

Title: Women-Focused Cardiovascular Rehabilitation: An International Council of Cardiovascular Prevention and Rehabilitation Clinical Practice Guideline

Short title: ICCPR Guideline: Women-Focused CR

Authors: Gabriela Lima de Melo Ghisi, PT, PhD¹; Susan Marzolini, R.Kin, PhD^{1,4}; Jennifer Price, RN, PhD²; Theresa M. Beckie, RN, PhD^{3,3a}; Taslima Mamataz, MD, MSc.^{1,4}; Aliya Naheed, MD, PhD⁵; Sherry L. Grace, PhD, CRFC^{1,4,6}

Institutional affiliations:

¹KITE- Toronto Rehabilitation Institute, University Health Network, University of Toronto, 550 University Ave, Toronto, ON, M5G 2A2, Canada

²Women's College Hospital, 76 Grenville St., 7th Floor, Toronto, ON, M5S 1B2, Canada

³College of Nursing, Division of Cardiovascular Sciences, University of South Florida, 12901 Bruce B. Downs Blvd. Tampa, Florida, 33612, USA

^{3a}College of Medicine, Division of Cardiovascular Sciences, University of South Florida, 12901 Bruce B. Downs Blvd, Tampa, FL, 33612, USA

⁴Faculty of Health, York University, 4700 Keele Street, Toronto, ON, M3J 1P3, Canada

⁵Initiative for Non-Communicable Diseases, Health System and Population Studies Division, International Centre for Diarrheal Diseases Research Bangladesh, 68 Shaheed Tajuddin Ahmed Sarani, Dhaka, Bangladesh

⁶Peter Munk Cardiac Centre, University Health Network, University of Toronto, 550 University Ave, Toronto, ON, M5G 2A2, Canada

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 (ASSOBRAFIR), 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 (SORECAR), Taiwan Academy of Cardiovascular and Pulmonary Rehabilitation (TACVPR) and World Hypertension League (WHL).

Word count: 9,819

Corresponding author: Sherry L. Grace, PhD, FCCS, CRFC; Professor, Faculty of Health, York University – Bethune 368, 4700 Keele Street, Toronto, ON M3J 1P3, Canada. Email: sgrace@yorku.ca, Phone: (416) 736-2100 x.22364; Twitter @sherrylgrace

Brief Summary

This guideline provides guidance on how best to deliver women-focused cardiovascular rehabilitation (CR). Recommendations related to referral, setting and delivery were developed based on a review in accordance with AGREEII and finalized through a modified Delphi process. Certainty of evidence for the final 15 recommendations was low to moderate, and strength mostly strong. It is suggested that all programs should offer women-focused programming, comprising as many of the definitional elements as possible, to optimize outcomes.

Abstract

Women-focused cardiovascular rehabilitation (CR; phase II) aims to better engage women, and may result in better quality-of-life than traditional programs. This first clinical practice guideline by the International Council of Cardiovascular Prevention and Rehabilitation (ICCPR) provides guidance on how to deliver women-focused programming. The writing panel comprised experts with diverse geographic representation, including multidisciplinary healthcare providers, a policy-maker, and patient partners. The guideline was developed in accordance with AGREE II and RIGHT. Initial recommendations were based on 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 webcall was convened to achieve consensus; 15 panelists confirmed strength of revised recommendations (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 one recommendation, $\geq 75\%$ voted to include; implementability ratings were $<5/7$ for 4 recommendations, but only one for impact. Ultimately one recommendation was excluded, one separated into two and all revised (two substantively); one 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.

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

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.³ Indeed, rigorous reviews have established the approximately 20% reductions in mortality and morbidity with CR,^{4,5} as well as clinically-meaningful increases in quality of life.⁶ As in most CVD research,⁷ women are also under-represented in CR research,^{8,9} but there are real-world population-level data to support that these CR benefits hold in women as well,^{10–12} although often men's outcomes are better than women's.^{13,14} Nevertheless, CVD clinical practice guidelines,^{15,16} including those in women,¹⁷ 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,^{18–20} they are also less likely to attend CR.^{21–23} Accordingly, “women-focused” models of CR have been developed, to better engage women and optimize their outcomes.²⁴ By women-focused CR, we are referring to holistic programs: (a) with at least some CR components (i.e., can be women-focused sessions) delivered with $\geq 50\%$ women (e.g., could be “women-only”), and (b) comprising some form(s) of

tailoring to meet women's needs or preferences (e.g., comprehensive psychosocial screening and programming, education content, and/or forms of exercise).²⁵ Moreover, women should be given (c) the choice of delivery mode (i.e., to address women's common transportation barriers and time constraints related to caregiving and work responsibilities),²⁶ and where the setting is not remote, programs should consider women's preferences around environment (e.g., respect for privacy).²⁵ Finally, (d) the interprofessional staff should have a depth of knowledge in the area (e.g., 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 (ICCPR) global CR audit revealed 686 women-focused programs in 45 countries.²⁷

Objectives

The objectives of this first clinical practice guideline are to provide guidance to the CR community on how to best engage women with cardiovascular diseases including stroke and peripheral arterial disease (PAD) in their programs through design of their programming, while optimizing their outcomes (i.e., mortality, morbidity, functional capacity, psychosocial well-being and quality of life). Cost, resource implications, feasibility and patient preferences²⁸ are foremost considerations in the recommendations.

Methods

Please see the Supplemental Methods 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 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 non-enrollment for women (and men).^{29–31} While there is wide variation, referral is significantly lower in women (40% vs 50% in men),²¹ and this could be due to some unconscious clinician bias.³² 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.³³ However, physicians can also be a hindrance to referral, such as where they inform patients they are “too well” or “too sick” to be appropriate CR candidates.^{34,35}

While women may seek out their own referrals if they are aware of CR services,^{34,36,37} research and guidelines recommend the institution of automated / systematic referral, which overcomes sex biases.^{38,39} Increased education of physicians and other healthcare providers is needed to raise awareness of the importance of CR, as well as the indications, exercise contraindications and safety of CR programs.³⁴ Referral should be accompanied by bedside education and discussion to encourage women’s attendance at CR programs.^{40,41} In particular, common barriers women face should be discussed such as transportation, care-giving responsibilities and perceptions towards exercise²⁸ (see implementation tools in Supplemental Appendix S1⁴²).

CR Environment

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

The staff delivering care in a women-focused CR program should be considered. Staff should have expertise in women with CVD, and deliver patient-centered care for women.^{24,44} The multidisciplinary team should include a regulated mental healthcare professional where possible, given the high rate of psychosocial distress in women with CVD.⁴⁵ While some programs may 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, 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, as this is important to women.⁴² As women also report disliking rushing and crowding,⁴² allowing women time and space to change and prepare for class is important, as is the time following class as this may be a chance to connect with peers or ask CR staff any individual questions.⁴⁶ 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.²⁵

CR Delivery

Intake Assessment

Initial assessment is a core component of CR,^{3,47-49} to ascertain safety, determine patient goals and develop a plan of care. While clinical recommendations are available elsewhere,⁵⁰ there are some particular considerations relating to women.⁵¹

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, as this is more prevalent in women and negatively impacts CVD outcomes as well.^{24,52}

A careful clinical history should be taken, ensuring comprehensive assessment to minimize any safety issues due to unidentified cardiac or other issues, given women often have other forms of heart disease and diagnostic tests are less sensitive in women than men.¹ This should also include consideration of history of cancer due to the cardiotoxicity of some treatments,⁵³ as well as comorbidities more common in women that may complicate prognosis, such as autoimmune conditions.⁵⁴ Careful attention to function and mobility is important as women experience more osteoporosis, frailty and have a higher incidence of falls.⁵⁵

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.⁵⁶ 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.⁵⁷

Finally, sex and gender-related symptoms should be documented.⁵⁸ Menopausal symptoms, and urinary incontinence due to pelvic floor changes arising from pregnancy may 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 which describe in full tailoring CR based on

sociodemographic characteristics,⁵⁹ type of cardiac indication for CR (see supplement Tables XI-XVII), and comorbidities (see Supplemental Tables XIV, XX-XXII).⁶⁰

Exercise Component

The CR exercise practitioner must consider safety, dose and modality of exercise that will result in optimal adherence and outcomes⁶¹ 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 psychosocial obstacles that women more commonly experience, while being sensitive to issues related to gender.⁶²

Safety is especially important for women. Women have indicated that being monitored during exercise, and having their co-existing conditions taken into consideration in their exercise prescription makes them feel safe.^{63,25,33} Pre-participation education should include a description of risks and benefits of exercise, about their individually-tailored prescription, allowing time to discuss with others.⁶⁴ 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 co-existing conditions such as diabetes should be addressed; this may help mitigate the higher CR attrition in women than men with comorbid diabetes.^{65,66}

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^{67,68}, and are less likely to resolve in women than men, leading to withdrawal from CR.^{68,69} 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.⁷⁰

Fatigue greatly impacts women's motivation and experience exercising.^{25,26,71} Patients should be educated on the causes (e.g., low cardiorespiratory fitness, employment and caregiver responsibilities) and what can be done to mitigate fatigue (e.g., exercise, planning based on energy level, shorter but more frequent bouts).⁷² Action planning and motivational interviewing can be utilized to help mitigate this.^{73,74}

The previously-mentioned obstacles may prevent a greater proportion of women than men from reaching a true physiological maximum on an exercise stress test, and this may be exacerbated by the fact that most exercise test protocols were validated in men. Therefore, prescribing aerobic exercise based on peak values attained (heart rate or $\dot{V}O_{2peak}$) may 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, as it does not require maximal performance on the test and most people with CVD can reach this intensity.^{75,76} When ergospirometry is not available, the talk test and rating of perceived exertion⁷⁷ in combination with predicted/measured % of heart rate peak can be used to guide exercise intensity.

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

Women may need more flexibility with scheduling of exercise sessions, due to multiple role obligations for example.⁸⁰ Moreover, modality of aerobic exercise can effect women's enjoyment and hence engagement.⁶² Women report treadmill and cycle only exercise to be boring, and preferred to have a choice.²⁵ While alternative types of exercise such as Tai Chi and

yoga may be more enjoyable, the effect on CVD risk reduction, morbidity and mortality is somewhat limited.^{81–83} Nevertheless, incorporating alternative types of exercise such as dance and yoga may be appreciated as an adjunct to CR programming.⁸⁴ Unfortunately, not many programs tend to offer these alternatives,⁸⁵ thus challenges to implementation need to be identified and overcome.

