

## Guidelines

# Women-Focused Cardiovascular Rehabilitation: An International Council of Cardiovascular Prevention and Rehabilitation Clinical Practice Guideline\*

Gabriela Lima de Melo Ghisi, PT, PhD,<sup>a</sup> Susan Marzolini, R. Kin, PhD,<sup>a,b</sup>

Jennifer Price, RN, PhD,<sup>c</sup> Theresa M. Beckie, RN, PhD,<sup>d,e</sup> Taslima Mamataz, MD, MSc,<sup>a,b</sup>

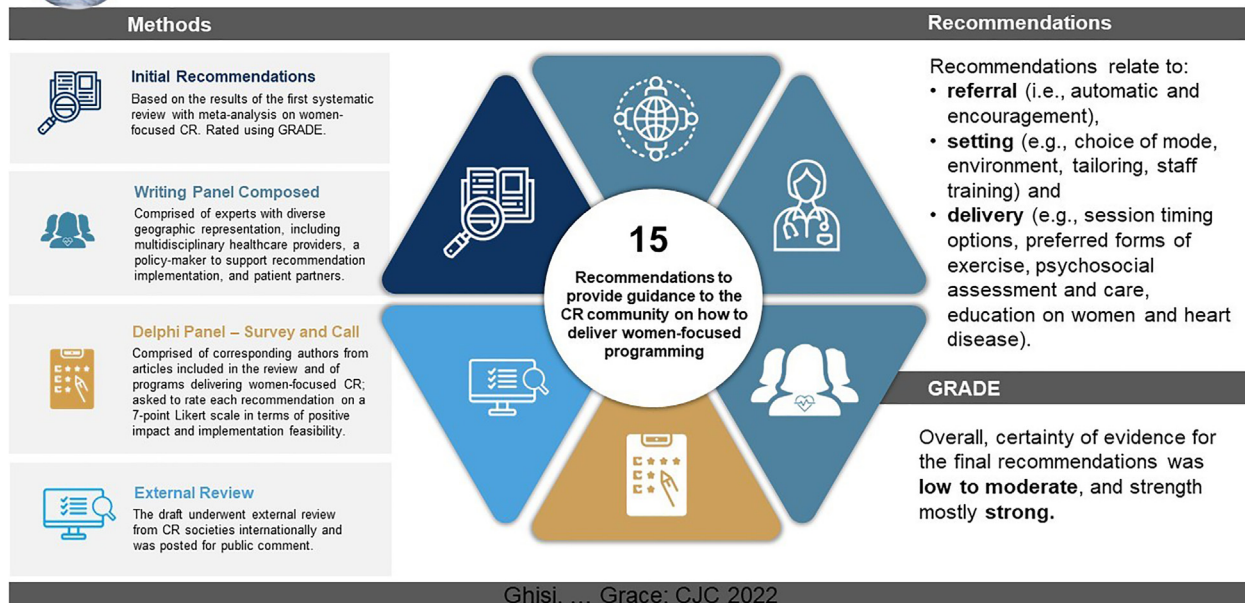
Aliya Naheed, MD, PhD,<sup>f</sup> and Sherry L. Grace, PhD, CRFC<sup>a,b,g</sup>

<sup>a</sup> KITE-Toronto Rehabilitation Institute, University Health Network, University of Toronto, Toronto, Ontario, Canada; <sup>b</sup> Faculty of Health, York University, Toronto, Ontario, Canada; <sup>c</sup> Women's College Hospital, Toronto, Ontario, Canada; <sup>d</sup> College of Nursing, Division of Cardiovascular Sciences, University of South Florida, Tampa, Florida, USA; <sup>e</sup> College of Medicine, Division of Cardiovascular Sciences, University of South Florida, Tampa, Florida, USA; <sup>f</sup> Initiative for Non-Communicable Diseases, Health System and Population Studies Division, International Centre for Diarrheal Diseases Research Bangladesh, Dhaka, Bangladesh; <sup>g</sup> Peter Munk Cardiac Centre, University Health Network, University of Toronto, Toronto, Ontario, Canada



International Council of  
Cardiovascular Prevention  
and Rehabilitation (ICCP)

## Women-Focused Cardiovascular Rehab: Practice Guideline



Ghisi, ... Grace; CJC 2022

### ABSTRACT

Women-focused cardiovascular rehabilitation (CR; phase II) aims to better engage women, and might result in better quality of life than traditional programs. This first clinical practice guideline by the International Council of Cardiovascular Prevention and Rehabilitation (ICCP) provides guidance on how to deliver women-focused programming. The writing panel comprised experts with diverse

### RÉSUMÉ

La réadaptation cardiaque centrée (RC) sur les femmes (phase II) vise une meilleure participation des femmes, et pourrait permettre une plus grande amélioration de leur qualité de vie que les programmes traditionnels. Ces premières lignes directrices de pratique clinique, élaborées par l'International Council of Cardiovascular Prevention and Rehabilitation (ICCP), comportent des directives sur la façon de mettre en place

geographic representation, including multidisciplinary health care providers, a policy-maker, and patient partners. The guideline was developed in accordance with Appraisal of Guidelines for Research and Evaluation (AGREE II) and the Reporting Items for practice Guidelines in Health care (RIGHT). Initial recommendations were on the basis of a meta-analysis. These were circulated to a Delphi panel (comprised of corresponding authors from review articles and of programs delivering women-focused CR identified through ICCPR's audit; N = 76), who were asked to rate each on a 7-point Likert scale in terms of impact and implementability (higher scores positive). A Web call was convened to achieve consensus; 15 panelists confirmed strength of revised recommendations (Grading of Recommendations Assessment, Development, and Evaluation [GRADE]). The draft underwent external review from CR societies internationally and was posted for public comment. The 14 drafted recommendations related to referral (systematic, encouragement), setting (model choice, privacy, staffing), and delivery (exercise mode, psychosocial, education, self-management empowerment). Nineteen (25.0%) survey responses were received. For all but 1 recommendation,  $\geq 75\%$  voted to include; implementability ratings were  $< 5/7$  for 4 recommendations, but only 1 for effect. Ultimately 1 recommendation was excluded, 1 separated into 2 and all revised (2 substantively); 1 recommendation was added. Overall, certainty of evidence for the final recommendations was low to moderate, and strength mostly strong. These recommendations and associated tools can support all programs to feasibly offer some women-focused programming.

des programmes de réadaptation centrée sur les femmes. Le comité de rédaction était composé d'experts provenant de diverses régions géographiques, dont des professionnels de la santé de plusieurs disciplines, un décideur politique et des patients partenaires. Les lignes directrices ont été élaborées selon les principes AGREE II (*Appraisal of Guidelines for Research and Evaluation II*) et RIGHT (*Reporting Items for practice Guidelines in Healthcare*). Les premières recommandations, basées sur une méta-analyse, ont été soumises à un panel Delphi composé d'auteurs d'articles de synthèse et de programmes de RC centrée sur les femmes, ciblés lors de l'enquête menée par l'ICCPR (N = 76). Les membres du panel ont évalué chacune des recommandations sur une échelle de Likert à sept points (dans laquelle un score plus élevé correspondait à une perception plus positive), en fonction de leurs répercussions et de leur applicabilité. Une rencontre virtuelle a été tenue pour atteindre un consensus et 15 panélistes ont confirmé la force des recommandations passées en revue (selon l'approche GRADE [*Grading of Recommendations Assessment, Development, and Evaluation*]). La version préliminaire des recommandations a été soumise à une révision externe par des sociétés de RC de partout dans le monde et a été diffusée publiquement en vue d'obtenir des commentaires. Les 14 recommandations préliminaires portaient sur l'orientation (l'orientation systématique et les encouragements à participer), le contexte (le choix du modèle, le respect de la vie privée et le personnel) et la prestation du programme (la modalité des exercices, l'aspect psychosocial, la formation et le renforcement des capacités d'autoprise en charge). Dix-neuf (25,0 %) réponses ont été reçues lors d'un sondage. Sauf pour une recommandation, les votes étaient à  $\geq 75\%$  en faveur de l'inclusion des recommandations; quatre recommandations ont obtenu un score inférieur à 5/7 pour ce qui est de l'applicabilité, et une seule recommandation a obtenu un tel score pour ce qui est des répercussions. En définitive, une recommandation a été retirée, une a été séparée en deux recommandations distinctes, et toutes ont fait l'objet d'une révision (deux recommandations ont été révisées considérablement); une recommandation a ensuite été ajoutée. Dans l'ensemble, le degré de certitude des données probantes pour les recommandations finales a été évalué comme étant faible à modéré, tandis que la force des recommandations a été évaluée comme étant généralement élevée. Ces recommandations et les outils qui y sont associés peuvent soutenir la mise en place de tous les programmes, afin d'offrir de façon réalisable des programmes de RC centrée sur les femmes.

Cardiovascular disease (CVD) prevalence in women is very high at 6403 cases per 100,000, and is particularly high in the Middle East and North African, Eastern European, and

Central Asian regions.<sup>1</sup> While globally there has been a decrease in CVD burden since 1990, it has increased in many of these African, Asian, as well as Western Pacific countries,<sup>1</sup>

Received for publication March 30, 2022. Accepted June 17, 2022.

