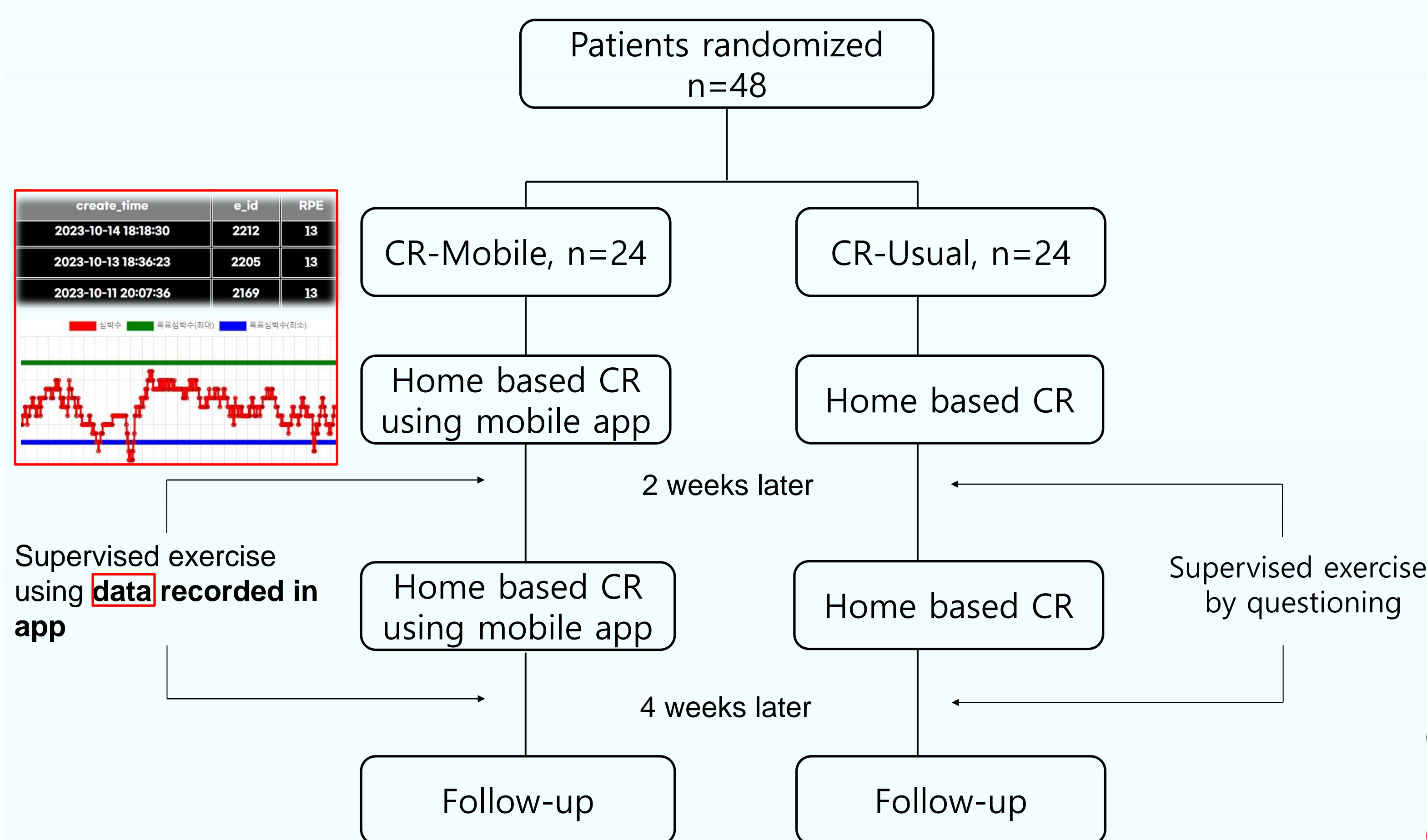


Figure 2. (A) patients doing exercise tolerance test, (B, C) exercise prescription either through a **mobile app** or **verbally**, (D, E) home based cardiac rehabilitation **with or without mobile app**, **(F) exercise readjustment through the data recorded in the mobile app every 2 weeks**, **(G) exercise readjustment by questioning the patients over the phone every 2 weeks**.

