European Journal of Cardiovascular Nursing

EUROPEAN SOCIETY OF CARDIOLOGY®

Original Article

European Journal of Cardiovascular Nursing
1–8

DOI: 10.1177/1474515114548649
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Single-item measures for depression and anxiety: Validation of the Screening Tool for Psychological Distress in an inpatient cardiology setting

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Abstract

Background: Depression and anxiety are common among patients with cardiovascular disease (CVD) and confer significant cardiac risk, contributing to CVD morbidity and mortality. Unfortunately, due to the lack of screening tools that address the specific needs of hospitalized patients, few cardiac inpatient programs offer routine screening for these forms of psychological distress, despite recommendations to do so.

Aims: The purpose of this study was to validate single-item measures for depression and anxiety among cardiac inpatients.

Methods: Consecutive inpatients were recruited from the cardiology and cardiac surgery step-down units at a university-affiliated, quaternary-care hospital. Subjects completed a questionnaire that included: (a) demographics, (b) single-item-measures for depression and anxiety (from the Screening Tool for Psychological Distress (STOP-D)), and (c) Hospital Anxiety and Depression Scale (HADS).

Results: One hundred and five participants were recruited with a wide variety of cardiac diagnoses, having a mean age of 66 years, and 28% were women. Both STOP-D items were highly correlated with their corresponding validated measures and demonstrated robust receiver-operator characteristic curves. Severity scores on both items correlated well with established severity cut-off scores on the corresponding subscales of the HADS.

Conclusions: The STOP-D is a self-administered, self-report measure using two independent items that provide severity scores for depression and anxiety. The tool performs very well compared with other previously validated measures. Requiring no additional scoring and being free, STOP-D offers a simple and valid method for identifying hospitalized cardiac patients who are experiencing psychological distress. This crucial first step triggers initiation of appropriate monitoring and intervention, thus reducing the likelihood of the adverse cardiac outcomes associated with psychological distress.

Keywords

Depression, anxiety, screening, cardiac, inpatient, single-item measures, assessment

Date received: 22 November 2013; revised: 27 May 2014; accepted: 28 July 2014

Introduction

Psychological distress is common among patients with cardiovascular disease (CVD) with estimates ranging from 15–50%, depending on the population and the type of distress being measured.[1–3] For example, depression has been shown to be roughly three times more common in patients after an acute myocardial infarction (MI) than in the general population.[3] In addition, psychological distress confers significant cardiac risk, contributing to the morbidity and

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mortality associated with CVD.[1–10] While screening tools do exist, they are often expensive, time-consuming and typically require expert interpretation.[11–14] Because of these barriers, it is possible that some cardiac programs do not offer routine screening of inpatients for psychological distress, despite recommendations to do so from working groups in the USA,[3] Canada,[15] Britain,[16] and Europe.[17] In fact, in a recent American Heart Association Scientific statement paper, Lichtman et al.[4] recommended that, due to the preponderance of evidence, depression should be elevated to the status of risk factor for adverse medical outcomes among cardiac patients. The Screening Tool for Psychological Distress (STOP-D)[18] is a simple tool for screening for psychological distress that was originally developed and validated in a cardiac outpatient setting.

Considerable literature exists attesting to the significant risk that psychosocial distress confers on patients with CVD. Several types of psychosocial distress, such as depression, anxiety, stress, anger and low social support, have been shown to contribute to the morbidity and mortality associated with CVD.[1–10] However, the strongest and most consistent support is found for the negative impact of depression and anxiety.[1,4,7,8,10,19–23] The mortality rate among depressed cardiac patients is much higher than that of non-depressed patients.[7,8,24,25] This relationship persists whether the endpoint is cardiac-related death or all-cause mortality. Further, there is evidence of a dose-response relationship between the magnitude of the depression detected and the risk of mortality.[10] For example, in cardiac patients, mild symptoms of depression have been found to confer a relative risk (RR) of 1.76 (95% confidence interval (CI): 0.98–3.17), whereas this increases to a relative risk of 3.17 (95% CI: 1.79–5.60) in patients with moderate symptoms. Likewise, anxiety is a well-established risk factor in the progression of CVD among previously healthy patients.[26,27] Specifically, the RR of cardiac death for patients with anxiety but no previous history of cardiac illness was found to be 2.5 (95% CI: 1.0–6.0). Anxiety has also been shown to adversely affect outcomes in patients with known CVD.[1,8,9,20–22,28–30] Among heart failure patients, anxiety has been found to be a predictor of worsening functional status[31] and increased re-hospitalizations.[32]

