Web-based nursing intervention to promote physical activity among older adults with coronary heart disease: Protocol for a mixed method pilot study

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Submitted to: JMIR Research Protocols
on: October 17, 2024

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Abstract

Background: Given the high prevalence of coronary heart disease among older adults and the aging of populations, there is a need for secondary prevention interventions to help older adults become more physically active. Web-based interventions could be considered for this purpose, knowing that Internet use is growing rapidly among older adults. In addition, since older adults would appreciate developing a trusting relationship with a nurse, web-based interventions should include this support, which is not widely observed in the literature.

Objective: The purpose of this study is to evaluate a web-based nursing intervention aimed at promoting physical activity in people aged 65 years and older with coronary heart disease.

Methods: A web-based nursing intervention was developed according to the Intervention Mapping framework, in collaboration with a team of healthcare professionals (n=5) and based on the needs of older adults (n=10). The 7-session weekly intervention aims to support older adults living with coronary artery disease in resuming, maintaining or increasing their level of physical activity after coronary bypass surgery or percutaneous coronary intervention. The intervention offers educational content on coronary heart disease and physical activity, suggestions for physical activity, reflective activities, case histories of older adults who have experienced different journeys, an electronic physical activity diary to track progress, and support from a nurse through feedback to increase knowledge, motivation, and sense of self-efficacy. The preliminary effects and impacts of the intervention will be assessed through a mixed method pilot study with a sequential explanatory design. First, a single group pre-post test will be used to assess the intervention's preliminary effects on physical activity (electronic journal), quality of life (SF-36v2 questionnaire), knowledge (quiz), motivation and self-efficacy (visual analog scale) of 30 older adults living with coronary heart disease, as well as the feasibility of the intervention. Second, a descriptive qualitative design will employ semi-structured interviews to assess the intervention's impacts as perceived by 8 to 12 older adults and its acceptability. Quantitative data on the effects of the intervention will be integrated with the collection and analysis of qualitative data to assess the impact perceived by older adults, using matrices. Non-parametric statistics and a thematic analysis will be produced. A joint display will be used to integrate mixed data.

Results: The results of this study will provide insight into the preliminary evaluation of a web-based nursing intervention to support older adults living with coronary heart disease as they increase their physical activity levels. The recruitment commenced in June 2024, and data collection should be completed by March 2025.

Conclusions: With the potential to promote older adults' health, this study could guide the development of new intervention to meet the needs of the aging population. Clinical Trial: ClinicalTrials.gov NCT16197347.

(JMIR Preprints 17/10/2024:67678)
DOI: https://doi.org/10.2196/preprints.67678

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Conclusion: With the potential to promote older adults' health, this study could guide the development of new intervention to meet the needs of the aging population.

Trial Registration: ClinicalTrials.gov NCT16197347.

Keywords: older adult, physical activity, web-based intervention, coronary heart disease

Introduction

With the aging of the population, coronary heart disease (CHD) is becoming more prevalent among older adults [1]. CHD is characterized by obstructions in the coronary arteries by cholesterol plaques, preventing oxygen-rich blood from being delivered to the hearth [2]. Older adults are at greater risk of developing CHD due to physiological aging (i.e., stiffness of the arteries, buildup of fatty deposits in the walls of arteries over the years). While aging is major risk factor, the progression

of CHD can be modified by risk reduction strategies (i.e., secondary prevention) to improve survival, and quality of life among older adults. Secondary prevention of CHD includes interventions designed to address cardiovascular risk factors through the adoption of healthy lifestyle habits (i.,e., physical activity, diet, smoking cessation, stress management) [3]. Increasing physical activity is a core component of secondary prevention, and one of the most important habits to change due to its direct association with a reduced risk of complications and mortality associated with CHD [4-7]. Physical activity has many benefits for the health of older adults, such as improving quality of life [8,9]. Moreover, such individuals would consider an improved quality of life as a priority recovery goal following a coronary event [10,11].

In this regard, secondary prevention interventions have been shown to help promote healthy lifestyles in people with CHD [8,9]. However, these interventions, such as cardiac rehabilitation programs, are underused [12], especially by older adults [13,14]. Cardiac rehabilitation programs usually involve a multidisciplinary follow-up (physician, nurse, nutritionist and kinesiologist), a group exercise program, nutritional advice and psychological support [9]. Older adults may have difficulty accessing these programs in secondary prevention centers and be reluctant to participate in this type of group program [15]. Current secondary prevention programs are designed for adults in general, and do not support the needs of the older adults, particularly in relation to comorbidities, frailty or physical limitations [13]. Given the paucity of literature on the needs of older adults for secondary prevention of CHD, it would appear essential to explore this subject to develop new accessible interventions that are suitable for this population.

A home-based secondary prevention intervention may represent a good alternative for promoting access to secondary prevention. These interventions, such as home-based cardiac rehabilitation programs, are shown to be just as beneficial to healthy lifestyle habits as those provided in health centers [16,17]. Nevertheless, home-based interventions can be difficult to deploy and implement in the health care system due to their high cost [8] and a lack of human and financial resources [18].

The global Covid-19 pandemic has also underscored the urgent need to develop new strategies to promote remote access to health care. This is especially relevant with vulnerable persons such as older adults, as a way to preserve their health [19].

Advances in e-Health technologies (i.e., the delivery of health care and services using information and communication technologies, including the web) are resulting in increased use [20]. Web-based interventions can be defined as care or treatments aimed at promoting behavior change and delivered, via a web browser, over the Internet through various technological tools such as computers, tablets, and smartphones [20]. Web-based interventions could be considered as a means to support older adults with CHD in their adoption of healthy lifestyle behaviors because of their accessibility and flexibility of use [21], and considering that use of the Internet among older adults has increased significantly in recent years [22]. To date, the available web-based secondary prevention interventions have been offered to everyone with CHD, regardless of their age. However, older adults may have secondary prevention needs that are different from other adults because of the heterogenous changes that occur with aging (e.g., decreased functional capacity, comorbidities, frailty) [23,24]. Several authors argue that a web-based secondary prevention intervention should be developed to address the challenges associated with aging and to respond to the individualized needs of older adults [25,26]. Individualized needs are personal factors that may be social- or health-related and must be met in order to promote quality of life [27]. For e, a group of older adults may have different needs in terms of the information they want, how they should manage their complex condition, or strategies that would help them maintain their various physical capacities [27]. However, the results of systematic reviews show that web-based secondary prevention interventions for people with CHD are mostly tailored rather than individualized [28], and that they should focus more on interaction with a professional [29]. This situation calls for new studies.

