

Women-only cardiac rehabilitation delivery around the world

Authors: Karam Turk-Adawi, PhD^a; Marta Supervia, MD^{b,c}; Francisco Lopez-Jimenez, MD^c; Anfal Adawi, MA^d; Masoumeh Sadeghi, MD^e; & Sherry L. Grace, PhD^{d,f}

^a College of Health Sciences, QU Health, Qatar University, Al Jamiaa St, Doha, Qatar

^b Gregorio Marañón General University Hospital, Gregorio Marañón Health Research Institute, Dr. Esquerdo, 46, 28007 Madrid, Spain

^c Mayo Clinic, Rochester, 200 First St. SW Rochester, MN 55905, USA

^d York University, 4700 Keele Street, Toronto Ontario, Canada, M3J1P3

^e Cardiac Rehabilitation Research Center, Cardiovascular Research Institute, Isfahan University of Medical Sciences, Isfahan, Iran

^f KITE-University Health Network, University of Toronto, 399 Bathurst St, Toronto, ON M5T 2S8, Canada

Corresponding Author:

Prof. Sherry L Grace, PhD, FCCS, CRFC; Bethune 368, York University, 4700 Keele Street, Toronto, ON, M3J 1P3, Canada; Phone: (416) 736-2100 ext. 22364; sgrace@yorku.ca; @sherrylgrace

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Declaration of interest

The authors declare that there is no conflict of interest

Abstract

BACKGROUND: Women utilize cardiac rehabilitation (CR) significantly less than men. Gender-tailored CR improves adherence and mental health outcomes when compared to traditional programs.

This study ascertained the availability of women-only (W-O) CR classes globally.

METHODS: In this cross-sectional study, an online survey was administered to CR programs globally, assessing delivery of W-O classes, among other program characteristics. Univariate tests were performed to compare provision of W-O CR by program characteristics.

RESULTS: Data were collected in 93/111 countries with CR (83.8% country response rate); 1,082 surveys (32.1% program response rate) were initiated. Globally, 38 (40.9%; range from 1.2-100.0% of programs/country) countries and 110 (11.8%) programs offered W-O CR. W-O CR was offered in 55 (7.4%) programs in high-income countries, versus 55 (16.4%) programs in low- and middle-income countries ($p<.001$); it was offered most commonly in the Eastern Mediterranean region ($n=5$, 55.6%; $p=.22$). Programs that offered W-O CR were more often located in an academic or tertiary facility, served more patients/year, offered more components, treated more patients/session, offered alternative forms of exercise, had more staff (including cardiologists, dietitians, and administrative assistants, but not mental healthcare professionals), and perceived space and human resources to be less of a barrier to delivery than programs not offering W-O CR (all $p<.05$).

CONCLUSION: W-O CR was not commonly offered. Only larger, well-resourced programs seem to have the capacity to offer it, so expanding delivery may require exploiting low-cost, less human resource-intensive approaches such as online peer support.

Keywords: Cardiac Rehabilitation; women; women only cardiac rehabilitation

Introduction

Cardiovascular disease (CVD) is one of the leading burdens of disease and disability in women globally, and it is growing. Women with CVD often have poorer quality of life than men.[1] They are less likely to receive evidence-based management, including revascularization, preventive medications, and cardiac rehabilitation (CR), such that they often have poorer outcomes.[2–6]

Cardiac rehabilitation is a guideline-recommended (including women-specific CVD guidelines) model of care for the management of CVD.[7,8] It is well-established that participation in CR reduces cardiovascular mortality, re-hospitalization and improves quality of life.[9,10] Despite the great need and these benefits, significantly fewer women access CR than men,[11,12] and those that do are less likely to complete the program.[13]

Reasons for this persistent under-representation of women in CR globally is quite well-understood. Strategies to improve women's CR utilization have been identified.[11,12,14,15] One of the main approaches is to offer gender-tailored or women-only CR (W-O CR).[16–18] Research demonstrates women would prefer gender-tailored CR,[19] and trials have shown that such programs can result in greater adherence,[20,21] improved mental health outcomes,[20,22] and equivalent functional (among other) outcomes when compared to traditional co-ed programs.[20,23] However, it is not known how commonly W-O CR is offered globally. Therefore, the objectives of this study were to characterize: (a) delivery of W-O CR classes by country, and (b) the nature of programs that are more likely to offer W-O CR to understand factors associated with its' provision.

