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# Development, piloting and validation of the Recommending Cardiac Rehabilitation (ReCaRe) instrument

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ABSTRACT

*Background:* Health practitioners' values, attitudes and beliefs largely determine their referrals to cardiac rehabilitation (CR).
*Objective:* To develop and test the Recommending Cardiac Rehabilitation scale (ReCaRe), designed to assess health professionals attitudes, values and beliefs to CR referral.
*Methods:* ReCaRe was appraised for: content validity (Delphi method, expert panel); interpretability and face validity (interview, health professionals); factor structure and internal consistency (survey, health professionals); and test-retest reliability (survey, health professionals). Normative scores were collated.
*Results:* ReCaRe initially comprised 75 items. Initially, a Content Validity Index (CVI) was calculated for ratings of item relevance (CVI range; 0.27–1.0), which resulted in the removal of 19 items. After preliminary validation and psychometric testing, 34 items were factor-analysed ($n = 24$) providing a 17-item, four-factor scale: perceived severity and susceptibility ($\alpha = 0.93$, $\kappa = 0.37$); perceived service accessibility ($\alpha = 0.91$, $\kappa = 0.67$); perceived benefit ($\alpha = 0.97$, $\kappa = 0.47$); perceived barriers and attitudes ($\alpha = 0.82$, $\kappa = 0.49$). ReCaRe normative scores ($n = 75$) are reported.
*Conclusions:* This psychometric analysis found ReCaRe to demonstrate good face validity, internal consistency and fair to substantial test-retest reliability. The next step is to validate these initial findings on a larger sample size to confirm whether ReCaRe can enable identification of factors impacting CR referral.


## Background

Cardiac rehabilitation (CR) programs are advocated for all those patients who present with acute coronary syndromes (ACS).[1] There is now good evidence that these programs improve quality of life (QoL),[2] exercise capacity,[2,3] adherence to medication and lifestyle recommendations,[3] reduce hospital admissions,[2] morbidity[2–4] and mortality.[2–5] Aptly, guidelines for the management of ACS, world-wide, recommend CR as an integral component of patient care at Class I, Evidence A level.[6–8] Despite these recommendations and decades of effort to improve participation, CR programs continue to be underused.[9–14]

Reasons for suboptimal enrolment in CR programs have been attributed to numerous factors that can be categorized into patient, provider and health system barriers.[3,15,16] Many of these are difficult to overcome, such as patient factors e.g., age, gender, language and poor health literacy. Additionally, health-system factors include location, no public transport and lack of systematic referral systems.[3] In comparison, provider barriers such as lack of familiarity with CR and failure to communicate the benefits of CR have far greater potential to be overcome.[15,16] For example, two systematic reviews investigating factors affecting CR referral identified 'clinician endorsement' of CR as the most consistently identified factor affecting patient CR enrolment.[3,16] Essentially, referrals by clinicians have potential to improve the continuum of care, inclusive of subsequent CR participation rates.

Current methods of referral involve cardiologist, general practitioner, cardiac rehabilitation nurse or self-referral. Referral systems include paper based, fax, telephone bookings and electronic medical record

This work has not been presented in whole or in part in any professional or scientific forum.

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**Table 1**
Stages of ReCaRe development and psychometric evaluation

| Step | Objective | Methods/Processes | Participants | Item inclusion criteria |
|---|---|---|---|---|
| 1. Content validation—Delphi method | Identify a comprehensive set of relevant items for inclusion in ReCaRe | A literature review[13] identified the associated theoretical constructs whereby items from existing measurement instruments were then identified and adapted for CR referral Delphi method was used to obtain consensus for item inclusion via an expert panel | Expert panel comprised of CR clinicians; cardiac nurses, cardiac researchers; a psychologist; an epidemiologist | Item Content Validity Index (CVI) ≥0.6; expert panel consensus |
| 2. Content validation—expert interviews | Examine usability testing via face validity and interpretability of items | Face-to-face interviews using 'think-out-loud' method | 10 CR health professionals: 4 cardiologists; 3 occupational therapists; 2 cardiac nurses; 1 mental health nurse | Item interpretability applying criterion of saturation |
| 3. Psychometric validation—Chronbach's alpha and factor analysis | Determine ReCaRe factor structure and internal consistency | Online survey data; factor analysis and Cronbach's alpha | 24 health CR professionals including: cardiologists; nurses; physiotherapists; general practitioners | Items retained on basis of Cronbach's alpha (>0.80) Factors retained on basis of visualisation of screeplot. Items retained on basis of factor loadings of ≥0.50. |
| 4. Psychometric validation—test-retest reliability | Identify stability of the ReCaRe instrument over time | Online survey data (5-week interval); weighted Kappa statistic | 21 members of the Australian Cardiovascular Nursing College | Agreement nterpretation[22]: >0.40, moderate; >0.60, substantial; >0.80, excellent |

systems. A comprehensive review of CR referral and enrolment identified referral failure and lack of provider encouragement as key factors for low CR enrolment and endorsement by the clinician and a personal two-way discussion with the patient as key factors for improving referral practices.[9] Further, a recent review examining clinician attitudes, values and beliefs and their effect on CR referral identified that clinician knowledge of CR benefits, their value placed on CR programs and their personal health beliefs as underpinning referral patterns; concluding that 'clinicians' recommendations remain the strongest predictor of CR participation'.[10] These findings are well-aligned with two widely used theories in health behaviour research, the Health Belief Model (HBM)[17] and the Theory of Planned Behaviour (TPB).[18] Key to the HBM are attitudes and beliefs which are used to explain and predict health service uptake.[17] In terms of referral practice, this would relate to the value placed on CR by the clinician in terms of disease severity versus perceived benefits and barriers. Whereas the TPB predicts health behaviours in terms of attitudes, subjective norms and perceived control.[18] Thus, as per these theories, referral to CR is essentially determined by the clinicians expected outcomes of CR, salient beliefs toward CR and perceived ability for the patient to engage in CR. Formal assessment of the attitudes, values and beliefs of healthcare providers toward CR referral is therefore a logical step toward identifying and subsequently addressing any potential barriers to CR referral, e.g. via targeted education campaigns.