Patient Education

Patient education is an internationally-agreed core component of CR,^{48,49,86} given proven benefits in CVD patients (although reviews include a low proportion of women).⁸⁷ Women have different preferences for delivery mode and information needs than men,^{88–91} and lower knowledge pre-program.⁹² Available CR guidelines do not address tailoring patient education to women however.⁴⁸ Ten of the 28 studies included in the reviews which form the basis for this guideline explicitly reported offering gender-tailored education.^{74,93–101} 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,^{102–104} as are recommendations on standardized CR education content.¹⁰⁵ Comprehensive evidence-based CR education is available open access online.^{106–110} Recommendations for gender-tailoring CR for women include consideration of process/mode and content. Women may have greater transportation barriers than men, more family responsibilities constraining their time, and need for social support;^{25,26} hence women's preferred education mode should be assessed (e.g., 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 may be best. Programs should ensure staff delivering education to women have the relevant expertise and deliver it in accordance with best practices.⁴⁴

There are additional topics that should be covered for women with CVD, including but not limited to: ensuring women are informed about CR (see above section on referral and encouragement), the different pathophysiology of CVD in females, different forms of CVD more common in women and how they are diagnosed, impacts of menopause, risk factors (including psychosocial issues) and comorbidities (e.g., 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.¹ Given the greater volume of content to be covered, it is advisable programs assess knowledge and information needs in patients at intake, and only offer needed education based on specific patient circumstances.

Psychosocial Component

Several social determinants of health^{111–115} and psychosocial issues (e.g., social isolation, stress)^{116–121} are closely related to CVD outcomes, and are more predominant in women than men (e.g., depression, anxiety, low socioeconomic status, intimate partner violence, adverse childhood experiences).⁴⁵ 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,¹²² however there are no data in the CR setting where there is long-term follow-up; hence we do recommend such screening if program patients can access providers trained in mental healthcare.

Where psychosocial issues are identified, women should be provided evidence-based treatments where they are established^{123,124} where there are no evidence-based treatments, the support, education and exercise as delivered in women-focused CR can attenuate these excess

risks.^{125–127} Positive psychological exercises could also be considered (e.g., mindfulness, pleasurable and meaningful acts, expressive writing).¹²⁸

Guidance on best practices in delivering the psychosocial component of CR is available elsewhere.¹²⁹ Caution is warranted however, as there has been an inclination toward harm in two major trials of psychosocial interventions delivered to women with CVD,^{130,131} and hence programs need to ensure only regulated mental healthcare providers are delivering any psychosocial counselling to women, and that it is evidence-based.

Other considerations for these women-focused CR recommendations are found in the Supplemental Results, including details regarding CR setting / mode of delivery, patient preferences and values, special populations (stroke and PAD 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^{132,133} need to be addressed. The TAKEHeart program in the United States is an excellent model to support implementation of systematic inpatient referral and encouragement of women to attend at the bedside.

Once women are referred, while we recommend they be provided a choice of program setting, there is little available guidance on triage assessment,¹³⁴ 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.¹³⁵ Women should also be given some options with regard to session timing offerings.⁸⁰

Some barriers to implementation of women-focused CR at the program-level are outlined above. In non-low-resource settings, cost will still be a barrier to implementation, given most CR programs are insufficiently resourced to meet need¹³⁶ and that often staff with additional specialized training would be needed to implement these recommendations. Where it is not feasible to even offer one women-focused CR session, women should be directed to asynchronously-available evidence-based resources tailored to women, such as is provided in the 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, 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 impact could be greater utilization, and given the dose-response effects of CR,^{137,138} better outcomes in women. Indeed, given 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 re-hospitalization, as well as optimize role resumption and quality of life in women, and decrease healthcare costs.

Acknowledgements: see Supplement

Funding: There is no funding for this guideline.

Disclosures: None

References

1. Vogel B, Acevedo M, Appelman Y, et al. The Lancet women and cardiovascular disease Commission: reducing the global burden by 2030. *Lancet*. 2021;397:2385-2438.
2. 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(19):1163-1170.
3. Grace SL, Turk-Adawi KI, Contractor A, et al. Cardiac rehabilitation delivery model for low-resource settings. *Heart*. 2016;102(18):1449-1455.
4. Taylor RS, Dalal HM, McDonagh STJ. The role of cardiac rehabilitation in improving cardiovascular outcomes. *Nat Rev Cardiol*. 2021;19:180-194.
5. 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(12):514.
6. 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(3):352-364.
7. 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;141:540-548.
8. Dibben G, Faulkner J, Oldridge N, et al. Exercise-based cardiac rehabilitation for coronary heart disease. *Cochrane Database Syst Rev*. 2021;(11):CD001800.
9. 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(1):39-42.

10. Colbert JD, Martin BJ, Haykowsky MJ, et al. Cardiac rehabilitation referral, attendance and mortality in women. *Eur J Prev Cardiol.* 2015;22(8):979-986.
11. 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.* 2021:1-8.
12. Ekblom 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.* 2021;(6):zwab083.
13. 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(5):575-579.
14. 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(11):1237-1245.
15. 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(24):2564-2603.
16. 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(22):2458-2473.
17. 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(11):1243-1262.
18. 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.
 19. Kawamoto KR, Davis MB, Duvernoy CS. Acute Coronary Syndromes: Differences in Men and Women. *Curr Atheroscler Rep*. 2016;18(12):73.
 20. Garcia M, Mulvagh SL, Noel C, Merz B, Buring JE, Manson JE. Cardiovascular Disease in Women: Clinical Perspectives HHS Public Access. *Circ Res*. 2016;15:1273-1293.
 21. 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(4):423-441.
 22. 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(7):793-800.
 23. Oosenbrug E, Marinho RP, Zhang J, et al. Sex differences in cardiac rehabilitation adherence: a meta-analysis. *Can J Cardiol*. 2016;32(11):1316-1324.
 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):1-20.
 25. Moore SM, Kramer FM, Moore, S M; Kramer FM. Women's and men's preferences for cardiac rehabilitation program features. *J od Cardiopulm Rehabil*. 1996;16(3):163-168.
 26. 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 Heal*. 2009;18(2):209-216.

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(1):135-143.
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(3):229-235.
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(5):541-552.
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(1):10-14.
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 Heal.* 1998;7(6):717-723.
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(10):948-959.
35. Price J. A Pilot Trial of a Coaching Intervention Designed to Increase Women's Attendance at Cardiac Rehabilitation Intake. *PhD Diss Univ Toronto.* 2012.

<https://tspace.library.utoronto.ca/handle/1807/34854>.

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(1):23-27.
37. Rolfe DE, Sutton EJ, Landry M, Sternberg L, D Price JA. Women's Experiences Accessing a Women-Centered Cardiac Rehabilitation Program A Qualitative Study. *J Cardiovasc Nurs*. 2010;25(4):332-341.
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(2):192-199.
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(8):1018-1025.
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(2):123-129.
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(3):32-41.
44. Ramlakhan JU, 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(1):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(4):305-311.
 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(8):744-752.
 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(3):303-322.
 48. Mehra VM, Gaalema DE, Pakosh M, Grace SL. Systematic review of cardiac rehabilitation guidelines: Quality and scope. *Eur J Prev Cardiol.* 2020;27(9):912-928.
 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(16):1715-1733.
 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 th. *Eur Heart J.* 2021;42(34):3227-3337.

51. Smith JR, Thomas RJ, Bonikowske AR, Hammer SM, Olson TP. Sex Differences in Cardiac Rehabilitation Outcomes. *Circ Res*. 2022;130(4):552-565.
52. Du Mont J, Forte T, Cohen MM, Hyman I, Romans S. Changing help-seeking rates for intimate partner violence in Canada. *Women Health*. 2005;41(1):1-19.
53. Wilcox NS, Rotz SJ, Mullen M, et al. Sex-Specific Cardiovascular Risks of Cancer and Its Therapies. *Circ Res*. 2022;130(4):632-651.
54. Moran CA, Collins LF, Beydoun N, et al. Cardiovascular Implications of Immune Disorders in Women. *Circ Res*. 2022;130(4):593-610.
55. Wenger NK. Cardiovascular Disease in Women: Understanding the Journey. *Clin Chem*. 2021;67(1):24-29.
56. Lau ES, Binek A, Parker SJ, et al. Sexual Dimorphism in Cardiovascular Biomarkers: Clinical and Research Implications. *Circ Res*. 2022;130(4):578-592.
57. O’Kelly AC, Michos ED, Shufelt CL, et al. Pregnancy and Reproductive Risk Factors for Cardiovascular Disease in Women. *Circ Res*. 2022;130(4):652-672.
58. Pacheco C, Mullen K-A, 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*. November 2021.
59. Mathews L, Brewer LPC. A Review of Disparities in Cardiac Rehabilitation: EVIDENCE, DRIVERS, AND SOLUTIONS. *J Cardiopulm Rehabil Prev*. 2021;41(6):375.
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. *Eur J Prev Cardiol*. 2014;21(6):664-681.
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 o. *Circulation*. 2007;115(20):2675-2682.
 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(3):203-208.
 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(8):1834-1846.
 64. Benko C, Pelster B. How women decide. *Harv Bus Rev*. 2013;91(9):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(5):845-850.
 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*. 2021.
 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(5):856-862.
 68. Marzolini S, Candelaria H, Oh P. Prevalence and impact of musculoskeletal comorbidities in cardiac rehabilitation. *J Cardiopulm Rehabil Prev*. 2010;30(6):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(6):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(3):139-146.
71. Marzolini S, Mertens DJ, Oh PI, Plyley MJ. Self-reported compliance to home-based resistance training in cardiac patients. *Eur J Cardiovasc Prev Rehabil*. 2010;17(1):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(9):1557-1564.
73. Perry CK, Bennett JA. Heart disease prevention in women: promoting exercise. *J Am Acad Nurse Pract*. 2006;18(12):568-573.
74. Beckie TM, Beckstead JW. Predicting cardiac rehabilitation attendance in a gender-tailored randomized clinical trial. *J Cardiopulm Rehabil Prev*. 2010;30(3):147-156.
75. Marzolini S, Oh PI, McIlroy W, Brooks D. The feasibility of cardiopulmonary exercise testing for prescribing exercise to people after stroke. *Stroke*. 2012;43:1075-1081.
76. Gordon NF, Scott CB. Exercise intensity prescription in cardiovascular disease: Theoretical basis for anaerobic threshold determination. *J Cardiopulm Rehabil*. 1995;15:193-196.
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(1):230-245.
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 Rehabilitation Prev.* 2021;5(3):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(2):215-218.
 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(12):1513-1522.
 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(3):291-307.
 82. Guddeti RR, Dang G WM and AV. Role of yoga in cardiac disease and rehabilitation. *J Cardiopulm Rehabilitation Prev.* 2019;39:146-152.
 83. Liu T, Chan AW LY and T-PR. 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;17:368-383.
 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(7):761-778.
85. Supervia M, Turk-Adawi K, Lopez-Jimenez F, et al. Nature of Cardiac Rehabilitation Around the Globe. *eClinicalMedicine*. 2019;13:46-56.
 86. Grace SL, Turk-Adawi KI, Contractor A, et al. Consensus statement: Cardiac rehabilitation delivery model for low-resource settings. *Heart*. 2016;102(18):1449-1455.
 87. Anderson L, Brown JPR, Clark AM, et al. Patient education in the management of coronary heart disease. *Cochrane Database Syst Rev*. 2017;6(6):CD008895.
 88. 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(1):42-48.
 89. Crane PB. I want to know: exploring how older women acquire health knowledge after a myocardial infarction. *J Women Aging*. 2001;13(4):3-20.
 90. Arora NK, McHorney CA. Patient preferences for medical decision making: who really wants to participate? *Med Care*. 2000;38(3):335-341.
 91. 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(1).
 92. Ghisi, Gabriela Lima de Melo, Aultman C, Oh P. A Core Curriculum for a Core Component: the multilingual Cardiac CollegeTM serves as an adaptable core patient education curriculum that increases disease-knowledge in cardiac rehabilitation participants across the globe. *J Cardiopulm Rehabil Prev*. 2022;42(4):in press.
 93. Beckie TM, Beckstead JW, Kip K, Fletcher G. Physiological and exercise capacity improvements in women completing cardiac rehabilitation. *J Cardiopulm Rehabil Prev*.

