Title Page

Type of Submission: Original Investigation

Full Title: Evaluation of an Online Course in Five Languages for Inpatient Cardiac Care Providers on Promoting Cardiac Rehabilitation: Reach, Effects and Satisfaction

Running Title: Course for Promoting CR at Bedside - Evaluation

Authors: Fiorella A. Heald, MD[a,b]; Carolina Santiago de Araújo Pio, PhD[b]; Xia Liu, RN, MN[c]; Fernando Rivera Theurel, MD[b]; Bruno Pavy, MD[d]; Sherry L. Grace, PhD[a,b,e]

[a]Faculty of Health, York University, Toronto, Ontario, Canada

[b]KITE-Toronto Rehabilitation Institute, University Health Network, University of Toronto, Ontario, Canada

[c]School of Nursing, Shanghai Jiaotong University, Shanghai, China

[d]Cardiac Rehabilitation Department, Hospital Loire-Vendée-Océan, Machecoul, France

[e]Peter Munk Cardiac Centre, University Health Network, University of Toronto, Ontario, Canada

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

Keywords: cardiac rehabilitation, health personnel, patient participation, training course, continuing education

Sources of Support: None

Conflicts of Interest: All authors declare no conflicts of interest.

Author Statement: All authors have read and approved the manuscript.

Word count: 2814

Number of tables: 3

Number of figures: 1

Number of references: 17

Number of online supplemental materials: 4

Structured Abstract

Purpose: Evidence proves health care providers should promote cardiac rehabilitation (CR) to patients face-to-face to increase CR enrollment. An online course was designed to promote this at the bedside; it is evaluated herein in terms of reach, effect on knowledge, attitudes, discussion self-efficacy and practices, and satisfaction.

Methods: Design was observational, one-group pretest-posttest. Some demographics were requested from learners taking all language versions of the 20-minute course: English, Portuguese, French, Spanish, and simplified Chinese, available at https://globalcardiacrehab.com/CR-Utilization. Investigator-generated items in the pre- and post-test and evaluation survey administered using Google Forms were based on Kirkpatrick's training evaluation model.

Results: The course was initiated by 522 learners from 33/203 (16.3%) countries; most commonly female (n=341, 65.3%) nurses (n=180, 34.5%) from high-income countries (n=259, 56.7%), completing the English (n=296, 56.7%) and Chinese (n=108, 20.7%) versions. 414 (79.3%) completed the post-test and 302 (57.9%) completed the evaluation. Median CR attitudes were 5/5 on the Likert scale at pre-test, suggesting some selection bias. Mean CR knowledge (7.22±2.14/10), discussion self-efficacy (3.86±0.85/5), and practice (4.13±1.11/5) significantly improved after completion of the course (all $P<.001$). Satisfaction was high regardless of language version (4.44±0.64/5; $P=.593$).

Conclusions: This free, open-access course is effective in increasing CR knowledge, self-efficacy, and encouragement practices among participating inpatient cardiac providers, with high satisfaction. While testing impact on actual CR use is needed, it should be more broadly

disseminated to increase reach, in an effort to increase patient enrollment in CR, to reduce morbidity and mortality.

Condensed Abstract

Health care providers should promote cardiac rehabilitation (CR) to patients face-to-face to increase enrollment. An evidence-based 20-minute online course for inpatient cardiac providers on promoting patient participation available in 5 languages and assessed in 522 learners in 33 countries was effective in increasing CR knowledge, self-efficacy, and encouragement practices.

INTRODUCTION

Cardiac rehabilitation (CR) is a comprehensive care model for secondary prevention.[1,2] Participation improves outcomes, including quality of life,[3] morbidity and mortality.[4] Despite guidelines recommending CR referral,[5] CR utilization is sub-optimal.[6,7] While there is considerable variability, meta-analyses of internationally-available data reveal only an average of 43% of eligible patients are referred to CR,[8] and 42% enrol[9]; rates are much lower in low-resource settings.[10]

A Cochrane review of trials to increase CR utilization revealed that health care providers (HCP) are influential in encouraging patients to enroll, particularly when they do so face-to-face.[11] Correspondingly, following a needs assessment, a free, theoretically-based[12] online course was developed for HCP as a tool to implement these findings (http://learnonthego.ca/Courses/promoting_patient_participation_in_CR_2020/promoting_patient_participation_in_CR_2020EN/story_html5.html).[13] It educates HCP about CR, conveys the importance of their encouragement, as well as how they can provide strong, positive CR endorsement to patients at the bedside. No other courses addressing this are available internationally to our knowledge. Initial evaluation at a single centre in Canada was positive.[13]

A generic version has been created that is applicable globally, to promote CR also in low-resource settings where it is greatly needed. It has been translated to four other languages. Herein we evaluate: (1) reach, (2) effect on CR knowledge, attitudes, discussion self-efficacy and practices, as well as (3) satisfaction with the course.

METHODS

This was an observational study, using a one group pretest-posttest design. The multi-step, evidence-based development process and validation of the English online course is described elsewhere.[13] The course takes approximately 20 min to complete, including all assessments, but is not time-limited.