**\*Endorsed by:** Association of Clinical and Academic Physiotherapists of Nigeria (ACAPN), American Society for Preventive Cardiology (ASPC), Association Francophone de Cardiologie Préventive (AFCP), Australian Cardiovascular Health and Rehabilitation Association (ACRA), Austrian Association of Prevention and Rehabilitation, Brazilian Association of Cardiorespiratory Physiotherapy and Intensive Care Physiotherapy (ASSO-BRAFIR), British Association for Cardiovascular Prevention and Rehabilitation (BACPR), Cardiopulmonary and Metabolic Rehabilitation Study Group of the Department of Ergometry and Rehabilitation (DERC) of the Brazilian Society of Cardiology and DERC Women Committee, Canadian Association of Cardiovascular Prevention and Rehabilitation (CACPR), Chilean Society of Kinesiology in Cardiology and Cardiovascular Surgery (SOCKICAR), Costa Rican Association of Cardiology, Georgian Association of Cardiovascular

Prevention and Rehabilitation (GACPR), Iranian Heart Foundation, Korean Academy of Cardiopulmonary Rehabilitation Medicine, Mexican Society for Heart Care, National Institute for Prevention and Cardiovascular Health (NIPC; Ireland), Pakistan Society of Physical Medicine and Rehabilitation (PSPMR), Philippine Heart Association, Cardiac Rehabilitation and Exercise Physiology Section of the Polish Cardiac Society (PCS), Saudi Heart Association Group for Prevention and Rehabilitation (SGCPR), Singapore Heart Foundation, Spanish Society of Cardiopulmonary Rehabilitation (SOR-ECAR), Taiwan Academy of Cardiovascular and Pulmonary Rehabilitation (TACVPR), and World Hypertension League (WHL).

Corresponding author: Dr Sherry L. Grace, Faculty of Health, York University — Bethune 368, 4700 Keele St, Toronto, Ontario M3J 1P3, Canada. Tel.: +1-416-736-2100 ×22364.

E-mail: [sgrace@yorku.ca](mailto:sgrace@yorku.ca)

See page 8 for disclosure information.

and prevalence declines have stagnated in women since 2010 globally.<sup>1</sup> Patients with CVD are at increased risk of mortality and morbidity,<sup>2</sup> and indeed CVDs are the leading cause of death among women globally.<sup>1</sup>

Cardiovascular rehabilitation (CR) is an outpatient model of secondary preventive care proven to mitigate this burden. Therein, internationally-agreed core CR components such as structured exercise, medical risk factor management, patient education, and counselling are delivered by a multidisciplinary team.<sup>3</sup> Indeed, rigorous reviews have established the approximately 20% reductions in mortality and morbidity with CR,<sup>4,5</sup> as well as clinically meaningful increases in quality of life.<sup>6</sup> As in most CVD research,<sup>7</sup> women are also under-represented in CR research,<sup>8,9</sup> but there are real-world population-level data to support that these CR benefits hold in women as well,<sup>10-12</sup> although often men's outcomes are better than women's.<sup>13,14</sup> Nevertheless, CVD clinical practice guidelines,<sup>15,16</sup> including those in women,<sup>17</sup> highly recommend CR referral.

Consistent with the fact that fewer women with CVD receive diagnostic tests, secondary prevention drugs, and revascularization procedures compared with men,<sup>18-20</sup> they are also less likely to attend CR.<sup>21-23</sup> Accordingly, "women-focused" models of CR have been developed, to better engage women and optimize their outcomes.<sup>24</sup> By women-focused CR, we are referring to holistic programs: (1) with at least some CR components (ie, can be women-focused sessions) delivered with  $\geq 50\%$  women (eg, could be "women-only"); and (2) comprising some form(s) of tailoring to meet women's needs or preferences (eg, comprehensive psychosocial screening and programming, education content, and/or forms of exercise).<sup>25</sup> Moreover, women should be given (3) the choice of delivery mode (ie, to address women's common transportation barriers and time constraints related to caregiving and work responsibilities),<sup>26</sup> and where the setting is not remote, programs should consider women's preferences around environment (eg, respect for privacy).<sup>25</sup> Finally, (4) the interprofessional staff should have a depth of knowledge in the area (eg, specialization in risk factor management, exercise prescription, and mental health in women with CVDs), as well as have the sensitivities and approaches to effectively work with patients who identify as women. The International Council of Cardiovascular Prevention and Rehabilitation's (ICCPD) global CR audit revealed 686 women-focused programs in 45 countries.<sup>27</sup>

## Objectives

The objectives of this first clinical practice guideline are to provide guidance to the CR community on how to best engage women with CVDs including stroke and peripheral arterial disease in their programs through design of their programming, while optimizing their outcomes (ie, mortality, morbidity, functional capacity, psychosocial well-being, and quality of life). Cost, resource implications, feasibility, and patient preferences<sup>28</sup> are foremost considerations in the recommendations.

## Methods

Please see the *Supplemental Methods* section of the [Supplementary Material](#) for details on focus, target audience, writing panel composition, evidentiary basis, as well as the

recommendation development and consensus processes. A synopsis of the development process is shown in [Figure 1](#).

## Results

Please see the *Supplemental Results* section of the [Supplementary Material](#) for details regarding the recommendation development and consensus process. Panelist recommendation ratings are summarized in [Supplemental Table S1](#), as well as final decisions on each. Final recommendations, along with level and certainty of evidence, are shown in [Table 1](#) (see summary in [Figure 1](#)). An explication of these recommendations follows.

### CR referral process

Lack of referral to CR is one of the largest predictors of nonenrollment for women (and men).<sup>29-31</sup> Although there is wide variation, referral is significantly lower in women (40% vs 50% in men),<sup>21</sup> and this could be because of some unconscious clinician bias.<sup>32</sup> Physician recommendation or endorsement is one of the most important predictors of CR participation, because patients generally require their referral and often closely heed their recommendations.<sup>33</sup> However, physicians can also be a hindrance to referral, such as when they inform patients they are "too well" or "too sick" to be appropriate CR candidates.<sup>34,35</sup>

Although women might seek out their own referrals if they are aware of CR services,<sup>34,36,37</sup> research and guidelines recommend the institution of automated/systematic referral, which overcomes sex biases.<sup>38,39</sup> Increased education of physicians and other health care providers is needed to raise awareness of the importance of CR, as well as the indications, exercise contraindications, and safety of CR programs.<sup>34</sup> Referral should be accompanied by bedside education and discussion to encourage women's attendance at CR programs.<sup>40,41</sup> In particular, common barriers women face should be discussed such as transportation, care-giving responsibilities, and perceptions toward exercise<sup>28</sup> (see implementation tools in [Supplemental Appendix S1](#)<sup>42</sup>).

### CR environment

The context of CR programs can influence women's decision-making with respect to program enrollment and completion.<sup>43</sup> At a macro level, women's engagement might be influenced by the perceived safety of the clinic/community centre location itself.<sup>34</sup>

The staff delivering care in a women-focused CR program should be considered. Staff should have expertise in women with CVD, and deliver patient-centred care for women.<sup>24,44</sup> The multidisciplinary team should include a regulated mental health care professional where possible, because of the high rate of psychosocial distress in women with CVD.<sup>45</sup> Although some programs might aim to employ female staff to deliver women-focused programming, it is most important that staff have the sensitivities and awareness to develop a therapeutic relationship with them.

Where women-only CR is being delivered, the ability to provide separate spaces should be considered. Regardless, facilities should be such that privacy can be ensured, such as for changing or assessing body composition for example, because



this is important to women.<sup>42</sup> Because women also report disliking rushing and crowding,<sup>42</sup> allowing women time and space to change and prepare for class is important, as is the time after class as this might be a chance to connect with peers or ask CR staff any individual questions.<sup>46</sup> Indeed, women also express a strong desire for social interaction, wanting to meet other individuals who have had the same lived experiences and with whom they can connect.<sup>25</sup>

## CR delivery

**Intake assessment.** Initial assessment is a core component of CR,<sup>3,47-49</sup> to ascertain safety, determine patient goals, and develop a plan of care. Although clinical recommendations are available elsewhere,<sup>50</sup> there are some particular considerations relating to women.<sup>51</sup>

Women's context and history should be considered. Demographic information, social determinants of health as well as enquiry into psychosocial health is important to identify potential barriers to participation and ensure the care plan addresses all relevant issues. Screening for gender-based violence is important, because this is more prevalent in women and negatively affects CVD outcomes as well.<sup>24,52</sup>

A careful clinical history should be taken, ensuring comprehensive assessment to minimize any safety issues due to unidentified cardiac or other issues, because women often have other forms of heart disease and diagnostic tests are less sensitive in women than men.<sup>1</sup> This should also include consideration of history of cancer because of the cardiotoxicity of some treatments,<sup>53</sup> as well as comorbidities more common

in women that might complicate prognosis, such as autoimmune conditions.<sup>54</sup> Careful attention to function and mobility is important because women experience more osteoporosis, frailty, and have a higher incidence of falls.<sup>55</sup>

Cardiovascular risk factors such as blood pressure are also assessed, and then used to track progress in CR. Women have additional risk factors, and some CVD risk factors are manifested differently or are more hazardous in women.<sup>56</sup> Preeclampsia, gestational diabetes, pregnancy-induced hypertension, small for gestational age infants, preterm births, and early or surgical menopause have all been recognized as early indicators of increased cardiovascular risk but are not routinely documented as important data.<sup>57</sup>