- 2013;33(1):16-25.
94. Beckie TM, Beckstead JW. The effects of a cardiac rehabilitation program tailored for women on global quality of life: A randomized clinical trial. *J Women's Heal.* 2010;19(11):1977-1985.
 95. 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(1):3-12.
 96. 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(7):31.
 97. Gary RA, Sueta CA, Dougherty M, et al. Home-based exercise improves functional performance and quality of life in women with diastolic heart failure. *Hear Lung.* 2004;33(4):210-218.
 98. Gary RA. The effectiveness of a home-based exercise program in older women with diastolic heart failure. *PhD Diss.* 2003.
 99. Wheeler JRC. Can a Disease Self-Management Program Reduce Health Care Costs? The Case of Older Women with Heart Disease. *Med Care.* 2003;41(6):706-715.
 100. 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(8):956-962.
 101. 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(1):123-134.
 102. Russell Sally S. An overview of adult-learning processes. *Urol Nurs.* 2006;26(5):349-352.

103. Collins J. Education techniques for lifelong learning: principles of adult learning. *Radiographics*. 2004;24(5):1483-1489.
104. Chase TM. Learning styles and teaching strategies: enhancing the patient education experience. *SCI Nurs*. 2001;18(3):138-141.
105. National Heart Foundation of Australia. *A Pathway to Cardiac Recovery Standardised Program Content for Phase II Cardiac Rehabilitation*.; 2019.
[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).
106. Gln 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.
107. Ghisi GL de M, 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(5):612-621.
108. Ghisi GL de M, Grace SL, Anchique C V., 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(5):1140-1148.
109. de Melo Ghisi GL, 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(6):399-406.
110. Ghisi GL de M, 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(4):214.

111. 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(9):873-898.
112. 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(9):985-993.
113. 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(3):244-253.
114. 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(2):23438.
115. 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(1).
116. 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(7):614-623.
117. 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(3):e000687.
118. 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(9):1049-1053.
119. 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;73:344-352.
 120. Bucholz 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(5):e001252.
 121. 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(9):1179-1185.
 122. 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(1):45-53.
 123. 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.
 124. Tully PJ, Ang SY, Lee EJJ, et al. Psychological and pharmacological interventions for depression in patients with coronary artery disease. *Cochrane Database Syst Rev*. 2021;12(12):CD008012.
 125. 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(2):312-320.
126. 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(1):38-48.
 127. 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(4):335-349.
 128. 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(12):1382-1396.
 129. Pogossova 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(10):1290-1306.
 130. 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(4):571-579.
 131. 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 (ENRICHD) Randomized Trial. *JAMA*. 2003;289(23):3106-3116.
 132. Tsui CK-Y, 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(4):192-197.
133. 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(6):323-335.
 134. 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(1):E69-E89.
 135. 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(4):565-577.
 136. Turk-Adawi K, Supervia M, Lopez-Jimenez F, et al. Cardiac Rehabilitation Availability and Density around the Globe. *eClinicalMedicine.* 2019;13:31-45.
 137. 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(20):e021356.
 138. 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(11):1644-1659.
 139. 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(2):79-86.

140. 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(6):323-335.
141. Resurreccion DM, Motrico E, Rigabert A, et al. Barriers for Nonparticipation and Dropout of Women in Cardiac Rehabilitation Programs: A Systematic Review. *J Women's Heal.* 2017;07(8):849-859.
142. Beckstead JW, Pezzo M V., 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(1):63-74.
143. Fernandez RS, Salamonson 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(6):390-394.
144. Heindl B, Ramirez L, Joseph L, Clarkson S, Thomas R B V. Hybrid cardiac rehabilitation - The state of the science and the way forward. *Prog Cardiovasc Dis.* 2021;epub:S0033-0620(21)00136-5.
145. 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(2):202-211.
146. Reed JL, Harris JM, Midence L, Yee EB, Grace SL. Evaluating the Heart Wise ExerciseTM program: A model for safe community exercise programming. *BMC Public Health.* 2016;16(1):190.
147. Nathanail SK, Gyenes GT, Damme AV, Parent EC KM. Participant exercise attendance in

- community-based bridging, and hospital-based cardiac rehabilitation: a retrospective case control study. *CJC Open*. 2021;epub.
148. 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;223:436-443.
 149. 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(6):e16420.
 150. Keteyian SJ, Ades PA, Beatty AL, Gavic-Ott A, Hines S, Lui K, Schopfer DW, Thomas RJ SL. A Review of the Design and Implementation of a Hybrid Cardiac Rehabilitation Program: AN EXPANDING OPPORTUNITY FOR OPTIMIZING CARDIOVASCULAR CARE. *J Cardiopulm Rehabilitation Prev*. 2022;42(1):1-9.
 151. Rathert C, Wyrwich MD, Boren SA. Patient-centered care and outcomes: a systematic review of the literature. *Med Care Res Rev*. 2013;70(4):351-379.
 152. Lau ES, Hayes SN, Volgman AS, Lindley K, Pepine CJ WM. Does Patient-Physician Gender Concordance Influence Patient Perceptions or Outcomes? *J Am Coll Cardiol*. 2021;77(8):1135-1138.
 153. 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.
 154. Midence L, Mola A, Terzic CM, Thomas RJ, Grace SL. Ethnocultural diversity in cardiac rehabilitation. *J Cardiopulm Rehabil Prev*. 2014;34(6):437-444.
 155. Parry M, Watt-Watson J. Peer support intervention trials for individuals with heart disease: a systematic review. *Eur Hear J Cardiovasc Nurs*. 2010;9(1):57-67.
 156. 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 Women's Heal.* 2002;11(9):773-791.
157. Sawan MA, Calhoun AE, Fatade YA, Wenger NK. Cardiac rehabilitation in women, challenges and opportunities. *Prog Cardiovasc Dis.* February 2022:S0033-0620(22)00014-7.
 158. El Khoudary SR, Aggarwal B, Beckie TM, Hodis HN, Johnson AE, Langer RD, Limacher MC, Manson JE, Stefanick ML AM. American Heart Association Prevention Science Committee of the Council on Epidemiology and Prevention; and Council on Cardiovascular and Stroke Nursing. Menopause Transition and Cardiovascular Disease Risk: Implications for Timing of Early Prevention: A S. *Circulation.* 2020;142(25):e506-e532.
 159. Bonsignore A, Marzolini S OP. 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(3):277-281.
 160. 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.
 161. 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(7):633-640.
 162. 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(2):107-114.

163. Baumeister H, Hutter N BJ. Psychological and pharmacological interventions for depression in patients with coronary artery disease. *Cochrane Database Syst Rev*. 2011;9:CD008012.
164. Richards SH, Anderson L, Jenkinson CE, Whalley B, Rees K, Davies P, Bennett P, Liu Z, West R, Thompson DR TR. Psychological interventions for coronary heart disease: Cochrane systematic review and meta-analysis. *Eur J Prev Cardiol*. 2018;25(3):247-259.
165. Reiner IC, Tibubos AN, Werner AM, Ernst M, Brähler E, Wiltink J, Michal M, Schulz A, Wild PS, Münzel T, Arnold N, Mahmoudpour SH, Lackner KJ, Pfeiffer N BM. The association of chronic anxiousness with cardiovascular disease and mortality in the community: results from the Gutenberg Health Study. *Sci Rep*. 2020;10(1):12436.
166. Bucholz EM, Strait KM, Dreyer RP, Geda M, Spatz ES, Bueno H, Lichtman JH, D'Onofrio G, Spertus JA KH. 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(5):e001252.
167. Lett HS, Blumenthal JA, Babyak MA, Catellier DJ, Carney RM, Berkman LF, Burg MM, Mitchell P, Jaffe AS SN. Social support and prognosis in patients at increased psychosocial risk recovering from myocardial infarction. *Heal Psychol*. 2007;26(4):418-427.
168. O'Neill A, Scovelle AJ. Intimate Partner Violence perpetration and cardiovascular risk: A systematic review. *Prev Med Rep*. 2018;10:15-19.
169. 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 Heal Soc Behav*.

- 2014;55(4):403-423.
170. Barnason S, White-Williams C, Rossi LP, Centeno M, Crabbe DL, Lee KS, McCabe N, Nauser J, Schulz P, Stamp K WK. American Heart Association Council on Cardiovascular and Stroke Nursing; Council on Cardiovascular Disease in the Young; Council on Clinical Cardiology; and Stroke Council. Evidence for Therapeutic Patient Education Interventions to Promote Cardiovascular. *Circ Cardiovasc Qual Outcomes*. 2017;10(6):e000025.
 171. Shi W, Ghisi GLM, Zhang L, Hyun K, Pakosh M GR. 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;epub:zvac001.
 172. 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(1):42-48.
 173. Crane PB. I Want to Know: Exploring How Older Women Acquire Health Knowledge after a Myocardial Infarction. *J Women Aging*. 2001;13(4):3-20.
 174. 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(4):388-395.
 175. 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(10):919-944.
 176. 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(5):794-802.
177. 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(1):e001570.
 178. 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;11:821-830.
 179. 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(4):230-239.