Methods

Design and Procedure

This was a cross-sectional study, presenting secondary analysis of the first global survey of CR programs. Detailed methods are reported elsewhere below,[24,25] but are summarized briefly. The study protocol was approved by York University's Office of Research Ethics (Toronto, Canada) and Mayo Clinic's

Institutional Review Board (Rochester, United States). Participating CR centers provided informed consent electronically.

First, a list of all countries globally was compiled, by cross-referencing several key sources.[26] Two hundred and three countries were considered.[25] Countries were categorized by World Health Organization (WHO) region, as well as by the World Bank country income classification.[27,28]

Next, which countries offered any CR was established. Several strategies and sources were used: (a) a previously-published review on global availability of CR,[29] among other reviews,[30] and (b) a search of Google Scholar, among other databases, for articles or abstracts on CR. For countries where no CR was in evidence, the authors searched the internet and queried key informants/experts via the International Council of Cardiovascular Prevention and Rehabilitation (ICCPR) to verify.

Finally, CR programs in each country where CR existed were surveyed. The total number of programs and contacts to reach those programs for data collection were sought from cardiac societies, and if not, from CR experts. The survey was then emailed to all identified programs, with repeat mailings to non-responders. Contacts were sent two email reminders. Data collection occurred from February 2016-July 2017 via online survey administered through REDCap.

Sample

The sample was comprised of all CR programs world-wide offering Phase II (i.e., post-acute care discharge) services. Programs that offered: (1) initial assessment, (2) structured exercise, and (3) at least one other strategy to control CV risk factors, were included. All CR programs were contacted in countries with ≤ 350 programs; otherwise, a random subsample of 250 were contacted (this was only the case for the United States). The random subsample was generated electronically using the simple random sample module in SAS.

Measures

The survey is available elsewhere.[24] Central to this paper, programs were asked to report their country and whether they offered “women-only classes” in any model (yes/no).

Program characteristics were also assessed, including: location, wait times, source of funding, service delivery cost estimates, annual patient volumes, number of program sessions (dose), whether the program offers alternative forms of exercise (e.g., yoga, dance) or CR in alternative settings (i.e. home-based, community-based), type and number of professionals on CR team, and barriers to delivery (e.g., space, equipment, financial and human resources; rated on a 5-point Likert scale). A composite measure of 11 internationally-agreed core components by CR societies (e.g., initial assessment, exercise training, patient education, management of CV risk factors, stress management, tobacco cessation intervention/counselling) was also computed.[31–34]

Statistical analyses

IBM SPSS version 25 was used.[35] Descriptive statistics were used to characterize which countries offered W-O classes, and the proportion of programs in each country offering it. Availability was compared by WHO region and country income classification using generalized linear mixed models to account for clustering of programs. Finally, program characteristics (independent variables) associated with provision of W-O classes (dependent variable) were tested using chi-square or independent samples t-tests as applicable.

Results

As reported elsewhere,[25] there were 111/203 (54.7%) countries in the world with CR, of which data were collected in 93 (83.8% country response rate). The number of responding programs / country (mean=9.7±17.3 surveys initiated), and program response rate by country (32.1% globally) are also reported elsewhere.[24] The total sample size was 1082 surveys.

Delivery of W-O CR Globally

As shown in Figure 1, 38 (40.9%) countries with CR offered W-O CR globally (18.7% of all countries globally). Of those offering W-O CR, in 6 countries (10.5%; Afghanistan, Bahrain, Belarus, Bosnia and Herzegovina, Chile, Qatar) all CR programs offered it (but there was only one program in 4 of these countries), and in another 3 countries W-O CR was offered in $\geq 50\%$ of programs (Iran, Pakistan, Greece). In countries that delivered it, on average $32.1 \pm 33.8\%$ (median=1; Q25-Q75=1-3) of programs offered it; with a range from 1.2% of programs offering W-O CR in Australia to 100% in the countries listed above (Table 2).

By WHO region (Figure 2), provision of W-O CR was highest in Eastern Mediterranean countries (EMR; $n=5$, 55.6%) as well as Europe ($n=19$, 46.3%), and lowest in Africa ($n=1$, 20.0%; $p=.22$). W-O CR was offered in 22 (46.8%) high-income countries (HICs), versus 16 (34.0%) low- and middle-income countries (LMICs; $p<.001$; in 12 [40.0%] upper-middle income, 3 [20.0%] lower-middle income, and 1 [50.0%] low-income country).