Many recent studies suggest that web-based interventions for older adults should allow for the development of a trusting relationship with a health professional [30,31] in order to maintain the

older adult's commitment to change [32,33]. However, to date, few authors have included interactions with healthcare professionals throughout the web-based interventions [29,34]. A nurse could be a preferred professional to provide this type of support, given the important role nurses play in health promotion to support the adoption of healthy lifestyle habits [35,36] and their interpersonal skills, which are appreciated by older adults [32,37,38]. To facilitate change, web-based interventions should also be developed based on factors that influence changes in the target population, such as motivation or self-efficacy [39,40]. Despite the few studies that address these factors, some authors point out that older adults with CHD have little motivation to change, have low confidence in their ability to become active because of diminished physical abilities related to age [10,41], and are poorly informed about the benefits of secondary prevention [41,42].

There is a need for a novel secondary prevention intervention individualized to the needs of older adults and based on a trusting relationship with a healthcare professional who will sustain the older adult's knowledge, motivation and self-efficacy toward physical activity. To our knowledge, no web-based intervention has been developed that is specifically designed for older adults with CHD and includes support from a nurse.

Aim and research questions

The purpose of this study is to evaluate a web-based nursing intervention to support older adults living with CHD in engaging in physical activity. This study aims to answer the following questions:

1. What is the acceptability (content, structure, usefulness) and feasibility (recruitment, retention, adherence, fidelity) of a web-based nursing intervention to support older adults living with CHD in engaging in physical activity?

2. What are the preliminary effects of the web-based nursing intervention on the physical activity level and quality of life of older adults living with CHD?

3. What are the qualitative impacts of the web-based nursing intervention as perceived by older

adults on their physical activity level, quality of life, motivation, knowledge and self-efficacy?

4. How can the preliminary effects of a web-based nursing intervention, developed in response to the needs of older adults living with CHD, be illustrated by its impacts as perceived by older adults post-intervention?

Methods

This protocol is registered on ClinicalTrials.gov (ID: NCT16197347).

Intervention

The nurse-led web-based intervention, named "*Changeons ensemble*," was designed to support older adults living with CHD in engaging in physical activity. The intervention was developed by the student researcher (AL), her supervisor (VD), a team of experts (i.e., older adult with CHD, geriatrician, physiotherapist, kinesiologist, nurse specialized in secondary prevention), and following the Intervention Mapping approach [40], which includes a needs assessment of older adults living with CHD (n=10). The Intervention Mapping framework is relevant to the present study, as it offers a model for intervention development in health promotion that includes all the decision-making steps for intervention planning [40]. Using this framework enabled a systematic approach to intervention development based as much on data collected from a population as on empirical data.

The intervention is based on the Information-Motivation-Behavioral skills (IMB) model which relies on three constructs: information, motivation, and behavioral skills. The IMB model posits that an individual with the necessary **information** and a high level of **motivation** can apply **behavioral skills** (i.e., self-efficacy) to achieve behavior change [43]. This model has been selected because it can be used to act on the factors that seem most likely to influence the behavior of older adults, such as knowledge, motivation, and self-efficacy [41], as these factors converge with the constructs of the model. Figure 1, which was adapted with the authors' permission [44], presents the IMB model and the relationships between the constructs.

Fig 1. IMB model adapted for use in the present study.

Through the intervention, information on physical activity and CHD, such as recommendations, benefits and impacts, are provided to increase older adults' knowledge. The intervention aims to bring out the person's motivation by providing the support of a nurse and by exploring and reinforcing the benefits of change. Vicarious experience, verbal persuasion, ad reinforcement of past and current successes are strategies used within the intervention to promote self-efficacy [45].

The team of experts was consulted for feedback on the intervention's content in relation to their expertise. The older adults with CHD offered his opinion on the usefulness and relevance of the intervention's content and components to be consistent with the needs of the target population. The geriatrician's contribution was to ensure that the intervention was aligned with the various challenges that can arise with aging, while the physiotherapist offered his expertise on functional limitations and physical activity. The kinesiologist's role was to validate the examples of suggested exercises for participants, ensuring they were safe in relation to CHD. The nurse ensured that the content was in line with clinical guidelines for older adults living with CHD.

Changeons ensemble is a 7-session, nurse-led, web-based intervention that includes educational content (e.g., recommendations on physical activity and CHD), reflexive activities (e.g., identifying motivation for physical activity), case stories (e.g., different pathways of older adults living with CHD who engage in physical activity), physical activity suggestions (e.g., instructions and images of cardiovascular or balance exercises), forums (e.g., ask questions, exchange with peers), goal planning (e.g., a target to be reached each week, with an action plan to achieve it), and an electronic physical activity diary. With a new session available every week, participants log in with a username and password on a secure Moodle platform, accessible 24/7 at a time convenient to them. The intervention proposes an initial meeting in person, via videoconference or by phone with

the nurse, to foster the older adult's commitment to the intervention and help build a relationship of trust [31,38]. Every week, the nurse supports participants virtually by monitoring their progress, providing asynchronous written feedback by responding to their answers to reflective activities, and facilitating discussions and answering questions on the forum. In this role, the nurse aims to value participants, empower their abilities, bring out their motivations, highlight their progress, and offer advice and encouragement to promote physical activity, quality of life, knowledge, motivation, and self-efficacy. The Consolidated Standards of Reporting Trials eHealth (CONSORT-EHEALTH) was applied to ensure that all the aspects of the web-based intervention have been reported [20].