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
<u>Women's Referral to CR</u>				
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 (e.g., 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 (e.g., educating providers that comorbidities and older/younger age do not preclude referral).	⊕⊕⊕⊕High	Strong	39,139–142
2.	CR programs should educate providers (e.g., 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	28,40,143
<u>CR Setting: Mode of Delivery and Environment</u>				
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 (+/- technology using mode as per women's preferences as well as device availability), or a hybrid model, where available and reimbursed.	⊕⊕⊕○Moderate	Strong	26,62,84,135,141,144–150
4.	The CR environment should be optimized to meet women's preferences, values and goals, including consideration of: ensuring privacy (e.g., 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 may not be appropriate.	⊕⊕⊕○Moderate	Strong	25,80,141,63,37

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	151,152
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 (e.g., synchronous or asynchronous, virtual or in-person, depending on feasibility and patient preference).	⊕⊕○○Lo w	Weak	153,154,155
<u>Women-Focused CR Delivery</u>				
7.	As 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	24,153,51
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	80,26,141,156
9.	Women's context, clinical history, and comorbidities should be considered fulsomely 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, falls risk / osteoporosis, as well as autoimmune conditions.	⊕⊕○○ Low	Strong	1, 157, 158,159
10.	CR programs should endeavor to provide preferred forms of aerobic exercise for women (e.g., 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,	⊕⊕⊕○ Moderate	Strong	25,82–84,160–162

	places to engage in forms of exercise preferred by women should be identified in the community as an adjunct (e.g., swimming/aquatics, yoga, tai chi).			
11.	Individually-tailored aerobic and resistance exercise prescriptions should consider musculoskeletal issues (e.g., 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 (e.g., social support, relationship health, depression, anxiety, stress, socioeconomic issues, informal caregiving activities). Where issues are identified and the program lacks expertise on the team, referral to a specialist may be warranted. Re-assessment should be undertaken, and communication be made to the woman's primary care provider with consent to ensure on-going monitoring and follow-up.	⊕⊕⊕○ Moderate	Strong	163–169
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	87,90, 91,170–173
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 (e.g., access to community centres). This may 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	155,174, 175, 176
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	151,177– 179

CR, cardiovascular rehabilitation; GRADE, grading of recommendations assessment, development, and evaluation; MSK, musculoskeletal management

Figures

Figure 1: Summary of methods and recommendations

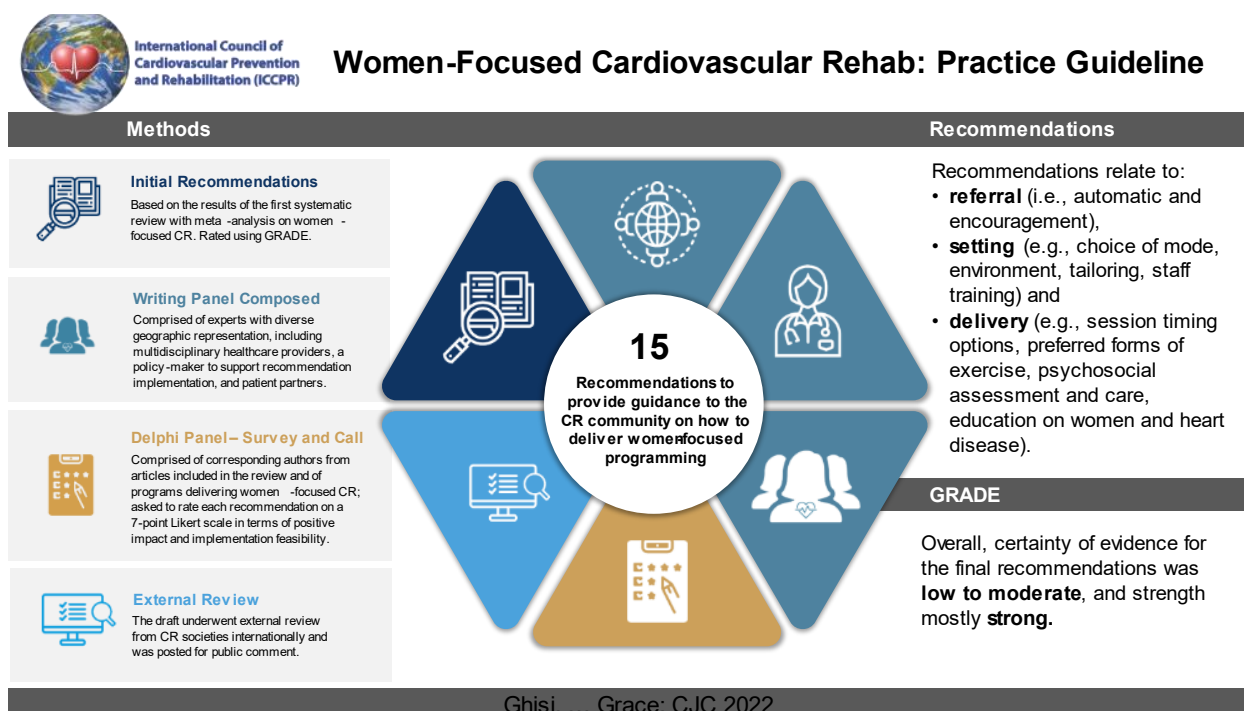


Figure legends: CR, cardiac rehabilitation

Supplemental Methods

The focus of this guideline is delivery of secondary prevention and rehabilitation of CVD in women. By CR program, we are referring to phase II (post-acute) programs, however these recommendations may also be suitable for inpatient and maintenance programs.¹ The CR setting to which this guideline is applicable includes supervised programs in clinical (e.g., hospital to primary care) or community settings, as well as home-based programs, which may involve technology. Home-based CR delivered 1-1 would be considered “women-focused” where elements of items b and/or d in the introduction are applied.² As per the mission of the ICCPR, this guideline takes into consideration the context of programs in low-resource settings.³

The target population is adult women (using this term to encompass sex and gender, and including those assigned female sex at birth as well as individuals who identify as women or non-binary),⁴ with a CVD indicated for CR (i.e., evidence of benefit from randomized trials for reductions in mortality or morbidity when compared to usual care).⁵ Specifically, this guideline focuses on delivery of CR to women with stable coronary artery disease, a history of acute coronary syndrome +/- revascularization (percutaneous or surgical),⁶ heart failure (including with preserved ejection fraction),⁷ or ambulatory patients with stroke or PAD.⁸

The target end-users of this guideline are chiefly CR providers of any discipline and administrators. The recommendations provided herein are also directed to healthcare practitioners providing inpatient acute cardiac care (e.g., nurses, physiotherapists, pharmacists), any referring providers (e.g., cardiac specialist, physiatrist, internist, family physicians) as tailored promotion of CR to women should be initiated in the inpatient setting.⁹ Broader healthcare administrators and policy-makers from the institutional, regional, national and international levels are other potential users of the guideline. Female CVD patients and their

family may also be interested in this guideline, to be informed about what type of CR could be available to them, or to work with programs to implement the recommendations herein.

Writing Panel Composition & Stakeholder Engagement

The writing panel co-chairs (GG, SLG) were approved by the ICCPR Executive Committee. The co-chairs then developed an outline and set out to populate the writing panel so that the sections could be drafted by experts in each area, and this was considered by the Executive; the corresponding authors of studies which were included in the reviews which form the evidentiary basis for this clinical practice guideline were considered,^{2,10} with the aim also of ensuring that the panel had diverse geographic representation, and included the CR-delivering healthcare provider types that would be implementing the recommendations (e.g., nurses, physiotherapist).

Two female cardiac patient partners from a low-resource setting were solicited to serve (one age 74 and the other 82, and one of lower education level and the other higher), as well as a policy-maker with international experience (AN) to promote implementability and uptake of the recommendations. The World Health Organization and World Heart Federation (of which ICCPR is an Associate member) were informed about the initiative.

All members were required to disclose conflicts of interest, financial relationships or personal interests from 12 months before initiation of the writing effort that could impact their contributions to this guideline. All authors declared none (available from corresponding author upon request).

Evidence collection, Grading criteria and Synthesis

This clinical guideline is based on the results of the first systematic review with meta-analysis on women-focused CR undertaken by several of the authors (TM, GG, SLG).^{2,10} In

brief, comprehensive literature searches were performed of 8 databases, from inception. The search strategy was based on the following parameters: inclusion of female adults (≥ 18 years) with any cardiac condition, where the study could be of any design (primary research only) and with any outcome, although we focused in particular on access, utilization, satisfaction, cost, as well as psychosocial (e.g., depression, anxiety, quality of life), heart-health behaviour and clinical (i.e., risk factors, functional capacity, morbidity and mortality) outcomes. Randomized trials were considered separately to undertake meta-analyses where it was possible based on availability of evidence, with separate consideration of usual care versus active comparison arms. Again, the intervention had to comprise women-focused CR as defined previously.

Quality of each study was rated using the Mixed-Methods Assessment Tool.¹¹ Risk of bias in trials was also assessed using Cochrane's tool (v1).¹² Following meta-analysis where possible, evidence for each outcome was evaluated according to the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) system.¹³ Where meta-analysis could not be performed, results were analyzed in accordance with the Synthesis Without Meta-analysis (SWiM) reporting guideline.¹⁴

The first-ever reviews of women-focused CR revealed the diversity of what is considered women-focused CR, and it is unclear with what elements women are most satisfied.² Given the limited availability of this model of CR,¹⁵ accessibility is very limited, and whether availability results in greater CR utilization in women cannot be established.² In terms of impact, while there are few studies available, women-focused CR appears to be equivalent in effect to traditional CR in terms of functional capacity improvements, but results in significantly better quality of life.¹⁰ One study reported favorable economic impact and another reduced sick days,^{16, 17} but the cost-effectiveness of traditional CR is well-established across many contexts and from many

perspectives.^{18,19,20} No harms were identified, and it is known that traditional and home-based CR are safe.^{6,21,22}

Development and Consensus Process

The guideline was developed in accordance with the Appraisal of Guidelines for Research and Evaluation (AGREE)-II,²³ the Institute of Medicine's Trustworthiness Standards²⁴ and the Reporting Items for practice Guidelines in HealTh care (RIGHT).²⁵ Recommendations were initially developed by the panel co-chairs, with strength of recommendations based on GRADE.^{13,26} Articles included in the review were used as a basis for ratings,^{2,10} but in many cases additional evidence was also considered, using publications that were part of author's personal databases. The 14 drafted recommendations were circulated to all other authors and ICCPR executive for initial input (Supplemental Table S1).

An online survey was created in Qualtrics to solicit ratings of each recommendation. Delphi panelists, described below, were first asked to specify whether or not the recommendation should be included (yes/no). Next, on a scale from 1-7, they rated each recommendation in terms of (a) potential positive impact for women's CR adherence and/or outcomes, and (b) feasibility of implementation (including in low-resource settings). The anchors were from "no impact" to "major impact" and "not feasible" to highly feasible", respectively (higher scores more positive). For each recommendation there was also a free-text box where panelists were invited to make suggestions about revision to wording or other considerations that could be addressed. Finally, panelists were asked to specify recommendations that should be added.