The theories of HBM and TPB have been used in the development of instruments measuring attitudes and beliefs across various conditions including diabetes,[19] angina,[20] coeliac disease[21] and in suicide prevention.[22] Furthermore, the integration of these two social psychological theories has been found to be particularly useful for development of effective communication campaigns that aim to change people's intentions to engage in a health behaviour.[23] However, to date, no such instrument exists for the measurement of these constructs in regard to CR referral practices. Thus, the primary aim of this study was to develop and test the psychometric properties of the Recommending Cardiac Rehabilitation (ReCaRe) instrument, a new scale designed to measure health professionals attitudes, values and beliefs to CR referral. A secondary aim was to obtain normative data for ReCaRe from a CR workforce.

## Methods

A mixed methods design was used in two stages. Stage One comprised the development and psychometric evaluation of ReCaRe. Stage Two was the collation of normative ReCaRe data from a sample of CR health professionals. Data was collected between 30 March 2016 - 31 December 2017. Ethics approval for each stage of the study was awarded by Flinders University Social and Behavioural Research Committee (#7230) and the University of South Australia Human Research Ethics Committee (#35608).

### *Stage One: development and psychometric evaluation of ReCaRe*

Development and testing of the psychometric properties of ReCaRe was guided by best practice[24] and conducted in four steps: 1 content validation - Delphi method; 2 content validation - expert interviews; 3 psychometric validation - Cronbach's alpha and factor analysis; and 4 psychometric validation - test-retest reliability (see Table 1). Developed to assess clinicians' attitudes, values and beliefs to CR referral, the initial version of items for inclusion in ReCaRe, were based on our review of the literature[10] and the two aligned psychological theories; the HBM and TPB.[17,18] As such, the initial version comprised 47 items (see Appendix B) sourced from scales assessing the core constructs of ReCaRe (attitudes, values and beliefs): Diabetes Health Belief Scale,[19] a scale that assesses attitudes about compliance with prescribed diabetes medical regimes (16 items); Angina Beliefs Scale,[20] a scale that elicits beliefs and misconceptions about angina (6 items); Attitudes to Suicide Prevention,[22] a scale that assesses health professionals attitudes toward suicide prevention (10 items); and 15 items based on the HBM and TPB composed by the authors. For steps 1–3 in Stage 1, a convenience sample was sourced via the health networks of the authors; of note, participants were not involved in more than one step.

### *Step 1 content validation—Delphi method*

*Participants.* A panel ($n = 13$) of national and internationally recognised experts in the field of cardiovascular health and rehabilitation working across Australia comprised: CR clinicians; cardiac nurses; cardiac researchers; a psychologist; and an epidemiologist.

*Procedure. Expert consensus via Delphi method.* Facilitated by an independent research consultant, the first version of ReCaRe (47 items) was presented and rated by the expert panel in a face-to-face meeting (round one). Two subsequent rounds were conducted via email. For each round members of the expert panel rated each item on a 4-point

scale from 'Totally irrelevant' (= 1) to 'Extremely relevant' (= 4) and were encouraged to provide reasons for their ratings, propose additional items and offer any additional comment regarding items i.e. clarity, response format, fit with target construct. After each round an anonymised summary of: item ratings, proposed additional and redundant items, and accompanying comments were circulated to the expert panel for further judgement of item necessity.

*Analysis.* Item ratings were analysed using a Content Validity Index (CVI). The CVI was calculated as a proportion (0–1.0) of total 'item relevance' ratings by each member of the expert panel, with higher scores indicating higher degrees of agreement by the panel on the relevance of an item for the scale. To ensure strong face validity, as agreed by the expert panel,[25] items with a CVI <0.6 were removed after each round (see Appendix D). As per Yaghmaie, 'content validity is a subjective judgment of experts about the degree of relevant construct in an assessment instrument'.[25] Proposed additional or redundant items or item alterations were agreed via consensus.

*Step 2 content validation—expert interviews*

*Participants.* A total of 10 CR health professionals directly involved in referral for CR were interviewed: 4 cardiologists; 3 occupational therapists; 2 cardiac nurses; and 1 mental health nurse.

*Procedure.* Usability testing for face validity and interpretability of items and response formats was accomplished using the 'think-out-loud' method in individual, face-to-face interviews[24] facilitated by an independent research consultant. Participants were asked to verbalize their thoughts as they read each item aloud. Participants were guided through the evaluation by a facilitator, who could prompt them if they stopped thinking aloud. The think-out-loud method offers a qualitative lens to understand the reasoning's behind participant choices. Informed consent was obtained, and interviews were recorded.

*Analysis.* The facilitator, primarily for the purpose of exclusion or revision, evaluated participant dialogues. Dialogue were assessed in terms of whether each item and response format were appropriate and easily understood by participants; items were revised accordingly. The criterion of saturation was applied; recruitment continued until no new issues were identified.

*Step 3 psychometric validation—Cronbach's alpha and factor analysis*

*Participants.* An online survey was sent to 67 health professionals working in the area of CR including: cardiologists; nurses; physiotherapists; and general practitioners. A convenience sample (independent of steps 1 and 2) was sourced via health networks of the authors.

*Procedure.* ReCaRe was administered using an online survey (LimeSurvey Version 2.05+ Build 150211). Surveys were anonymous and completion implied consent. Each item was scored on a 5-point Likert scale: 1) Strongly disagree to 5) Strongly agree. Accordingly, higher scores were indicative of a greater influence on decision making when recommending CR.

*Analysis.* Psychometric properties of ReCaRe were assessed by analysis of internal consistency and factorial structure. Factor analysis and Cronbach's alpha were applied on the modified questionnaire from step 2. Internal consistency was analysed by Cronbach's alpha, reflecting the internal correlation between items and factors. As a widely accepted rule of thumb, an alpha value of 0.70 is an acceptable lower bound for scale reliability, 0.80 is good and 0.90 is excellent.[22] In order to maximise scale reliability all items with an alpha value less than 0.80 were excluded. Dimensional structure of ReCaRe, and construct validity, was analysed by exploratory factor analysis. Factor extraction was performed using principal axis factoring with varimax rotation in order to maximize the loadings of as many items as possible on one or more of the factors. Once factors were established, a correlation matrix was generated, whereby the associations between items and factors were identified by factorial loadings greater than 0.50 on only one factor. Cronbach's alpha and factor analysis were performed using Stata v 11.2 (© 1985-2009 StataCorp LP. College Station, TX, USA).