Unfortunately, despite their prevalence and negative impact on health, depression and anxiety commonly go unrecognized and untreated in the absence of systematic screening.[33,34] While several excellent and well-validated tools for measuring depression and anxiety exist, they fail to meet the needs of an inpatient cardiac setting. Examples of well-validated tools for detecting depression and anxiety include the Hospital Anxiety and Depression Scale (HADS),[11] the Beck Depression Inventory (BDI-II)[12] and Beck Anxiety Inventory (BAI),[13] and the Patient Health Questionnaire (PHQ-9).[14] However, these tools are limited because they require staff to score and interpret the results. Further, most of these scales have a per-use fee and many hospitals are not able to absorb these costs in their budgets. Thus, there exists a need for a very brief, cost-effective,

Over the last week, how much have you been bothered by:

1. Feeling sad, down, or uninterested in life?
   0 1 2 3 4 5 6 7 8 9
   not at all — a little — moderately — severely

2. Feeling anxious or nervous?
   0 1 2 3 4 5 6 7 8 9
   not at all — a little — moderately — severely

3. Feeling stressed?
   0 1 2 3 4 5 6 7 8 9
   not at all — a little — moderately — severely

4. Feeling angry?
   0 1 2 3 4 5 6 7 8 9
   not at all — a little — moderately — severely

5. Not having the social support you feel you need?
   0 1 2 3 4 5 6 7 8 9
   not at all — a little — moderately — severely

Figure 1. The Screening Tool for Psychological Distress (STOP-D).

screening tool to improve the rate of identification of depression and anxiety among cardiac inpatients so that these patients may ultimately receive an appropriate referral and treatment, if warranted. An ideal screening tool would be both acceptable to patients and not overly burdensome to nurses, who are already responsible for administering other screening tools.[35] Currently there are no one-item measures for depression and anxiety that have been validated among hospitalized cardiac patients. The lack of such measures in turn could contribute to the under-recognition of depression and anxiety.

The STOP-D was initially developed and validated in the outpatient cardiology setting.[18] The STOP-D (Figure 1) is a brief (five-item) and cost-effective screening tool which provides severity scores for each of the common psychosocial problem areas: depression, anxiety, stress, anger, and low social support. It is free of charge, can be completed by a patient in about one minute, with minimal assistance from a health professional, and requires no time for scoring or interpretation. Of the five constructs the original STOP-D measured, only depression and anxiety are diagnosable conditions with consensus regarding symptomatology and appropriate cut-off scores. Further, depression and anxiety have the most readily available and effective treatments available to inpatients (e.g. treatment of depression and anxiety with medications such as selective serotonin re-uptake inhibitors [SSRIs]), even in the absence of mental health professionals. Validation of the tool for use in inpatients is necessary because the gold-standard instruments to which the STOP-D was compared in the outpatient setting are not considered optimal tools for hospitalized patients. For these reasons, the current study aimed to validate the depression and anxiety items of the STOP-D for use in the cardiac inpatient setting. It should be noted that all five items on the STOP-D (measuring depression, anxiety, stress, anger and low social support) were validated in the course of this research, but only the depression and anxiety findings are reported here. Validation findings of the other

STOP-D items (stress, anger and low social support) largely replicated the outpatient results and are available from the first author.

Methods

We used a prospective, cross-sectional design to evaluate the existing STOP-D tool when used with cardiac inpatients, and to compare it to previously validated tools.

Sample and setting

The study was conducted on the cardiology and cardiac surgery step-down units of a university-affiliated, tertiary/quaternary-care hospital, which admit patients with the full range of cardiac diagnoses and procedures. Inclusion criteria for the study were cardiac inpatients of 19 years of age or older, ability to provide informed consent, and ability to read and complete the English-language questionnaire without assistance. Exclusion criteria included: presence of dementia or delirium and inability to read English, or provide informed consent for any reason.