This English version, including the embedded point-of-care tool with discussion points for download (Supplemental Figure 1) as well as assessments, were translated to Portuguese, French, Spanish and traditional Chinese character; languages were chosen based on CR need by country/ region,[14] or request from International Council of Cardiovascular Prevention and Rehabilitation (who developed the position statement on which the course is based)[6] member associations. They were first translated via Google Translate, which was then edited by a bilingual CR expert, except the Chinese version which was translated by a bilingual CR expert, and then reviewed by several nurses and a professional translator. Images were revised as needed, and each version has an embedded patient handout regarding CR from a reliable source in the corresponding language.

The courses were created in Articulate, and are posted on http://learnonthego.ca with the support of educational developers at University Health Network (Toronto); the Chinese version was posted using Sojump. All are freely available at: https://globalcardiacrehab.com/CR-Utilization.

The translations are disseminated by the International Council of Cardiovascular Prevention and Rehabilitation to member associations, as well as more broadly via their website and social media. The course is also shown on some guideline clearinghouses as a position statement[6] implementation tool (Canadian Medical Association Infobase, Guidelines International Network, and ECRI Institute).

Learners are first directed to an embedded pre-test survey created in Google Forms. After viewing the course, they are again directed to Google Forms to take a post-test, and then to complete a course evaluation. Learners provide 3 initials to enable linkage of pre- and post-test surveys only. Participants are required to complete the pre- and post-tests as well as evaluation in order to attain a completion certificate for continuing professional education credits (Canadian Cardiovascular Society / Royal College of Physicians and Surgeons of Canada [who have agreements with American Medical Association], Continuing Professional Development–United Kingdom; note these associations also disseminate the course via their channels).

PARTICIPANTS

The course is directed towards any acute cardiovascular HCP in any country working with patients indicated for CR, or those wanting to. Test scores and evaluation responses from inception (i.e., September 2019 for English, June 2020 for Portuguese and French, September 2020 for Chinese, and October 2020 for Spanish) to November 2020 were utilized. Learners who completed any test items were included.

MEASURES

Sociodemographic and occupational characteristics were assessed pre-test (Supplemental Material 1). The pre- and post-test surveys as well as evaluation items were designed to assess participants' reaction to the course (level 1; i.e., satisfaction etc.), learning (level 2; i.e., knowledge, attitudes, self-efficacy), and behavior (level 3; i.e., CR discussion practices) based on Kirkpatrick's training evaluation model.[12] This well-established conceptual framework, also including a 4th level of results, enables assessment that educational activities lead to desired outcomes.

The pre- and post-tests consist of the same 6 multiple-choice and 4 true-or-false questions assessing knowledge (Supplemental Material 1; section A; Kirkpatrick level 2). The number of correct knowledge answers in the pre- and post-tests (first attempt) was computed for the 10 questions in section A (0 as the lowest and 10 as the highest score denoting greatest knowledge), as per the scoring key in Supplemental Material 1. Some items were revised for clarity or to avert ceiling effects, and some new items were added (denoted in Supplemental Material 1).

There are also 7 questions assessing CR knowledge (1 item), attitudes (1 item), self-efficacy (3 items), and practice (2 items), on Likert scales, all created by the authors (Supplemental Material 1, section B; Kirkpatrick Levels 2 and 3). Around the time of creating the translations, these non-evaluation item responses were perused to understand performance.

Finally, the evaluation and feedback survey (Kirkpatrick level 1) was comprised of 5-point Likert scale and open-ended items regarding learners' perception and comments on the course (Supplemental Material 2).

STATISTICAL ANALYSES

Statistical analyses were performed using the Statistical Package for Social Sciences version 27 for Macintosh. Descriptive statistics were first used to describe reach (i.e., number of learners who initiated the course and their country of origin) and learner characteristics. The number of learners who fully completed the post-test survey was computed; differences between completers and non-completers were tested using chi-square and the Mann-Whitney U test as applicable.

To assess effects, total knowledge scores were computed; mean and standard deviation were calculated for total knowledge pre- and post-test (section A). Individual items from the pre- and post-tests were tested using McNemar's tests to investigate any significant change in the

proportion of correct answers after completion of the course. Wilcoxon signed-rank tests were computed to test for changes in total knowledge scores from pre to post-test.

Section B relate to levels 2 and 3 of Kirkpatrick's model. Most items were scored on a 5-point Likert scale, but items 2 and 4 related to discussion practices were scored on a 3-point Likert scale; for these 2 items, the mean score was converted into a 5-point Likert scale to facilitate comparison with other items. Mean and standard deviation or frequencies and percentages were computed for each item. To assess change in total pre- and post-test scores for continuous items for learners who fully completed both, Wilcoxon signed-rank tests were used.

To assess whether sex, profession, years in practice, country income classification and course language were associated with the pre- and post-test knowledge scores and other course effects, linear regressions with a stepwise method were used. Finally, for the evaluation portion, mean and standard deviations were computed for the Likert-type items, and an overall mean was computed. Open-ended responses were coded using content analysis.[15]

RESULTS

Overall, 522 learners from 33 (16.3% of all globally) countries initiated the course; 198 (43.3%) were from lower-middle- and upper-middle-income countries (n=15; 45.5% of countries). Their characteristics are shown in Table 1. There were 52 (10.0%) students, primarily in kinesiology. Allied health care professions specified were most commonly: physiotherapists (n=33), kinesiologists (n=8), and exercise physiologists (n=7).