*Step 4 psychometric validation—test-retest reliability*

*Participants.* Twenty-one members of the Australian Cardiovascular Nursing College (ACNC) were recruited (independent of steps 1 to 3) via email with a link to the survey.

*Procedure.* Internal consistency of ReCaRe was further determined using standard test-retest reliability indicating agreement between repeated assessments. The ReCaRe was administered online via LimeSurvey (Version 2.05+ Build 150,211) at two time points 3–6 weeks apart. Survey completion was anonymous, and completion was taken to imply consent.

*Analysis.* Test-retest reliability was estimated using the weighted kappa ($k$) statistic (SAS v.9.1, © 2002–2003, SAS Institute Inc., Cary, NC, USA) to provide a measure of test–retest reliability at item level. Clear guidelines for test-retest reliability exist with cut-off points established for interpretation of $k$: <0 poor; 0.00–0.19 slight; 0.20–0.39 fair; 0.40–0.59 moderate; 0.60–0.79 substantial; and 0.80–1.00 almost perfect agreement.[26]

*Stage 2: collation of normative ReCaRe data from a sample of CR health professionals*

*Participants*

Normative ReCaRe scores were generated from a sample of 81 Australian CR health professionals.

*Procedure*

To establish normative reference values ReCaRe was administered online via LimeSurvey (Version 2.05+ Build 150211). An email invite with a link to the online survey was distributed to members of the Australian Cardiovascular Health and Rehabilitation Association (ACRA); and to the Australian Nursing and Midwifery Federation (ANMF). Completion was anonymous and implied consent.

*Analysis*

Distribution of ReCaRe scores were performed using Stata v 11.2 descriptive analyses, overall and stratified by practitioner characteristics. Item summaries were presented using a radar plot.

## Results

*Stage One: development and psychometric evaluation of ReCaRe*

*Step 1 content validation—Delphi method*

All members of the expert panel ($n$ = 13) contributed to three rounds of Delphi technique, one face-to-face and two via email, to achieve consensus of ReCaRe items for Step 2 of content validation. Round 1 resulted in 28 additional items including items from: the Illness Perception Questionnaire-revised, modified for assessment of patients' representations of atrial fibrillation[27] (20 items); Pearlin's Mastery Scale, a scale that assesses the degree individual's believe their life is under their control[28] (3 items); and items relating to perceived quality and accessibility of CR services generated by members of the expert panel (5 items). Thus 75 items in total entered into Delphi Round 2. Items with a CVI <0.6 were removed (CVI range; 0.27–1.0).

Rounds 2 and 3 resulted in: removal of 19 items (CVIs <0.6); removal of eight items considered redundant; addition of 1 item; and revision of 16 items. Revision of items largely pertained to interpretability and consistency of wording. Consensus was also achieved on a 5-point Likert scale from 1 (Strongly Disagree) to 5 (Strongly Agree). Step 1 resulted in 49 items for inclusion in Step 2 content validation.

*Step 2 content validation—expert interviews*

Of the 49 items appraised in Step 2 two were removed, 24 were revised as per participant recommendations and 23 were accepted without revision. Removal of items was the result of poor item interpretability. Revision of items, for the most part, was replacement of 'referral' with 'recommend' to ensure instrument applicability to CR health professionals outside positions of formal referral. Step 2 resulted in 47 items for inclusion in Step 3 psychometric validation.

*Step 3 psychometric validation—Cronbach's alpha and factor analysis*

A 40% ($n = 27$) response rate was achieved to the online survey. Employment classifications of respondents were as follows: general practitioners ($n = 9$); cardiologists ($n = 5$); exercise physiologists ($n = 3$); registered CR nurses ($n = 4$); physiotherapists ($n = 2$); and four 'other'. Three records were incomplete, giving a total sample of 24. To further refine measurement of the construct iterative Cronbach's alpha was applied whereby between iterations weaker scale items are dropped (alpha values <0.80). Three iterations reduced the item set from 47 to 34.

To assist with scale refinement, explore and clarify scale structure and elucidate any salient subscales, principal factor analysis was used with these 34 items, identifying four salient factors (eigenvalues >2.0) clearly supported by the succeeding plateau on the scree curve. Seventeen items with item loadings of <0.50 were dropped. The final model included four factors and explained 45.6% of the variance. Cronbach's alpha demonstrated robust factor structure ranging from 0.82 to 0.97. Table 2 displays the factor loadings of the items. Theoretical interpretation of factors, based on the HBM and TPB, was implemented to identify the underlying factors each item best represented. Table 2 depicts each item according to its best-matched domain, where theory was not appropriate a pragmatic solution was applied e.g. service accessibility. Accordingly, each of the factors were assigned the following names: factor 1 'Perceived patient severity and susceptibility' accounted for 15.5% of total variance; factor 2 'Perceived service accessibility' (11.1% of variance); factor 3 'Perceived benefit' (10.4% of variance); and factor 4 'Perceived barriers and attitudes' (8.7% of variance).

*Step 4 psychometric validation—test-retest reliability*

Twenty-one cardiac health professionals completed the final 17-item ReCaRe scale (see Appendix C) on two occasions 6 weeks apart ($x = 36 \pm 15$, days). An item-level weighted Kappa, aggregated to each factor, indicated good test-retest reliability for Service accessibility ($k = 0.67$, 0.50–0.85). Moderate test-retest reliability was found for two factors: Perceived barriers and attitudes ($k = 0.49$, 0.35–0.63); Perceived benefit ($k = 0.47$, 0.23–0.70). Fair test-retest reliability was indicated for the remaining factor: Perceived patient severity and susceptibility ($k = 0.37$, 0.24–0.50).