Procedure

Subjects were provided information about the study by their bedside nurse. Once a potential subject expressed interest in the study, the research assistant described the study procedures to them, reviewed the consent form and answered any questions. After obtaining informed consent, research assistants instructed participants on how to complete the questionnaire, which contained the psychological screening items described below as well as questions about demographic and health status. A privacy envelope for the questionnaire packet was provided, allowing the subjects to complete the items at their leisure during their admission, generally within 24 h of discharge. All questionnaires were collected prior to discharge.

Measures

Demographic data were collected by a combination of self-report (gender, relationship status, employment status, education, and income) and health record review (age and cardiac diagnosis).

The original STOP-D is a five-item measure, with one item assessing each of the following psychosocial constructs: depression, anxiety, stress, anger and social support (Figure 1). Each item is considered to be a stand-alone item with no summation score to reflect overall distress. We previously validated the STOP-D in the outpatient cardiac setting.[18] It was found to have reasonable criterion validity. The depression item was highly correlated to the BDI[12] (r=0.83, p<0.001). Likewise, the STOP-D anxiety item was compared to the BAI[13] and was found to have a reasonably strong linear relationship (r=0.66, p<0.001). Receiver-operator characteristic (ROC) curve analyses revealed an area under the curve (AUC) for the depression item to be 0.90 (p<0.001) and the AUC for the anxiety item was 0.82 (p<0.001). An optimal cut-off score for the STOP-D depression item was found to be three (sensitivity=82% and specificity=86%). The optimal cut off score for the STOP-D anxiety item was also found to be three (sensitivity=73% and specificity=79%). For this analysis, we focused on two single items: depression and anxiety. Each was evaluated separately, comparing it to a validated self-report measure for each condition.

The STOP-D depression item was evaluated using the depression subscale of the HADS.[11] The HADS is a 14-item self-report instrument with two subscales (depression and anxiety). Each subscale is comprised of seven items, with subscale scores ranging from 0–21, and with higher scores reflecting more severe distress. For clinical interpretation, the established cut-off score for the HADS depression subscale is seven: a score of seven or below is considered to reflect minimal symptoms of depression and to be in the normal range of functioning; scores between 8–10, mild depression; between 11–14, moderate; and between 15–21, severe depression. The HADS is a reliable and valid instrument for assessing anxiety and depression in medical unit inpatients in general[11,36,37] and in cardiac patients specifically.[38,39] It has compared favorably to the Primary Care Evaluation of a Mental Disorders (PRIME-MD); a tool that reliably diagnoses depression and anxiety, based on the Diagnosis and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV).[39] Those investigators reported an area under the ROC curve of 0.81 for depression and 0.71 for anxiety. The authors found a cutoff score of seven on each HADS subscale determined PRIME-MD diagnosis of depression or anxiety. The sensitivity and specificity were 81% and 54% respectively for depression, and 81% and 40% for the anxiety subscale.

We evaluated the STOP-D anxiety item against the anxiety subscale of HADS.[11] Like the depression subscale, the anxiety subscale is a seven-item self-report instrument for measuring the severity of anxiety, with anxiety subscale scores ranging from 0–21, and higher scores reflecting more severe anxiety. The HADS anxiety subscale has established cutoff scores for clinical interpretation:[11] a score from 0–7 is considered reflective of minimal symptoms of anxiety and in the normal range of functioning; scores between 8–10, mild anxiety; 11–14, moderate; and scores between 15–21 reflect severe anxiety. The HADS anxiety subscale has been shown to be a reliable and valid instrument when used with patient hospitalized on medical units.[11,36,37]

Ethics

The local Research Ethics Board approved the study, and patients gave written informed consent prior to completing the study questionnaire. All patients with elevated scores on

either the HADS (a score of eight or more)[11] or the STOP-D (a score of three or higher)[18] were offered a follow-up appointment or assessment with either a psychologist from our cardiac program (but who was not a member of the study team), or the consult-liaison psychiatrist on call.

Statistical analyses

Pearson product-moment correlations were performed for the depression and anxiety items of the STOP-D and the HADS, to evaluate concurrent validity.[40,41] Generally speaking, correlations above 0.50 are considered large.[42]

ROC curve analyses were also performed for the depression and anxiety items of the STOP-D and their corresponding validated measures. The ROC-curve analyses provide information regarding the sensitivity and specificity of each screening item, as well as the overall fit.[43,44] The overall fit is described by the AUC; a perfect test would have an AUC=1. A rule of thumb for evaluating the AUC is as follows: 0.5–0.7 has low accuracy; 0.7–0.9 indicates moderate accuracy and 0.9 and above indicates high accuracy.[45,46] Sensitivity is the probability that a patient with a positive diagnosis will have a positive test result. Specificity, on the other hand, is the probability that a patient with a negative diagnosis will have a negative result. Examining both specificity and sensitivity is useful for identifying appropriate cut-off scores.