W-O CR was offered in 110 (11.8%) programs globally (Table 2). As reported elsewhere, provision of W-O CR was highest among programs in the EMR ($p<.01$). In HICs, W-O CR was offered in 55/747 (7.4%) programs, versus 55/335 (16.4%) programs in LMICs ($p=.07$; 50/279 [17.9%] in upper-middle income, 4/54 [7.4%] programs in lower-middle income, and 1/2 [50.0%] programs in low-income countries).

Factors Associated with Program Delivery of W-O CR

Characteristics of CR programs offering W-O CR are shown in Table 1. Factors associated with W-O CR provision are also shown. Univariate analysis showed that offering W-O CR was significantly greater with each of the following: being situated in an academic/tertiary facility, serving a greater number of patients per year, treating more patients per exercise session, offering more core components, having telemetry, offering alternative forms of exercise (e.g. dance, yoga, tai chi), having more staff (including cardiologists, dietitians, non-physiotherapist exercise professionals, and administrative assistants), and

perceiving safety and human resources as less of a barrier to delivery, when compared to programs that do not offer W-O CR.

Discussion

W-O CR is of equivalent efficacy to traditional CR,[20,23] may be associated with greater adherence[16] and psychosocial well-being,[22] and women often prefer it.[19] Nevertheless, only approximately 1/5 of countries globally offer W-O CR, with just over 100 programs offering at least some W-O classes. There was significant regional variation in the proportion of programs delivering it, with it being most commonly-offered in the EMR (although this should be interpreted with caution as the sample size was small in the EMR); this is likely attributable to religious and cultural values in the region.[14] W-O classes were not commonly offered in HICs despite greater availability of resources. For example, in Australia only one percent of programs offered W-O classes.

Programs offering W-O classes appeared to have the capacity to do so because they were larger, more well-resourced programs. For instance, they were more often in academic centres, treated more patients, were more comprehensive, and had less space and human resource constraints. It was found that the programs offering W-O CR more often offered alternative forms of exercise, which is in accordance with women's preferences for dance and yoga for example.[37] While programs offering W-O classes had more staff, it was discouraging that they did not have more mental health professionals on staff, considering the high and hazardous burden of depression in women with CVD,[38,39] among other psychosocial concerns (e.g., anxiety, socioeconomic status).

Limitations and Directions for Future Research

As summarized elsewhere,[24,25] findings should be interpreted with some caution. First, some programs may not have been identified; therefore, availability of W-O CR could be under-estimated. Indeed, we were unable to collect data in 18 countries presumed to have CR, and assumed that they did not offer W-O CR. On the other hand, although a high response rate at the country-level of 85% was

achieved, the response rate among programs within countries was only 1/3, and hence there may be bias, with more established/larger programs (which may be more likely to offer W-O CR as identified herein, and also have more staff and hence capacity to complete the survey) represented in the sample. Therefore, there is likely some error associated with estimates of W-O CR availability.

Other limitations relate to design and analyses. Causal conclusions cannot be drawn. This was the first examination of factors related to delivery of W-O CR, and therefore further research is needed to verify the findings, including direction of effect. Due to the exploratory nature of the analyses to ascertain characteristics of programs that are more likely to offer W-O CR, multiple comparisons were performed, which would have increased error.

There are also measurement issues. The survey was self-report, and respondents may have responded in a socially-desirable manner, thus inflating reported rates of W-O CR delivery. Second, the survey queried offering W-O “classes”; we did not ask about full W-O “programs” (nor did we ask whether the W-O content was tailored to women’s needs and preferences,[37] or comprised solely single-sex services of the same content as the traditional programs). The rates of W-O CR delivery would likely be lower if delivery of W-O programs were assessed. This is an important area for future research. In addition, there is a need to know more about what exactly programs are delivering in their W-O classes (and programs), but it does seem that alternative exercise modalities and settings are being exploited. Are programs tailoring education session content or offering a few “women-tailored” sessions per program (e.g., discussion of comorbid conditions and CV risk factors more common in women such as depression),[17] offering W-O education and/or exercise sessions only, offering exercise modalities that are preferred by women (e.g., dance, aerobics; i.e., cause less pain and fatigue such as yoga and aquabics),[37,40] or other program modifications to meet women’s needs and preferences (e.g., early contacts to increase enrolment, peer support, more emotional support / psychosocial services)?