Four hundred and fourteen (79.3%) completed the post-test; years in practice was significantly greater among learners who did not finish the post-test, and the Chinese version had a significantly higher proportion of completers compared to any of the other language versions

(Table 1). Learners from lower-middle-income countries (42.9%) were significantly less likely to complete the post-test survey (*P*=.032). Finally, 302 (57.9%) completed the evaluation survey.

CR knowledge scores (multiple choice) are presented in Table 2. As shown, there were significant improvements in knowledge scores on 5/10 items, as well as in the overall score upon completing the online course.

The mean scores from the Likert items in section B (i.e., knowledge, attitudes, self-efficacy, and practice for Kirkpatrick's levels 2 and 3) are presented in Table 3. As also shown, there were significant increases from pre to post-course on 6 of the 7 items, with significant increases in the overall scores as well.

Finally, in the linear regression models, the correlates of higher knowledge pre-test scores (section A) were the English version (*B*=1.75; *P*<.001), more years in practice (*B*=0.02; *P*=.008), and being a female (*B*=0.42; *P*=.016); being an allied HCP (*B*=–0.51; *P*=.004), being from a lower-income country (*B*=–1.24; *P*=.004), and the Chinese version (*B*=–0.54; *P*=.015) were associated with lower scores. Correlates of higher knowledge post-test scores were the English version (*B*=2.66; *P*<.001); the Chinese version (*B*=–1.18; *P*<.001), being from a lower-income country (*B*=–3.52; *P*<.001), being a male (*B*=–0.69; *P*<.001), and being an allied HCP (*B*=–0.50; *P*=.006) were associated with lower scores. For section B (Kirkpatrick's level 2 and 3), at pre-test, the French version (*B*=0.61; *P*=.001) and more years in practice (*B*=0.01; *P*=.009) were associated with significantly greater scores; the Chinese version was associated with significantly lower scores at pre-test (*B*=–0.79; *P*<.001) and post-test (*B*=–0.50; *P*<.001).

Learner responses to course evaluation Likert items are shown in Figure 1; satisfaction was very high. With regard to the open-ended items (n=82 responses), the most significant things participants learned from this course included: identifying good and poor candidates for CR

(n=15; 18.3%), how to conduct CR discussions with patients (n=14; 17.1%), the importance of HCP promoting CR to patients (n=11; 13.4%), evidence of CR benefits (n=11; 13.4%), factors that should / should not impact referral to CR (n=5; 6.1%), CR components (n=4; 4.9%), and availability of alternative CR delivery models (e.g., women-focused and home-based CR; n=4, 4.9%). Participants reported benefits as a result of taking this course included (n=79 responses): starting to discuss the importance of CR with their patients and encouraging them to participate (n=56; 70.1%), sharing this new knowledge of CR / this course with their colleagues (n=11; 13.9%), and referring more eligible patients to CR (n=3; 3.9%).

Seventy participants reported anticipated barriers or opportunities as they applied what they learned in this course. Reported barriers included: limited resources or access to CR (such as availability of CR programs locally and alternative delivery models; n=14; 20.0%), patient perception / acceptance of the importance of CR (n=11; 15.7%), and that implementing this new knowledge would require a team effort and they have limited health human resources where they work (n=7; 10.0%); Nineteen (27.1%) respondents reported no barriers. Anticipated opportunities included: availability of alternative CR delivery models (n=7; 10.0%), and patients would feel motivated if they are encouraged and informed of CR benefits (n=3; 4.3%). Finally, additional comments or feedback participants shared (n=32 responses) included positive feedback such as the usefulness and good quality of, as well as satisfaction with, the course (n=21; 65.6%); learners also offered some minor suggestions for improvements, changes, and additional content (n=7, 21.3%).

DISCUSSION

Based on evidence, HCP should promote CR to patients face-to-face in order to increase CR enrollment.[16] This study aimed to evaluate a generic version of an online professional

development course available in 5 languages to promote CR encouragement practices of inpatient HCP. While reach is modest to date, knowledge, self-efficacy and encouragement intentions of HCP significantly increased after completing this online course; participating HCP reported high satisfaction with the course, such that it is warranted to promote this more broadly.

Learners have taken the course from all World Health Organization regions. Learners from these diverse countries had significant improvements in CR knowledge, self-efficacy and practice, as well as evaluated this course positively, supporting international applicability. Indeed, great efforts were taken to get input on the course to ensure broadest relevance, but it must be conceded that in some countries some of the content would not apply, such as having available translators for example.

Nevertheless, while the International Council of Cardiovascular Prevention and Rehabilitation's global audit ascertained CR is available in 111/203 (54.7%) countries of the world,[14] we have only reached HCP in one-third of those (Table 1). But if one considers there is only sufficient density such that CR encouragement is not futile (i.e, at least 1 spot for every 15 incident ischemic heart disease patients per year) in approximately 45 countries,[14] then our international reach is somewhat more favourable. Considering CR utilization is suboptimal in almost every country (with the potential exception of the United Kingdom), we must endeavour to reach more HCP in countries where CR density is greatest such that they have the capacity to treat referred patients,[14] such as the United States, Canada, Argentina, Barbados, Uruguay, Colombia, France, Australia, Grenada, Guam, as well as Trinidad and Tobago, where the first language spoken matches the course translations available. We are doing a good job in Canada, but clearly we must reach more physicians and males.