*Stage 2: collation of normative ReCaRe data in a sample of CR health professionals*

A 27% ($n = 81$) response rate was achieved in the online survey. Six surveys were incomplete leaving a total sample of 75. Demographic data is presented in Table 3. Table 3 presents the score distributions for the ReCaRe sub-scales, overall and stratified by respondent characteristics. Higher scores represent greater respondent agreement to each item in regard to recommending CR. Overall, the sample scored highest (all within the fourth quartile) on the two subscales of, *Perceived patient severity* and *susceptibility* and *Perceived benefit,* indicating that of the four domains these two were the most influential when recommending patients for CR. This was followed by *Perceived barriers and attitudes* with all respondents scoring within the second quartile, then *Perceived service accessibility* where all respondents scored in the first percentile.

**Table 2**
Classification of ReCaRe factorial structure by loadings using exploratory factor analysis

| | | Factors | | | |
|---|---|---|---|---|---|
| Item | Original domain classification | 1 | 2 | 3 | 4 |
| 8 | HBM perceived severity | 0.833 | | | |
| 7 | HBM perceived severity | 0.870 | | | |
| 1 | HBM perceived severity | 0.688 | | | |
| 2 | HBM perceived susceptibility | 0.786 | | | |
| 3 | HBM perceived susceptibility | 0.582 | | | |
| 4 | HBM perceived susceptibility | 0.578 | | | |
| 37 | TPB Attitudes | 0.864 | | | |
| 71 | Service accessibility | | 0.841 | | |
| 73 | Service accessibility | | 0.855 | | |
| 74 | Service accessibility | | 0.816 | | |
| 9 | HBM perceived benefit | | | 0.945 | |
| 10 | HBM perceived benefit | | | 0.932 | |
| 11 | HBM perceived benefit | | | 0.891 | |
| 13 | HBM perceived barriers | | | | 0.605 |
| 15 | HBM perceived barriers | | | | 0.655 |
| 24 | TPB Attitudes | | | | 0.817 |

**Nb.** The four factors were labelled as follows: perceived severity and susceptibility, 7 items; perceived service accessibility, 3 items; perceived benefit, 3 items; and perceived barriers and attitudes, 3 items.

## Discussion

Globally, CR is the recommended standard of care after a cardiac event, yet it remains underutilised worldwide.[9-14] Poor CR enrolment has been attributed to many factors, though critical to increasing referral is clinician endorsement of CR.[3,10,12] To the best of our knowledge ReCaRe is the first measurement instrument developed to identify the key factors that influence health professionals decision making when recommending CR. To ensure fidelity to the underlying construct, a systematic and rigorous process of scale development was adopted. The findings presented have provided an indication of the psychometric properties on ReCaRe including: strong face validity, internal consistency and fair to substantial test-retest reliability. Further to this, four domains salient to the decision making process of health professionals when recommending CR were identified: perceived patient severity and susceptibility; perceived benefit; perceived barriers and attitudes; and perceived service accessibility.

Importantly, items of the ReCaRe scale were generated by end-users who were active participants through the process including content via consensus, interpretability of items and response format. Providing a platform for clinicians, whom are actively involved in the referral process for CR, to participate in the content and design of ReCaRe has ensured a breadth of practice, viewpoints and perspectives were taken into consideration, thus increasing potential for transferability into clinical practice.

These findings, which are well aligned with the health behaviour theories of the HBM[17] and TPB,[18] highlight the potential influence of clinicians' personal health beliefs when making decisions to refer or recommend CR.[10] The ability to measure key factors in the decision making of those who recommended CR will expand current knowledge of barriers and misconceptions with regard to CR. In addition, systematic identification of factors most influential on clinician decision making for CR referral, via a numerical score, will facilitate rapid development of targeted (high scoring ReCaRe domains) interventions to increase CR referral. For example, interventions may include strategies to increase clinician awareness of the impact that personal values,

**Table 3**
Normative ReCaRe data in an Australian CR health professional workforce sample

| Characteristics | | PPSS Mean (SD) range | PSA Mean (SD) range | PBEN Mean (SD) range | PBA Mean (SD) range | Total score |
|---|---|---|---|---|---|---|
| Total sample ($n$ = 75) | | 31.1(4.2) [7–35] | 3.9(1.6) [3–9] | 13.9(1.9) [3–15] | 7.1(2.4) [4–14] | 33.9(7.2) [6–43] |
| Sex | F | 31.6(2.9) [23–35] | 3.9(1.6) [3–9] | 13.9(1.8) [3–15] | 6.9(2.3) [4–14] | 34.7(6.1) [19–43] |
| | M | 27.6(8.3) [7–35] | 3.9(1.3) [3–6] | 13.3(1.9) [11–15] | 8.5(2.3) [5–11] | 28.5(11.1) [6–39] |
| Age group | under 45 | 30.6(2.6) [27–35] | 4.3(2.2) [3–9] | 14.0(1.4) [11–15] | 7.6(2.7) [4–14] | 32.7(6.2) [20–40] |
| | 45–54 | 30.4(5.4) [7–35] | 4.0(1.4) [3–8] | 13.3(2.5) [3–15] | 7.4(2.2) [4–11] | 32.3(8.5) [6–43] |
| | 55 or over | 32.0(3.5) [23–35] | 3.6(1.4) [3–9] | 14.3(1.2) [11–15] | 6.6(2.4) [4–12] | 36.0(6.0) [21–43] |
| Practice location | Metro | 31.0(5.2) [7–35] | 3.9(1.4) [3–9] | 14.1(1.5) [11–15] | 7.3(2.4) [4–12] | 34.0(8.1) [6–43] |
| | Non Metro | 31.1(2.5) [26–35] | 3.9(1.8) [3–9] | 13.6(2.3) [3–15] | 7.2(2.3) [4–14] | 33.6(6.0) [19–42] |
| Practice setting | Hospital | 31.1(5.2) [7–35] | 3.7(1.5) [3–9] | 14.2(1.2) [11–15] | 7.1(2.4) [4–12] | 34.4(7.9) [6–43] |
| | Community Health Centre | 31.4(3.0) [23–35] | 3.4(0.9) [3–6] | 13.5(3.0) [3–15] | 6.6(2.2) [4–11] | 34.9(6.4) [19–43] |
| | Other | 31.0(3.3) [24–35] | 4.5(1.9) [3–9] | 13.6(1.6) [11–15] | 7.6(2.5) [4–14] | 32.4(6.9) [20–43] |
| Profession | Specialist Nurse | 30.9(4.6) [7–35] | 3.8(1.3) [3–8] | 13.7(2.1) [3–15] | 7.0(2.3) [4–12] | 33.8(7.7) [6–43] |
| | Other | 31.5(3.0) [24–35] | 4.1(2.1) [3–9] | 14.2(1.2) [11–15] | 7.5(2.5) [4–14] | 34.2(6.1) [20–43] |
| Years of practice | 9 years or less | 29.9(5.9) [7–35] | 4.2(2.0) [3–9] | 13.8(1.5) [11–15] | 7.4(2.6) [4–14] | 32.0(8.7) [6–43] |
| | 10–19 years | 31.0(3.5) [23–35] | 3.8(1.1) [3–6] | 13.6(2.5) [3–15] | 7.1(2.3) [4–11] | 33.7(7.2) [17–43] |
| | 20 years or more | 32.2(2.9) [24–35] | 3.9(1.6) [3–9] | 14.2(1.2) [11–15] | 7.0(2.4) [4–12] | 35.5(5.8) [21–43] |
| Patients per month | 0–20 patients | 30.6(2.6) [26–35] | 4.2(1.9) [3–9] | 14.2(1.3) [11–15] | 7.4(1.8) [5–10] | 33.2(4.5) [25–42] |
| | 21–50 patients | 31.7(3.5) [23–35] | 3.5(1.2) [3–8] | 13.4(2.6) [3–15] | 7.0(2.5) [4–12] | 34.7(7.3) [17–43] |
| | More than 50 patients | 31.4(5.6) [7–35] | 3.8(1.2) [3–6] | 14.3(1.2) [12–15] | 6.7(2.4) [4–11] | 35.3(8.2) [6–43] |