The established cut-off scores for both the depression and anxiety subscales of the HADS[11] were used to diagnose the disorder for the ROC analysis. For example, it has been established that a HADS depression subscale score of eight or more represents at least mild clinical depression, so for the ROC analysis, any patient with a score of eight or more on the HADS depression subscale was considered depressed. Similarly, a score of eight or more was considered to represent an anxious patient in the HADS anxiety subscale.

Results

Between January 2012–March 2012, we recruited 105 consecutive subjects from 312 patients screened (56% consent rate, see Figure 2). The most common reasons for refusal to participate were: (a) feeling too sick or tired to fill out the questionnaire packets; or (b) being uninterested in participating in research of any sort.

Sample characteristics

Participants had a median age of 66 years and were predominantly male (similar to the Canadian average for patients hospitalized for ischemic heart disease).[47] The majority were married or living in a common-law relationship, and retired, and had completed at least secondary school (Table 1). Coronary artery disease and related diagnoses accounted for 60% of the diagnoses; approximately 47% of the participants had been admitted for a cardiac surgical procedure. The median length of stay was five days, and this is consistent with our program's inpatient average (personal communication, J. McGladrey, Program Director, Heart Centre, St. Paul's Hospital, Vancouver, Canada).

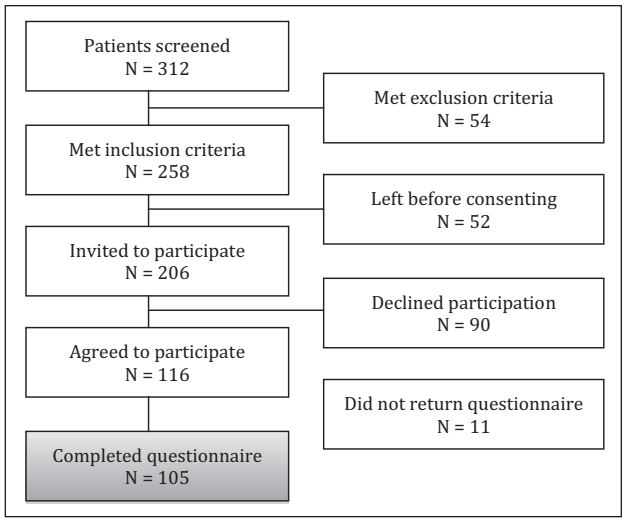

Figure 2. Screening and recruitment flow chart.

Table 1. Demographic and clinical characteristics of sample.

Variable	*n*=105
Age, mean±standard deviation (SD) years (range 18–89)	66±13
Male sex (%)	76 (72)
Married or common-law (%)	67 (64)
Employed at least part-time (%)	30 (29)
⩾High school education (%)	84 (80)
Cardiology service (vs cardiac surgery) (%)	56 (53)
Primary diagnoses[a] (*n*=104)	
Acute coronary syndrome (%)	34 (32)
Heart failure (%)	13 (12)
Coronary artery disease (%)	29 (28)
Valvular disease (%)	28 (27)
Cardiac arrhythmia (%)	19 (18)
Device lead infection (%)	1 (1)
Other (%)	13 (12)

[a]Percentages total >100 because some patients had more than one diagnosis.

Correlations

Both the STOP-D depression and the STOP-D anxiety items correlated highly with the appropriate corresponding subscale of the HADS (Table 2). The correlation between the STOP-D depression item and the HADS depression subscale was strong (r=0.77, p<0.001). Likewise, the

Table 2. Correlations between Screening Tool for Psychological Distress (STOP-D) items and Hospital Anxiety and Depression Scale (HADS) subscale.

HADS	STOP-D (n=104)	
	Depression item	Anxiety item
Depression subscale	0.77[a]	0.59[a]
Anxiety subscale	0.66[a]	0.75[a]

[a]p<0.01.