Design

A pilot study with an explanatory sequential mixed design (quantitative → qualitative) [46,47] will be conducted to evaluate the intervention's preliminary effects and impacts.

Quantitative component

For the quantitative component, a single group pre-post test design will be used to evaluate quantitatively the preliminary effects of the intervention on physical activity level, quality of life, motivation, knowledge, and self-efficacy. This quantitative component is presented according to the Standard Protocol Items: Recommendations for Interventional Trials (SPIRIT) checklist [48] presented in Multimedia Appendix 1.

Qualitative component

For the qualitative component, a descriptive qualitative approach will be used to assess the acceptability and feasibility of the intervention, as well as its impact, as perceived by the older adults on their level of physical activity, quality of life, knowledge, motivation, and self-efficacy. The Consolidated criteria for Reporting Qualitative research (COREQ) checklist presented in Multimedia Appendix 2 to ensure that the qualitative portion of the study is explicitly reported [49].

Setting and sample

Participants will be recruited in the cardiac units of a French-language university hospital in

Montreal (Canada). The intervention will be delivered on the open source learning platform Moodle [50].

Quantitative component

To assess the preliminary effects of the intervention, we will seek to enroll 30 older adults living with CHD. According to some authors, 30 participants is sufficient for a pilot study [51,52]. They will be recruited by the student researcher by convenience sampling during their hospitalization for coronary bypass graft surgery or a percutaneous coronary intervention. The first author (AL) will screen each patient's record to verify eligibility, and then meet with the eligible patients to evaluate their interest in participating in the project after their hospitalization. Eligibility criteria for participation in this study will be: (1) aged 65 years or older, (2) agreement to participate in the study within 3 months post-hospitalization for a coronary bypass graft surgery or 1 month for a percutaneous coronary intervention (3) no concurrent involvement in an intervention designed to increase their level of physical activity (e.g., a cardiac rehabilitation program, consultation with physical activity expert) during their participation in the project, (4) fluency in French, spoken and written, (5) access to a computer connected to the Internet, and (6) no cognitive impairments according to the patient record (i.e., decreased or impaired complex attention, executive functions, learning abilities, memory or social skills). Recruitment will take place from June 2024 to February 2025.

Qualitative component

We will contact the 30 older adults who took part in the intervention by phone to invite them to participate in the qualitative evaluation, with the goal of recruiting 8 to 12 participants. As suggested by several authors [53,54], we estimate that we will need 8 to 12 participants to reach data saturation regarding their perceptions of the intervention's impacts and its acceptability. Since the study requires a long-term commitment from the participants, we may not be able to reach the desired number of participants for the qualitative analysis. These results will form part of the

assessment of the project's feasibility.

Data collection

The data collection period is planned from June 2024 to April 2025. Table 1 summarizes the study variables and measures, which are discussed in detail in the following paragraphs.

Table 1. Summary of study variables and measurements

Study variable	Instrument/measure	
	Quantitative component	***Qualitative component***
Sociodemographic data	Self-administered questionnaire	
Intervention's acceptability		Semi-structured interviews with questions on appreciation of the intervention's content and structure
Intervention's feasibility	Logbook with data (%) on recruitment, retention, adherence, and fidelity to the intervention	
Physical activity	Electronic physical activity diary inspired by the International Physical Activity Questionnaire [55]	Semi-structured interview
Quality of life	SF-36v2 questionnaire: 36 items with 3-, 5- and 6-point Likert scales [56,57]	
Knowledge	Quiz consisting of 5-multiple-choice questions	
Motivation	Visual analog 10-point Likert	
Self-efficacy	Visual analog 10-point Likert scale	

Quantitative component

For the quantitative component, we will assess the preliminary effects of the intervention on the participants' physical activity level, quality of life, knowledge, motivation, and self-efficacy (**Question 2**). For sociodemographic data, a questionnaire will be completed by the participants at T1

(pre-intervention).

Physical activity. Participants' physical activity level will be measured at T1 and T2 (post-intervention) via an electronic physical activity diary completed by the participants on the platform. Self-reported physical activity diary has been shown to be easy to administer, well accepted, and more practical than other objective assessment of physical activity, such as accelerometers [58,59]. In this study, the electronic diary was inspired by the French version of the International Physical Activity Questionnaire [60], by assessing physical activity over the last 7 days (type of physical activity and duration). It enables participants to self-monitor their physical activity each week, by entering the type and duration of physical activity performed.

Quality of life. The French Canadian version of a quality-of-life questionnaire (SF-36v2 Health Survey [57]) will be completed by participants at T1 and T2 via LimeSurvey©. This questionnaire has 36 items to answer on 3-, 5- and 6-point Likert scales, with a higher score indicating a better quality of life. It covers eight concepts: physical functioning, bodily pain, role limitations due to physical health problems, role limitations due to personal or emotional problems, emotional well-being, social functioning, energy/fatigue, and general health perceptions. The SF-36v2 is a revised and improved version of the SF-36 [61]. The SF-36v2 has good psychometric properties, with internal consistency reliability ranging from 0.83 to 0.95, a test-retest reliability ranged from 0.64 to 0.86 and a median correlations of items to their scales ranging from 0.612 and 0.87 [61].

Knowledge. Participants' level of knowledge will be assessed through a quiz to be developed by the research team according to the content of the intervention. The quiz will include five multiple choice questions about physical activity (e.g., Which of these answers are benefits of engaging in physical activity?) and will be completed by participants at T1 and T2 via LimeSurvey©.

Motivation. Participants' motivation will be assessed at T1 and T2 by auto-captured data on the platform with a visual analogue 10-point Likert scale (i.e., How important is it for you to increase

your physical activity level?; 0=Somewhat important and 10=Extremely important). Visual analogue scales are useful for assessing change in individuals over time in a way that is comparable to more traditional Likert-type scales [62,63]. Visual analogue scales have been used in several studies to rate subjective feelings about motivation, as they lacked valid rating scales [64-66].