Respondents from all but 4 countries are from countries where CR density is very low.[14] Pre-test knowledge scores were significantly lower among these respondents, especially those in China-- where CR is growing at the fastest rate of any country globally-- suggesting need for the course and that we are reaching our intended audience. These HCP likely work in institutions with CR programs, and we hope they may now champion broader availability with their new knowledge.[17]

This study provides some insights regarding areas where CR knowledge is still limited, even after course completion. It was insufficiently evident to learners that inspiratory muscle training is not a major component of CR,[1] that a HCP (not volunteer) should be encouraging patients to attend as there is more impact,[11] that all patients should be encouraged to attend whether one has a perception a patient may or may not be willing to attend, and that few patient factors should discourage referral.[6]

Caution is warranted in interpreting these findings. First, in relation to design, there was no control group as a comparison, so effects of history and practice effects from the first knowledge test cannot be ruled out as alternative explanations for the increases observed. Moreover, there was no randomization, so no causal conclusions can be drawn; further testing through a randomized design is warranted based on the promising results herein. Second, the translations were not undertaken by professional translators, which may have limited conveyance of key concepts and impacted the comprehensibility of the survey items; there were a few differences when comparing the survey results from the various language versions (data not shown) which have been due to measurement error. Third, generalizability is limited as the sample is one of convenience. Moreover, there may be selection bias, such that people who were interested in taking the course may value the importance of CR (e.g., at pre-test, learners rated

the importance of providing CR information to patients and intention to do so as 5/5). This may have resulted in higher scores on the pre-test, minimizing capacity for change at post-test; this appeared to be the case for CR attitudes, where an observable increase was precluded due to a ceiling effect. Fourth, while attrition for the post-test was minimal, there was some retention bias in terms of years in practice and much higher retention for those completing the Chinese versus all other language versions; retention for the post-course evaluation was moderate.

Finally, there are measurement issues. The measures were investigator-generated, and there were some issues with the knowledge items identified. Moreover, the outcomes assessed were limited. Retention of knowledge and attitude change was not measured (i.e., no follow-up post-course); most crucially, clinical practice impacts (i.e., whether more HCP are having CR discussions with patients routinely after completing the course, and the quality of the discussions; Level 4 of Kirkpatrick's model[12]) and self-efficacy after having some discussions with patients at the bedside were not assessed. It would also be useful to know if HCP are using the point-of-care tool (Supplemental Figure 1) to ensure comprehensive discussions with patients, and whether they are providing the patient handout recommended in the course. Future research should assess whether more patients treated by HCP who have completed the course are actually enrolling in CR more often compared to patients treated by HCP who have not taken the course.

CONCLUSIONS

Considering as well the previous positive evaluation of this course,[13] results of this study suggest this open access, evidence-based online course to promote patient participation in CR available in 5 languages is effective in increasing CR knowledge, self-efficacy, and encouragement practices among inpatient cardiac HCP. HCP were very satisfied with the course,

and while testing impact on actual CR use is needed, concerted promotion is warranted. Each HCP that takes the course will treat many patients over many years, so impact on CR encouragement could be great. This should result in more patients enrolling in CR, ultimately reducing morbidity and mortality at a population level.

ACKNOWLEDGEMENTS

The authors acknowledge Ms. Magali Julien, from the University Health Network (Toronto, Canada) eLearning department for her support in launching the course translations.

REFERENCES

1. 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.
2. American Association for Cardiovascular and Pulmonary Rehabilitation (AACVPR). *Guidelines for Cardiac Rehabilitation and Secondary Prevention Programs*. 5th ed. Champaign, Illinois: Human Kinetics; US; 2013.
3. 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.
4. Anderson L, Thompson DR, Oldridge N, et al. Exercise-based cardiac rehabilitation for coronary heart disease. *Cochrane Database Syst Rev*. 2016;2016(1):CD001800.
5. 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. *Circulation*. 2011;124(22):2458-2473.
6. 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.
7. Grace SL, Prior PL, Mamataz T, Hartley T, Oh P, Suskin N. Cardiac Rehabilitation Component Attendance and Impact of Intervening Clinical Events, as Well as Disease Severity and Risk Factor Burden. *J Cardiopulm Rehabil Prev*. 2021;41(1):40-45.
8. 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.

9. Samayoa L, Grace SL, Gravely S, et al. Sex differences in cardiac rehabilitation enrollment: a meta-analysis. *Can J Cardiol*. 2014;30(7):793-800.

10. Turk-Adawi KI, Grace SL. Narrative review comparing the benefits of and participation in cardiac rehabilitation in high-, middle- and low-income countries. *Heart Lung Circ*. 2015;24(5):510-520.

11. 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(2):CD007131.

12. Kirkpatrick D. Great ideas revisited: revisiting Kirkpatrick's four-level model. *Train Dev*. 1996;50(1):54-59.

13. Santiago de Araújo Pio C, Gagliardi A, Suskin N, Ahmad F, Grace SL. Implementing recommendations for inpatient healthcare provider encouragement of cardiac rehabilitation participation: development and evaluation of an online course. *BMC Health Serv Res*. 2020;20(1):768.

14. Turk-Adawi K, Supervia M, Lopez-Jimenez F, et al. Cardiac rehabilitation availability and density around the globe. *EClinicalMedicine*. 2019;13:31-45.

15. Krippendorff K. *Content Analysis: An Introduction to Its Methodology*. 2nd ed. Thousand Oaks, California: Sage Publications, Inc.; 2004.