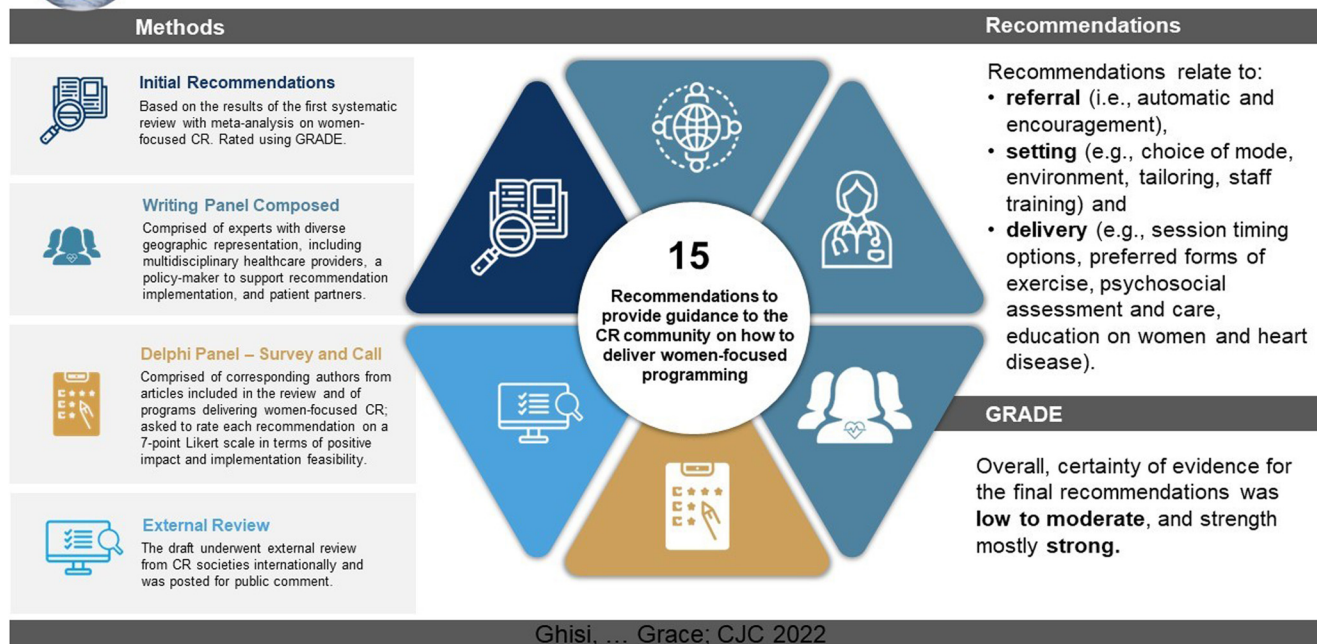
Finally, sex- and gender-related symptoms should be documented.<sup>58</sup> Menopausal symptoms, and urinary incontinence due to pelvic floor changes arising from pregnancy might also be a concern for women embarking in an exercise program. As in any CR program, the comprehensive information from the assessment should be used to inform the individualized treatment plan. The reader is referred to key articles that describe in full tailoring CR on the basis of sociodemographic characteristics,<sup>59</sup> type of cardiac indication for CR (see Supplemental Tables XI-XVII), and comorbidities (see Supplemental Tables XIV, and XX-XXII).<sup>60</sup>

**Exercise component.** The CR exercise practitioner must consider safety, dose, and modality of exercise that will result in optimal adherence and outcomes<sup>61</sup> when prescribing as well as progressing aerobic and resistance training to men and women with CVD. Specific to this guideline, the practitioner should prescribe exercise with attention to the physical and



International Council of  
Cardiovascular Prevention  
and Rehabilitation (ICCP)

## Women-Focused Cardiovascular Rehab: Practice Guideline



Ghisi, ... Grace; CJC 2022

**Figure 1.** Summary of methods and recommendations. CR, cardiac rehabilitation; GRADE, Grading of Recommendations Assessment, Development, and Evaluation.

**Table 1. Final recommendations for women-focused cardiovascular rehabilitation, with level of evidence**

Recommendations	Certainty of the evidence (GRADE)	Strength of the recommendations	Evidentiary basis
<b>Women's referral to CR</b>			
1. To facilitate referral of all CR-indicated women and reduce sex/gender bias, CR programs should work with referral sources to institute systematic referral (eg, acute coronary syndrome and revascularization patients flagged for referral in electronic patient records, with referral information seamlessly flowing to CR site). Barriers and sources of bias in the referral process should be considered and mitigated (eg, educating providers that comorbidities and older/younger age do not preclude referral).	⊕⊕⊕⊕ High	Strong	39,138-141
2. CR programs should educate providers (eg, physicians, nurses, physiotherapists) at the referral sources regarding the importance of encouraging women's attendance at the bedside, and tailoring that discussion to women's personal barriers and preferences. Where possible, essential care partners/support persons may be included in these discussions. Materials on the importance of CR for women could be provided to patients. A process to ensure these discussions take place should be implemented, and overseen by a champion.	⊕⊕⊕⊕ High	Strong	28,40,142
<b>CR setting: mode of delivery and environment</b>			
3. After safety is assessed/discussed, women should be provided the choice of participating in a centre-based (clinical or community) or home-based setting (with or without technology using mode as per women's preferences as well as device availability), or a hybrid model, where available and reimbursed.	⊕⊕⊕○ Moderate	Strong	26,62,84,134,140,143-149
4. The CR environment should be optimized to meet women's preferences, values and goals, including consideration of: ensuring privacy (eg, change room facilities, body composition assessment), as well as avoiding crowding and rushing. A safe space should be fostered, such that inclusion of male support persons in some elements of women-only programs might not be appropriate.	⊕⊕⊕○ Moderate	Strong	25,37,63,80,140
5. It is conditionally recommended that interprofessional staff, ideally with sociodemographic characteristics mirroring those of the women they serve, should have the sensitivities and approaches to effectively work with patients who identify as women and to develop a therapeutic relationship with them. They should have a depth of knowledge on women (sex/gender) and CVD.	⊕⊕○○ Low	Weak	150,151
6. Whether CR is delivered one-on-one or in groups, we suggest that providers aim to individually tailor care provision to women's needs and preferences, with consideration of intersectionality, including gender identity, ethnocultural background and/or religion. A qualified recommendation is that women receiving one-on-one models be offered the opportunity to connect with other women in the program (eg, synchronous or asynchronous, virtual or in-person, depending on feasibility and patient preference).	⊕⊕○○ Low	Weak	152-154
<b>Women-focused CR delivery</b>			
7. Because women are the most populous under-represented group in CR, it is suggested that all programs should offer women-focused programming, comprising as many of the definitional elements of women-focused CR as possible. Where resources are limited, this could include offering, for example, some women-only virtual education or exercise sessions, or peer support programs. We suggest all women participate in programs with at least some form of sex and/or gender tailoring.	⊕⊕○○ Low	Strong	24,51,152
8. It is conditionally recommended that women be offered as much choice as possible in CR session timing (whether women-only or traditional models).	⊕⊕⊕○ Moderate	Weak	26,80,140,155
9. Women's context, clinical history, and comorbidities should be considered fully at the initial assessment in developing their individual CR treatment plan. Particular considerations include mental health and psychosocial issues, menopausal status, frailty, cancer history, and concerns about urinary incontinence, fall risk/osteoporosis, as well as autoimmune conditions.	⊕⊕○○ Low	Strong	1,156-158
10. CR programs should endeavour to provide preferred forms of aerobic exercise for women (eg, alternatives to treadmill/stationary cycling such as overground exercise [walking and/or jogging, including outdoors], evidence-based forms of aerobic dance, and aerobics). If this is not possible, places to engage in forms of exercise preferred by women should be identified in the community as an adjunct (eg, swimming/aquatics, yoga, tai chi).	⊕⊕⊕○ Moderate	Strong	25,82-84,159-161
11. Individually tailored aerobic and resistance exercise prescriptions should consider musculoskeletal issues (eg, arthritis), body mass index/obesity, exercise history, pain, and fatigue.	⊕⊕⊕○ Moderate	Strong	25,26,71
12. The psychosocial needs of women should be assessed and addressed in an evidence-based manner (eg, social support, relationship health, depression, anxiety, stress, socioeconomic issues, informal caregiving activities). When issues are identified and the program lacks expertise on the team, referral to a specialist might be warranted. Reassessment should be undertaken, and communication be made to the woman's primary care provider with consent to ensure ongoing monitoring and follow-up.	⊕⊕⊕○ Moderate	Strong	162-169

Continued

Table 1. Continued.

	Recommendations	Certainty of the evidence (GRADE)	Strength of the recommendations	Evidentiary basis
13.	If sex/gender-specific education cannot be delivered directly within CR, women might be directed to education resources on matters specific to women and cardiovascular diseases, in multiple media where possible (see implementation tools in Supplemental Appendix S1).	⊕⊕○○ Low	Weak	86-90,168,169
14.	It is conditionally recommended that from the outset of CR, staff should support women in the self-management of their heart health as well as promote their heart-health behaviours in the program and beyond, through encouraging their resilience and autonomy. This might involve, for example, exploring means of exercise maintenance without the use of equipment only available at the program (eg, access to community centres). This might also involve promotion of continued peer support post-program, as well as ensuring women are confident working with their primary and specialty care providers to optimize secondary CVD prevention and associated health conditions long-term.	⊕⊕○○ Low	Weak	154,170-172
15.	Program evaluation should involve assessing women's satisfaction with delivery (particularly women-focused aspects), as well as analysis of sex differences in CR satisfaction and outcomes. Corresponding quality improvement activities should be instituted where possible.	⊕⊕○○ Low	Strong	150,173-175

⊕⊕○○ Low: The true effect might be markedly different from the estimated effect; ⊕⊕⊕○ Moderate: The authors believe that the true effect is probably close to the estimated effect; ⊕⊕⊕⊕ High: The authors have a lot of confidence that the true effect is similar to the estimated effect.