There are other important areas for further study. It is unknown how many W-O sessions are offered to patients at these programs, and if there is sufficient choice in terms of time offered for women

to take advantage of the sessions while fulfilling their multiple roles.[41] It would also be important to understand whether there is sufficient space for separate change rooms in these programs (particularly considering space was a barrier to W-O CR delivery and women report valuing privacy at CR).[37] Finally, considering the programs offering it were able to do so as they had less space and fewer human resource constraints, clearly the resource implications of offering W-O programs and classes needs to be considered.[42] It may be more feasible to offer W-O sessions than full programs when all factors are considered.

Other Research and Policy Implications

Given the benefits of W-O CR,[16–23, 41] likely broader availability should be achieved. However, given the findings herein, there is likely a wide variation in W-O CR delivery in the real-world which would impact patient outcomes. Accordingly, some standards should be agreed (e.g., model based on principles of women's health, in a safe and non-competitive environment,[17] and fully comprehensive offering all core components)[43,44] to ensure consistent, high-quality delivery where implemented.

Space and human resource constraints will need to be considered so that W-O CR can be feasibly be more widely implemented. Potentially online peer support could be exploited, given women prefer more support from CR, this could benefit their psychosocial well-being as well as promote self-management, and it requires few resources.[45] Other eCR resources could be used, such as meditation apps and behavioural trackers. Implementation could be facilitated by working with the ~100 programs offering it in the 38 countries where it is available, and expanding from there.

Conclusion

Despite evidence that W-O CR may improve utilization for such an under-served group in need, it was not commonly offered. It appears that only larger, well-resourced and staffed programs have the capacity to offer W-O CR, and so expanding delivery may require exploiting less human resource-intensive approaches requiring little space such as online peer support. If it were feasible to offer at least

some W-O CR sessions, potentially more women would participate, and achieve the 20% mortality and morbidity reductions associated with participation.

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Table 1: Characteristics of programs with women-only classes, and association with offering such classes

Factor	Program offers W-O CR°	Program does not offer W-O CR°	Univariate Test Statistic	p
Year program started	2001.2 ± 15.3	2001.3 ± 12.2	t=0.08	0.94
CR Location			chi-square=4.60	0.09
Urban	90 (81.8%)	595 (73.2%)		
Suburban	13 (11.8%)	114 (14.0%)		
Rural	7 (6.4%)	104 (12.8%)		
CR Facility Located in;			chi-square=20.50	0.001
Academic hospital	64 (58.2%)	378 (46.6%)		
Community hospital	10 (9.1%)	158 (19.5%)		
Rehabilitation hospital	17 (15.5%)	64 (7.9%)		
Other	5 (4.5%)	50 (6.2%)		
Not in a hospital	14 (12.7%)	162 (20.0%)		
CR located in a tertiary hospital (yes)	64 (58.2%)	378 (46.6%)	chi-square=5.30	0.03
Source of funding			chi-square=0.61	0.74
Public	57 (52.3%)	457 (56.0%)		
Private	23 (21.1%)	152 (18.6%)		
Hybrid	29 (26.6%)	207 (25.4%)		
Estimated cost to treat one patient/ program (PPP 2016)	\$1268.8 ± 1637.9	\$1281.9 ± 2449.9	t=0.05	0.96
Wait time to start (weeks)	3.7 ± 4.2	3.6±3.6	t=-0.38	0.70
Patient volume (no. of patients served/program /year)	868.6 ± 1774.6	446.0 ±706.3	t=-2.30	0.02
Number core components offered‡	9.3 ± 1.6	8.7± 1.8	t=-3.23	0.001
Maximum number patients/exercise session	14.0 ±12.1	11.5±7.5	t=-2.60	<0.01