Self-efficacy. As for motivation, participants' self-efficacy level will also be assessed at T1 and T2 by auto-captured data on the platform using a visual analogue 10-point Likert scale (i.e., If you decided to increase your level of physical activity, how confident would you be in your ability to succeed?; 0=Somewhat confident and 10=Extremely confident). Visual analogue scales have been shown in several studies to be a valid method that allows individuals to visually estimate their sense of self-efficacy [67,68].

Feasibility. The following feasibility parameters will be assessed: (1) recruitment (i.e., the proportion of eligible patients who agree to participate in the study), (2) retention (i.e., the proportion of participants who complete the intervention), (3) adherence (the proportion of sessions and activities completed), and (4) fidelity to the intervention (i.e., the difference between the planned and delivered intervention). Given that we are interested in a vulnerable clientele that has a low participation rate in cardiac rehabilitation programs [14] and in research projects in general [69], we anticipate some challenges, in terms of both recruitment and retention of participants. For these reasons, and because the refusal rate during recruitment of older adults generally varies from 20% to 50% [70], we consider it feasible to achieve a recruitment rate of 70% for the desired sample size (n=21 older adults) in the given recruitment time (i.e., one year). Also, of this number, we will aim to obtain a retention rate of 75% of the participants for completion of the intervention and data collection (n=16 older adults), considering that a retention rate of about 70%-80% is observed in similar studies of web-based interventions with populations of older adults [33,71,72].

Qualitative component

For the qualitative component, we will assess the acceptability (**Question 1**) and the impacts

(**Question 3**) of the intervention. Semi-structured interviews will be conducted post-intervention (T2) by a master's student, a member of the research team (LG), who is unbiased and trained in conducting interviews. The interviews will last approximately 30 minutes and will be conducted by phone. Acceptability will be assessed through data collected on the intervention's structure (i.e., delivery mode, number of sessions, frequency, and duration) and content (i.e., information and activities proposed) to determine whether participants found the intervention appropriate to their situation and relevant in supporting their engagement in physical activity [73]. During the interviews, we will also evaluate the impacts of the intervention, as perceived by the participants, on their physical activity level, quality of life, knowledge, motivation, and self-efficacy (e.g., Have you noticed any changes since participating in the Changeons ensemble intervention? If so, please tell us about the changes in your physical activity level).

Data integration (mixed component)

For a mixed explanatory sequential design study, some authors propose developing joint display (see Table 2 for an example). Joint display allows for the presentation of integrated quantitative data (e.g., statistical) and qualitative data (e.g., verbatim) [74]. In this study, quantitative data on the effects of the intervention will be integrated into the qualitative results [46] of the older adult’s perceptions of the impacts of the intervention. The quantitative results will be integrated into the qualitative results to illustrate how the quantitative effects of the intervention can be connected to the qualitative impacts on physical activity level, quality of life, knowledge, motivation, and feelings of self-efficacy (**Question 4**). To this end, we will follow the four steps proposed by Johnson, Grove and Clarke [75], which are: (1) listing, i.e., listing data in the quantitative data (statistics) or the qualitative data (verbatims) or categories column; (2) matching, i.e., matching quantitative data with qualitative data based on their similarity, patterns or parallels; (3) checking, i.e., verify whether the data are matched correctly; and (4) pillar building, i.e., comparing and contrasting the findings from the last steps to build proposals based on patterns and insights in the integration themes column, to

help clarify connections between the data.

Table 1. Example of joint display

Quantitative data	Quantitative categories	Integration themes	Qualitative categories	Qualitative data
Quality of life score (T1-T2)	Increased quality of life	Improved quality of life following the intervention	Feel better	Verbatim of the older adult's perceptions of the impacts of the intervention (e.g., "*The intervention helped me to feel better,*" participant X).

Analysis

The sample will be described with descriptive statistics (e.g., mean, standard deviation, percentage, and frequency). Descriptive statistics will also be used to compare, between pre and post-intervention, participants' level of physical activity, knowledge, motivation and self-efficacy as well as feasibility data. The Wilcoxon Signed-Rank test will be performed to compare the results from the SF-36v2 questionnaire. Statistical analyses will be performed using the QualityMetric's PRO CoRE system [76]. Semi-structured interviews will be recorded and transcribed in verbatims, and a thematic analysis [77] will be performed by using QDA Miner. The data will be analyzed by the student researcher (AL) and validated by her supervisor (VD). Themes and sub-themes will be identified from the verbatim transcripts and then grouped according to their complementarity, similarity, recurrence or divergence to form salient thematic clusters. The links between these themes will be further explored to create thematic groupings, and a thematic tree will be developed in the form of a diagram [77].

Ethics

This study was approved by the ethics committee of the Centre hospitalier de l'Université de

Montréal (23.237) and the Science and Health Research Ethics Committee of Université de Montréal (2024-5351). We will obtain written informed consent from the participants. The data will be anonymized and stored on a secure server at the research center of the Centre hospitalier de l'Université de Montréal.

Discussion

This paper describes the protocol of a study aimed at evaluating a web-based nursing intervention to promote physical activity among older adults with CHD. To our knowledge, this is the first study to propose a nurse-led web-based intervention developed according to the needs of older adults with CHD. This study has important implications for both practice and research.

In terms of practice, the intervention has the potential to promote physical activity and quality of life among elderly persons with CHD, as well as increase their knowledge, motivation, and sense of self-efficacy. This nurse-led intervention, specifically developed with and for older adults with CHD, could potentially respond to the needs of a sub-group of the population that is often excluded from secondary prevention programs. In terms of the research, this study will generate knowledge about the acceptability and feasibility of this intervention which could lead to its evaluation on a larger scale and guide further studies in this area. By providing the support of a nurse despite the virtual mode of delivery, this study will generate more knowledge on the role played by nurses in supporting the adoption of healthy lifestyle habits via the web, what has been little studied. However, we believe that this intervention modality may allow nurses to follow more older adults than they would in a face-to-face intervention.