16. Khadanga S, Savage PD, Gaalema DE, Ades PA. Predictors of Cardiac Rehabilitation Participation. *J Cardiopulm Rehabil Prev*. 2021;(Ahead of Print).

17. Babu AS, Lopez-Jimenez F, Thomas RJ, et al. Advocacy for outpatient cardiac rehabilitation globally. *BMC Health Serv Res*. 2016;16(1):471.

Figure Legends

Figure 1. Course Evaluation, N=302

Mean and standard deviation shown.

Response options: 5=Strongly agree; 4=Agree; 3=Neither disagree, nor agree; 2=Disagree; 1=Strongly disagree; higher score indicates more positive evaluation.

Table 1. Reach and Characteristics of Health Care Providers Initiating Online Course by Retention

Characteristics	Completed Post-Test n=414 (79.3%)	Did not Complete Post-Test n=108 (20.7%)	Total[a] N=522
Sex			
Female	261 (76.5%)	80 (23.5%)	341 (74.9%)
Male	93 (81.6%)	21 (18.4%)	114 (25.1%)
Profession			
Physician	73 (75.3%)	24 (24.7%)	97 (21.7%)
Nurse or nurse-practitioner	147 (81.7%)	33 (18.3%)	180 (40.2%)
Allied health care provider or other	127 (74.3%)	44 (25.7%)	171 (38.2%)
Years in practice	11.12 ± 10.18	14.19 ± 10.07	11.80 ± 10.22[c]
Course language			[b]
English	226 (76.4%)	70 (23.6%)	296 (56.7%)[e]
Portuguese	30 (75.0%)	10 (25.0%)	40 (7.7%)[f]
French	17 (63.0%)	10 (37.0%)	27 (5.2%)[g]
Spanish	36 (70.6%)	15 (29.4%)	51 (9.8%)[h]
Chinese	105 (97.2%)	3 (2.8%)	108 (20.7%)[e,f,g,h]
Country			
Andorra[j]	1 (100.0%)	0 (0.0%)	1 (0.2%)
Australia	6 (100.0%)	0 (0.0%)	6 (1.3%)
Azerbaijan[j,k]	0 (0.0%)	1 (100.0%)	1 (0.2%)
Barbados	0 (0.0%)	1 (100.0%)	1 (0.2%)
Brazil[k]	28 (73.7%)	10 (26.3%)	38 (8.3%)
Brunei Darussalam	1 (100.0%)	0 (0.0%)	1 (0.2%)
Canada	107 (82.9%)	22 (17.1%)	129 (28.2%)
Chile	1 (100.0%)	0 (0.0%)	1 (0.2%)
China[k]	107 (97.3%)	3 (2.7%)	110 (24.1%)
Colombia[k]	9 (64.3%)	5 (35.7%)	14 (3.1%)
Egypt[k]	1 (100.0%)	0 (0.0%)	1 (0.2%)
France	9 (47.4%)	10 (52.6%)	19 (4.2%)

Greece	1 (100.0%)	0 (0.0%)	1 (0.2%)
India[k]	4 (36.4%)	7 (63.6%)	11 (2.4%)
Iraq[j,k]	0 (0.0%)	1 (100.0%)	1 (0.2%)
Ireland	6 (54.5%)	5 (45.5%)	11 (2.4%)
Malaysia[k]	1 (100.0%)	0 (0.0%)	1 (0.2%)
Myanmar[j,k]	1 (100.0%)	0 (0.0%)	1 (0.2%)
New Zealand	1 (50.0%)	1 (50.0%)	2 (0.4%)
Pakistan[k]	0 (0.0%)	1 (100.0%)	1 (0.2%)
Paraguay[k]	5 (50.0%)	5 (50.0%)	10 (2.2%)
Peru[k]	3 (100.0%)	0 (0.0%)	3 (0.7%)
Puerto Rico	1 (100.0%)	0 (0.0%)	1 (0.2%)
Qatar	5 (83.3%)	1 (16.7%)	6 (1.3%)
Russia[k]	2 (66.7%)	1 (33.3%)	3 (0.7%)
Saudi Arabia	2 (66.7%)	1 (33.3%)	3 (0.7%)
Singapore	2 (33.3%)	4 (66.7%)	6 (1.3%)
South Africa[k]	1 (100.0%)	0 (0.0%)	1 (0.2%)
Spain	18 (75.0%)	6 (25.0%)	24 (5.3%)
Thailand[k]	1 (50.0%)	1 (50.0%)	2 (0.4%)
United Arab Emirates	1 (100.0%)	0 (0.0%)	1 (0.2%)
United Kingdom	15 (57.7%)	11 (42.3%)	26 (5.7%)
United States of America	15 (75.0%)	5 (25.0%)	20 (4.4%)

Note: number of sample and percentages, or mean and standard deviation are shown.

[a]chi-square or Mann-Whitney U test comparing post-test completers to non-completers (i.e., answered all items).

[b]indicates $P<.05$.

[c]indicates $P<.01$.

[d]indicates $P<.001$.

[e,f,g,h,i]*post-hoc* test with Bonferroni when significant; $P<.001$

[j]country has no cardiac rehabilitation to our knowledge.[14]

[k]low or middle-income country according to World Bank (https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups).