Delphi panelists comprised corresponding authors from each of the 28 studies included in the women-focused CR review,^{2,10} as well as CR providers who participated in ICCPR's 2016/17

global CR audit who denoted offering at least some women-focused sessions at their program and provided their email to be contacted;¹⁵ there were 74 (67.3%) respondents who provided contact information, but another 36 programs that reported offering some women-focused CR did not. These parties were emailed an invitation with details of the initiative (including proposed definition of women-focused CR) and survey link in December 2021, including a call for any women-focused CR implementation tools they would be willing to share.

Based on best practice,²⁷ it was established a priori to consider recommendations where $\geq 75\%$ of respondents agreed it should be included, as well as impact and implementability average scores $\geq 5/7$ to have consensus for inclusion. Those recommendations with $< 50\%$ agreement for inclusion, as well as impact and implementability average scores $< 4/7$ were considered to have consensus for exclusion. All other recommendations were considered to have “unclear consensus”, and with consideration of open-ended comments, would be discussed on the consensus call.

Open-ended feedback was incorporated into the recommendations using tracked changes. The co-chairs discussed suggestions for additional recommendations, and drafted them for consideration by the panelists as well where it was deemed warranted. This was then shared with all respondents who provided their name to review.

A web call was convened in February 2022 to confirm recommendation inclusion/exclusion decisions, discuss recommendations where consensus was lacking, discuss potential revision of recommendations with consensus for inclusion based on comments provided, and consider new recommendations until consensus was achieved. The senior author chaired the call, ensuring all perspectives were voiced. The recommendations were revised accordingly, with strength of recommendations / certainty of evidence finalized for each based

on GRADE after the call.¹³ The final recommendations and GRADE ratings were then shared with panelists and patient partners for confirmation.

The guideline outline was discussed by the author team on a call before the consensus process. Benefits and harms of the recommendations were considered, as well as costs and implementability. Section authors provided their sections after the process, which were collated by the senior author; the full draft was then circulated to the writing panel for input. Feedback was incorporated by the co-chairs. Where there were significant outstanding questions, a webcall of authors was planned, but ultimately not necessary.

The drafted guideline was then shared with all those invited to the Delphi panel, who were considered an independent external review panel of experts (see acknowledgments). The draft was also posted on ICCPR's website for a 14-day period to enable interested public stakeholders to provide input. It was also shared with all 42 member societies of ICCPR and 16 "friends" from countries where CR is emerging. Input received from associations and stakeholders was documented and considered, and integrated where appropriate. The document was then submitted to the ICCPR Executive Committee for quality assurance, and ultimate approval.

The writing panel will consider updating this guideline if substantive new evidence is available that may change practice in recommendation areas where there is uncertainty, new studies become available with ample power, and/or there is a reason to incorporate new methods, as per best practices.²⁸

Supplemental Results

Women-Focused CR Recommendation Development Process

Of those 94 unique women-focused CR experts globally invited to serve as Delphi panelists including co-authors, 18 (19.1%) email addresses were confirmed as no longer valid, and 19 (25.0%) responded (one anonymously); respondents were from all World Health Organization regions except Africa.

Based on the rating scheme, results suggested consensus to include 10/14 recommendations, and unclear consensus for recommendation five, as well as three, eight and 14 (issues of feasibility only for latter three). Based on comments, some edits were made to these four recommendations. Then comments for all other recommendations were considered; recommendation 11 regarding exercise was separated into 2 recommendations. Ultimately, revisions were made to every recommendation, with some of the suggestions for additional recommendations which pertained to existing recommendations incorporated therein (e.g., fostering a safe space, considering intersectionality, community settings).

The consensus call was attended by all seven co-authors plus eight other panelists from diverse regions. First, the definition of women-focused CR was discussed, and following some edits, consensus achieved on the four elements.

Next, the four recommendations with unclear consensus were discussed. There was a decision to re-frame recommendation five on staff not to specify sex, but instead to focus on characteristics, training and approach. Panelists then decided that related recommendation nine was not necessary, considering also that patient-centered care is relevant for men and women, and thus out of scope. Recommendations three and eight were discussed with the revisions from the comments, and the decisions were to include them given specification that these only be applied where feasible. Discussion about recommendation 14 centered around the scope of post-

CR care being more in the domain of the health system, although the audience for this guideline includes policy-makers. Given the importance of continuity of care for optimal secondary prevention, it was decided to re-frame the recommendation to focus on what should be done within CR to support women to achieve optimal secondary prevention and quality of life post-program given their unique challenges.

Half of respondents had forwarded additional recommendations in their survey responses. They were considered in terms of scope, and relevance to women-focused CR specifically; some of the suggestions were set aside accordingly by the panel. Some were included as directions for future research (e.g., seldom-heard women). There was agreement on incorporating some of the points into existing recommendations, as had been circulated prior to the meeting. Inclusion of family was discussed; it was agreed that women patients are more often unpartnered and hence use of more inclusive terminology was needed (e.g., support persons). It was agreed these parties should be engaged at the stage of CR referral to support women's enrolment, but that inclusion of husbands in women-only exercise sessions may be problematic for some group class participants. Rather than adding a recommendation, this was added to recommendations two and four, respectively. Ultimately, one new recommendation was added, regarding evaluation (#15).

The inclusion of all recommendations was confirmed, and finally revisions to included recommendations based on open-ended feedback was discussed. Some further wording changes were made for clarity (e.g., "weighing" in recommendation 4 changed to "body composition assessment"). Means to provide support to women in one-on-one models was discussed in relation to recommendation seven. For recommendation 10, panelists discussed the lack of evidence for some alternative forms of exercise, and thus specified "evidence-based" to qualify

delivery of aerobic forms of dance. Final decisions on each recommendation are shown in Supplemental Table S1.

A written record of feedback received from the external review and public comment period as well as corresponding edits has been archived. Input did not result in alteration to the recommendations, but some sections of the text were clarified and some additional considerations added along with supporting references (e.g., early and surgical menopause assessment at intake, Indigenous considerations). Note that considerations for delivery of CR to women more broadly (i.e., not specific to women-focused CR) are well-reviewed elsewhere, including all components such as diet.²⁹

Other Considerations for Women-Focused CR Recommendation

Women-focused CR could be offered in clinical, community, hybrid or home-based (including incorporation of digital technologies) settings. Offering it only in a clinical setting raises the common barriers among women of distance, time conflicts, lack of transportation, and /or transportation cost.³⁰ Location and ease of access are key for women.³¹

Recent research suggests that alternatively offering programming hybrid or in the community, and in the case of this guideline we hope women-focused programming specifically, may facilitate greater women's engagement.^{32–34} Features of community-based CR appealing to women have been elucidated.³⁵ How to best leverage digital technologies for women-focused CR requires further investigation; however, where women have the technology and digital literacy, exploiting commonly-used apps to facilitate women's education in CR, health behaviour change (e.g., tracking exercise intensity) as well as peer support and psychosocial well-being appears prudent.³⁶ However, few trials of mobile phone-based CR involve women, and none provide sex-specific analyses.^{37–41}

Previous research has elucidated women's needs and preferences for CR⁴² as well as for delivery models specifically.^{43,44} Many of these, as well as other preference and value considerations are addressed in the recommendation elucidation. However, this work is quite dated; women's needs and preferences should be established in the current context, particularly given CR is now often delivered using new technology.⁴⁵ Moreover, investigation of the CR preferences and needs of women with the following characteristics is necessary: those of lower socioeconomic status, of various sexualities and gender identities, ethnocultural backgrounds (including Indigenous), occupying various societal roles (e.g., informal caregiving, in abusive relationships), young and old, with women's more common yet only recently-investigated and

hence less understood cardiac conditions (e.g., ischemia with non-obstructive coronary arteries) and multimorbidity (including mental health and cognitive conditions), in low-resource and non-Western (including less gender-egalitarian) cultures. Then these needs and preferences can be met.

Until these are well-known, program staff could assess women's preferences individually by, for example, administering the CR Preferences Form at time of intake assessment, and then using the results to inform the treatment plan.⁴⁶ Programs may also benefit from recommending women patients complete the CR barriers scale (CRBS)³⁰ and Information Needs in CR (INCR) scales⁴⁷ at intake. These validated scales are available in self-report form in various languages online (<https://globalcardiacrehab.com/For-Patients>), with mitigation strategies suggested in lay language for their biggest barriers as well as patient information sources provided where gaps exist; the means to share results with CR programs directly are also provided.

People with PAD and those with stroke are severely under-represented in CR; this disparity is even greater for women.^{48–50} With regard to the former, in 5 retrospective CR studies, <36% (12%–35%) of all PAD participants were women,^{51–55} despite the fact that women represent ~52% of people with PAD worldwide.^{56,57} This under-representation extends to stroke, where among 116 consecutively-enrolled stroke outpatients eligible for CR, only 24% of those that enrolled were women, despite the higher point estimate of incident and prevalent strokes in women than in men globally.^{58,59} It is therefore not surprising that there is little to no research on tailoring CR to women with stroke or PAD.^{60–62}

The under-representation and under-investigation is of concern because women with these conditions have greater depressive symptoms, pain, fatigue, poorer cardiorespiratory fitness, quality of life and functional mobility than their male counterparts, which are parameters

that can improve with CR/exercise participation.^{63,64–73} Regarding mobility, eligibility criteria for CR entry are based on level, where a progressively greater proportion of people with PAD and stroke are excluded from CR as their mobility deficits increase.^{48,49} This would disproportionately restrict entry of women with stroke or PAD, given their greater functional impairment than men. Therefore, having less restrictive inclusion criteria where feasible may mitigate sex differences in access, and ensure exercise engagement among those who most need it. Other strategies are to have stroke-specific and PAD-specific referral brochures for patients and families that target women (i.e., pictures of older and younger women exercising with and without mobility aids, or using arm ergometry), including how the program can help, who can join, and what happens during the program (including pain management).