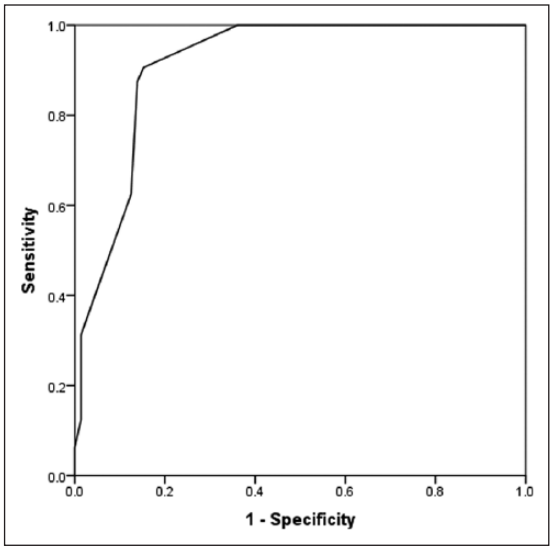

Figure 3. Receiver-operator characteristic (ROC) curve analysis of the Screening Tool for Psychological Distress (STOP-D) depression item (n=104). Area under the curve (AUC)=0.91 (p<0.001).

Table 3. Sensitivity and specificity of the Screening Tool for Psychological Distress (STOP-D) depression item (n=104).

Score	Sensitivity (%)	Specificity (%)	Youden's index
1	100	42	42
2	100	56	56
3	100	64	64
4	91	85	76
5	88	86	74
6	63	87	50
7	31	99	30
8	13	99	12
9	6	100	6

correlation between the STOP-D anxiety item and the HADS anxiety subscale was strong (r=0.75 p<0.001).

STOP-D depression item

ROC-curve analysis (Figure 3) demonstrated that the STOP-D depression item is able to accurately identify depressed patients, as indicated by an overall AUC of 0.91 (p<0.001). Using Youden's index,[48] which balances sensitivity and specificity, we determined the optimal cutoff on the STOP-D depression item to be four (Table 3). This score on the depression item yields 91% sensitivity and 85% specificity.

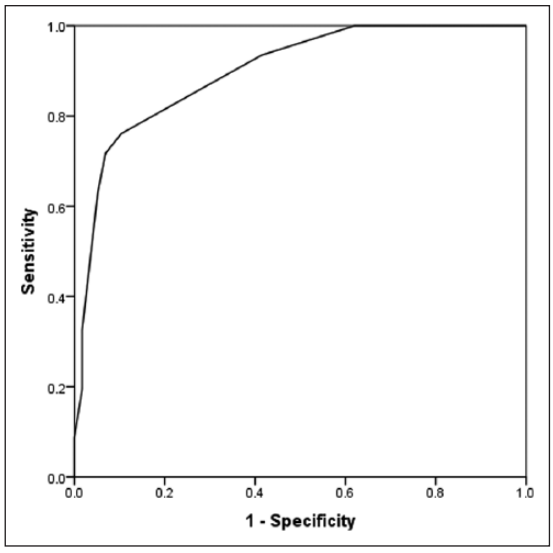

Figure 4. Receiver-operator characteristic (ROC) curve analysis of the Screening Tool for Psychological Distress (STOP-D) anxiety item (n=104). Area under the curve (AUC)=0.90 (p<0.001).

Table 4. Sensitivity and specificity of the Screening Tool for Psychological Distress (STOP-D) anxiety item (n=104).

Score	Sensitivity (%)	Specificity (%)	Youden's index
1	100	21	21
2	100	38	38
3	94	59	53
4	76	90	66
5	72	95	67
6	63	95	58
7	33	98	31
8	20	98	18
9	9	100	9

STOP-D anxiety item

ROC curve analysis (Figure 4) demonstrated that, using the HADS anxiety subscale as the standard, the STOP-D anxiety item performed well. It showed reasonable sensitivity and specificity for screening for anxiety as indicated by an overall AUC of 0.90 (p<0.001). For this item, the optimal cut-off was 5, again using Youden's index [48] (Table 4). This score yields 72% sensitivity and 95% specificity.