CR, cardiovascular rehabilitation; CVD, cardiovascular disease; GRADE, Grading of Recommendations Assessment, Development, and Evaluation.

psychosocial obstacles that women more commonly experience, while being sensitive to issues related to gender.<sup>62</sup>

Safety is especially important for women. Women have indicated that being monitored during exercise, and having their coexisting conditions taken into consideration in their exercise prescription makes them feel safe.<sup>25,33,63</sup> Pre-participation education should include a description of risks and benefits of exercise, about their individually-tailored prescription, allowing time to discuss with others.<sup>64</sup> Moreover, exercise logs and/or tracking devices to record heart rate, perceived exertion, fatigue, and pain level as appropriate, should be incorporated into the program and reviewed regularly by CR staff. Finally, benefits and precautions to ensure safety of exercise for those with coexisting conditions such as diabetes should be addressed; this might help mitigate the higher CR attrition rate in women than men with comorbid diabetes.<sup>65,66</sup>

Musculoskeletal issues disproportionately affect women, and should be considered from the initial exercise prescription. Arthritis/joint pain are predominant, particularly in the knees, hip, and back,<sup>67,68</sup> and are less likely to resolve in women than men, leading to withdrawal from CR.<sup>68,69</sup> To address this, current and previous musculoskeletal issue(s), location, and circumstance(s) that exacerbate pain or discomfort should be assessed pre-CR. This should inform choice of modality for aerobic exercise and selection of resistance exercises, as well as gradual progression of volume and intensity of exercise.<sup>70</sup>

Fatigue greatly affects women's motivation and experience of exercising.<sup>25,26,71</sup> Patients should be educated on the causes (eg, low cardiorespiratory fitness, employment and caregiver responsibilities) and what can be done to mitigate fatigue (eg, exercise, planning on the basis of energy level, shorter but more frequent bouts).<sup>72</sup> Action planning and motivational interviewing can be used to help mitigate this.<sup>73,74</sup>

The previously mentioned obstacles might prevent a greater proportion of women than men from reaching a true physiological maximum on an exercise stress test, and this

might be exacerbated by the fact that most exercise test protocols were validated in men. Therefore, prescribing aerobic exercise on the basis of peak values attained (heart rate or peak oxygen consumption [VO<sub>2</sub>]) might lead to a suboptimal training intensity. For CR programs that conduct cardiopulmonary exercise tests, a more metabolically uniform measure for prescription of exercise intensity would be ventilatory anaerobic threshold, because it does not require maximal performance on the test and most people with CVD can reach this intensity.<sup>75,76</sup> When ergospirometry is not available, the talk test and rating of perceived exertion<sup>77</sup> in combination with predicted/measured percent of heart rate peak can be used to guide exercise intensity.

On a related note, exercise prescription dose also deserves close attention, because women might not have the same increases in cardiorespiratory fitness with CR as men.<sup>78</sup> In prescribing and progressing intensity, we want women to fully reap the benefits of exercise,<sup>79</sup> but have to balance that with efforts to minimize pain and fatigue so women do not drop out of the program.

Women might need more flexibility with scheduling of exercise sessions, because of multiple role obligations for example.<sup>80</sup> Moreover, modality of aerobic exercise can affect women's enjoyment and hence engagement.<sup>62</sup> Women report treadmill and cycle-only exercise to be boring, and preferred to have a choice.<sup>25</sup> Although alternative types of exercise such as tai chi and yoga might be more enjoyable, the effect on CVD risk reduction, morbidity, and mortality is somewhat limited.<sup>81-83</sup> Nevertheless, incorporating alternative types of exercise such as dance and yoga might be appreciated as an adjunct to CR programming.<sup>84</sup> Unfortunately, not many programs tend to offer these alternatives,<sup>85</sup> thus challenges to implementation need to be identified and overcome.

**Patient education.** Patient education is an internationally agreed core component of CR,<sup>3,48,49</sup> with proven benefits in CVD patients (although reviews include a low proportion of women).<sup>86</sup> Women have different preferences for delivery

mode and information needs than men,<sup>87-90</sup> and lower levels of knowledge preprogram.<sup>91</sup> However, available CR guidelines do not address tailoring patient education to women.<sup>48</sup> Ten of the 28 studies included in the reviews that form the basis for this guideline explicitly reported offering gender-tailored education.<sup>74,92-100</sup> None of the studies included disease-related knowledge as an outcome, thus more work is needed in this area.

Best practices in adult education for CR (for men and women) are available elsewhere,<sup>101-103</sup> as are recommendations on standardized CR education content.<sup>104</sup> Comprehensive evidence-based CR education is available open access online.<sup>105-109</sup> Recommendations for gender-tailoring CR for women include consideration of process/mode and content. Women might have greater transportation barriers than men, more family responsibilities constraining their time, and need for social support,<sup>25,26</sup> hence, women's preferred education mode should be assessed (eg, remote [and if so, technology type or platform] or face-to-face; group or individual; synchronous or asynchronous), and where possible education should be delivered in accordance with their preferences, although delivery via multiple modes might be best. Programs should ensure staff delivering education to women have the relevant expertise and deliver it in accordance with best practices.<sup>44</sup>

There are additional topics that should be covered for women with CVD, including but not limited to: ensuring women are informed about CR (see the previous section on referral and encouragement), the different pathophysiology of CVD in women, different forms of CVD more common in women and how they are diagnosed, effects of menopause, risk factors (including psychosocial issues), and comorbidities (eg, autoimmune diseases) more common in women, cardiac effects of chemotherapy and breast irradiation treatment, as well as sex differences in risks and effectiveness of CVD treatments such as revascularization, medication, and even CR itself.<sup>1</sup> Because of the greater volume of content to be covered, it is advisable that programs assess knowledge and information needs in patients at intake, and only offer needed education on the basis of specific patient circumstances.

**Psychosocial component.** Several social determinants of health<sup>110-114</sup> and psychosocial issues (eg, social isolation, stress)<sup>115-120</sup> are closely related to CVD outcomes, and are more predominant in women than men (eg, depression, anxiety, low socioeconomic status, intimate partner violence, adverse childhood experiences).<sup>45</sup> Therefore, women-focused CR programs should make every effort to assess these factors. Research on depression screening in cardiac patients outside the CR setting does not suggest benefit,<sup>121</sup> however there are no data in the CR setting in which there is long-term follow-up; hence we do recommend such screening if program patients can access providers trained in mental health care.

Where psychosocial issues are identified, women should be provided evidence-based treatments where they are established.<sup>122,123</sup> Where there are no evidence-based treatments, the support, education, and exercise as delivered in women-focused CR can attenuate these excess risks.<sup>124-126</sup> Positive psychological exercises could also be considered (eg, mindfulness, pleasurable and meaningful acts, expressive writing).<sup>127</sup>

Guidance on best practices in delivering the psychosocial component of CR is available elsewhere.<sup>128</sup> Caution is warranted however, because there has been an inclination toward harm in 2 major trials of psychosocial interventions delivered to women with CVD,<sup>129,130</sup> and hence programs need to ensure only regulated mental health care providers are delivering any psychosocial counselling to women, and that it is evidence-based.

Other considerations for these women-focused CR recommendations are provided in the *Supplemental Results* section of the Supplementary Material, including details regarding CR setting/mode of delivery, patient preferences and values, special populations (stroke and peripheral arterial disease patients), as well as consideration of equity and feasibility related to low-resource settings.

## Discussion

With consideration of key factors now described, it is hoped that where available, CR could be tailored to meet women's needs and preferences. To support the community in implementing women-focused CR, received evidence-based tools to support delivery are shown in [Supplemental Appendix S1](#). As a first priority, the many barriers to, and low rate of, encouragement of women at the bedside to attend CR<sup>131,132</sup> need to be addressed. The TAKEHeart program in the United States (<https://takeheart.ahrq.gov>) is an excellent model to support implementation of systematic inpatient referral and encouragement of women to attend at the bedside.

When women are referred, although we recommend they be provided a choice of program setting, there is little available guidance on triage assessment,<sup>133</sup> and none specific to women that considers their unique needs such as less common and understood forms of CVD, transportation barriers, as well as psychological and socioeconomic challenges.<sup>134</sup> Women should also be given some options with regard to session timing offerings.<sup>80</sup>

Some barriers to implementation of women-focused CR at the program level are outlined previously. In non-low-resource settings, cost will still be a barrier to implementation, because most CR programs are insufficiently resourced to meet need<sup>135</sup> and that often staff with additional specialized training would be needed to implement these recommendations. When it is not feasible to even offer 1 women-focused CR session, women should be directed to asynchronously available evidence-based resources tailored to women, such as is provided in [Supplemental Appendix S1](#) (albeit only in English at this time). Moreover, women patients could be directed to unmoderated peer support chat groups using a freely-available App.

In the *Supplemental Discussion* section of the *Supplementary Material*, directions for future research and limitations are shown. The latter includes concerns regarding African representation and survey response rate.

## Conclusion

It is hoped that all programs will offer as many of the women-focused CR elements as possible to every female



patient, considering clinical and psychosocial issues as well as delivery processes, given their resources and current offerings. The effect could be greater utilization, and given the dose-response effects of CR,<sup>136,137</sup> better outcomes in women. Indeed, because of the prevalence of CVD in women, implementation of these recommendations and tools could result in significant public health benefit, such as reduced cardiovascular mortality, morbidity, and rehospitalization, as well as optimize role resumption and quality of life in women, and decrease health care costs.

### Acknowledgements

See the *Supplemental Acknowledgements* section of the *Supplementary Material*. See Supplement Funding: There is no funding for this guideline.

### Funding Sources

None.

### Disclosures

The authors have no conflicts of interest to disclose.