Another sex difference is that women, including those with cardiac diseases, are more likely to have asymptomatic PAD or have atypical symptoms of PAD than men.⁷⁴ This may be in part why PAD is under-diagnosed and under-treated in women worldwide (particularly in low- and middle-income countries), leading to delayed treatment and worse outcomes.^{75,74} It is important for the CR practitioner to be aware that difficulty walking because of PAD can be mistaken for hip or knee arthritis or spinal stenosis.⁷⁶ This presents a challenge as these are more common or more disabling issues for women in general than men.⁷⁷ However, CR provides an opportunity for identifying these women with or at high risk for PAD, by targeted use of the ankle-brachial index for timely diagnosis and treatment.^{75,74}

Women with stroke may be significantly more likely to decline to be referred to CR than men; fatigue being the only reason for declining that differed from men in one study.⁵⁸ Women may have more musculoskeletal issues and poorer adherence to outpatient stroke rehabilitation than men.⁴⁷

For the exercise practitioner, ways to overcome barriers reported more frequently by women with stroke and PAD are to re-assure them that exercise will not make the condition worse, help plan exercise where there is opportunity to sit when fatigued or if leg pain occurs, and to prescribe a modality of exercise that minimizes the risk of falls.⁷⁸ Strategies to manage fatigue, musculoskeletal issues, pain and psychosocial issues can be found in other sections. Nevertheless, once stroke and PAD patients enroll, there seems to be no sex difference in CR completion.^{51,58,79}

Low-Resource Settings and Consideration of Equity, Feasibility

Implementation of women-focused CR in low-resource settings³ will represent an even greater challenge, not only for socioeconomic reasons but also gender-related societal ones. Chief among barriers to implementation in these settings is the lower availability of CR, which results in no programs to tailor to women or greater geographic barriers.⁸⁰ Interestingly, much of the women-focused CR available globally is offered in lower-resource settings in the Eastern Mediterranean Region.¹⁵ Indeed, in these contexts, CR is often single-sex for cultural and/or religious reasons; hence there is experience and knowledge that could be transferred for the benefit of higher-resource contexts. Guidance on augmenting CR capacity in low-resource settings is offered elsewhere.^{81,1}

In many lower-resource regions of the world, gender inequality is greater,⁸² which likely leads to the lower use of CR in women in these regions than in more equitable societies, such as Sweden for example.⁸³ Women may be less likely to work outside the home, especially older women, and additionally often have less control over, and access to, the family's financial resources; this would be exacerbated in families of lower socioeconomic status. This could impede payment for CR services (which must be paid out-of-pocket more often in low-resource

settings²⁰) as well as needed funds to access CR (e.g., appropriate footwear, transportation). Family sizes are often larger,⁸⁴ so women are shouldering greater family responsibility, including caretaking responsibility that extends to parents and grandchildren. This represents a major time commitment for women, limiting time for their own cardiac care, which is also often not prioritized. Women may more often experience interpersonal violence,⁸⁵ and have subsequent psychosocial issues. Women may require their husband's consent to participate, and may not be able to participate if programs are not women-only.⁸⁶ Finally, many specialty physicians are male, and sexism exists in care;⁴ but regardless women should be encouraged to attend CR like men.

There are other important factors to consider in low-resource contexts. Chagas disease, rheumatic heart disease and congenital conditions are more common,^{87,88} so women will present with these CR indications. When recommending women exercise on non-CR days, there may be additional barriers to consider both within and outside the home. In the home, there may be less space for exercise, and there may be less money for any needed equipment. Outside the home, temperature extremes raise health concerns and there may be fewer green spaces for exercise. With regard to safety, road traffic injury,⁸⁹ air pollution,⁹⁰ as well as potential for assault in the evening may represent risks for women exercising outside in these contexts (although these issues can also be at play in all contexts).

Within CR programs themselves, there are additional considerations. Programs in low-resource settings can be shorter⁹¹ or women might not have funds to pay for sufficient sessions, despite their likely greater need for comprehensive programming. Education levels and literacy may be lower,⁹² so more time in patient education, using materials tailored to women's needs would be imperative in supporting women to understand and implement needed self-

management practices. Often, there is stigma and under-identification of psychosocial issues, despite higher burden in these settings;⁹³ CR programs should aim to identify such issues and ensure women have access to evidence-based treatments, given the hazards of depression and anxiety for example for mortality and morbidity in CVD patients.⁹⁴ Domestic labour may be leveraged as lifestyle activity, but women may have less experience with higher-intensity aerobic as well as resistance exercise and it may not be understood as important. Where women cannot come on-site, the potential of offering CR and peer support via commonly-used apps such as WhatsApp or WeChat could be explored (i.e., internet connection, devices, power available, data plans), to support women in their secondary preventive lifestyle changes and promote their psychosocial well-being.

Supplemental Discussion

Directions for Future Research

In addition to some directions raised herein, in the reviews underpinning this guideline, directions for future research are forwarded,^{2,10} and a recent review also presents a good overview.²⁹ Considerations around incorporating women with less-studied cardiac conditions that are more common in women (e.g., heart failure with preserved ejection fraction, ischemia with non-obstructive coronary arteries, stress cardiomyopathy, spontaneous coronary artery dissection) in CR are also recently reviewed elsewhere,⁹⁵ and we bolster that call for research in relation to these populations specifically in women-focused CR.

Most imperative is getting women into CR, and then facilitating their adherence. With regard to the former, research is needed on how to address the gender gap in physician CR encouragement.^{96,97} We would argue that where women-focused CR is available, inpatient cardiac care providers be informed, and encouraged to communicate it to patients and their family. Also scripts supporting referral discussions with women patients, as available in the implementation tools in the Appendix, need to be tested and revised based on findings. Whether knowledge of the availability of women-focused CR increases women's enrolment should be investigated. Standardized triage algorithms need to be developed and tested to support patient allocation to program model; but specifically in relation to this work, consideration of factors more common in female CVD patients and that are related to decisions to allocation to a women-focused model (e.g., session timing availability, safety, psychosocial well-being) must be incorporated in that assessment.

With regard to programming itself, as outlined in the reviews,^{2,10} features of women-focused CR that most engage women through to program completion must be identified. With regard to setting or models, research on how one-on-one CR (i.e., often home-based) should be

tailored to women to optimize utilization and outcomes also must be established; we identified no work in this area. Also needed is research into how hybrid models, as well as more-recently applied asynchronous and synchronous group online programming can meet women's needs, including how this affects outcomes. On a related note, data do suggest that exercise intensity is equivalent in unsupervised versus supervised programs,⁹⁸ but more research on this in women specifically is needed given their well-known barriers. It is encouraging that research attention has recently turned to sex differences in cardiorespiratory fitness in CR,⁹⁹ but more work to understand optimizing initial exercise prescriptions and progressing it for women is needed, to maximize outcomes without leading to dropout. Finally, where they are shown to be beneficial, the question of how CR programs can integrate women's preferred forms of exercise (e.g., Zumba) and how this affects outcomes needs investigation.

Limitations

The limitations of the evidence review are reported elsewhere.^{2,10} With regard to this guideline, we did not have representation on the writing panel from all global regions; for instance Africa was not represented, but there is limited CR and very limited women-focused CR there.¹⁵ There was good diversity in Delphi panelists, covering all regions but Africa. However, survey response rate was low. Finally, the authors are cautioned as while the additional literature from author's personal databases used to support the recommendations was assessed for quality, all references cited in the text were not.

Supplemental Acknowledgements

We are grateful to our patient partners Tereza Rodrigues Pinto and Ana Maria da Silva. We recognize the contributions of Delphi panelists Sol Vidal Almela, Holly Wykes, Evangelia Kouidi, Mahdiah Ghanbari, Debbie Childerhose, Faith Delos-Reyes, Simonetta Scalvini, Lee Wan Ling, Michael D Kennedy, Masoumeh Sadeghi, Priya Chockalingam, Robert Zecchin, Lucia Filippucci, and Mireille Landry. We also recognize external reviewers, particularly Robyn Gallagher, but also including Mary Whooley, Danielle A. Gomes Pereira, Diann Gaalema, Jose Antonio Caldas Teixeira, Marta Supervia, Ardiana Meity, Won-Seok Kim, Jibril Mohammed, Jamal Uddin, Nidal Tourkmani, Carlos Alberto Cordeiro Hossri, Susan Dawkes, Nabila N. Soomro and Fakhr Al-Ayoubi.

SUPPLEMENTAL REFERENCES

1. 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(3):303-322.
2. 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):1-20.
3. Van Zyl C, Badenhorst M, Hanekom S, Heine M. Unravelling “low-resource settings”: a systematic scoping review with qualitative content analysis. *BMJ Glob Heal*. 2021;6:5190.
4. Mauvais-Jarvis F, Noel Bairey Merz C, Barnes PJ, et al. Sex and gender: modifiers of health, disease, and medicine. *Lancet*. 2020;396(9):565-582.
5. Taylor RS, Dalal HM, McDonagh STJ. The role of cardiac rehabilitation in improving cardiovascular outcomes. *Nat Rev Cardiol*. 2021;19:180-194.
6. Dibben G, Faulkner J, Oldridge N, et al. Exercise-based cardiac rehabilitation for coronary heart disease. *Cochrane Database Syst Rev*. 2021;(11):CD001800.
7. Long L, Mordi IR, Bridges C, et al. Exercise-based cardiac rehabilitation for adults with heart failure. *Cochrane Database Syst Rev*. 2019;1(1):CD003331.
8. 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(22):2458-2473.
9. 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(2):192-199.
10. 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.
 11. Hong Q, Pluye P, Fàbregues S, et al. Mixed Methods Appraisal Tool (MMAT), Version 2018. <http://mixedmethodsappraisaltoolpublic.pbworks.com/>. Accessed February 22, 2022.
 12. Higgins J, Thomas J, Chandler J, et al. *Cochrane Handbook for Systematic Reviews of Interventions Version 6.0*. Cochrane; 2019.
 13. GRADEpro GDT: GRADEpro Guideline Development Tool[Software]. 2015. gradepro.org.
 14. Campbell M, Mckenzie JE, Sowden A, et al. Synthesis without meta-analysis (SWiM) in systematic reviews: reporting guideline. *BMJ*. 2020;368:16890.
 15. 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(1):135-143.
 16. Wheeler JRC. Can a Disease Self-Management Program Reduce Health Care Costs? The Case of Older Women with Heart Disease. *Med Care*. 2003;41(6):706-715.
 17. Andersson A, Sundel KL, Unden AL, Schenck-Gustafsson K, Eriksson I. A five-year rehabilitation programme for younger women after a coronary event reduces the need for hospital care. *Scand J Public Health*. 2010;38(6):566-573.
 18. Shields GE, Wells A, Doherty P, Heagerty A, Buck D, Davies LM. Cost-effectiveness of cardiac rehabilitation: a systematic review. *Heart*. 2018;104(17):1403-1410.
 19. Oldridge NB, Pakosh MT, Thomas RJ. Cardiac rehabilitation in low- and middle-income

