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Psychosocial Aspects in Cardiac Rehabilitation: From Theory to Practice

***A Position Paper from the Cardiac Rehabilitation Section of the
European Association of Cardiovascular Prevention and Rehabilitation
of the European Society of Cardiology***

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Abstract

A large body of empirical research shows that psychosocial risk factors (PSRFs) such as low socio-economic status, social isolation, stress, Type-D personality, depression and anxiety increase the risk of incident coronary heart disease (CHD) and also contribute to poorer health-related quality of life (HRQL) and prognosis in patients with established CHD. PSRFs may also act as barriers to lifestyle changes and treatment adherence and may moderate the effects of cardiac rehabilitation (CR). Furthermore, there appears to be a bidirectional interaction between PSRFs and the cardiovascular system. Stress, anxiety and depression affect the cardiovascular system through immune, neuroendocrine and behavioural pathways. In turn, CHD and its associated treatments may lead to distress in patients, including anxiety and depression. In clinical practice, PSRFs can be assessed with single-item screening questions, standardised questionnaires, or structured clinical interviews. Psychotherapy and medication can be considered to alleviate any PSRF-related symptoms and to enhance HRQOL, but the evidence for a definite beneficial effect on cardiac endpoints is inconclusive. A multimodal behavioural intervention, integrating counseling for PSRFs and coping with illness should be included within comprehensive CR. Patients with clinically significant symptoms of distress should be referred for psychological counseling or psychologically focused interventions and/or psychopharmacological treatment. To conclude, the success of CR may critically depend on the interdependence of the body and mind and this interaction needs to be reflected through the assessment and management of PSRFs in line with robust scientific evidence, by trained staff, integrated within the core CR team.

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Introduction

In medical practice, “stress” is a common psychosocial complaint from patients,¹ and the general public is increasingly concerned about the impact of psychosocial risk factors (PSRFs) on well-being and health.² Many clinicians, especially in the field of cardiovascular medicine, tend to have given little attention to this topic,³ perhaps because “stress” and “psychosocial factors” are terms with conceptual ambiguity, but also because clinicians have limited familiarity with strategies to manage PSRFs.²⁻⁵ Nevertheless, the link between psychosocial stress and cardiovascular disease (CVD) has clearly been identified as an important public health concern.⁶ In addition, systematic reviews and meta-analyses of prospective aetiologic studies have shown that PSRFs, including low socio-economic status (SES),^{7,8} lack of social support,⁹ acute and chronic life stresses,^{10,11} anger and hostility,¹² as well as anxiety¹³ and depression¹⁴ increase the risk of fatal and non-fatal CVD events, particularly incident coronary heart disease (CHD), and all-cause mortality. Likewise, and as will be further detailed below, PSRFs may adversely impact the prognosis of patients with clinically established CHD.^{3,4,15,16}

The INTERHEART case-control study, performed in 52 countries throughout Africa, Asia, Australia, Europe, the Middle East and North and South America, is one of the seminal studies that has been instrumental in increasing attention towards PSRFs in CVD.¹⁷ The study reported that perceived stress (due to work, home, finances or life events), and depression accounted for approximately 30% of the attributable risk of acute myocardial infarction (MI). The effects of PSRFs on acute MI were similar in men and women, all age groups, and all geographic regions of the world.¹⁷ As a consequence of this study and cumulative knowledge from over half a century of research, the importance of PSRFs, and their early recognition

and management, has been recognized in both previous and recent European guidelines on CVD prevention.^{18,19}

Knowing that the distinction between primary and secondary prevention of CHD is arbitrary in view of the underlying gradually developing atherosclerotic process, cardiac rehabilitation (CR) is an effective means for secondary prevention in patients with CHD.²⁰ CR represents an exercise-based multidisciplinary programme which aims to re-integrate patients with CHD, in particular after MI, into their former family, social and work-related lives and to support successful risk factor management, including lifestyle changes to decrease morbidity and mortality.²⁰ The core components of CR and competencies of health care professionals working in CR are the optimization of cardioprotective therapies and medical and lifestyle risk factor management, including education, health behavior change and PSRF assessment and management.^{20,21}

A recent meta-analysis showed that exercise-based CR reduced depression and the risk of recurrent CHD events to a similar extent as did mental health treatments (i.e., psychotherapy and antidepressants), whereas reduction of total mortality was only achieved by CR.²² Exercise-based CR has also been shown to reduce anxiety.²³ The mortality-lowering effects of exercise training during CR seems to be partially mediated by the beneficial effects of exercise on psychosocial stress, including symptoms of depression, anxiety, and hostility.²⁴ Therefore, the multidisciplinary approach of CR appears to be an ideal platform for PSRF management in patients with CHD.

This position paper aims to briefly review the PSRFs relevant for the management and prognosis of patients with established CVD and to highlight the potential of CR to improve PSRF control and management. While different groups of CVD patients, including those with chronic heart failure,²⁵ peripheral artery disease,²⁶ and an implantable

cardioverter-defibrillator²⁷, may all profit PSRF-wise from CR, this position paper focuses on psychosocial considerations in the rehabilitation of patients with uncomplicated CHD.

