Use of e-health to support exercise maintenance in cardiac patients

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Global burden of cardiovascular disease (CVD)

Figure 1 Comparison of leading causes of death over the past decade
CVD in Asia

Figure 3 CVD epidemiology in Asia

(Ohira, et al., 2013)
Increasing burden in Asia

World Population Growth

Ageing and Health

Populations are getting older

Percentage aged 60 years or older:
- 90% or more
- 70 to <90%
- 50 to <70%
- <70%

Urbanization

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Cardiac rehabilitation (CR)

• Definition: coordinated, multifaceted interventions designed to optimize a cardiac patient's physical, psychological, and social functioning, in addition to stabilizing, slowing, or even reversing the progression of the disease, thereby reducing morbidity and mortality. (Goble and Worcester, 1999)

• Involve a variety of therapies:
  – Risk factor assessment and management
  – Exercise training
  – Psychosocial support

• International clinical guidelines consistently identify exercise therapy as a central element of cardiac rehabilitation. (Blady, 2007; Graham 2007, NICE 2007)
The benefits of exercise-based CR:

- Results of systematic reviews and meta-analyses showed:
  - Significant reduction in CVD-related mortality, ranging from 20% to 36%  
  - Significant reduction in all-cause mortality, ranging from 13% to 26%  
    (Taylor, 2004; Heran, 2011; Lawler, 2011)
  - Significant reduction in risk of reinfarction (47%)  
    (Lawler, 2011)
  - Significant reduction in risk of hospital admissions, ranging from 18% to 31%  
    (Heran, 2011; Taylor, 2014; Anderson, 2016)
  - Significant reduction in total cholesterol level, triglyceride level, systolic blood pressure  
    (Taylor, 2004)
  - Significant reduction in self-reported smoking (36%)  
    (Taylor, 2004)
Utilization of excise-based CR

• Referral, enrolment, and completion are suboptimal worldwide, especially among women and older people (Beswick, 2004; Leon, 2005; Suaya, 2007; Clark, 2012; Beatty, 2013; Hutchinson, 2015).

• Only 10-20% of patients who survive an acute myocardial infarction (MI) participate in an exercise-based CR program. (Chan, Chau, & Chang, 2005; Lawler, 2011)

• Only 6.9% of women and 13.3% of men discharged after MI enroll in cardiac rehabilitation; among elderly patients, only 15% of women enroll, compared with 25% of men. (Filip, 1999)

Situation in Hong Kong:

- 25% patient attendance
- 10% to 36% drop-out rates

(Chan, Chau, & Chang, 2005; Chair, Chan, Thompson, Leung, Ng. Choi, 2011; Chair, Chan, Thompson, Leung, Ng. Choi, 2013)
Barriers to utilization of excise-based CR

Availability
- Do not adequately suit audiences’ availability
- Work and family commitment

Accessibility
- Geographical and time constraint
- Other medical conditions (e.g., arthritis)

Affordability
- Time, money, and inconvenience costs
New strategies are needed for the delivery of exercise-based CR.
Change in population characteristics and implication

- Young-onset
- Health literacy
- Education level

Technology advancement and popularity

E-health
Types of e-health service

- Internet based technologies and services
- Decision support tools (care pathways, guidelines)
- Telemedicine: Remote treatments
- mHealth mobile health device: apps and message service

E-health key application areas
Evolvement of e-health program

Interactive computerized interventions (e.g. computers, apps)

Computer print materials (e.g. pamphlets, newsletters)
Characteristics of e-health CR program

- Prompt communication
- Great penetration
- Equitable digital access
- Interactive
- Multi-media

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Application of e-health in CR: website
CVHealth website:  
www.cuhk.edu.hk/proj/CVHealth

• Funded by Knowledge Transfer Project Fund
• Aim: to empower the public to prevent and control the occurrence of Coronary Heart Disease, stroke and Hypertension.
• Supported by multidisciplinary experts
• Free for public access.
Application of e-health in CR: mixed-method study