### References

- Vogel B, Acevedo M, Appelman Y, et al. The Lancet Women and Cardiovascular Disease Commission: reducing the global burden by 2030. *Lancet* 2021;397:2385-438.
- Jernberg T, Hasvold P, Henriksson M, Hjelm H, Thuresson M, Janzon M. Cardiovascular risk in post-myocardial infarction patients: nationwide real world data demonstrate the importance of a long-term perspective. *Eur Heart J* 2015;36:1163-70.
- Grace SL, Turk-Adawi KI, Contractor A, et al. Cardiac rehabilitation delivery model for low-resource settings. *Heart* 2016;102:1449-55.
- Taylor RS, Dalal HM, McDonagh STJ. The role of cardiac rehabilitation in improving cardiovascular outcomes. *Nat Rev Cardiol* 2021;19:180-94.
- Kabboul N, Tomlinson G, Francis T, et al. Comparative effectiveness of the core components of cardiac rehabilitation on mortality and morbidity: a systematic review and network meta-analysis. *J Clin Med* 2018;7:514.
- Francis T, Kabboul N, Rac V, et al. The effect of cardiac rehabilitation on health-related quality of life in patients with coronary artery disease: a meta-analysis. *Can J Cardiol* 2019;35:352-64.
- Jin X, Chandramouli C, Allocco B, Gong E, Lam CSP, Yan LL. Women's participation in cardiovascular clinical trials from 2010 to 2017. *Circulation* 2020;141:540-8.
- Dibben G, Faulkner J, Oldridge N, et al. Exercise-based cardiac rehabilitation for coronary heart disease. *Cochrane Database Syst Rev* 2021;11:CD001800.
- Ghisi GLDM, Chaves GSDS, Bennett A, Lavie CJ, Grace SL. The effects of cardiac rehabilitation on mortality and morbidity in women: a meta-analysis attempt. *J Cardiopulm Rehabil Prev* 2019;39:39-42.
- Colbert JD, Martin BJ, Haykowsky MJ, et al. Cardiac rehabilitation referral, attendance and mortality in women. *Eur J Prev Cardiol* 2015;22:979-86.
- De Souza E Silva CG, Nishijuka FA, De Castro CLB, et al. Women have lower mortality than men after attending a long-term medically supervised exercise program. *J Cardiopulm Rehabil Prev* 2022;42:120-7.
- Eklblom Ö, Cider Å, Hambraeus K, et al. Participation in exercise-based cardiac rehabilitation is related to reduced total mortality in both men and women: results from the SWEDEHEART registry. *Eur J Prev Cardiol* 2022;29:485-92.
- Feola M, Garnero S, Daniele B, et al. Gender differences in the efficacy of cardiovascular rehabilitation in patients after cardiac surgery procedures. *J Geriatr Cardiol* 2015;12:575-9.
- Terada T, Chirico D, Tulloch HE, Scott K, Pipe AL, Reed JL. Sex differences in psychosocial and cardiometabolic health among patients completing cardiac rehabilitation. *Appl Physiol Nutr Metab* 2019;44:1237-45.
- Fihn SD, Gardin JM, Abrams J, et al. 2012 ACCF/AHA/ACP/AATS/PCNA/SCAI/STS guideline for the diagnosis and management of patients with stable ischemic heart disease: executive summary. *J Am Coll Cardiol* 2012;60:2564-603.
- Smith SC, Benjamin EJ, Bonow RO, et al. AHA/ACCF secondary prevention and risk reduction therapy for patients with coronary and other atherosclerotic vascular disease: 2011 update: a guideline from the American Heart Association and American College of Cardiology Foundation. *Circulation* 2011;124:2458-73.
- Mosca L, Benjamin EJ, Berra K, et al. Effectiveness-based guidelines for the prevention of cardiovascular disease in women-2011 update: a guideline from the American Heart Association. *Circulation* 2011;123:1243-62.
- Walli-Attaei M, Joseph P, Rosengren A, et al. Variations between women and men in risk factors, treatments, cardiovascular disease incidence, and death in 27 high-income, middle-income, and low-income countries (PURE): a prospective cohort study. *Lancet* 2020;396:97-109.
- Kawamoto KR, Davis MB, Duvernoy CS. Acute coronary syndromes: differences in men and women. *Curr Atheroscler Rep* 2016;18:73.
- García M, Mulvagh SL, Noel C, Merz B, Buring JE, Manson JE. Cardiovascular disease in women: clinical perspectives HHS public access. *Circ Res* 2016;15:1273-93.
- Colella TJ, Gravely S, Marzolini S, et al. Sex bias in referral of women to outpatient cardiac rehabilitation? A meta-analysis. *Eur J Prev Cardiol* 2015;22:423-41.
- Samayoa L, Grace SL, Gravely S, Scott LB, Marzolini S, Colella TJF. Sex differences in cardiac rehabilitation enrollment: a meta-analysis. *Can J Cardiol* 2014;30:793-800.
- Oosenbrug E, Marinho RP, Zhang J, et al. Sex differences in cardiac rehabilitation adherence: a meta-analysis. *Can J Cardiol* 2016;32:1316-24.
- Mamataz T, Ghisi GLM, Pakosh M, Grace SL. Nature, availability, and utilization of women-focused cardiac rehabilitation: a systematic review. *BMC Cardiovasc Disord* 2021;21:1-20.
- Moore SM, Kramer FM, Moore SM, Kramer FM. Women's and men's preferences for cardiac rehabilitation program features. *J Cardiopulm Rehabil* 1996;16:163-8.
- Grace SL, Gravely-Witte S, Kayaniyil S, Brual J, Suskin N, Stewart DE. A multisite examination of sex differences in cardiac rehabilitation barriers by participation status. *J Women's Health* 2009;18:209-16.



27. Turk-Adawi K, Supervia M, Lopez-Jimenez F, Adawi AM, Sadeghi M, Grace SL. Women-only cardiac rehabilitation delivery around the world. *Heart Lung Circ* 2021;30:135-43.
28. Colella TJF, Hardy M, Hart D, et al. The Canadian Women's Heart Health Alliance Atlas on the epidemiology, diagnosis, and management of cardiovascular disease in women—chapter 3: patient perspectives. *CJC Open* 2021;3:229-35.
29. Cooper AF, Jackson G, Weinman J, Horne R. Factors associated with cardiac rehabilitation attendance: a systematic review of the literature. *Clin Rehabil* 2002;16:541-52.
30. Jackson L, Leclerc J, Erskine Y, Linden W. Getting the most out of cardiac rehabilitation: a review of referral and adherence predictors. *Heart* 2005;91:10-4.
31. Stone JA, Arthur HM. Canadian guidelines for cardiac rehabilitation and cardiovascular disease prevention, second edition, 2004: executive summary. *Can J Cardiol* 2005;21(suppl D):3-19.
32. Kentner AC, Grace SL. Between mind and heart: sex-based cognitive bias in cardiovascular disease treatment. *Front Neuroendocrinol* 2017;45:18-24.
33. Lieberman L, Meana M, Stewart D. Cardiac rehabilitation: gender differences in factors influencing participation. *J Women's Health* 1998;7:717-23.
34. Clark AM, King-shier KM, Spaling MA, et al. Factors influencing participation in cardiac rehabilitation programmes after referral and initial attendance: qualitative systematic review and meta-synthesis. *Clin Rehabil* 2013;27:948-59.
35. Price J. A pilot trial of a coaching intervention designed to increase women's attendance at cardiac rehabilitation intake [PhD dissertation]. Toronto: University of Toronto, 2012. Available at: <https://tspace.library.utoronto.ca/handle/1807/34854>. Accessed March 1, 2022.
36. Grace SL, Evindar A, Brooks D, Jaglal S, Abramson BL, Nolan R. Increasing patient-initiation of cardiac rehabilitation referral in female percutaneous coronary intervention patients. *Can J Cardiovasc Nurs* 2005;15:23-7.
37. Rolfe DE, Sutton EJ, Landry M, Sternberg L, Price JAD. Women's experiences accessing a women-centered cardiac rehabilitation program: a qualitative study. *J Cardiovasc Nurs* 2010;25:332-41.
38. Grace SL, Chessex C, Arthur H, et al. Systematizing inpatient referral to cardiac rehabilitation 2010: Canadian Association of Cardiac Rehabilitation and Canadian Cardiovascular Society joint position paper. *Can J Cardiol* 2011;27:192-9.
39. Gravely S, Anand SS, Stewart DE, Grace SL; CRCARE Investigators. Effect of referral strategies on access to cardiac rehabilitation among women. *Eur J Prev Cardiol* 2014;21:1018-25.
40. Santiago de Araújo Pio C, Chaves GS, Davies P, Taylor RS, Grace SL. Interventions to promote patient utilisation of cardiac rehabilitation. *Cochrane Database Syst Rev* 2019;2:CD007131.
41. Santiago de Araújo Pio C, Beckie TM, Varnfield M, et al. Promoting patient utilization of outpatient cardiac rehabilitation: a joint International Council and Canadian Association of Cardiovascular Prevention and Rehabilitation position statement. *Int J Cardiol* 2020;298:1-7.
42. Moore SM. Women's views of cardiac rehabilitation programs. *J Cardiopulm Rehabil* 1996;16:123-9.
43. Price J, Landry M, Rolfe D, Delos-Reyes F, Groff L, Sternberg L. Women's cardiac rehabilitation: improving access using principles of women's health. *Can J Cardiovasc Nurs* 2005;15:32-41.
44. JU Ramlakhan, Foster AM, Grace SL, Green CR, Stewart DE, Gagliardi AR. What constitutes patient-centred care for women: a theoretical rapid review. *Int J Equity Health* 2019;18:182.
45. Shanmugasagaram S, Russell KL, Kovacs AH, Stewart DE, Grace SL. Gender and sex differences in prevalence of major depression in coronary artery disease patients: a meta-analysis. *Maturitas* 2012;73:305-11.
46. Sutantri S, Cuthill F, Holloway A. 'A bridge to normal': a qualitative study of Indonesian women's attendance in a phase two cardiac rehabilitation programme. *Eur J Cardiovasc Nurs* 2019;18:744-52.
47. Grace SL, Turk-Adawi KI, Contractor A, et al. Cardiac rehabilitation delivery model for low-resource settings: an International Council of Cardiovascular Prevention and Rehabilitation consensus statement. *Prog Cardiovasc Dis* 2016;59:303-22.
48. Mehra VM, Gaalema DE, Pakosh M, Grace SL. Systematic review of cardiac rehabilitation guidelines: quality and scope. *Eur J Prev Cardiol* 2020;27:912-28.
49. Price KJ, Gordon BA, Bird SR, Benson AC. A review of guidelines for cardiac rehabilitation exercise programmes: is there an international consensus? *Eur J Prev Cardiol* 2016;23:1715-33.
50. Visseren FLJ, MacH F, Smulders YM, et al. 2021 ESC guidelines on cardiovascular disease prevention in clinical practice. Developed by the Task Force for cardiovascular disease prevention in clinical practice with representatives of the European Society of Cardiology and 12 medical societies with the special contribution of the European Association of Preventive Cardiology (EAPC). *Eur Heart J* 2021;42:3227-37.
51. Smith JR, Thomas RJ, Bonikowske AR, Hammer SM, Olson TP. Sex differences in cardiac rehabilitation outcomes. *Circ Res* 2022;130:552-65.
52. Du Mont J, Forte T, Cohen MM, Hyman I, Romans S. Changing help-seeking rates for intimate partner violence in Canada. *Womens Health* 2005;41:1-19.
53. Wilcox NS, Rotz SJ, Mullen M, et al. Sex-specific cardiovascular risks of cancer and its therapies. *Circ Res* 2022;130:632-51.
54. Moran CA, Collins LF, Beydoun N, et al. Cardiovascular implications of immune disorders in women. *Circ Res* 2022;130:593-610.
55. Wenger NK. Cardiovascular disease in women: understanding the journey. *Clin Chem* 2021;67:24-9.
56. Lau ES, Binek A, Parker SJ, et al. Sexual dimorphism in cardiovascular biomarkers: clinical and research implications. *Circ Res* 2022;130:578-92.
57. O'Kelly AC, Michos ED, Shufelt CL, et al. Pregnancy and reproductive risk factors for cardiovascular disease in women. *Circ Res* 2022;130:652-72.
58. Pacheco C, Mullen KA, Coutinho T, et al. The Canadian Women's Heart Health Alliance Atlas on the epidemiology, diagnosis, and management of cardiovascular disease in women — chapter 5: sex- and gender-unique manifestations of cardiovascular disease. *CJC Open* 2021;4:243-62.
59. Mathews L, Brewer LPC. A Review of disparities in cardiac rehabilitation: evidence, drivers, and solutions. *J Cardiopulm Rehabil Prev* 2021;41:375-82.
60. Piepoli MF, Corrà U, Adamopoulos S, et al. Secondary prevention in the clinical management of patients with cardiovascular diseases. Core components, standards and outcome measures for referral and delivery: a policy statement from the Cardiac Rehabilitation Section of the European Association for Cardiovascular Prevention & Rehabilitation.