- countries: a review on cost and cost-effectiveness. *Int Health*. 2016;8(2):77-82.
20. Moghei M, Pesah E, Turk-Adawi K, et al. Funding sources and costs to deliver cardiac rehabilitation around the globe : Drivers and barriers. *Int J Cardiol*. 2019;276:278-286.
 21. Anderson L, Sharp GA, Norton RJ, et al. Home-based versus centre-based cardiac rehabilitation. *Cochrane Database Syst Rev*. 2017;6(6):CD007130.
 22. 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(1):E69-E89.
 23. Brouwers MC, Kho ME, Browman GP, et al. AGREE II: advancing guideline development, reporting and evaluation in health care. *Can Med Assoc J*. 2010;182(18):E839-E842.
 24. Institute of Medicine. *Standards for Developing Trustworthy Clinical Practice Guidelines*. Washington, D.C; 2011.
 25. Chen Y, Yang K, Marušić A, et al. A reporting tool for practice guidelines in health care: The RIGHT statement. *Ann Intern Med*. 2017;166(2):128-132.
 26. GRADEpro GDT. interactive Summaries of Qualitative Findings. software. <https://isoq.epistemonikos.org/>. Published 2015. Accessed February 18, 2022.
 27. Tu J V., Abrahamyan L, Donovan LR, Boom N. Best practices for developing cardiovascular quality indicators. *Can J Cardiol*. 2013;29(11):1516-1519.
 28. Garner P, Hopewell S, Chandler J, et al. When and how to update systematic reviews: consensus and checklist. *BMJ*. 2016;354:i3507.
 29. Smith JR, Thomas RJ, Bonikowske AR, Hammer SM, Olson TP. Sex Differences in

- Cardiac Rehabilitation Outcomes. *Circ Res*. 2022;130(4):552-565.
30. Grace SL, Gravely-Witte S, Kayaniyl S, Brual J, Suskin N, Stewart DE. A multisite examination of sex differences in cardiac rehabilitation barriers by participation status. *J Women's Heal*. 2009;18(2):209-216.
 31. 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(4):565-577.
 32. Reed JL, Harris JM, Cotie LM, Grace SL. What do We Know about Women Versus Men Who Attend Heart Wise Exercise Sessions? *Can J Cardiol*. 2016;32(4):s7.
 33. 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(1):190.
 34. Nathanail SK, Gyenes GT, Damme AV, Parent EC KM. Participant exercise attendance in community-based bridging, and hospital-based cardiac rehabilitation: a retrospective case control study. *CJC Open*. 2021;epub.
 35. 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(7):761-778.
 36. 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(6):e16420.
 37. Pfaeffli Dale L, Dobson R, Whittaker R, Maddison R. The effectiveness of mobile-health behaviour change interventions for cardiovascular disease self-management: A systematic review. *Eur J Prev Cardiol*. 2016;23(8):801-817.

38. Maddison R, Pfaeffli L, Whittaker R, et al. A mobile phone intervention increases physical activity in people with cardiovascular disease: Results from the HEART randomized controlled trial. *Eur J Prev Cardiol.* 2015;22(6):701-709.
39. Chow CK, Redfern J, Hillis GS, et al. Effect of Lifestyle-Focused Text Messaging on Risk Factor Modification in Patients With Coronary Heart Disease: A Randomized Clinical Trial. *JAMA.* 2015;314(12):1255-1263.
40. Prestwich A, Sniehotta FF, Whittington C, Dombrowski SU, Rogers L, Michie S. Does theory influence the effectiveness of health behavior interventions? Meta-analysis. *Health Psychol.* 2014;33(5):465-474.
41. Cradock KA, ÓLaighin G, Finucane FM, Gainforth HL, Quinlan LR, Ginis KAM. Behaviour change techniques targeting both diet and physical activity in type 2 diabetes: A systematic review and meta-analysis. *Int J Behav Nutr Phys Act.* 2017;14(1):18.
42. Moore SM, Kramer FM, Moore, S M; Kramer FM. Women's and men's preferences for cardiac rehabilitation program features. *J of Cardiopulm Rehabil.* 1996;16(3):163-168.
43. 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(3):203-208.
44. 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(12):1513-1522.
45. Ghisi GLM, Xu Z, Liu X, et al. Impacts of the COVID-19 pandemic on cardiac rehabilitation delivery around the world. *Glob Heart.* 2021;16(1):43.
46. Fernandez RS, Salamonson 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(6):390-394.
47. Ghisi GL, Grace SL, Thomas S, Evans MF, Oh P. Development and psychometric validation of a scale to assess information needs in cardiac rehabilitation: the INCR Tool. *Patient Educ Couns*. 2013;91(3):337-343.
 48. Toma J, Hammond B, Chan V, et al. Inclusion of people post-stroke in cardiac rehabilitation programs in Canada: A missed opportunity for referral. *CJC Open*. 2020;2:195-206.
 49. Ahden S, Ngo V, Hoskin J, et al. Inclusion of People With Peripheral Artery Disease in Cardiac Rehabilitation Programs: A Pan-Canadian Survey. *Hear Lung Circ*. 2021;30:1031-1043.
 50. Howes T, Mahenderan N, Freene N. Cardiac rehabilitation: are people with stroke or transient ischaemic attack being included? a cross-sectional survey. *Hear Lung Circ*. 2019;29(3):483-490.
 51. Devrome AN, Aggarwal S, McMurtry MS, et al. Cardiac rehabilitation in people with peripheral arterial disease: A higher risk population that benefits from completion. *Int J Cardiol*. 2019;285:108-114.
 52. Ambrosetti M, Temporelli PL, Faggiano P, et al. Lower extremities peripheral arterial disease among patients admitted to cardiac rehabilitation: the THINKPAD registry. *Int J Cardiol*. 2014;171(2):192-198.
 53. Jeger R V., Rickenbacher P, Pfisterer ME, Hoffmann A. Outpatient Rehabilitation in Patients With Coronary Artery and Peripheral Arterial Occlusive Disease. *Arch Phys Med Rehabil*. 2008;89(4):618-621.

54. Nguyen CH, Marzolini S, Oh P, Thomas SG. Entering cardiac rehabilitation with peripheral artery disease: a retrospective comparison to coronary artery disease. *J Cardiopulm Rehabil Prev.* 2020;40:255-262.
55. Stauber S, Guera V, Barth J, et al. Psychosocial outcome in cardiovascular rehabilitation of peripheral artery disease and coronary artery disease patients. *Vasc Med.* 2013;18(5):257-262.
56. Song P, Rudan D, Zhu Y, et al. Global, regional, and national prevalence and risk factors for peripheral artery disease in 2015: an updated systematic review and analysis. *Lancet Glob Heal.* 2019;7(8):e1020-e1030.
57. Pabon M, Cheng S, Altin SE, et al. Sex Differences in Peripheral Artery Disease. *Circ Res.* 2022;130(4):496-511.
58. Marzolini S, Fong K, Jagroop D, et al. Eligibility, Enrollment, and Completion of Exercise-Based Cardiac Rehabilitation Following Stroke Rehabilitation: What Are the Barriers? *Phys Ther.* 2020;100(1):44-56.
59. Feigin VL, Stark BA, Johnson CO, et al. Global, regional, and national burden of stroke and its risk factors, 1990–2019: A systematic analysis for the Global Burden of Disease Study 2019. *Lancet Neurol.* 2021;20(10):795-820.
60. Galati A, Piccoli M, Tourkmani N, et al. Cardiac rehabilitation in women: state of the art and strategies to overcome the current barriers. *J Cardiovasc Med.* 2018;19(12):689-697.
61. Parmenter BJ, Dieberg G, Smart NA. Exercise training for management of peripheral arterial disease: a systematic review and meta-analysis. *Sport Med.* 2015;45(2):231-244.
62. Tompra N, Foster C, Sanchis-Gomar F, de Koning JJ, Lucia A, Emanuele E. Upper versus lower limb exercise training in patients with intermittent claudication: a systematic

- review. *Atherosclerosis*. 2015;239(2):599-606.
63. Marzolini S, Oh PI, McIlroy W, Brooks D. The feasibility of cardiopulmonary exercise testing for prescribing exercise to people after stroke. *Stroke*. 2012;43:1075-1081.
 64. Glader E-L, Stegmayr B, Norrving B, et al. Sex differences in management and outcome after stroke: a Swedish national perspective. *Stroke*. 2003;34(8):1970-1975.
 65. Gray LJ, Sprigg N, Bath PMW, et al. Sex Differences in Quality of Life in Stroke Survivors. *Stroke*. 2007;38(11):2960-2964.
 66. McDermott MM, Ferrucci L, Liu K, et al. Women With Peripheral Arterial Disease Experience Faster Functional Decline Than Men With Peripheral Arterial Disease. *J Am Coll Cardiol*. 2011;57(6):707-714.
 67. McDermott MM, Greenland P, Liu K, et al. Sex differences in peripheral arterial disease: leg symptoms and physical functioning. *J Am Geriatr Soc*. 2003;51(2):222-228.
 68. Hirsch AT, Haskal ZJ, Hertzner NR, et al. ACC/AHA 2005 guidelines for the management of patients with peripheral arterial disease (lower extremity, renal, mesenteric, and abdominal aortic): a collaborative report from the American Association for Vascular Surgery/Society for Vascular Surgery, Soc. *J Am Coll Cardiol*. 2006;47(6):e1-e192.
 69. Jönsson AC, Lindgren I, Hallström B, Norrving B, Lindgren A. Prevalence and intensity of pain after stroke: a population based study focusing on patients' perspectives. *J Neurol Neurosurg Psychiatry*. 2006;77(5):590-595.
 70. Jelani Q, Mena-Hurtado C, Burg M, et al. Relationship between depressive symptoms and health status in peripheral artery disease: role of sex differences. *J Am Heart Assoc*. 2020;9(16):e014583.
 71. Breek JC, Hamming JF, De Vries J, van Berge Henegouwen DP, Van Heck GL. The

- impact of walking impairment, cardiovascular risk factors, and comorbidity on quality of life in patients with intermittent claudication. *J Vasc Surg.* 2002;36(1):94-99.
72. Schepers VP, Visser-Meily AM, Ketelaar M, Lindeman E. Poststroke Fatigue: Course and Its Relation to Personal and Stroke-Related Factors. *Arch Phys Med Rehabil.* 2006;87(2):184-188.
 73. Poynter B, Shuman Hon M, Diaz-Granados N, Kapral M, Grace SL, Stewart DE. Sex Differences in the Prevalence of Post-Stroke Depression: A Systematic Review. *Psychosomatics.* 2009;50(6):563-569.
 74. Hirsch AT, Allison MA, Gomes AS, et al. A call to action: women and peripheral artery disease: a scientific statement from the American Heart Association. *Circulation.* 2012;125(11):1449-1472.
 75. Vogel B, Acevedo M, Appelman Y, et al. The Lancet women and cardiovascular disease Commission: reducing the global burden by 2030. *Lancet.* 2021;397:2385-2438.
 76. Patel T, Baydoun H, Patel NK, et al. Peripheral arterial disease in women: the gender effect. *Cardiovasc Revascularization Med.* 2020;21(3):404-408.
 77. Peteler R, Schmitz P, Loher M, Jansen P, Grifka J, Benditz A. Sex-Dependent Differences in Symptom-Related Disability Due to Lumbar Spinal Stenosis. *J Pain Res.* 2021;14:747-755.
 78. de Sousa ASA, Correia MA, Farah BQ, et al. Barriers and Levels of Physical Activity in Symptomatic Peripheral Artery. *J Aging Phys Act.* 2019;27(5):719-724.
 79. Marzolini S, Balitsky A, Jagroop D, et al. Factors Affecting Attendance at an Adapted Cardiac Rehabilitation Exercise Program for Individuals with Mobility Deficits Poststroke. *J Stroke Cerebrovasc Dis.* 2016;25(1):87-94.