This study has certain limitations. First, the design for the quantitative evaluation of the intervention (i.e., a single group pre-post test) implies the absence of a control group. This means that we will not be able to eliminate the influence of cofounding variables. For example, our results may be influenced by our participants' social support networks and digital literacy, which could affect the study's internal validity. Second, since we are proposing a convenience sampling method

and participants may have a high level of digital literacy, the participants we recruit may not be representative of the senior population. As a result, we will not be able to generalize the results, but they will provide new knowledge on the acceptability and feasibility of the intervention, as well as its preliminary effects and impacts on older adults. To encourage the participation of older people with various levels of digital literacy, we will ensure that the intervention is easy for older adults to use by incorporating their preferences and comments throughout its development. In addition, an initial meeting with the nurse (face-to-face, online or by phone) will help participants understand how the platform works, making it easier to use. Support will be provided by the nurse throughout the intervention to address any difficulties experienced.

In conclusion, the global Covid-19 pandemic and the increasing use of the Internet by older adults suggest an urgent need to develop new models of care that can be accessed remotely. Such interventions should be capable of being individualized to the varying needs and preferences of older adults with CHD [25]. To facilitate the engagement of older adults in these types of interventions, a relationship of trust with a professional, such as a nurse, would appear to be essential [31,32]. We highly encourage researchers to continue developing and evaluating interventions that promote the health of older adults with CHD.

Acknowledgements

The authors wish to acknowledge the financial support received during the main author's doctoral studies: Canadian Institutes of Health Research, the Foundation of the Centre hospitalier de l'Université de Montréal, Ordre des infirmières et infirmiers du Québec, the Quebec network on Nursing Intervention Research, Université de Montréal Marguerite-d’Youville Research Chair on Humanistic Nursing Interventions, and the Faculty of Nursing at Université de Montréal.

Conflicts of Interest

None declared.

Multimedia Appendix

Multimedia Appendix 1: SPIRIT Checklist

Multimedia Appendix 2: COREQ checklist

References

1. Benjamin EJ, Muntner P, Alonso A, et al. Heart disease and stroke statistics—2019 update: A report from the American Heart Association. *Circulation*. 2019/03/05 2019;139(10):e56-e528. doi:10.1161/CIR.0000000000000659

2. National Heart Lung and Blood Institute. What is coronary heart disease? https://www.nhlbi.nih.gov/health/coronary-heart-disease#:~:text=Coronary%20heart%20disease%20is%20a,disease%20or%20ischemic%20heart%20disease.

3. Kulik A, Ruel M, Jneid H, et al. Secondary prevention after coronary artery bypass graft surgery. *Circulation*. 2015/03/10 2015;131(10):927-964. doi:10.1161/CIR.0000000000000182

4. Lopes AC, Ferreira, R., Vieira, J. V., Goes, M. M. Physical activity for elderly people after an acute myocardial infarction. *Gerontechnology*. 2020;1185:174-184. doi:10.1007/978-3-030-41494-8_17

5. Lahtinen M, Toukola T, Junttila MJ, et al. Effect of changes in physical activity on risk for cardiac death in patients with coronary artery disease. *The American Journal of Cardiology*. 2018/01/15/ 2018;121(2):143-148. doi:https://doi.org/10.1016/j.amjcard.2017.10.002

6. Ralph SAH, Held C, Hadziosmanovic N, et al. Physical activity and mortality in patients with stable coronary heart disease. *Journal of the American College of Cardiology*. 2017/10/03 2017;70(14):1689-1700. doi:10.1016/j.jacc.2017.08.017

7. Anderson L, Thompson DR, Oldridge N, et al. Exercise-based cardiac rehabilitation for coronary heart disease. *Cochrane Database of Systematic Reviews*. 2016;(1):Cd001800. doi:10.1002/14651858.CD001800.pub3

8. Schopfer DW, Forman DE. Cardiac rehabilitation in older adults. *The Canadian journal of cardiology*. Sep 2016;32(9):1088-96. doi:10.1016/j.cjca.2016.03.003

9. Ambrosetti M, Abreu A, Corrà U, et al. Secondary prevention through comprehensive cardiovascular rehabilitation: From knowledge to implementation. 2020 update. A position paper from the Secondary Prevention and Rehabilitation Section of the European Association of Preventive Cardiology. *European Journal of Preventive Cardiology*. 2020;28(5):460–495. doi:10.1177/2047487320913379

10. Jepma P, Snaterse M, Du Puy S, Peters RJG, op Reimer WJMS. Older patients' perspectives toward lifestyle-related secondary cardiovascular prevention after a hospital admission—a qualitative study. *Age and Ageing*. 2021;50(3):936-943. doi:10.1093/ageing/afaa283

11. Collins L, Pope JP. Why I get up off my butt: Older adults' motives to limit their sedentary behavior. *Journal of Aging and Physical Activity*. 01 Dec. 2021 2021;29(6):984-992. doi:10.1123/japa.2020-0311

12. Grace SL, Kotseva K, Whooley MA. Cardiac rehabilitation: Under-utilized globally. *Current Cardiology Reports*. 2021/07/16 2021;23(118):1-8. doi:10.1007/s11886-021-01543-x

13. Ruano-Ravina A, Pena-Gil C, Abu-Assi E, et al. Participation and adherence to cardiac rehabilitation programs: A systematic review. *International journal of cardiology*. Nov 15 2016;223:436-443. doi:10.1016/j.ijcard.2016.08.120

14. Resurrección DM, Moreno-Peral P, Gómez-Herranz M, et al. Factors associated with non-participation in and dropout from cardiac rehabilitation programmes: a systematic review of prospective cohort studies. *European Journal of Cardiovascular Nursing*. Jan 2019;18(1):38-47. doi:10.1177/1474515118783157

15. Sumner J, Grace SL, Doherty P. Predictors of cardiac rehabilitation utilization in England: Results from the national audit. *Journal of the American Heart Association*. Oct 21 2016;5(10):1-7. doi:10.1161/JAHA.116.003903