**Nb**. PPSS, perceived patient susceptibility & severity; PSA, perceived service accessibility; PBEN, perceived benefits; PBA, perceived barriers and attitudes.

attitudes and beliefs have on referral rates, communication campaigns to improve clinician-patient communication regarding referral to CR, and targeted education programs to increase the awareness of health professionals about the benefits of CR for all patients especially those at high risk, i.e. elderly, low socioeconomic status, English as a second language. In addition, to achieve greatest impact, the identified subscales, e.g. “perceived barriers”, “perceived benefits”, “service accessibility”, could be used to guide development of strategies to improve referral rates. As an assessment tool, ReCaRe also has the potential to be used to measure intervention effects and contribute to an evidence base to improve CR referral pathways and ultimately patient outcomes. These examples demonstrate the wide applicability of ReCaRe across education, research and clinical settings.

To be meaningful, assessment scores must have an empirical frame of reference. The identification of normative data in a sample of registered nurses has provided a reference point from which other health professional populations can be compared, and research questions empirically assessed. In our sample *Perceived patient severity and susceptibility* and *Perceived benefit* were identified as the primary determinants of patient referral for CR. Applying ReCaRe across various health professions has the potential to identify those segments of the health workforce that may benefit most from intervention.

The main strength in the development of this scale is the reliance on a systematic approach to validation comprising experts and key referral agents at each stage to ensure development was guided by a sample of professionals representative of those responsible for the referral of patients to CR. The step-by-step scale development methods employed inclusive of literature review, identification of underlying theoretical constructs, expert panel review, and robust psychometric evaluation e.g. single factor loadings, Cronbach’s alpha >0.80 and item loadings >0.50; have served to focus the development of an applicable scale, appropriate for use among CR referral agents.

The major limitation is the small sample size engaged for the psychometric validation. However, it has been shown that scale development of this nature is appropriate to ensure measures are validated and fit for purpose prior to use in clinical practice or fully powered studies.[29] Smaller samples are considered appropriate in instances of scale development and when estimating test-retest reliability.[30,31] A small sample size means an increase in difficulty to find statistical significance, thus when achieved the differences tend to be practically significant. Indeed, exploratory factor analysis has been found to produce reliable solutions in small samples.[32] Additionally, it has been reported in factor analysis that when communalities are high, the number of factors relatively small, and model error is low, small sample size should not be a major consideration.[33] However, due to the particularly small sample size, these findings can only be interpreted as providing an indication of factor structure and internal consistency and it is the intention of this research group to evaluate the psychometric properties of ReCaRe in a much larger sample to validate these initial findings.

The next steps are to replicate this validation using a large sample and to correlate ReCaRe scores with the frequency of those health professionals recommending rehabilitation to their patients. Further research in this area should focus on interventions that will lead to the behaviour change of clinicians to endorse CR programs universally in the same way that Quit Smoking programs have been successful.

The implications for clinical practice are, in order to achieve and measure outcomes such as improved referral rates, systems changes will be required to allow measurement of the referrer, which include paper, phone, electronic and even fax! Identifying referrers will allow us to identify hots spots and areas of need for clinician behaviour change.

To conclude, sound assessment of CR health professionals attitudes, values and beliefs to CR programs should be seen as the first step toward delineating the global phenomenon of low CR referral rates and developing systematic evidence-based interventions that target clinicians and providers of CR. The findings of this research have provided an indication of the sound psychometric properties of ReCaRe a measurement instrument designed to identify the key factors influencing decision making for CR referral.

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## Declaration of interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.hrtlng.2019.04.008.