Telemetry available	84 (76.4%)	418 (53.5%)	chi-square=20.50	<0.001
Program offers alternative forms of exercise ^a	61 (56.5%)	290 (35.5%)	chi-square=-17.76	<0.001
Number of education sessions offered / patient/program	7.8 ± 7.8	8.5 ± 11.1	t=0.78	0.44
Duration of education sessions (minutes)	43.1±28.4	47.4±30.0	t=1.46	0.15
Dose (total number of prescribed sessions/patient/program)	27.1 ± 22.0	28.74 ± 27.7	t=0.54	0.59
Program offers CR in alternative settings (e.g., home, community)	39 (35.5%)	236 (30.2%)	chi-square=-1.26	0.26
Healthcare professionals on CR team (full or part-time)				
Cardiologist	108 (98.2%)	592 (74.6%)	chi-square =30.90	<0.001
Nurse	101 (92.7%)	694 (87.2%)	chi-square =2.70	0.10
Dietitian	97 (90.7%)	623 (78.6%)	chi-square =8.60	<0.01
Physiotherapist	88 (81.5%)	624 (78.6%)	chi-square =0.49	0.49
Other exercise professional*	37 (33.9%)	390 (49.5%)	chi-square =9.28	<0.01
Administrative assistant	83 (79.0%)	498 (63.6%)	chi-square =9.80	<0.01
Mental health care professionals**	32 (30.2%)	195 (24.4%)	chi-square =1.65	0.20
Total number staff on CR team†	7.5 ± 3.23	5.7 ± 2.6	t=-5.77	<0.001
Barriers to CR Delivery[§]				

Lack of patient referral	3.16±1.6	3.35±1.5	t=1.16	0.25
Lack of equipment	2.25±1.3	2.42±1.4	t=1.29	0.20
Lack of space	2.50±1.4	2.80±1.5	t=2.16	0.03
Lack of human resources	2.8±1.5	3.21±1.44	t=2.68	<0.01
Lack of financial resources	3.4±1.5	3.5±1.4	t=1.08	0.28

* Combination of kinesiologists, exercise specialists, exercise physiologists and/or biokineticists

**Combination of psychologist, psychiatrist and/or social worker

†i.e., cardiologist, physiatrist, sports medicine physician, nurse/ practitioner, physiotherapist, exercise specialist/ kinesiologist, psychiatrist/ psychologist / social worker, dietitian, pharmacist, community health worker, administrative assistant/ secretary, other; part-time staff were counted as 0.5.

‡11 core components (as per CR societies statements[31],[32],[33],[34] were considered: initial assessment, risk assessment/stratification, exercise training, patient education, management of CV risk factors, nutrition counselling, stress management, smoking cessation, vocational counselling/return-to-work, end-of-program re-assessment and communication with primary care.

§ Scores range from 1 (this is definitely not an issue) to 5 (this is a major issue).

⊠ Alternative forms of exercise, such as yoga, dance or tai-chi

° n (%) or mean ± standard deviation

Note: Due to missing data, percentages are computed where the denominator is the number of valid responses from responding programs.

Acronyms: CR, cardiac rehabilitation; W-O, Women-only; SD, standard deviation; PPP, purchasing power parity.[46]

Table 2: Proportion of programs offering women-only CR in countries offering it (N=38)

WHO region n (%)	World Bank Country Income Classification	# CR programs responded /# CR programs in country (%)	# CR programs offering W- O CR
Africa			
South Africa	UMI	14/23 (60.9%)	3 (21.4%)
<i>Regional total (mean %)</i>			3 (21.4%)
Americas			
Brazil	UMI	30/75 (40.0%)	2 (6.7%)
Canada	HIC	57/170 (33.5%)	7 (12.3%)
Chile	HIC	1/10 (10.0%)	1 (100.0%)
Colombia	UMI	48/50 (96.0%)	3 (6.3%)
Paraguay	UMI	3/3 (100.0)	1 (33.3%)
United States*	HIC	65/2632 (2.5%)	4 (6.2%)
Uruguay	HIC	5/12 (41.7%)	1 (20.0%)
<i>Regional total (mean %)</i>			19 (9.4%)
Eastern Mediterranean			
Afghanistan	LIC	1/1 (100.0%)	1 (100.0%)
Bahrain	HIC	1/1 (100.0%)	1 (100.0%)
Iran	UMI	14/34 (41.2%)	7 (50.0%)
Pakistan	LMI	2/4 (50.0%)	1 (50.0%)
Qatar	HIC	1/1 (100.0%)	1 (100.0%)
<i>Regional total (mean %)</i>			11 (80.0%)
Europe			
Austria	HIC	5/26 (19.2%)	1 (20.0%)
Belarus	UMI	1/5 (20.0%)	1 (100.0%)
Bosnia And Herzegovina	UMI	1/1 (100.0%)	1 (100.0%)