Discussion

This study has shown that the STOP-D is a valid screening tool for depression and anxiety when used in cardiac inpatient settings. The correlations between the STOP-D items and the corresponding subscales of the HADS were strong, and likewise, the AUCs suggested the STOP-D is a screening tool with high accuracy.[44–46] Despite growing evidence that psychosocial distress contributes significantly to the morbidity, mortality, and progression of CVD, it is challenging to routinely screen for these risk factors on typical inpatient cardiology units. One important barrier to routine screening is the lack of a brief screening instrument that targets the psychosocial risk factors most relevant to the cardiac population. Even the briefest of the individual screening instruments available for depression and anxiety (a) have up to 20 items each, (b) must be scored and interpreted, and (c) are often copyrighted and carry a user fee. Using currently available measures is overly burdensome to most cardiology inpatient settings because of these financial and time costs. The STOP-D has been developed and validated to fill this need, and we believe it is likely to be acceptable to both patients and staff working in an acute setting.

It is noteworthy that this study closely replicated the findings of the original STOP-D validation study,[18] despite using different methods (the STOP-D was compared to different measures of depression and anxiety) and a different population of cardiac patients (inpatients versus outpatients). This attests to the strength of the STOP-D tool.

The STOP-D is comprised of stand-alone items. As such, we assessed the validity of each item individually. Users could therefore choose which forms of distress to measure, and create their own version of the tool to meet the unique needs of their setting. Given the well-established risk associated with both depression and anxiety in cardiac patients, as well as recommendations to screen for both of these conditions,[3,4] it is recommended that both the depression and anxiety items be used. These two conditions have readily available treatments in either the hospital or community setting, such as pharmacotherapy, and, depending on the setting, additional treatment options such as cognitive-behavioral therapy may also be available.

We recommend cut-off scores of four for the STOP-D depression item and five for the STOP-D anxiety item. We acknowledge that, using a cut-off of a score of four, the STOP-D depression item demonstrated a specificity of only 85%. Some caregivers may feel this level of false-positives (15%) is too high, considering it may trigger a referral to mental health services. However, to achieve a safe level of sensitivity, we recommend using this cut-off score. For the STOP-D anxiety item, we recommend a cut-off of five. This score yields a sensitivity of 72%, resulting in a false-negative rate of 28%. To offset this, caregivers could consider lowering the threshold for referral. However, if one uses a STOP-D anxiety score of three, although the sensitivity improves to 94%, the specificity drops to 59%. Therefore, we recommend using a cut-off score of five which yields the best balance between sensitivity and specificity.

Limitations

This study is limited in that all the data were collected at one site. However, because we included participants with a wide array of cardiac diagnoses, both medical and surgical, we do not feel this is a significant issue. Due to the relatively small sample size, a sex/gender-based analysis was not feasible, so it is unknown whether the items perform differently in men versus women. In addition, the evaluation was limited to English-speaking participants using an English tool. Validation in other languages and examination of ethnicity-based differences in the tool's performance would potentially broaden its applicability. Finally, it may be beneficial for future research to compare the utility of the STOP-D to the Structured Clinical Interview for DSM-IV Disorders.[49]

Conclusion

Hospital inpatients with cardiovascular disease often suffer from a multitude of comorbidities, some of which may go undiagnosed. The STOP-D is a very brief screening tool that accurately identifies cardiac inpatients experiencing the symptoms of depression or anxiety which have been clearly established as important risk factors for poor cardiac outcomes. The tool provides valuable information about the presence and severity of depression and anxiety and is both convenient and free. Cardiac patients experiencing psychological distress must be identified so that referral to appropriate resources for further assessment and treatment can occur. However, such screening needs to be acceptable to both patients and nurses, as well as financially sustainable within the hospital setting. Implementation of a screening program using the STOP-D can provide the essential step of identification without overburdening nursing staff. And further, through the acknowledgment and treatment of psychological distress, improved outcomes for cardiac patients may be realized.

Implications for practice

- Depression and anxiety negatively affect cardiac patients.
- The STOP-D screens cardiac inpatients for depression and anxiety.
- The STOP-D performs as well as other validated tools.
- The STOP-D is self-administered, free, and requires no scoring.

Conflict of interest

The authors declare that there is no conflict of interest.

Funding

This work was supported by a grant from the Providence Health Care Research Challenge. During this study, Martha Mackay was supported by a Research Scholarship Award from the Heart and Stroke Foundation of Canada.

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