## Appendix A. Author permissions to use items adapted from Scales

Revised Illness Questionnaire in Patients with Atrial Fibrillation (AF IPQ-R)
Diabetes Health Belief Scale
York Angina Beliefs Questionnaire
Attitudes to Suicide Prevention Scale
Pearlin's Mastery Scale

## Appendix B. Recommending Cardiac Rehabilitation (ReCaRe) Scale (Original)

Recommending Cardiac Rehabilitation (ReCaRe) scale (original)
Please consider the list of 47 items below for both RELEVANCE to the control of prescribing behaviour by clinicians and COVERAGE of all likely domains of behavioural control.

| Item | Totally Irrelevant | | | Extremely Relevant |
|---|---|---|---|---|
| 1. Acute coronary syndromes are serious if you don't control them | 1 | 2 | 3 | 4 |
| 2. The condition of my ACS patients would be worse if I did nothing about it | 1 | 2 | 3 | 4 |
| 3. I believe that my current prescribing of cardiac rehabilitation will prevent disease progression in my patients | 1 | 2 | 3 | 4 |
| 4. My prescribing of cardiac rehabilitation is appropriate | 1 | 2 | 3 | 4 |
| 5. My ACS patients are ok as long as they feel alright | 1 | 2 | 3 | 4 |
| 6. ACS will have a bad effect on the future health of my patients | 1 | 2 | 3 | 4 |
| 7. My ACS patients will experience a high level of cardiac events and complications | 1 | 2 | 3 | 4 |
| 8. I believe my ACS patients need good cardiac rehabilitation to manage their condition | 1 | 2 | 3 | 4 |
| 9. I believe ACS can be controlled and managed effectively | 1 | 2 | 3 | 4 |
| 10. I believe that good cardiac rehabilitation will help to control ACS in my patients | 1 | 2 | 3 | 4 |
| 11. If I improve my prescribing of cardiac rehabilitation to my patients, it will probably help them | 1 | 2 | 3 | 4 |
| 12. Cardiac rehabilitation will help my patients to do better | 1 | 2 | 3 | 4 |
| 13. I would have to change too many processes to change my prescribing patterns for cardiac rehabilitation | 1 | 2 | 3 | 4 |
| 14. My patients would have to change too many habits to adhere to a cardiac rehabilitation program | 1 | 2 | 3 | 4 |
| 15. It is difficult to follow guidelines/recommendations for the prescription of cardiac rehabilitation | 1 | 2 | 3 | 4 |
| 16. Evidence for the effectiveness of cardiac rehabilitation is insufficient or unclear | 1 | 2 | 3 | 4 |
| 17. Improving my prescribing of cardiac rehabilitation will help improve the condition of my patients | 1 | 2 | 3 | 4 |
| 18. I am confident that I can improve my prescribing of cardiac rehabilitation | 1 | 2 | 3 | 4 |
| 19. Improving my prescribing of cardiac rehabilitation is up to me | 1 | 2 | 3 | 4 |
| 20. I intend to try to improve my prescribing of cardiac rehabilitation (1 Extremely unlikely to 7 extremely likely) | 1 | 2 | 3 | 4 |
| 21. I would only prescribe cardiac rehabilitation to patients who I believe would comply | 1 | 2 | 3 | 4 |
| 22. For me to improve my prescribing of cardiac rehabilitation would be (1 Wasted effort to 7 Beneficial) | 1 | 2 | 3 | 4 |
| 23. Patients with many cardiovascular risk factors will be non-compliant and will not complete cardiac rehabilitation | 1 | 2 | 3 | 4 |
| 24. I resent being asked to do more to prevent cardiac events in my patients | 1 | 2 | 3 | 4 |
| 25. Prevention of cardiac events is not my responsibility | 1 | 2 | 3 | 4 |
| 26. Making more funds available to the appropriate health services would make no difference to the rate of cardiac events | 1 | 2 | 3 | 4 |
| 27. Working with cardiac rehabilitation patients is rewarding | 1 | 2 | 3 | 4 |
| 28. I feel defensive when people offer advice about cardiac rehabilitation or secondary prevention | 1 | 2 | 3 | 4 |
| 29. It's easy for people not involved in clinical practice to make judgements about cardiac rehabilitation and secondary prevention | 1 | 2 | 3 | 4 |
| 30. I don't feel comfortable assessing someone for absolute risk of cardiovascular events | 1 | 2 | 3 | 4 |
| 31. Cardiac rehabilitation and secondary prevention measures are a drain on resources and would be more useful elsewhere | 1 | 2 | 3 | 4 |
| 32. There is no way of knowing who will have another cardiovascular event | 1 | 2 | 3 | 4 |
| 33. What proportion of cardiovascular events do you consider preventable? | 1 | 2 | 3 | 4 |
| 34. How much do your colleagues think you should improve your prescribing of cardiac rehabilitation? | 1 | 2 | 3 | 4 |
| 35. How would you rate your current prescribing of cardiac rehabilitation in comparison to that of your colleagues? | 1 | 2 | 3 | 4 |
| 36. What my colleagues think I should do matters to me | 1 | 2 | 3 | 4 |
| 37. All angioplasty and CABG patients should be referred to cardiac rehabilitation and secondary prevention | 1 | 2 | 3 | 4 |
| 38. Clinicians should use clinical judgement about who should be referred | 1 | 2 | 3 | 4 |
| 39. In current practice stronger language is required to emphasise the importance of CR to patients | 1 | 2 | 3 | 4 |
| 40. To prevent mixed-messages interventional cardiologists should not tell patients they are fixed | 1 | 2 | 3 | 4 |
| 41. The current systems in place for referral to cardiac rehabilitation and secondary prevention program attendance make it easy for patient access | 1 | 2 | 3 | 4 |
| 42. Many patients don't believe that lifestyle factors contributed to their cardiovascular events | 1 | 2 | 3 | 4 |
| 43. Most of my patients put their cardiovascular events down to 'bad genetics' | 1 | 2 | 3 | 4 |

(continued)

(*Continued*)

| Item | Totally Irrelevant | | | Extremely Relevant |
|---|---|---|---|---|
| 44. Many patients believe that cardiac rehabilitation won't benefit them | 1 | 2 | 3 | 4 |
| 45. Many patients believe that deterioration of their cardiac condition is inevitable | 1 | 2 | 3 | 4 |
| 46. Most of my patients are positive about the benefits of cardiac rehabilitation | 1 | 2 | 3 | 4 |
| 47. Most of my patients would be happy just to maintain their current cardiovascular condition | 1 | 2 | 3 | 4 |

## Appendix C. Recommending Cardiac Rehabilitation (ReCaRe) Scale (Final)

Recommending Cardiac Rehabilitation (ReCaRe) scale (final)