16. Anderson L, Sharp GA, Norton RJ, et al. Home-based versus centre-based cardiac rehabilitation. *Cochrane Database of Systematic Reviews*. 2017;(6):CD007130.

doi:10.1002/14651858.CD007130.pub4

17. Snoek JA, Prescott EI, van der Velde AE, et al. Effectiveness of home-based mobile guided cardiac rehabilitation as alternative strategy for nonparticipation in clinic-based cardiac rehabilitation among elderly patients in Europe: A randomized clinical trial. *JAMA Cardiology*. 2021;6(4):463-468. doi:10.1001/jamacardio.2020.5218

18. Teja B, Daniel I, Pink GH, Brown A, Klein DJ. Ensuring adequate capital investment in Canadian health care. *Canadian Medical Association Journal*. 2020;192(25):E677. doi:10.1503/cmaj.191126

19. Astley CM, Clarke RA, Cartledge S, et al. Remote cardiac rehabilitation services and the digital divide: implications for elderly populations during the COVID19 pandemic. *European Journal of Cardiovascular Nursing*. 2021;20(6):521-523. doi:10.1093/eurjcn/zvab034

20. Eysenbach G. CONSORT-EHEALTH: Improving and standardizing evaluation reports of web-based and mobile health interventions. *Journal of medical Internet research*. 2011;13(4):e126. doi:10.2196/jmir.1923

21. Tuckson RV, Edmunds M, Hodgkins ML. Telehealth. *New England Journal of Medicine*. 2017/10/19 2017;377(16):1585-1592. doi:10.1056/NEJMsr1503323

22. Anderson M, Perrin A. Tech adoption climbs among older adults. https://www.pewresearch.org/internet/2017/05/17/tech-adoption-climbs-among-older-adults/

23. World Health Organization. Rapport mondial sur le vieillissement et la santé. August 30, 2022. https://apps.who.int/iris/bitstream/handle/10665/206556/9789240694842_fre.pdf;jsessionid=DA674058DD88CD9E5D81A3847D290360?sequence=1

24. Campbell D, Mudge DW, Craig JC, Johnson DW, Tong A, Strippoli GFM. Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients. *Cochrane Database of Systematic Reviews*. 2017;(4)doi:10.1002/14651858.CD004679.pub3

25. Allemann H, Poli A. Designing and evaluating information and communication technology-based interventions? Be aware of the needs of older people. *European Journal of Cardiovascular Nursing*. 2020;19(5):370-372. doi:10.1177/1474515119897398

26. Lutz AH, Forman DE. Cardiac rehabilitation in older adults: Apropos yet significantly underutilized. *Progress in cardiovascular diseases*. 2022/01/01/ 2022;70:94-101. doi:https://doi.org/10.1016/j.pcad.2022.01.001

27. McGilton KS, Vellani S, Yeung L, et al. Identifying and understanding the health and social care needs of older adults with multiple chronic conditions and their caregivers: a scoping review. *BMC Geriatrics*. 2018/10/01 2018;18(1):231. doi:10.1186/s12877-018-0925-x

28. Devi R, Singh SJ, Powell J, Fulton EA, Igbinedion E, Rees K. Internet-based interventions for the secondary prevention of coronary heart disease. *Cochrane Database Systematic Reviews*. Dec 22 2015;(12):1-18. doi:10.1002/14651858.CD009386.pub2

29. Brørs G, Pettersen TR, Hansen TB, et al. Modes of e-Health delivery in secondary prevention programmes for patients with coronary artery disease: a systematic review. *BMC Health Services Research*. 2019/06/10 2019;19(1)(364):1-24. doi:10.1186/s12913-019-4106-1

30. Pols J. Good relations with technology: Empirical ethics and aesthetics in care. *Nursing Philosophy*. 2017;18(1):e12154. doi:10.1111/nup.12154

31. van Middelaar T, Beishuizen CRL, Guillemont J, Barbera M, Richard E, Moll van Charante EP. Engaging older people in an internet platform for cardiovascular risk self-management: a qualitative study among Dutch HATICE participants. *BMJ Open*. 2018;8(1):e019683. doi:10.1136/bmjopen-2017-019683

32. Ligthart SA, van den Eerenbeemt KDM, Pols J, van Bussel EF, Richard E, Moll van Charante EP. Perspectives of older people engaging in nurse-led cardiovascular prevention programmes: a qualitative study in primary care in the Netherlands. *British Journal of General Practice*. 2015;65(630):e41-e48. doi:10.3399/bjgp15X683149

33. Richard E, Moll van Charante EP, Hoevenaar-Blom MP, et al. Healthy ageing through internet counselling in the elderly (HATICE): A multinational, randomised controlled trial. *The Lancet Digital Health*. 2019;1(8):e424-e434. doi:10.1016/S2589-7500(19)30153-0

34. Lavoie A, Dubé V. Web-Based Interventions to Promote Healthy Lifestyles for Older Adults: Scoping Review. *Interactive Journal of Medical Research*. 2022;11(2):e37315. doi:10.2196/37315

35. Ducharme F, Salois R. Rapport des commissaires sur les états généraux de la profession infirmière. https://www.oiiq.org/documents/20147/2943421/rapport-EG-2021.pdf

36. Pepin J, Larrue C, Allard E, Ha L. *La discipline infirmière : une contribution décisive aux enjeux de santé*. Secrétariat international des infirmières et infirmiers de l'espace francophone; 2015.

37. Lavoie A. *Évaluation qualitative d'une intervention infirmière d'entretien motivationnel à domicile auprès des personnes âgées sédentaires vivant avec la maladie coronarienne*. Mémoire de maîtrise. Université de Montréal; 2018.