Table 2. Provider Knowledge by Assessment Point

Test Item	Pre-test n=472	Post-test[a] n=414
1) Which of the following are benefits of CR? (all 3)	336 (71.2)	346 (83.6)[b]
2) There is high-quality evidence from trials demonstrating that cardiac rehabilitation should be recommended for acute coronary syndrome, coronary revascularization and ventricular arrhythmia patients.	131 (27.8)	201 (48.6)[b]
3) Patients with comorbid schizophrenia, advanced dementia and/or substance dependence are good candidates for cardiac rehabilitation.	327 (69.3)	300 (72.5)
4) Which one of the following patients is not a good candidate for CR?	254 (53.8)	358 (79.6)[b]
5) Which of the following is not a core component of CR?	231 (48.9)	240 (58.0)[b]
6) Who is responsible to communicate and provide positive cardiac rehab endorsement to the patient?	452 (95.8)	390 (94.2)
7) The evidence suggests it is key for a peer mentor or volunteer, not a health care provider, to encourage patients to participate in cardiac rehab.	307 (65.0)	280 (67.6)
8) Key messages you should convey to patients at the bedside about cardiac rehab do not include:	305 (64.6)	332 (80.2)[b]
9) Some patient groups, such as women, are less likely to participate in cardiac rehab, so precious time spent promoting attendance could be directed to patients that you believe are interested in attending.	133 (41.2)	111 (38.7)
10) Which of the following factors should NOT affect whom you encourage to attend cardiac rehab? (all 3)	202 (61.4)	179 (62.4)
Total score[c]	**6.28 ± 1.76**	**7.22 ± 2.14[b]**

CR, cardiac rehabilitation.

Note: Number of participants and percentage of those who answered each question correctly are shown.

[a]McNemar's test for individual items or Wilcoxon signed-rank test for the total score.

[b]indicates $P<.001$.

[c]Mean and standard deviation of overall test score out of 10.

Table 3. Provider Cardiac Rehabilitation Knowledge, Attitudes, Discussion Self-Efficacy, and Practice by Assessment Point

Test Item	Pre-test n=308	Post-test n=271
1) How familiar are you with what is offered and delivered to patients in CR?[a]	3.34 ± 1.28	4.01 ± 0.94[f]
2) Do you intend to discuss CR participation with eligible/indicated patients at the bedside?[b]	3.72 ± 1.53	4.40 ± 1.12[f]
3) Do you perceive you have all the information you need to comprehensively discuss CR at the bedside with your patients?[c]	3.12 ± 1.23	3.99 ± 0.90[f]
4) Do you provide any materials to patients about CR to take home with them (e.g., pamphlet or handout with weblink)?[b]	3.14 ± 1.73	3.87 ± 1.54[f]
5) How important is it to you to provide information about CR to patients before they are discharged?[d]	4.39 ± 0.95	4.43 ± 1.09
6) How confident are you that you can address any barriers patients raise regarding CR attendance?[e]	3.22 ± 1.03	3.77 ± 1.06[f]
7) How confident are you in answering questions patients raise about attending CR?[e]	3.29 ± 1.11	3.82 ± 1.08[f]
Overall Discussion Practice	**3.44 ± 1.35**	**4.13 ± 1.11[f]**
Overall Self-Efficacy	**3.21 ± 0.97**	**3.86 ± 0.85[f]**
Overall Total[g]	**3.48 ± 0.91**	**4.04 ± 0.73[f]**

Abbreviation: CR, cardiac rehabilitation.

Note: Mean and standard deviation are shown. Q-1 assesses knowledge; Q-5 attitudes; Q-3,6,7 self-efficacy; and Q-2,4 practice as per level 2 (learning) of Kirkpatrick's model.[12]

[a]scored on a 5-point Likert scale: 5=Very familiar; 4=Quite familiar; 3=Somewhat familiar; 2=Scantly familiar; 1=I am not familiar with CR

[b]scored on a 3-point Likert scale: 3=Yes, most of the time; 2=Sometimes; 1=No; converted into a 5-point Likert scale in analysis for comparability

[c]scored on a 5-point Likert scale: 5=Yes, I definitely have all the information I need to discuss CR; 4=Yes, I have the information I need; 3=I have most of the information I need; 2=I don't really have the information I need; 1=No