With regard recommending cardiac rehabilitation to your patients, please answer the following questions by indicating the extent to which you agree or disagree with each statement

| Item | Strongly Disagree | Disagree | Neither Agree nor Disagree | Agree | Strongly Agree |
|---|---|---|---|---|---|
| 1. I believe all my ACS patients need cardiac rehabilitation to manage their condition | 1 | 2 | 3 | 4 | 5 |
| 2. I believe that my cardiac patients with comorbidities need cardiac rehabilitation | 1 | 2 | 3 | 4 | 5 |
| 3. Acute coronary syndrome is a serious condition | 1 | 2 | 3 | 4 | 5 |
| 4. The condition of my ACS patients would be worse if cardiac rehabilitation is not used | 1 | 2 | 3 | 4 | 5 |
| 5. I believe that my current practices of recommending patients to cardiac rehabilitation will prevent disease progression in most of my patients | 1 | 2 | 3 | 4 | 5 |
| 6. My current use of recommendation to cardiac rehabilitation is appropriate | 1 | 2 | 3 | 4 | 5 |
| 7. All angioplasty and coronary artery by-pass graft (CABG) patients should be referred to cardiac rehabilitation | 1 | 2 | 3 | 4 | 5 |
| 8. I don't recommend my patients to cardiac rehabilitation because there are no services available locally | 1 | 2 | 3 | 4 | 5 |
| 9. I don't recommend my patients to cardiac rehabilitation because our local program is not run very well | 1 | 2 | 3 | 4 | 5 |
| 10. I don't recommend my patients to cardiac rehabilitation because I don't trust the team who runs our local program | 1 | 2 | 3 | 4 | 5 |
| 11. I believe that the management of heart disease can be improved with cardiac rehabilitation | 1 | 2 | 3 | 4 | 5 |
| 12. I believe that good cardiac rehabilitation will help to manage Acute Coronary Syndrome (ACS) in my patients | 1 | 2 | 3 | 4 | 5 |
| 13. If I recommended more patients to cardiac rehabilitation, it would be beneficial | 1 | 2 | 3 | 4 | 5 |
| 14. There are too many systems that need to change for me to alter my current practices of recommending patients to cardiac rehabilitation | 1 | 2 | 3 | 4 | 5 |
| 15. It is difficult to follow guidelines for the referral to cardiac rehabilitation | 1 | 2 | 3 | 4 | 5 |
| 16. Cardiac rehabilitation will be effective in preventing further cardiac events in most of my patients | 1 | 2 | 3 | 4 | 5 |
| 17. I resent other people telling me to refer my patients to cardiac rehabilitation | 1 | 2 | 3 | 4 | 5 |

Scoring of ReCaRe

Sum each of the four sub-scales: perceived severity and susceptibility, items 1–7; perceived service accessibility, items 8–10; perceived benefit, items 11–13; and perceived barriers and attitudes, items 14–17. Note one item, item 16 needs to be reversed scored prior to summing the sub-scale of perceived barriers and attitudes. The higher the score on each sub-scale the greater the influence of that salient domain on decision making when recommending CR.

## Appendix D. Table of CVI ratings for each item

| Item ID | Item | Construct | CVI |
|---|---|---|---|
| 1 | Acute coronary syndromes are serious if you don't control them. | HBM perceived susceptibility | 1.00 |
| 3 | I believe that my current prescribing of cardiac rehabilitation will prevent disease progression in my patients. | HBM perceived susceptibility | 1.00 |
| 8 | I believe my ACS patients need good cardiac rehabilitation to manage their condition. | HBM perceived severity | 1.00 |
| 9 | I believe ACS can be controlled and managed effectively. | HBM perceived benefit | 1.00 |
| 10 | I believe that good cardiac rehabilitation will help to control ACS in my patients. | HBM perceived benefit | 1.00 |
| 11 | If I improve my prescribing of cardiac rehabilitation to my patients, it will probably help them. | HBM perceived benefit | 1.00 |
| 12 | Cardiac rehabilitation will help my patients to do better. | HBM perceived benefit | 1.00 |
| 17 | Improving my prescribing of cardiac rehabilitation will help improve the condition of my patients. | SCT Outcome Expectations | 1.00 |
| 19 | Improving my prescribing of cardiac rehabilitation is up to me. | TPB Perceived behavioural control | 1.00 |
| 22 | For me to improve my prescribing of cardiac rehabilitation would be (1 Wasted effort to 7 Beneficial). | TPB Attitudes | 1.00 |
| 52 | Cardiac rehabilitation will be effective in preventing further cardiac events. | IPQ-R Treatment Control | 1.00 |
| 56 | What I recommend can determine whether my patients condition gets better or worse. | IPQ-R Personal Control | 1.00 |
| 57 | The course of my patients illness depends on both me and my patient. | IPQ-R Personal Control | 1.00 |
| 2 | The condition of my ACS patients would be worse if I did nothing about it. | HBM perceived susceptibility | 0.91 |
| 13 | I would have to change too many processes to change my prescribing patterns for cardiac rehabilitation. | HBM perceived barriers | 0.91 |
| 14 | My patients would have to change too many habits to adhere to a cardiac rehabilitation program. | HBM perceived barriers | 0.91 |
| 15 | It is difficult to follow guidelines/recommendations for the prescription of cardiac rehabilitation. | HBM perceived barriers | 0.91 |
| 18 | I am confident that I can improve my prescribing of cardiac rehabilitation. | TPB Perceived behavioural control | 0.91 |
| 21 | I would only prescribe cardiac rehabilitation to patients who I believe would comply. | TPB Intention | 0.91 |
| 23 | Patients with many cardiovascular risk factors will be non-compliant and will not complete cardiac rehabilitation. | TPB Attitudes | 0.91 |
| 25 | Prevention of cardiac events is not my responsibility. | TPB Attitudes | 0.91 |
| 37 | All angioplasty and CABG patients should be referred to cardiac rehabilitation and secondary prevention. | atheoretical | 0.91 |
| 53 | The negative effects of my patients condition can be prevented by cardiac rehabilitation. | IPQ-R Treatment Control | 0.91 |

(*continued*)