Czech Republic	HIC	6/15 (40.0%)	1 (16.7%)
Finland	HIC	11/25 (44.0%)	1 (9.1%)
France	HIC	16/130 (12.3%)	1 (6.3%)
Georgia	UMI	13/17 (76.5%)	1 (7.7%)
Germany	HIC	34/120 (28.3%)	5 (14.7%)
Greece	HIC	4/4 (100.0%)	3 (75.0%)
Hungary	HIC	20/33 (60.6%)	2 (10.0%)
Israel	HIC	6/22 (27.3%)	1 (16.7%)
Italy	HIC	70/221 (31.7%)	12 (17.1%)
Lithuania	HIC	9/25 (36.0%)	2 (22.2%)
Poland	HIC	21/56 (37.5%)	1 (4.8%)
Portugal	HIC	21/23 (91.3%)	1 (4.8%)
Serbia	UMI	2/2 (100.0%)	1 (50.0%)
Spain	HIC	47/87 (54.0%)	3 (6.4%)
Turkey	UMI	9/10 (90.0%)	4 (44.4%)
United Kingdom	HIC	83/296 (28.0%)	3 (3.6%)
<i>Regional total (mean %)</i>			45 (32.6%)
South-East Asia			
India	LMI	18/23 (78.3%)	2 (11.1%)
Indonesia	LMI	10/13 (76.9%)	1 (10.0%)
<i>Regional total (mean %)</i>			3 (10.6%)
Western Pacific			
Australia	HIC	85/314 (27.1%)	1 (1.2%)
China	UMI	83/216 (38.4%)	25 (30.1%)
Malaysia	UMI	4/6 (66.7%)	1 (25.0%)
New Zealand	HIC	27/43 (62.8%)	2 (7.4%)
<i>Regional total (mean %)</i>			29 (15.9%)

Global total (mean %)		848/4749 (17.9%)	110 (13.0%)
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*random sub-sample of only 250 programs surveyed. Therefore, proportion of programs offering women-only classes should not be over-interpreted.

Acronyms: HIC, high-income country; UMI, upper-middle income country; LMI, lower-middle income country; LIC, Low-income country, WHO=World Health Organization