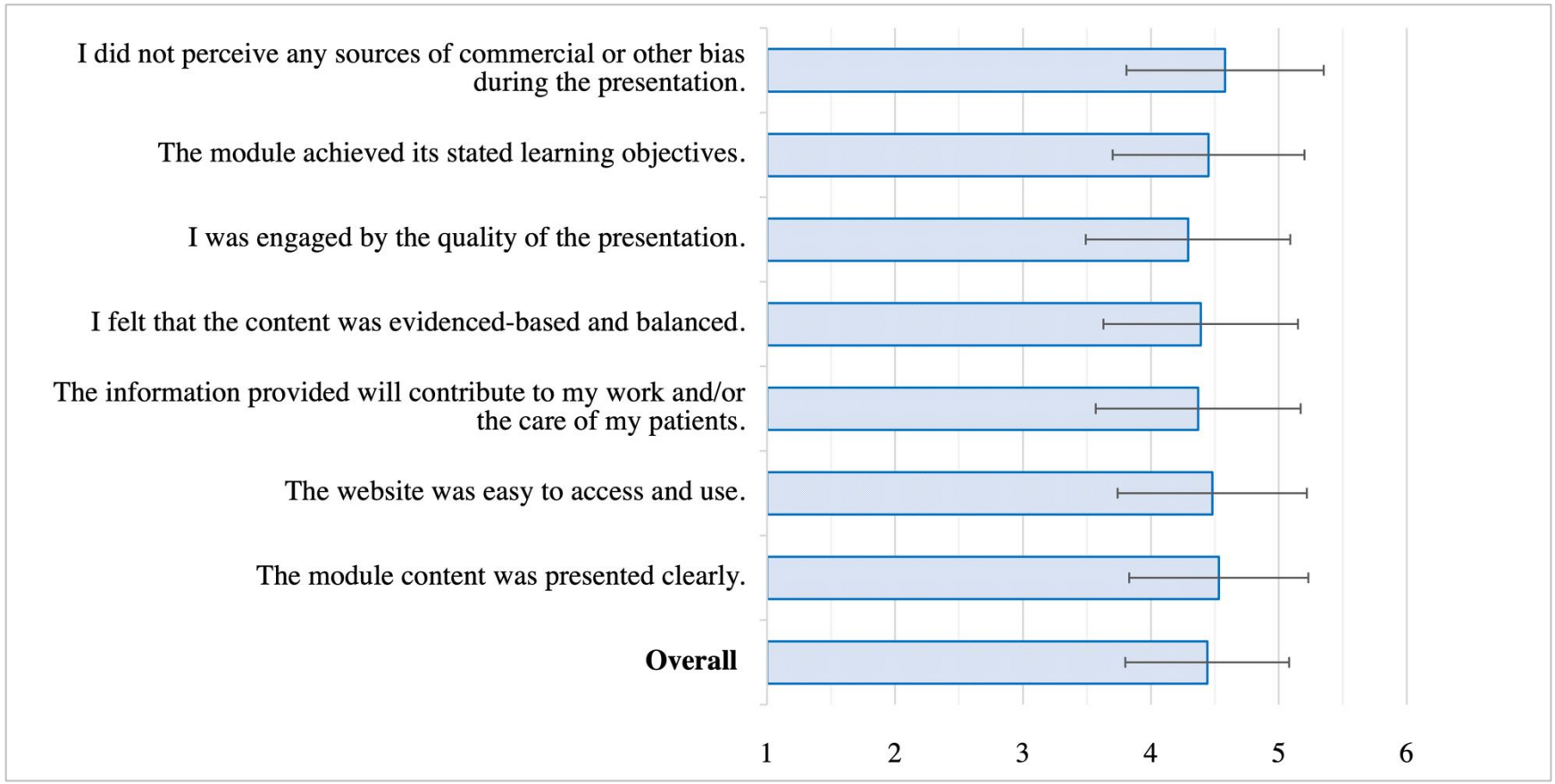
[d]scored on a 5-point Likert scale: 5=Very important; 4=Quite important; 3=Somewhat important; 2=Slightly important; 1=Not at all important

[e]scored on a 5-point Likert scale: 5=Very confident; 4=Quite confident; 3=Somewhat confident; 2=Not very confident; 1=Not at all confident

[f]Wilcoxon signed-rank test: $P<.001$.

[g]out of 5; higher score indicates better knowledge, attitudes, self-efficacy, or practice.

Figure 1.


I did not perceive any sources of commercial or other bias during the presentation.
The module achieved its stated learning objectives.
I was engaged by the quality of the presentation.
I felt that the content was evidenced-based and balanced.
The information provided will contribute to my work and/or the care of my patients.
The website was easy to access and use.
The module content was presented clearly.
Overall
1
2
3
4
5
6

SUPPLEMENTAL DIGITAL CONTENT

Evaluation of an Online Course in Five Languages for Inpatient Cardiac Care Providers on Promoting Cardiac Rehabilitation: Reach, Effects and Satisfaction

Fiorella A. Heald, MD; Carolina Santiago de Araújo Pio, PhD; Xia Liu, RN, MN, Fernando Rivera Theurel, MD; Bruno Pavy, MD; Sherry L. Grace, PhD

Supplemental Figure 1. Point-of-Care Tool with Discussion Points

Supplemental Material 1. Pre-Test of Online Course: "Promoting Patient Participation in Cardiac Rehabilitation"

Supplemental Material 2. Evaluation and Feedback Form for Online Course: "Promoting Patient Participation in Cardiac Rehabilitation"

Supplemental Figure 1. Point-of-Care Tool with Discussion Points

CR, cardiac rehabilitation.

Supplemental Material 1. Pre-Test of Online Course: "Promoting Patient Participation in Cardiac Rehabilitation"

Instructions: Please complete the following quiz. You will be asked to complete some of the same knowledge questions at the end of the course.