- Project title: The effectiveness of a home-based interactive e-health educational intervention (e-HEI) for middle-aged coronary heart disease (CHD) adults
- Funded by HRMF (Health and Medical Research Fund)
- Aims:
  - To evaluate the effectiveness of a home-based e-HEI program on improvements in exercise amount, exercise adherence, and self-efficacy on exercise
- Study design: mixed-method study (RCT followed with a qualitative process evaluation)
Uniqueness of e-HEI
(http://ehealth.nur.cuhk.edu.hk)

- Knowledge related to CHD and measures to modify risk factors

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<th>行動</th>
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Outcome measures

• Total physical exercise (GSLTPA score)
  - Godin-Shepherd Leisure Time Physical Activity Questionnaire
    (Godin and Shephard, 1985)
  - Weekly frequencies of strenuous, moderate, and light activities are multiplied by 9, 5, 3 METs respectively. Total weekly leisure activity is calculated in arbitrary units by summing the products of the separate components.
  - This scale has been shown to have good psychometric properties. (Jacobs, Ainsworth, Hartman, 1993; Sallis, Buono, Roby, et al, 1993)

• Exercise Adherence
  - 80% Compliance to the agreed target: 150 min per week or Time prescribed by physician
Result on GSLTPA Score

Baseline
16.85
15.74

3 Months
19.25
14.58

6 Months
18.24
14.82

p = 0.02*

p = 0.14

Intervention
Control
Result on Exercise Adherence

- Baseline: 36.20%
- 3 Months: 36.40%
- 6 Months: 38.20%

Control Group:
- Baseline: 43.40%
- 3 Months: 37.70%
- 6 Months: 38.40%

p = 0.29

Intervention vs Control:
- Baseline: 36.20% vs 43.40%
- 3 Months: 36.40% vs 37.70%
- 6 Months: 38.20% vs 38.40%

p = 0.77
E-health in exercise-based CR: Australia
E-health in exercise-based CR: Myheartmate
Role of nurses in e-health exercise-based CR

To ensure the e-health practice:

• S conform to **STANDARDS**
• A be **ACCEPTABLE** to patients, clients, carers, and health care workers
• F be **FIT** for purpose and practice
• E be supported by **EVIDENCE**
• R be **RISK MANAGED and safe**

Royal college of Nursing,
e/sites/Royal%20College%20of%20Nursing%20Guidance%20Document%20Putting%20information%20at%20the%20heart%20of%20nursing%20care%20How%20IT%20is%20revolutionizing%20health%20care.pdf
Factors that promote the implementation of e-health program

• Ease-to-use interface
• Individual tailoring
• Cognitive participation
  – Legitimize participation in the implementation process and promote it as a worthwhile activity
  – Engage with potential professionals and users
• Collective action
  – Roles, responsibilities, and training
  – Address organizational issues: adequate resources, administrative support, policy support, stands and interoperability
• Reflective monitoring
  – Make the benefits of new technologies transparent through ongoing evaluation and feedback

(Mair, May, O’Donnell, Finch, Sullivan, Murray, 2012)
E-health in Asia

- Competence training
- Patient-centered metrics
- Family care partnering
- Cultural customization
- Multidisciplinary approach

Person-centered e-health care
E-health research

1. Define the problem
   - Understand the problem, context & stakeholder needs
   - Identify relevant psychology etc. theories
   - Formalise user requirements & the context of use
   - Scan existing relevant technologies / solutions
   - Identify potentially appropriate new technology / solution

2. Research, design & develop solution
   - Co-design, develop & prototype solution in collaboration with stakeholders

3. Evaluate solution & generate evidence

4. Support innovation
   - Support uptake & spread
   - Knowledge exchange with stakeholders
   - Carry out evidence synthesis
   - Carry out impact evaluation

Funding
Thank you