38. Beishuizen CR, Akenine U, Barbera M, et al. Integrating nurses' experiences with supporting behaviour change for cardiovascular prevention into a self-management internet platform in Finland and the Netherlands: a qualitative study. *BMJ Open*. 2019;9(6):e023480. doi:10.1136/bmjopen-2018-023480

39. Kok G, Gottlieb NH, Peters G-JY, et al. A taxonomy of behaviour change methods: an Intervention Mapping approach. *Health Psychology Review*. 2016;10(3):297-312. doi:10.1080/17437199.2015.1077155

40. Bartholomew LKE, Markham CM, Ruiter RAC, Fernández ME, Kok G, Parcel GS. *Planning health promotion programs: An Intervention Mapping approach*. 4 ed. John Wiley & Sons; 2016.

41. Cleary K, LaPier T, Rippee A. Perceptions of exercise and quality of life in older patients in the United States during the first year following coronary artery bypass surgery. *Physiotherapy Theory and Practice*. 2015;31(5):337-46. doi:10.3109/09593985.2015.1004770

42. Young L, Barnason S. Older patients' perception and experience with lifestyle changes

following cardiac revascularization. *American Journal of Clinical Medicine*. 2014;10(1):30-38. http://aapsus.org/wp-content/uploads/Older-Patients-Perception.pdf

43. Fisher WA, Fisher JD, Shuper PA. Chapter Three - Social psychology and the fight against AIDS: An Information–Motivation–Behavioral skills model for the prediction and promotion of health behavior change. In: Olson JM, Zanna MP, eds. *Advances in Experimental Social Psychology*. Academic Press; 2014:105-193.

44. Fisher JD, Fisher WA. Changing AIDS-risk behavior. *Psychological bulletin*. 1992;111(3):455-474. doi:10.1037/0033-2909.111.3.455

45. Bandura A. *Auto-efficacité : Le sentiment d'efficacité personnelle*. 3 ed. de Boeck Université; 2018.

46. Pluye P, Bengoechea E, Granikov V, Kaur N, Tang D. A world of possibilities in mixed methods: Review of the combinations of strategies used to integrate qualitative and quantitative phases, results and data. *International Journal of Multiple Research Approaches*. 07/16 2018;10(1):41-56. doi:10.29034/ijmra.v10n1a3

47. Creswell JW, Clark VLP. *Designing and conducting mixed methods research*. SAGE Publications; 2017.

48. Chan AW, Tetzlaff JM, Altman DG, et al. SPIRIT 2013 statement: defining standard protocol items for clinical trials. *Annals of internal medicine*. Feb 5 2013;158(3):200-7. doi:10.7326/0003-4819-158-3-201302050-00583

49. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. Dec 2007;19(6):349-57. doi:10.1093/intqhc/mzm042

50. Garrison DR. *E-Learning in the 21st century: A community of inquiry framework for research and practice*. 3 ed. 2016.

51. Thabane L, Ma J, Chu R, et al. A tutorial on pilot studies: the what, why and how. *BMC*

Medical Research Methodology. 2010/01/06 2010;10(1):1. doi:10.1186/1471-2288-10-1

52. Hertzog MA. Considerations in determining sample size for pilot studies. *Research in Nursing & Health*. 2008/04/01 2008;31(2):180-191. doi:https://doi.org/10.1002/nur.20247

53. Glaser BG, Strauss AL. *The Discovery of Grounded Theory : Strategies for Qualitative Research.* Aldine; 1967.

54. Hennink M, Kaiser BN. Sample sizes for saturation in qualitative research: A systematic review of empirical tests. *Social Science & Medicine*. 2022/01/01/ 2022;292:114523. doi:https://doi.org/10.1016/j.socscimed.2021.114523

55. Craig CL, Marshall AL, SjÖStrÖM M, et al. International Physical Activity Questionnaire: 12-Country reliability and validity. *Medicine & Science in Sports & Exercise*. 2003;35(8)doi:10.1249/01.MSS.0000078924.61453.FB

56. Dauphinee SW, Gauthier L, Gandek B, Magnan L, Pierre U. Readying a US measure of health status, the SF-36, for use in Canada. *Clininal and Investigative Medicine*. Aug 1997;20(4):224-38.

57. QualityMetric. The SF-36v2® Health Survey. https://www.qualitymetric.com/health-surveys/the-sf-36v2-health-survey/

58. Knell G, Gabriel KP, Businelle MS, Shuval K, Wetter DW, Kendzor DE. Ecological Momentary Assessment of Physical Activity: Validation Study. *J Med Internet Res*. 2017/07/18 2017;19(7):e253. doi:10.2196/jmir.7602

59. Kowalski K, Rhodes R, Naylor P-J, Tuokko H, MacDonald S. Direct and indirect measurement of physical activity in older adults: a systematic review of the literature. *International Journal of Behavioral Nutrition and Physical Activity*. 2012/12/18 2012;9(1):148. doi:10.1186/1479-5868-9-148

60. Crinière L, Lhommet C, Lecomte P, Couet C, Oppert JM, Jacobi D. P94 Validation du IPAQ français version longue chez les personnes diabétiques. *Diabetes & Metabolism*. 2009/03/01/

2009;35:A50. doi:10.1016/S1262-3636(09)71892-0

61. Maruish ME. *User's manual for the SF-36v2 Health Survey*. 3 ed. Lincoln, RI: QualityMetric Incorporated.; 2011.

62. Kuhlmann T, Dantlgraber M, Reips U-D. Investigating measurement equivalence of visual analogue scales and Likert-type scales in Internet-based personality questionnaires. *Behavior research methods*. 2017/12/01 2017;49(6):2173-2181. doi:10.3758/s13428-016-0850-x

63. Guyatt GH, Townsend M, Berman LB, Keller JL. A comparison of Likert and visual analogue scales for measuring change in function. *Journal of chronic diseases*. 1987/01/01/ 1987;40(12):1129-1133. doi:https://doi.org/10.1016/0021-9681(87)90080-4

64. Yoshida T, Otaka Y, Kitamura S, et al. Development and validation of new evaluation scale for measuring stroke patients' motivation for rehabilitation in rehabilitation wards. *PLOS ONE*. 2022;17(3):e0265214. doi:10.1371/journal.pone.0265214