1) In which country do you work? _____

2) What is your profession?
   - ☐ Physician
   - ☐ Nurse / nurse-practitioner
   - ☐ Allied health care provider / Other (please specify below)

   2a) Specify your profession: _____

3) Years in practice: _____

4) Select your sex:
   - ☐ Female
   - ☐ Male
   - ☐ Prefer not to answer/other

Section A: Cardiac Rehabilitation Knowledge

1) Which of the following are benefits of cardiac rehabilitation (CR)? (check all that apply)*
   - □ **Reducing cardiovascular death and re-hospitalization**
   - □ **Guiding patients to lead a heart-healthy lifestyle**
   - □ **Significantly improving patient's quality of life**
   - □ Significant and sustained weight loss
   - □ All of the above are benefits of CR

2) There is high-quality evidence from trials demonstrating that cardiac rehabilitation should be recommended for acute coronary syndrome, coronary revascularization and ventricular arrhythmia patients.
   - □ True
   - □ **False**

3) Patients with comorbid schizophrenia, advanced dementia and/or substance dependence are good candidates for cardiac rehabilitation.
   - □ True
   - □ **False**

4) Which one of the following patients is not a good candidate for CR?
   - □ STEMI patient who is depressed

- □ PCI patient who is depressed
- □ NSTEMI patient who lives outside of the city
- □ **Patient with decompensated heart failure that lives outside of the city**
- □ Older NSTEMI patient without a spouse / informal caregiver to help with CR transportation

5) Which of the following is not a core component of CR? (check all that apply)*
   - □ Nutrition counselling/education
   - □ Smoking cessation interventions
   - □ **Inspiratory muscle training**
   - □ All of the above are offered as part of CR

6) Who is responsible to communicate and provide positive cardiac rehab endorsement to the patient?*
   - ☐ The acute care specialist
   - ☐ **All providers in the patient's circle of care play a role**
   - ☐ The family doctor

7) The evidence suggests it is key for a peer mentor or volunteer, not a health care provider, to encourage patients to participate in cardiac rehab
   - □ True
   - □ **False**

8) Key messages you should convey to patients at the bedside about cardiac rehab do <u>not</u> include:
   - □ **Cardiac rehab is heavily focused on exercise**
   - □ It is recommended patients with their heart condition attend cardiac rehab because of the benefits that are established
   - □ That they have been referred to cardiac rehab and the program will be calling them to arrange starting
   - □ That you perceive they will greatly benefit from participating in cardiac rehab and so you encourage them to go

9) Some patient groups, such as women, are less likely to participate in cardiac rehab, so precious time spent on promoting attendance could be directed to patients that you believe are interested in attending.†
   - □ True
   - □ **False**

10) Which of the following factors should NOT affect whom you encourage to attend cardiac rehab? (check all that apply)†
   - □ Patient being discharged to long-term care
   - □ **Female patient**
   - □ **Patient has peripheral vascular disease**
   - □ **Patient lacks proficiency in the language of the program delivery**

Section B: Knowledge, Attitudes, Self-efficacy, and Practice

1) How familiar are you with what is offered and delivered to patients in cardiac rehabilitation (CR)?
   - □ Very familiar
   - □ Quite familiar
   - □ Somewhat familiar
   - □ Scantly familiar
   - □ I am not familiar with CR

2) Do you intend to discuss CR participation with eligible/indicated patients at the bedside?
   - □ Yes, most of the time
   - □ Sometimes
   - □ No

3) Do you perceive you have all the information you need to comprehensively discuss CR at the bedside with your patients?
   - □ Yes, I definitely have all the information I need to discuss CR
   - □ Yes, I have the information I need
   - □ I have most of the information I need
   - □ I don't really have the information I need
   - □ No

4) Do you provide any materials to patients about CR to take home with them (e.g., pamphlet or handout with weblink)?
   - □ Yes, most of the time
   - □ Sometimes
   - □ No

5) How important is it to you to provide information about CR to patients before they are discharged?
   - □ Not at all important
   - □ Slightly important
   - □ Somewhat important
   - □ Quite important
   - □ Very important

6) How confident are you that you can address any **barriers** patients raise regarding CR attendance?
   - □ Not at all confident
   - □ Not very confident
   - □ Somewhat confident
   - □ Quite confident
   - □ Very confident

7) How confident are you in answering **questions** patients raise about attending CR?

- □ Not at all confident
- □ Not very confident
- □ Somewhat confident
- □ Quite confident
- □ Very confident

Notes:
Section A: assesses CR knowledge (score ranges from 0 as the lowest and 10 as the highest score denoting greatest knowledge; same for the old version).
Section B: Q-1 assesses knowledge; Q-5 assesses CR attitudes; Q-3,6,7 self-efficacy; and Q-2,4 practice (note Q-4 is worded "will you" at post-test).
Scoring: Bold font indicates the correct answer(s) for knowledge questions.
*item was revised slightly due to ceiling effect.
†item was added to improve the evaluation.
Abbreviations: CR, cardiac rehabilitation; PCI, percutaneous coronary intervention; STEMI, ST-elevation myocardial infarction.

Supplemental Material 2. Evaluation and Feedback Form for Online Course: "Promoting Patient Participation in Cardiac Rehabilitation"

Thinking about the eLearning module you just completed, please indicate to what degree you agree with each statement on the following rating scale:

	Strongly Disagree	Disagree	Neither Disagree, Nor Agree	Agree	Strongly Agree
1. I did not perceive any sources of commercial or other bias during the presentation.					
2. The module achieved its stated learning objectives.					
3. I was engaged by the quality of the presentation.					
4. I felt that the content was evidenced-based and balanced.					
5. The information provided will contribute to my work and/or the care of my patients.					
6. The website was easy to access and use.					
7. The module content was presented clearly.					

8. What is the most significant thing you learned/took away from this module?

_____
_____
_____

9. As a result of taking this online course, my patients, practice, research or health region will benefit because I will:

_____
_____

_____

10. What barriers and opportunities do you anticipate as you apply what you learned in this session?

_____
_____
_____

11. Additional comments and/or feedback you would like to share:

_____
_____
_____