RESULTS

Table 1. Demographic characteristics of participants

	Total (n=48)	CR-Mobile (n=24)	CR-Usual (n=24)	p-value
Age (Years)	57.0±9.9	58.0±12.4	56.0±7.0	0.501
Sex, No.				0.551
male (%)	45 (93.8)	22 (91.7)	23 (95.8)	
female (%)	3 (6.3)	2(8.3)	1(4.2)	
BMI (kg/m ²)	25.3±3.1	25.1±2.6	25.6±3.6	0.581
LVEF (%)	53.6±9.7	54.7±11.3	52.5±8.0	0.441
Comorbidities				
HTN (%)	18 (39.1)	10 (43.5)	8 (34.8)	0.546
DM (%)	12 (26.1)	5 (21.7)	7 (30.4)	0.502
DL (%)	18 (39.1)	7 (30.4)	11 (47.8)	0.227
Intervention				0.312
PCI	47 (97.9)	24 (100)	23 (95.8)	
PCI+CABG	1 (2.1)	0 (0)	1 (4.2)	

Values are presented as mean ± standard deviation. Test statistics are presented as χ^2 or t value. Abbreviations; CR-Mobile, home-based cardiac rehabilitation supervised by mobile health care application; CR-Usual, home-based cardiac rehabilitation verbally supervised; BMI, body mass index; LVEF, left ventricular ejection fraction; HTN, hypertension; DM, diabetes mellitus; DL, dyslipidemia; PCI, percutaneous coronary intervention; CABG, coronary artery bypass surgery.

Table 2. Primary and secondary outcome parameters at baseline and 6-week follow-up.

	CR-Mobile group (n=20)			CR-Usual group (n=21)			Mobile vs Usual	
	Baseline	Post (6weeks)	p-value	Baseline	Post (6weeks)	p-value	Time	Time x Group
VO ₂ max (mL/kg/min)	27.34±3.86	30.52±7.24	0.011*	25.75±7.18	29.05±9.96	0.020*	0.001	0.947
METs	7.8±1.1	8.7±2.1	0.011*	7.4±2.1	8.3±2.8	0.011*	0.001	0.947
HR _{rest} (beats/min)	66.7±6.8	68.4±4.7	0.255	69.9±5.2	70.5±6.7	0.648	0.251	0.604
HR _{max} (beats/min)	143.7±14.4	147.2±19.6	0.403	145.2±16.8	146.0±23.2	0.825	0.434	0.624
SBP _{rest} (mmHg)	114.8±13.3	116.8±18.7	0.584	122.2±18.6	128.2±16.0	0.078	0.103	0.400
DBP _{rest} (mmHg)	73.7±9.8	74.1±10.9	0.857	72.7±11.1	77.0±14.1	0.258	0.198	0.285
SBP _{max} (mmHg)	161.9±30.3	171.5±28.1	0.191	177.9±28.5	164.2±35.9	0.127	0.718	0.044
DBP _{max} (mmHg)	74.0±10.4	79.7±18.0	0.118	82.6±17.6	82.9±16.3	0.513	0.210	0.247
KASI	54.9±8.3	57.9±6.4	0.195	54.6±7.0	59.4±4.3	0.004	0.005	0.502
EQ-5D	5.2±0.6	5.5±0.6	0.332	5.4±0.7	5.6±1.2	0.565	0.291	0.814
PHQ-9	0.3±1.3	0.4±1.0	0.713	0.1±0.3	0.2±0.5	0.655	0.669	0.863

Values are presented as mean ± standard deviation. Effects of cardiac rehabilitation on the endpoints were analyzed using paired t-test. Repeated-measures analysis of variance was conducted to examine within-group and between-group over-time differences. p-value <0.05 was considered to be of statistical significance. Abbreviations; CR-Mobile, home-based cardiac rehabilitation supervised by mobile health care application; CR-Usual, home-based cardiac rehabilitation verbally supervised; VO₂max, maximal oxygen consumption; METs, metabolic equivalents; HR_{rest}, resting heart rate; HR_{max}, maximal heart rate; SBP_{rest}, resting systolic blood pressure; DBP_{rest}, resting diastolic blood pressure; SBP_{max}, maximal systolic blood pressure; DBP_{max}, maximal diastolic blood pressure; KASI, Korean activity scale/index; EQ-5D, EuroQoL-5 dimensions; PHQ-9, patient health questionnaire-9.

CONCLUSION

These results suggest that a 6-week home based CR with **exercise readjustment using mobile app** for patients with AMI has the **potential to improve exercise capacity** as well as verbally supervised. Although significant differences were not observed between the groups, further large-scale multicenter studies including the group that not being supervised exercise readjustment, are needed.