(*Continued*)

| Item ID | Item | Construct | CVI |
|---|---|---|---|
| 54 | Cardiac rehabilitation can control my patients condition. | IPQ-R Treatment Control | 0.91 |
| 4 | My prescribing of cardiac rehabilitation is appropriate. | HBM perceived susceptibility | 0.89 |
| 16 | Evidence for the effectiveness of cardiac rehabilitation is insufficient or unclear. | HBM perceived barriers | 0.82 |
| 31 | Cardiac rehabilitation and secondary prevention measures are a drain on resources and would be more useful elsewhere. | TPB Attitudes | 0.82 |
| 32 | There is no way of knowing who will have another cardiovascular event. | TPB Attitudes | 0.82 |
| 38 | Clinicians should use clinical judgement about who should be referred. | atheoretical | 0.82 |
| 41 | The current systems in place for referral to cardiac rehabilitation and secondary prevention program attendance make it easy for patient access. | atheoretical | 0.82 |
| 44 | Many patients believe that cardiac rehabilitation won't benefit them. | atheoretical | 0.82 |
| 46 | Most of my patients are positive about the benefits of cardiac rehabilitation. | atheoretical | 0.82 |
| 72 | I don't refer my patients to cardiac rehabilitation because the local program is not appropriate for them. | atheoretical | 0.82 |
| 20 | I intend to try to improve my prescribing of cardiac rehabilitation. | TPB Intention | 0.80 |
| 7 | My ACS patients will experience a high level of cardiac events and complications. | HBM perceived severity | 0.73 |
| 26 | Making more funds available to the appropriate health services would make no difference to the rate of cardiac events. | TPB Attitudes | 0.73 |
| 27 | Working with cardiac rehabilitation patients is rewarding. | TPB Attitudes | 0.73 |
| 30 | I don't feel comfortable assessing someone for absolute risk of cardiovascular events. | TPB Attitudes | 0.73 |
| 35 | How would you rate your current prescribing of cardiac rehabilitation in comparison to that of your colleagues? | TPB Subjective norm | 0.73 |
| 39 | In current practice stronger language is required to emphasise the importance of cardiac rehabilitation to patients. | atheoretical | 0.73 |
| 40 | To prevent mixed-messages interventional cardiologists should not tell patients they are fixed. | atheoretical | 0.73 |
| 42 | Many patients don't believe that lifestyle factors contributed to their cardiovascular events. | atheoretical | 0.73 |
| 45 | Many patients believe that deterioration of their cardiac condition is inevitable. | atheoretical | 0.73 |
| 55 | There is nothing which can help my patients condition. | IPQ-R Treatment Control | 0.73 |
| 59 | I have the power to influence my patients illness. | IPQ-R Personal Control | 0.73 |
| 65 | I expect my patient to have this illness for the rest of their life. | IPQ-R Timeline (acute/chronic) | 0.73 |
| 71 | I don't refer my patients to cardiac rehabilitation because there are no services available locally. | service accessibility | 0.73 |
| 73 | I don't refer my patients to cardiac rehabilitation because our local program is not run very well. | perceived quality | 0.73 |
| 5 | My ACS patients are ok as long as they feel alright. | HBM perceived severity | 0.64 |
| 47 | Most of my patients would be happy just to maintain their current cardiovascular condition. | atheoretical | 0.64 |
| 62 | My patients' illness is likely to be permanent rather than temporary. | IPQ-R Timeline (acute/chronic) | 0.64 |
| 67 | My patients' symptoms change a great deal from day to day. | IPQ-R Timeline (cyclical) | 0.64 |
| 74 | I don't refer my patients to cardiac rehabilitation because I don't trust the team who runs our local program. | perceived quality | 0.64 |
| 75 | My own lifestyle choices make it difficult for me to discuss lifestyle changes with my patients. | personal values | 0.64 |
| 6 | ACS will have a bad effect on the future health of my patients. | HBM perceived severity | 0.60 |
| 24 | I resent being asked to do more to prevent cardiac events in my patients. | TPB Attitudes | 0.60 |
| 29 | It's easy for people not involved in clinical practice to make judgements about cardiac rehabilitation and secondary prevention. | TPB Attitudes | 0.55 |
| 33 | What proportion of cardiovascular events do you consider preventable? | TPB Attitudes | 0.55 |
| 43 | Most of my patients put their cardiovascular events down to 'bad genetics'. | atheoretical | 0.55 |
| 50 | I often feel helpless in dealing with the problems of my patients. | mastery | 0.55 |
| 51 | There is very little that can be done to improve my patients illness. | IPQ-R Treatment Control | 0.55 |
| 60 | My actions will have no effect on the outcome of my patients illness. | IPQ-R Personal Control | 0.50 |
| 28 | I feel defensive when people offer advice about cardiac rehabilitation or secondary prevention. | TPB Attitudes | 0.45 |
| 34 | How much do your colleagues think you should improve your prescribing of cardiac rehabilitation? | TPB Subjective norm | 0.45 |
| 48 | I have little control over the clinical course my patients condition will take. | mastery | 0.45 |
| 58 | Nothing I do will effect my patients illness. | IPQ-R Personal Control | 0.45 |
| 69 | My patients' illness is very unpredictable. | IPQ-R Timeline (cyclical) | 0.45 |
| 66 | My patients' illness will improve in time. | IPQ-R Timeline (acute/chronic) | 0.40 |
| 70 | My patient goes through cycles in which their illness gets better and worse. | IPQ-R Timeline (cyclical) | 0.40 |
| 49 | I can do just about anything I really set my mind to in clinical practice. | mastery | 0.36 |
| 63 | My patients' illness will last for a long time. | IPQ-R Timeline (acute/chronic) | 0.36 |
| 68 | My patients' symptoms come and go in cycles. | IPQ-R Timeline (cyclical) | 0.36 |
| 36 | What my colleagues think I should do matters to me. | TPB Subjective norm | 0.27 |
| 61 | My patients' illness will last a short time. | IPQ-R Timeline (acute/chronic) | 0.27 |
| 64 | My patients' illness will pass quickly. | IPQ-R Timeline (acute/chronic) | 0.27 |

Content Validity Indices (CVI) for each of the 75 sourced items for the development of the instrument. Collaborators (the listed authors) were asked to rate each item on a scale of 1–4 from “Totally Irrelevant” to “Extremely Relevant” to the behaviour of referring/recommending patients to cardiac rehabilitation. The CVI is calculated for each item as the proportion of relevant ratings (scores of 3 or 4).

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