65. Fritz KM, O'Connor PJ. Acute exercise improves mood and motivation in young men with ADHD symptoms. *Medicine & Science in Sports & Exercise*. 2016;48(6)

66. Caponnetto P, Magro R, Inguscio L, Cannella MC. Quality of life, work motivation, burn-out and stress perceptions benefits of a stress management program by autogenic training for emergency room staff: A pilot study. *Mental Illness*. 2018;10(2):67-70. doi:10.1108/mi.2018.7913

67. Turner NM, van de Leemput AJ, Draaisma JM, Oosterveld P, ten Cate OT. Validity of the visual analogue scale as an instrument to measure self-efficacy in resuscitation skills. *Med Educ*. May 2008;42(5):503-11. doi:10.1111/j.1365-2923.2007.02950.x

68. Bergström G, Börjesson M, Schmidt C. Self-efficacy regarding physical activity is superior to self-assessed activity level, in long-term prediction of cardiovascular events in middle-aged men. *BMC public health*. 2015/08/25 2015;15(1):820. doi:10.1186/s12889-015-2140-4

69. Forsat ND, Palmowski A, Palmowski Y, Boers M, Buttgereit F. Recruitment and retention of older people in clinical research: A systematic literature review. *Journal of the American Geriatrics*

Society. 2020/12// 2020;68(12):2955-2963. doi:10.1111/jgs.16875

70. Ridda I, MacIntyre CR, Lindley RI, Tan TC. Difficulties in recruiting older people in clinical trials: An examination of barriers and solutions. *Vaccine*. 2010/01/22/ 2010;28(4):901-906. doi:10.1016/j.vaccine.2009.10.081

71. Dyck VD, Herman K, Poppe L, Crombez G, De Bourdeaudhuij I, Gheysen F. Results of MyPlan 2.0 on physical activity in older belgian adults: Randomized controlled trial. *Journal of medical Internet research*. 2019;21(10):e13219. doi:10.2196/13219

72. Volders E, Bolman CAW, de Groot RHM, Verboon P, Lechner L. The effect of Active Plus, a computer-tailored physical activity intervention, on the physical activity of older adults with chronic illness(es) - A cluster randomized controlled trial. *International journal of environmental research and public health*. 2020;17(7):2590. doi:10.3390/ijerph17072590

73. Feeley N, Cossette S. Pilot studies for randomized clinical trials. *Routledge International Handbook of Advanced Quantitative Methods in Nursing Research*. Routledge International; 2015:199-212.

74. Guetterman TC, Fetters MD, Creswell JW. Integrating quantitative and qualitative results in health science mixed methods research through joint displays. *The Annals of Family Medicine*. 2015;13(6):554. doi:10.1370/afm.1865

75. Johnson RE, Grove AL, Clarke A. Pillar integration process: A joint display technique to integrate data in mixed methods research. *Journal of Mixed Methods Research*. 2019/07/01 2017;13(3):301-320. doi:10.1177/1558689817743108

76. QualityMetric. Desktop Software. https://www.qualitymetric.com/desktop-software/

77. Paillé P, Mucchielli A. *L'analyse qualitative en sciences humaines et sociales*. 4 ed. Armand Colin; 2016:430.

Authors' contributions:

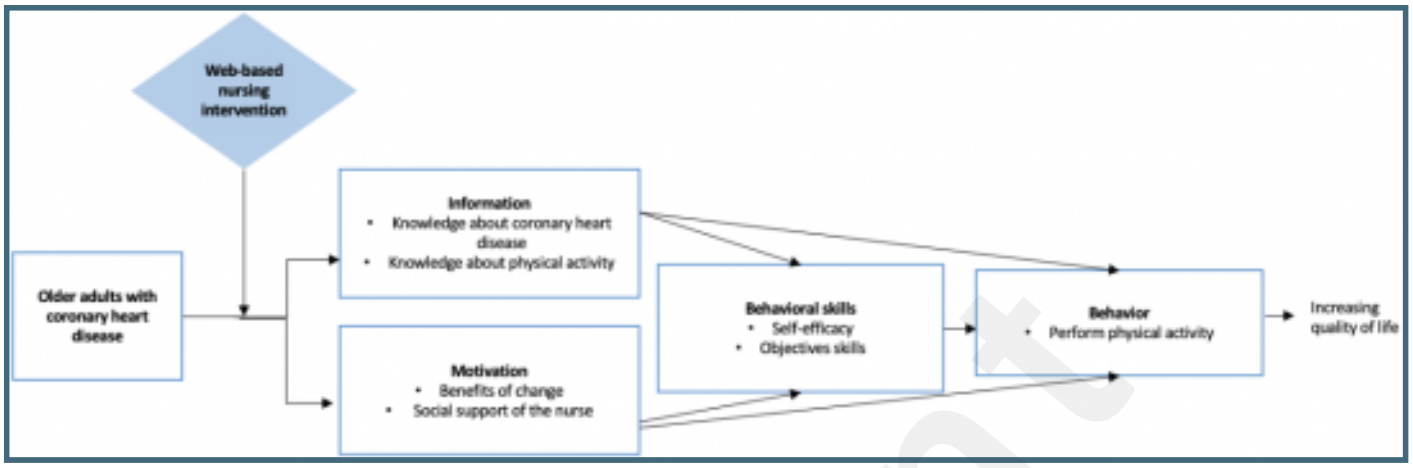
AL: protocol design, writing the original draft of the manuscript.

VD: supervision of protocol design, editing and revision of the manuscript.

Supplementary Files

Figures

IMB model adapted for use in the present study.



Multimedia Appendixes

SPIRIT checklist.
URL: http://asset.jmir.pub/assets/fb8211d1170d4aeff5dc263b461e602f.doc

COREQ checklist.
URL: http://asset.jmir.pub/assets/ee1b8c99a8be9327f05ff74abd6b6660.docx