- Endorsed by the Committee for Practice Guidelines of the European Society of Cardiology. *Eur J Prev Cardiol* 2014;21:664-81.
61. Balady GJ, Williams MA, Ades PA, et al. Core components of cardiac rehabilitation/secondary prevention programs: 2007 update: a scientific statement from the American Heart Association Exercise, Cardiac Rehabilitation, and Prevention Committee, the Council on Clinical Cardiology; the Councils on Cardiovascular Nursing, Epidemiology and Prevention, and Nutrition, Physical Activity, and Metabolism; and the American Association of Cardiovascular and Pulmonary Rehabilitation. *Circulation* 2007;115:2675-82.
  62. Grace SL, Racco C, Chessex C, Rivera T, Oh P. A narrative review on women and cardiac rehabilitation: program adherence and preferences for alternative models of care. *Maturitas* 2010;67:203-8.
  63. Sutton EJ, Rolfe DE, Landry M, et al. Cardiac rehabilitation and the therapeutic environment: the importance of physical, social, and symbolic safety for programme participation among women. *J Adv Nurs* 2012;68:1834-46.
  64. Benko C, Pelster B. How women decide. *Harvard Business Review* 2013;91:78-84.
  65. Armstrong MJ, Martin BJ, Arena R, et al. Patients with diabetes in cardiac rehabilitation: attendance and exercise capacity. *Med Sci Sport Exerc* 2014;46:845-50.
  66. Marzolini S, Banks L, Oh PI. Sex differences in predictors of completion of a 6-month adapted cardiac rehabilitation program for people with type 2 diabetes and no known cardiac disease. *Can J Diabetes* 2022;46:277-286.e1.
  67. Marzolini S, Oh PI, Alter D, Stewart DE, Grace SL. Musculoskeletal comorbidities in cardiac patients: prevalence, predictors, and health services utilization. *Arch Phys Med Rehabil* 2012;93:856-62.
  68. Marzolini S, Candelaria H, Oh P. Prevalence and impact of musculoskeletal comorbidities in cardiac rehabilitation. *J Cardiopulm Rehabil Prev* 2010;30:391-400.
  69. Marzolini S, Brooks D, Oh PI. Sex differences in completion of a 12-month cardiac rehabilitation programme: an analysis of 5922 women and men. *Eur J Cardiovasc Prev Rehabil* 2008;15:698-703.
  70. Squires RW, Kaminsky LA, Porcari JP, Ruff JE, Savage PD, Williams MA. Progression of exercise training in early outpatient cardiac rehabilitation: an official statement from the American Association of Cardiovascular and Pulmonary Rehabilitation. *J Cardiopulm Rehabil Prev* 2018;38:139-46.
  71. Marzolini S, Mertens DJ, Oh PI, Pyley MJ. Self-reported compliance to home-based resistance training in cardiac patients. *Eur J Cardiovasc Prev Rehabil* 2010;17:35-49.
  72. Marzolini S, Oh PI, Thomas SG, Goodman JM. Aerobic and resistance training in coronary disease: single versus multiple sets. *Med Sci Sports Exerc* 2008;40:1557-64.
  73. Perry CK, Bennett JA. Heart disease prevention in women: promoting exercise. *J Am Acad Nurse Pract* 2006;18:568-73.
  74. Beckie TM, Beckstead JW. Predicting cardiac rehabilitation attendance in a gender-tailored randomized clinical trial. *J Cardiopulm Rehabil Prev* 2010;30:147-56.
  75. Marzolini S, Oh PI, McIlroy W, Brooks D. The feasibility of cardiopulmonary exercise testing for prescribing exercise to people after stroke. *Stroke* 2012;43:1075-81.
  76. Gordon NF, Scott CB. Exercise intensity prescription in cardiovascular disease: theoretical basis for anaerobic threshold determination. *J Cardiopulm Rehabil* 1995;15:193-6.
  77. Hansen D, Abreu A, Ambrosetti M, et al. Exercise intensity assessment and prescription in cardiovascular rehabilitation and beyond: why and how: a position statement from the Secondary Prevention and Rehabilitation Section of the European Association of Preventive Cardiology. *Eur J Prev Cardiol* 2022;29:230-45.
  78. Duggal NA, Scalzitti DA, Watkins S, Hecht O, Johnson SJ, Woolstenhulme JG. Sex-based differences in metabolic equivalents (METs) after cardiac rehabilitation: a systematic review. *J Cardiopulm Rehabil Prev* 2021;5:1000143.
  79. Khadanga S, Savage PD, Pecha A, Rengo J, Ades PA. Optimizing training response for women in cardiac rehabilitation: a randomized clinical trial. *JAMA Cardiol* 2022;7:215-8.
  80. Andraos C, Arthur HM, Oh P, Chessex C, Brister S, Grace SL. Women's preferences for cardiac rehabilitation program model: a randomized controlled trial. *Eur J Prev Cardiol* 2015;22:1513-22.
  81. Chu P, Gotink RA, Yeh GY, Goldie SJ, Hunink MGM. The effectiveness of yoga in modifying risk factors for cardiovascular disease and metabolic syndrome: a systematic review and meta-analysis of randomized controlled trials. *Eur J Prev Cardiol* 2016;23:291-307.
  82. Guddeti RR, Dang G, Williams MA, Alla VM. Role of yoga in cardiac disease and rehabilitation. *J Cardiopulm Rehabil Prev* 2019;39:146-52.
  83. Liu T, Chan AW, Liu YH, Taylor-Piliae RE. Effects of Tai Chi-based cardiac rehabilitation on aerobic endurance, psychosocial well-being, and cardiovascular risk reduction among patients with coronary heart disease: a systematic review and meta-analysis. *Eur J Cardiovasc Nurs* 2018;17:368-83.
  84. Vidal-Almela S, Czajkowski B, Prince SA, et al. Lessons learned from community- and home-based physical activity programs: a narrative review of factors influencing women's participation in cardiac rehabilitation. *Eur J Prev Cardiol* 2020;28:761-78.
  85. Supervia M, Turk-Adawi K, Lopez-Jimenez F, et al. Nature of cardiac rehabilitation around the globe. *eClinicalMedicine* 2019;13:46-56.
  86. Anderson L, Brown JPR, Clark AM, et al. Patient education in the management of coronary heart disease. *Cochrane Database Syst Rev* 2017;6:CD008895.
  87. Stewart DE, Abbey SE, Shnek ZM, Irvine J, Grace SL. Gender differences in health information needs and decisional preferences in patients recovering from an acute ischemic coronary event. *Psychosom Med* 2004;66:42-8.
  88. Crane PB. I want to know: exploring how older women acquire health knowledge after a myocardial infarction. *J Women Aging* 2001;13:3-20.
  89. Arora NK, McHorney CA. Patient preferences for medical decision making: who really wants to participate? *Med Care* 2000;38:335-41.
  90. Greco A, Cappelletti ER, Monzani D, et al. A longitudinal study on the information needs and preferences of patients after an acute coronary syndrome. *BMC Fam Pract* 2016;17:136.
  91. Ghisi GLDM, Aultman C, Oh P. A core curriculum for a core component: the multilingual Cardiac College™ serves as an adaptable core patient education curriculum that increases disease-knowledge in cardiac rehabilitation participants across the globe. *J Cardiopulm Rehabil Prev*, in press.