80. Pesah E, Turk-Adawi K, Supervia M, et al. Cardiac rehabilitation delivery in low/middle-income countries. *Heart*. 2019;105(23):1806-1812.
81. Grace SL, Turk-Adawi KI, Contractor A, et al. Cardiac rehabilitation delivery model for low-resource settings. *Heart*. 2016;102(18):1449-1455.
82. Gender Equality by Country 2022. <https://worldpopulationreview.com/country-rankings/gender-equality-by-country>. Accessed February 27, 2022.
83. Borg S, Öberg B, Leosdottir M, Lindolm D, Nilsson L, Bäck M. Factors associated with non-Attendance at exercise-based cardiac rehabilitation. *BMC Sports Sci Med Rehabil*. 2019;11(1):1-10.
84. Pezzulo C, Nilsen K, Carioli A, et al. Geographical distribution of fertility rates in 70 low-income, lower-middle-income, and upper-middle-income countries, 2010–16: a subnational analysis of cross-sectional surveys. *Lancet Glob Heal*. 2021;9(6):e802-e812.
85. García-Moreno C, Pallitto C, Devries K, et al. *Global and Regional Estimates of Violence against Women: Prevalence and Health Effects of Intimate Partner Violence and Non-Partner Sexual Violence*.; 2013.
<https://apps.who.int/iris/bitstream/handle/10665/85239/?sequence=1>. Accessed February 27, 2022.
86. Sharif R. An Exploration of the Cardiac Rehabilitation Needs of Pakistani Heart Failure (HF) Patients and their Family Caregivers-A Qualitative Study. *PhD Diss*. 2020;Birmingham(City):University. [http://www.open-access.bcu.ac.uk/12133/1/RS PHD THESIS 2020.pdf](http://www.open-access.bcu.ac.uk/12133/1/RS%20PHD%20THESIS%202020.pdf). Accessed February 27, 2022.
87. Coura JR, Vias PA. Chagas disease: a new worldwide challenge. *Nature*. 2010;465(7301):S6-S7.

88. Tibazarwa KB, Volmink JA, Mayosi BM. Incidence of acute rheumatic fever in the world: a systematic review of population-based studies. *Heart*. 2008;94(12):1534-1540.
89. James SL, Lucchesi LR, Bisignano C, et al. Morbidity and mortality from road injuries: results from the Global Burden of Disease Study 2017. *Inj Prev*. 2020;26(Suppl 2):i46-i56.
90. Tainio M, Jovanovic Andersen Z, Nieuwenhuijsen MJ, et al. Air pollution, physical activity and health: A mapping review of the evidence. *Environ Int*. 2021;147(Feb):105954.
91. Chaves G, Turk-Adawi K, Supervia M, et al. Cardiac Rehabilitation Dose Around the World: Variation and Correlates. *Circ Cardiovasc Qual Outcomes*. 2020;13(1):e005453.
92. Graetz N, Woyczynski L, Wilson KF, et al. Mapping disparities in education across low- and middle-income countries. *Nature*. 2019;577:235-238.
93. Mascayano F, Armijo JE, Yang LH. Addressing Stigma Relating to Mental Illness in Low- and Middle-Income Countries. *Front Psychiatry*. 2015;6:38.
94. Carney RM, Freedland KE. Depression and coronary heart disease. *Nat Rev Cardiol*. 2017;14(3):145-155.
95. Sawan MA, Calhoun AE, Fatade YA, Wenger NK. Cardiac rehabilitation in women, challenges and opportunities. *Prog Cardiovasc Dis*. February 2022:S0033-0620(22)00014-7.
96. Kentner AC, Grace SL. Between mind and heart: Sex-based cognitive bias in cardiovascular disease treatment. *Front Neuroendocrinol*. 2017;45:18-24.
97. Tsui CK-Y, 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(4):192-197.
98. Keteyian SJ, Grimshaw C, Brawner CA, et al. A Comparison of Exercise Intensity in Hybrid Versus Standard Phase Two Cardiac Rehabilitation. *J Cardiopulm Rehabil Prev.* 2021;41(1):19-22.
99. Khadanga S, Gaalema DE, Savage P, Ades PA. Underutilization of Cardiac Rehabilitation in Women: BARRIERS and SOLUTIONS. *J Cardiopulm Rehabil Prev.* 2021;41(4):207-213.

Supplemental Table S1: Initial Recommendations with Delphi Ratings and Panel Decisions

	Recommendations	Include? n (% yes)	Potential Positive Impact *	Feasibility of Implementation *	Panel Decision
	<u>Women's Referral to CR</u>				
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	19 (100.0)	6.6±0.7	5.5±1.3	include
2	CR programs should educate providers at the referral sources regarding the importance of encouraging women's attendance at the bedside, and tailoring that discussion to women's more-common barriers and preferences	19 (100.0)	6.7±0.5	5.7 ±1.0	include
	<u>CR Setting</u>				
3	Women should be provided the choice of a supervised or unsupervised/home-based setting where safety is not an issue and there are no concerns about depression.	16 (94.1)	6.2±1.1	4.9±1.3	include
4	CR context should be optimized to meet women's preferences with regard to: privacy (e.g., changeroom facilities, weighing), crowding, rushing	16 (88.9)	5.6±1.5	5.4±1.3	include
5	Where possible, female providers should deliver CR care to female patients	12 (66.7)	4.8±2.0	4.7±2.1	Revise substantively
6	Where unsupervised CR is delivered one-on-one, providers should attempt to tailor to women's needs and preferences, as outlined in the delivery section below.	17 (94.4)	6.2±1.1	6.1±1.1	include
	<u>Women-Focused CR Delivery</u>				
7	As women are the most populous under-represented group in CR, programs should offer some form of tailoring for women where possible. At the least a synchronous virtual session should be offered.	16 (88.9)	6.2±1.5	5.8±1.4	include
8	Women should be offered as much choice as possible in session timing	16 (88.9)	6.4±1.1	4.9±1.4	Include
9	Care should be delivered in a patient-centered manner, specific to women.	18 (100.0)	6.4±0.9	5.8±1.3	when discussing changes

					to recommendation 5, it was decided to exclude this related recommendation
10	Women's comorbidities and gender-related symptoms should be considered in developing their individual treatment plan, including mental health and psychosocial issues, menopausal status, cancer history, and concerns about urinary incontinence, falls risk / osteoporosis, as well as autoimmune conditions / MSK in relation to exercise.	18 (100.0)	6.5±0.8	6.0±1.2	include
11	Programs should endeavour to provide preferred forms of aerobic exercise for women (e.g., walking not on a treadmill, swimming/aquabics, dance, aerobics/zumba). If this is not possible, individually-tailored exercise prescriptions must take musculoskeletal issues and exercise history into consideration (i.e., pain and fatigue), and/or other forms of exercise preferred by women should be made available in addition to traditional treadmill / cycle ergometers (e.g., yoga).	18 (100.0)	6.7±0.7	5.3±1.6	Include , but was broken into 2 recommendations
12	The psychosocial needs of women should be assessed and addressed in an evidence-based manner (e.g., social support, relationship health, depression, anxiety, stress, socioeconomic issues, informal caregiving activities). Where issues are identified, reassessment should be undertaken, and communication be made to the woman's primary care provider to ensure on-going monitoring and follow-up.	18 (100.0)	6.6±0.7	6.0±1.1	include
13	if it cannot be delivered directly, women should be directed to education resources on	14 (77.8)	6.1±1.4	6.1±1.3	include

	matters specific to women and cardiovascular diseases				
14	Women should be offered a means of continued support post-program.	16 (88.9)	6.4±0.9	4.8±2.0	revise substantially

CR, cardiovascular rehabilitation; MSK, musculoskeletal.

*mean and standard deviation of rating on scale from 1 to 7, with higher scores being more positive (e.g., major impact or highly feasible)

Supplemental Appendix S1

**Appendix 1: Women-Focused Cardiovascular Rehabilitation Implementation Tools**Systematic Referral with Bedside Encouragement of Women Inpatients

Training in implementing: <https://takeheart.ahrq.gov/>

Resources to support, and provider talking points tailored to women:

https://sgrace.info.yorku.ca/files/2021/11/MillionHearts_CR-referral-scripts-w-tools_MDAPPs-other_women_clean.pdf?x38148

Exercise Sessions

Recorded women-focused exercise sessions in English, by type (e.g., dance, yoga, resistance):

<https://www.healtheuniversity.ca/EN/CardiacCollege/Pages/Women-Learn-Online.aspx>

Patient Education

Recorded evidence-based women-focused education lectures in English, by topic (includes about heart diseases, medications, diet, psychosocial well-being etc.):

<https://www.healtheuniversity.ca/EN/CardiacCollege/Pages/Women-Learn-Online.aspx>

Online sources of information on women and CVD created for patients and evidence-based:

- Go Red for Women <https://www.goredforwomen.org/> (English and Spanish)
- Heart Foundation of Australia <https://www.heartfoundation.org.au/Conditions/heart-conditions-in-women>
- Centers for Disease Control USA <https://www.cdc.gov/heartdisease/women.htm>
- Heart and Stroke Foundation of Canada <https://www.heartandstroke.ca/heart-disease/what-is-heart-disease/types-of-heart-disease/women-and-heart-disease> (English, French)
- Office of Women's Health US <https://www.womenshealth.gov/heart-disease-and-stroke/heart-disease/heart-disease-resources>
- CardioSmart US <https://www.cardiosmart.org/topics/women-and-heart-disease>

Support Groups

- US Women's Heart Foundation <https://www.womenheart.org/>
- Canadian Women's Peer Support Heart Hub <https://cwhhc.ottawaheart.ca/national-alliance/projects-and-initiatives/canadian-womens-peer-support-heart-hub>