Figure

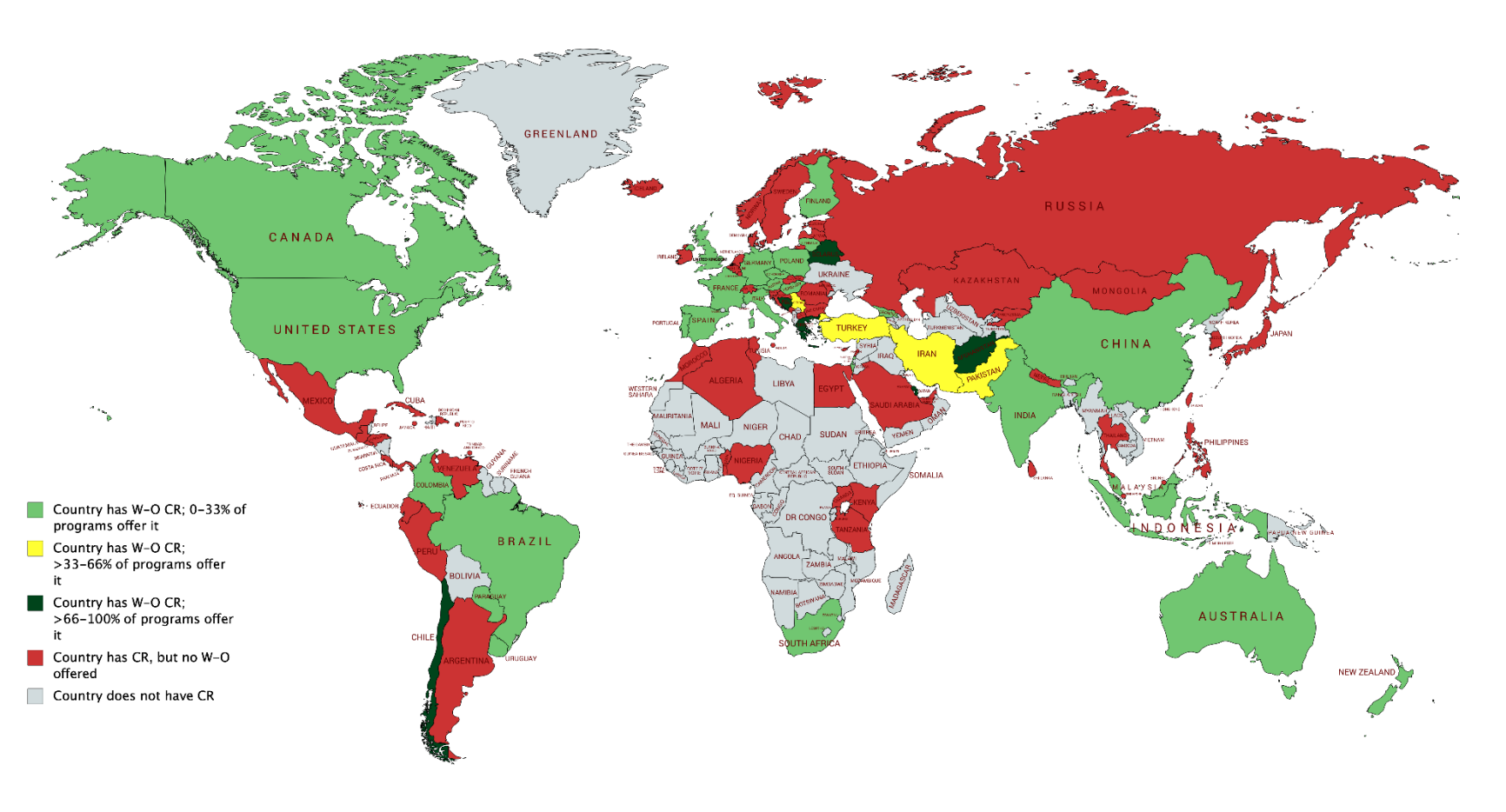


Figure 1. Countries offering women-only cardiac rehabilitation classes, and proportion of programs offering it.

CR: Cardiac rehabilitation; W-O: women-only

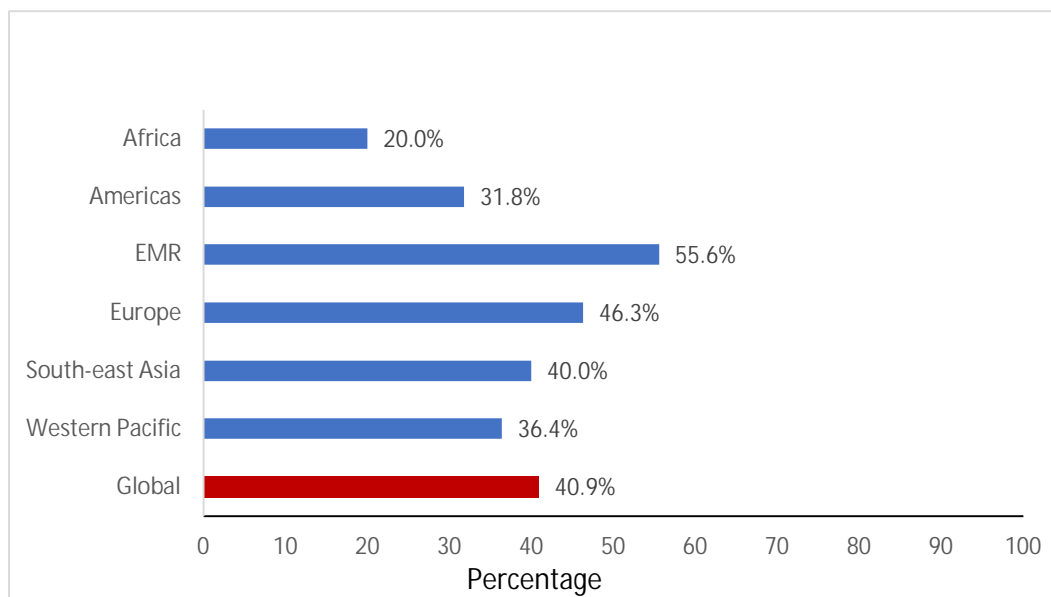


Figure 2. Percentage of countries offering women-only classes by WHO region.

Note: General linear mixed model (considers countries nested within regions) comparing availability of women-only classes by region $p=0.22$.

WHO, World Health Organization; EMR, Eastern Mediterranean Region