92. Beckie TM, Beckstead JW, Kip K, Fletcher G. Physiological and exercise capacity improvements in women completing cardiac rehabilitation. *J Cardiopulm Rehabil Prev* 2013;33:16-25.
93. Beckie TM, Beckstead JW. The effects of a cardiac rehabilitation program tailored for women on global quality of life: a randomized clinical trial. *J Womens Health* 2010;19:1977-85.
94. Beckie TM, Beckstead JW, Schocken DD, Evans ME, Fletcher GF. The effects of a tailored cardiac rehabilitation program on depressive symptoms in women: a randomized clinical trial. *Int J Nurs Stud* 2011;48:3-12.
95. Gary R. Exercise self-efficacy in older women with diastolic heart failure: results of a walking program and education intervention. *J Gerontol Nurs* 2006;32:31-9 [quiz 40-1].
96. Gary RA, Sueta CA, Dougherty M, et al. Home-based exercise improves functional performance and quality of life in women with diastolic heart failure. *Heart Lung* 2004;33:210-8.
97. Gary RA. The effectiveness of a home-based exercise program in older women with diastolic heart failure [PhD dissertation]. Chapel Hill: University of North Carolina, 2003.
98. Wheeler JRC. Can a disease self-management program reduce health care costs? The case of older women with heart disease. *Med Care* 2003;41:706-15.
99. Midence L, Arthur HM, Oh P, Stewart DE, Grace SL. Women's health behaviours and psychosocial well-being by cardiac rehabilitation program model: a randomized controlled trial. *Can J Cardiol* 2016;32:956-62.
100. Davidson P, Digiacomo M, Zecchin R, et al. A cardiac rehabilitation program to improve psychosocial outcomes of women with heart disease. *J Womens Health (Larchmt)* 2008;17:123-34.
101. Russell SS. An overview of adult-learning processes. *Urol Nurs* 2006;26:349-52.
102. Collins J. Education techniques for lifelong learning: principles of adult learning. *Radiographics* 2004;24:1483-9.
103. Chase TM. Learning styles and teaching strategies: enhancing the patient education experience. *SCI Nurs* 2001;18:138-41.
104. National Heart Foundation of Australia: A Pathway to Cardiac Recovery Standardised Program Content for Phase II Cardiac Rehabilitation. Available at: [https://www.heartfoundation.org.au/getmedia/006fd247-6163-4d04-9b85-9e90a5adbea0/A\\_Pathway\\_to\\_Phase\\_II\\_Cardiac\\_Recovery\\_\(Full\\_Resource\)-\(3\).pdf](https://www.heartfoundation.org.au/getmedia/006fd247-6163-4d04-9b85-9e90a5adbea0/A_Pathway_to_Phase_II_Cardiac_Recovery_(Full_Resource)-(3).pdf). Accessed March 1, 2022.
105. Glm G, Scane K, Sandison N, Maksymiu S, Skeffington V, Oh P. Development of an educational curriculum for cardiac rehabilitation patients and their families. *J Clin Exp Cardiol* 2015;6:5.
106. Ghisi GL, Grace SL, Thomas S, Oh P. Behavior determinants among cardiac rehabilitation patients receiving educational interventions: an application of the health action process approach. *Patient Educ Couns* 2015;98:612-21.
107. Ghisi GLM, Grace SL, Anchique CV, et al. Translation and evaluation of a comprehensive educational program for cardiac rehabilitation patients in Latin America: a multi-national, longitudinal study. *Patient Educ Couns* 2021;104:1140-8.
108. Ghisi GLM, Chaves GSS, Ribeiro AL, Oh P, Britto RR, Grace SL. Comprehensive cardiac rehabilitation effectiveness in a middle-income setting: a randomized controlled trial. *J Cardiopulm Rehabil Prev* 2020;40:399-406.
109. Ghisi GLM, Rouleau F, Ross MK, et al. Effectiveness of an education intervention among cardiac rehabilitation patients in Canada: a multi-site study. *CJC Open* 2020;2:214-21.
110. Havranek EP, Mujahid MS, Barr DA, et al. Social determinants of risk and outcomes for cardiovascular disease: a scientific statement from the American Heart Association. *Circulation* 2015;132:873-98.
111. Ohm J, Skoglund PH, Discacciati A, et al. Socioeconomic status predicts second cardiovascular event in 29,226 survivors of a first myocardial infarction. *Eur J Prev Cardiol* 2018;25:985-93.
112. Safford MM, Reshetnyak E, Sterling MR, et al. Number of social determinants of health and fatal and nonfatal incident coronary heart disease in the REGARDS study. *Circulation* 2021;143:244-53.
113. Johnson AE, Herbert BM, Stokes N, Brooks MM, Needham BL, Magnani JW. Educational attainment, race, and ethnicity as predictors for ideal cardiovascular health: from the National Health and Nutrition Examination Survey. *J Am Heart Assoc* 2022;11:e023438.
114. Javed Z, Haisum Maqsood M, Yahya T, et al. Race, racism, and cardiovascular health: applying a social determinants of health framework to racial/ethnic disparities in cardiovascular disease. *Circ Cardiovasc Qual Outcomes* 2022;15:e007917.
115. Xu X, Bao H, Strait K, et al. Sex differences in perceived stress and early recovery in young and middle-aged patients with acute myocardial infarction. *Circulation* 2015;131:614-23.
116. Kershaw KN, Brenes GA, Charles LE, et al. Associations of stressful life events and social strain with incident cardiovascular disease in the Women's Health Initiative. *J Am Heart Assoc* 2014;3:e000687.
117. Lespérance F, Frasure-Smith N, Talajic M, Bourassa MG. Five-year risk of cardiac mortality in relation to initial severity and one-year changes in depression symptoms after myocardial infarction. *Circulation* 2002;105:1049-53.
118. Grace SL, Abbey SE, Irvine J, Shnek ZM, Stewart DE. Prospective examination of anxiety persistence and its relationship to cardiac symptoms and recurrent cardiac events. *Psychother Psychosom* 2004;73:344-52.
119. Buchholz EM, Strait KM, Dreyer RP, et al. Effect of low perceived social support on health outcomes in young patients with acute myocardial infarction: results from the VIRGO (Variation in Recovery: Role of Gender on Outcomes of Young AMI Patients) study. *J Am Heart Assoc* 2014;3:e001252.
120. Grace SL, Abbey SE, Kapral MK, Fang J, Nolan RP, Stewart DE. Effect of depression on five-year mortality after an acute coronary syndrome. *Am J Cardiol* 2005;96:1179-85.
121. Kronish IM, Moise N, Cheung YK, et al. Effect of depression screening after acute coronary syndromes on quality of life: the CODIACS-QoL randomized clinical trial. *JAMA Intern Med* 2020;180:45-53.
122. Ski CF, Taylor RS, McGuigan K, Lambert JD, Richards SH, Thompson DR. Psychological interventions for depression and anxiety in patients with coronary heart disease, heart failure or atrial fibrillation. *Cochrane Database Syst Rev* 2020;7:CD013508.
123. Tully PJ, Ang SY, Lee EJ, et al. Psychological and pharmacological interventions for depression in patients with coronary artery disease. *Cochrane Database Syst Rev* 2021;12:CD008012.
124. Shen BJ, Gau JT. Influence of depression and hostility on exercise tolerance and improvement in patients with coronary heart disease. *Int J Behav Med* 2017;24:312-20.
125. Kazukauskienė N, Burkauskas J, Macijauskienė J, et al. Mental distress factors and exercise capacity in patients with coronary artery disease

- attending cardiac rehabilitation program. *Int J Behav Med* 2018;25:38-48.
126. Rutledge T, Redwine LS, Linke SE, Mills PJ. A meta-analysis of mental health treatments and cardiac rehabilitation for improving clinical outcomes and depression among patients with coronary heart disease. *Psychosom Med* 2013;75:335-49.
  127. Kubzansky LD, Huffman JC, Boehm JK, et al. Positive psychological well-being and cardiovascular disease: JACC Health Promotion Series. *J Am Coll Cardiol* 2018;72:1382-96.
  128. Pogosova N, Saner H, Pedersen SS, et al. Psychosocial aspects in cardiac rehabilitation: from theory to practice. A position paper from the Cardiac Rehabilitation Section of the European Association of Cardiovascular Prevention and Rehabilitation of the European Society of Cardiology. *Eur J Prev Cardiol* 2015;22:1290-306.
  129. Frasure-Smith N. Long-term survival differences among low-anxious, high-anxious and repressive copers enrolled in the Montreal Heart Attack Readjustment trial. *Psychosom Med* 2002;64:571-9.
  130. Berkman LF, Blumenthal J, Burg M, et al. Effects of treating depression and low perceived social support on clinical events after myocardial infarction: the Enhancing Recovery in Coronary Heart Disease Patients (ENRICH) randomized trial. *JAMA* 2003;289:3106-16.
  131. Tsui CKY, Shanmugasagaram S, Jamnik V, Wu G, Grace SL. Variation in patient perceptions of healthcare provider endorsement of cardiac rehabilitation. *J Cardiopulm Rehabil Prev* 2012;32:192-7.
  132. Ghisi GL, Polyzotis P, Oh P, Pakosh M, Grace SL. Physician factors affecting cardiac rehabilitation referral and patient enrollment: a systematic review. *Clin Cardiol* 2013;36:323-35.
  133. Thomas RJ, Beatty AL, Beckie TM, et al. Home-based cardiac rehabilitation: a scientific statement from the American Association of Cardiovascular and Pulmonary Rehabilitation, the American Heart Association, and the American College of Cardiology. *Circulation* 2019;140:E69-89.
  134. Supervia M, Medina-Inojosa JR, Yeung C, et al. Cardiac rehabilitation for women: a systematic review of barriers and solutions. *Mayo Clin Proc* 2017;92:565-77.
  135. Turk-Adawi K, Supervia M, Lopez-Jimenez F, et al. Cardiac rehabilitation availability and density around the globe. *eClinicalMedicine* 2019;13:31-45.
  136. Medina-Inojosa JR, Grace SL, Supervia M, et al. Dose of cardiac rehabilitation to reduce mortality and morbidity: a population-based study. *J Am Heart Assoc* 2021;10:e021356.
  137. Santiago de Araújo Pio C, Marzolini S, Pakosh M, Grace SL. Effect of cardiac rehabilitation dose on mortality and morbidity: a systematic review and meta-regression analysis. *Mayo Clin Proc* 2017;92:1644-59.
  138. Santiago De Araújo Pio C, Beckie TM, Varnfield M, et al. Promoting patient utilization of outpatient cardiac rehabilitation: a joint International Council and Canadian Association of Cardiovascular Prevention and Rehabilitation Position Statement. *J Cardiopulm Rehabil Prev* 2020;40:79-86.
  139. Ghisi GLM, Polyzotis P, Oh P, Pakosh M, Grace SL. Physician Factors affecting cardiac rehabilitation referral and patient enrollment: a systematic review. *Clin Cardiol* 2013;36:323-35.
  140. Resurreccion DM, Motrico E, Rigabert A, et al. Barriers for nonparticipation and dropout of women in cardiac rehabilitation programs: a systematic review. *J Womens Health (Larchmt)* 2017;26:849-59.
  141. Beckstead JW, Pezzo MV, Beckie TM, Shahraki F, Kentner AC, Grace SL. Physicians' tacit and stated policies for determining patient benefit and referral to cardiac rehabilitation. *Med Decis Mak* 2014;34:63-74.
  142. Fernandez RS, Salomonson Y, Juergens C, Griffiths R, Davidson P. Validation of the revised cardiac rehabilitation preference form in patients with post-percutaneous coronary intervention. *J Cardiopulm Rehabil Prev* 2007;27:390-4.
  143. Heindl B, Ramirez L, Joseph L, Clarkson S, Thomas RBV. Hybrid cardiac rehabilitation - the state of the science and the way forward. *Prog Cardiovasc Dis* 2022;70:175-82.
  144. Dalal HM, Evans PH, Campbell JL, et al. Home-based versus hospital-based rehabilitation after myocardial infarction: a randomized trial with preference arms-Cornwall Heart Attack Rehabilitation Management Study (CHARMS). *Int J Cardiol* 2007;119:202-11.
  145. Reed JL, Harris JM, Midence L, Yee EB, Grace SL. Evaluating the Heart Wise Exercise™ program: a model for safe community exercise programming. *BMC Public Health* 2016;16:190.
  146. Nathanail SK, Gyenes GT, Damme AV, Parent EC, Kennedy MD. Participant exercise attendance in community-based bridging, and hospital-based cardiac rehabilitation: a retrospective case control study. *CJC Open* 2021;4:364-72.
  147. Ruano-Ravina A, Pena-Gil C, Abu-Assi E, et al. Participation and adherence to cardiac rehabilitation programs. A systematic review. *Int J Cardiol* 2016;223:436-43.
  148. Sengupta A, Beckie T, Dutta K, Dey A, Chellappan S. A mobile health intervention system for women with coronary heart disease: usability study. *JMIR Form Res* 2020;4:e16420.
  149. Keteyian SJ, Ades PA, Beatty AL, et al. A review of the design and implementation of a hybrid cardiac rehabilitation program: an expanding opportunity for optimizing cardiovascular care. *J Cardiopulm Rehabil Prev* 2022;42:1-9.
  150. Rathert C, Wyrwich MD, Boren SA. Patient-centered care and outcomes: a systematic review of the literature. *Med Care Res Rev* 2013;70:351-79.
  151. Lau ES, Hayes SN, Volgman AS, et al. Does patient-physician gender concordance influence patient perceptions or outcomes? *J Am Coll Cardiol* 2021;77:1135-8.
  152. Mamataz T, Ghisi GL, Pakosh M, Grace SL. Outcomes and cost of women-focused cardiac rehabilitation: a systematic review and meta-analysis. *Maturitas* 2022;160:32-60.
  153. Midence L, Mola A, Terzic CM, Thomas RJ, Grace SL. Ethnocultural diversity in cardiac rehabilitation. *J Cardiopulm Rehabil Prev* 2014;34:437-44.
  154. Parry M, Watt-Watson J. Peer support intervention trials for individuals with heart disease: a systematic review. *Eur Hear J Cardiovasc Nurs* 2010;9:57-67.
  155. Scott LA, Ben-Or K, Allen JK. Why are women missing from outpatient cardiac rehabilitation programs? A review of multilevel factors affecting referral, enrollment, and completion. *J Womens Health* 2002;11:773-91.
  156. Sawan MA, Calhoun AE, Fatade YA, Wenger NK. Cardiac rehabilitation in women, challenges and opportunities. *Prog Cardiovasc Dis* 2022;70:111-8.



157. El Khoudary SR, Aggarwal B, Beckie TM, et al. Menopause transition and cardiovascular disease risk: implications for timing of early prevention: a scientific statement from the American Heart Association. *Circulation* 2020;142:e506-32.
158. Bonsignore A, Marzolini S, Oh P. Cardiac rehabilitation for women with breast cancer and treatment-related heart failure compared with coronary artery disease: a retrospective study. *J Rehabil Med* 2017;49:277-81.
159. Wojcieszczyk J, Szczepanska-Gieracha J, Wojtynska R, et al. Impact of different cardiac rehabilitation (CR) programs on quality of life and depression in women with ischemic heart disease (IHD). *Eur Psychiatry* 2012;27(suppl 1):1.
160. Murphy BM, Zaman S, Tucker K, et al. Enhancing the appeal of cardiac rehabilitation for women: development and pilot testing of a women-only yoga cardiac rehabilitation programme. *Eur J Cardiovasc Nurs* 2021;20:633-40.
161. Belardinelli R, Lacalaprice F, Ventrella C, Volpe L, Faccenda E. Waltz dancing in patients with chronic heart failure: new form of exercise training. *Circ Heart Fail* 2008;1:107-14.
162. Richards SH, Anderson L, Jenkinson CE, et al. Psychological interventions for coronary heart disease: Cochrane systematic review and meta-analysis. *Eur J Prev Cardiol* 2018;25:247-59.
163. Baumeister H, Hutter N, Bengel J. Psychological and pharmacological interventions for depression in patients with coronary artery disease. *Cochrane Database Syst Rev* 2011;9:CD008012.
164. Reiner IC, Tibubos AN, Werner AM, et al. The association of chronic anxiousness with cardiovascular disease and mortality in the community: results from the Gutenberg Health Study. *Sci Rep* 2020;10:12436.
165. Lett HS, Blumenthal JA, Babyak MA, et al. Social support and prognosis in patients at increased psychosocial risk recovering from myocardial infarction. *Health Psychol* 2007;26:418-27.
166. O'Neill A, Scovelle AJ. Intimate partner violence perpetration and cardiovascular risk: a systematic review. *Prev Med Rep* 2018;10:15-9.
167. Liu H, Waite L. Bad marriage, broken heart? Age and gender differences in the link between marital quality and cardiovascular risks among older adults. *J Health Soc Behav* 2014;55:403-23.
168. Barnason S, White-Williams C, Rossi LP, et al. Evidence for therapeutic patient education interventions to promote cardiovascular patient self-management: a scientific statement for healthcare professionals from the American Heart Association. *Circ Cardiovasc Qual Outcomes* 2017;10:e000025.
169. Shi W, Ghisi GLM, Zhang L, Hyun K, Pakosh MGR, Shi W, Ghisi GLM, Zhang L, Hyun K, Pakosh M, Gallagher R. A systematic review, meta-analysis, and meta-regression of patient education for secondary prevention in patients with coronary heart disease: impact on psychological outcomes. *Eur J Cardiovasc Nurs* 2022:zvax001.
170. Clark AM, Munday C, McLaughlin D, Catto S, McLaren A, Macintyre PD. Peer support to promote physical activity after completion of centre-based cardiac rehabilitation: evaluation of access and effects. *Eur J Cardiovasc Nurs* 2012;11:388-95.
171. Prince SA, Reed JL, Martinello N, et al. Why are adult women physically active? A systematic review of prospective cohort studies to identify intrapersonal, social environmental and physical environmental determinants. *Obes Rev* 2016;17:919-44.
172. Reid RD, Wooding EA, Blanchard CM, et al. A randomized controlled trial of an exercise maintenance intervention in men and women after cardiac rehabilitation (ECO-PCR Trial). *Can J Cardiol* 2021;37:794-802.
173. Doyle C, Lennox L, Bell D. A systematic review of evidence on the links between patient experience and clinical safety and effectiveness. *BMJ Open* 2013;3:e001570.
174. Ali S, Chessex C, Bassett-Gunter R, Grace SL. Patient satisfaction with cardiac rehabilitation: association with utilization, functional capacity, and heart-health behaviors. *Patient Prefer Adherence* 2017;11:821-30.
175. Taherzadeh G, Filippo DE, Kelly S, et al. Patient-reported outcomes in cardiac rehabilitation: what do we know about program satisfaction? A review. *J Cardiopulm Rehabil Prev* 2016;36:230-9.

### Supplementary Material

To access the supplementary material accompanying this article, visit the online version of the *Canadian Journal of Cardiology* at [www.onlinecjc.ca](http://www.onlinecjc.ca) and at <https://doi.org/10.1016/j.cjca.2022.06.021>.