Whereas there is a high level of evidence for the importance of PSRFs for cardiovascular health and prognosis^{3-5,15} and for their interaction with secondary prevention measures including CR,^{20,21} there is less scientific evidence regarding indications for and methods of screening or of the value of therapeutic interventions and their impact on prognosis. Therefore, this position paper reflects expert opinions on these aspects with the aim of (1) increasing awareness of the importance of PSRFs in the management of CVD, (2) providing an overview on different types of PSRF and their role in CR based on available evidence, and (3) making recommendations with respect to screening and management of PSRFs in the CR of CHD patients. By doing so, we acknowledge that position papers should be in agreement and consistent with guidelines covering a particular clinical topic²⁸ in this case with the European guidelines on CVD prevention in clinical practice regarding PSRFs.¹⁹

Psychosocial risk factors and stress

There is no unifying theory about the definition of a “psychosocial factor” as a potential contributor to disease.² Some authors propose to limit the term to psychological processes which develop from interactions between individuals and their social environment (e.g. social support, work stress), but not to include psychological characteristics which describe individuals (e.g. depression, hostility).^{2,29} This view bears conceptual appeal for the tailoring of interventions to target social circumstances influencing health in CR. On the other hand, many psychological characteristics that describe individuals co-exist with disadvantageous social circumstances.^{30,31} Therefore, this position paper applies an umbrella concept to the definition of PSRFs of CVD as is common practice in behavioral cardiology.³

Three categories of PSRFs for a poor prognosis in patients with uncomplicated CHD (the largest group treated in CR) can usually be distinguished. These categories relate to characteristics of the social environment, personality traits, and negative affect (Table 1).⁴

PSRFs and psychological/psychosocial stress are sometimes used as mutually exchangeable constructs, but this does not serve well a scientific understanding of the concept of psychological stress.⁴ When talking about “stress”, a distinction must be made between “stressors” as individually taxing situations and the “stress response” to these demands in cognitive, mental, behavioral, and physiological terms.⁵ A taxing or demanding situation will be appraised as irrelevant, challenging, or threatening, and be labeled as a “stressor” or not depending on the individual’s perceived competencies to control and manage it.³² As a result of several moderating factors, including genetic, biographical, demographic, personality (e.g., anger-proneness), and disease characteristics (e.g. pre-existing CHD), some individuals are more vulnerable than others to react to stress in a more intense or chronic manner than would be expected as an evolutionary beneficial fight-flight response.³³ The neurobiological, neuroendocrine, and autonomic activation patterns accompanying maladaptive stress responses may bring forward dysfunctional cognitions (e.g. worrying), negative affect (e.g., depression, anxiety), poor health behaviors (e.g. unhealthy diet, sleep disturbances) and biological changes contributing to atherosclerosis (e.g. low-grade inflammation).³⁴ The experience of symptoms of negative affect, such as symptoms of depression and anxiety, is sometimes captured as “psychological distress” which may also include somatic symptoms and social withdrawal.³⁵ As such, high levels of in-hospital psychological distress after acute MI predicted cardiac mortality over the subsequent 5 years in men undergoing usual care, but not in those highly stressed patients who participated in a one-year programme of stress monitoring and intervention.³⁶

The formulation of the above stress concept allows an assignment of different PSRFs to either the level of stressors (e.g. work stress) or the level of the stress response (e.g. depressive symptoms); it also allows a distinction between acute stress (e.g. traumatic experiences) and chronic stressors (e.g. work stress).⁴ In the CR setting, clinicians should be aware that when talking about “stress”, patients may refer to demanding life circumstances, unpleasant feelings or somatic symptoms.⁵ When assessed through simple self-report questions asking about the frequency and intensity of feeling stressed, perceived stress has been shown to predict incident CHD.³⁷ However, to pinpoint the subjective meaning of what is meant by the word “stress”, the clinician needs to thoroughly assess illness perception and health beliefs of the patient.

Linking psychosocial risk factors with coronary heart disease

Behavioral and pathophysiological mechanisms interact and contribute to the initiation, progression, and clinical manifestation of atherosclerotic CVD.^{3,4,38} It is important to recognise the existence, interaction and relevance of these mechanisms (Table 2)^{10,39-62} and of common genetic variants such as the serotonin transporter polymorphism or polymorphisms of inflammatory biomarkers which are linked to depression and CHD.⁶⁴ Whilst PSRFs such as anxiety and depression may affect the cardiovascular system through biological and behavioral pathways, it must also be emphasized that CHD and its treatments may, in turn, evoke stress^{65,66} and bring forth PSRFs like depression and posttraumatic stress disorder (PTSD).^{67,68} The impact of CHD on partners is important, as partners have the potential to affect patients’ responses to their diagnosis and management.⁶⁷ Compared to usual care, a CR programme involving partners was shown to improve knowledge of heart

disease, reduce psychological distress, and improve satisfaction with care in both post-MI patients and their partners with a lasting effect at least up to one year.⁶⁹

Clustering of psychosocial and traditional risk factors of cardiovascular disease

Psychosocial risk factors tend to cluster together and to co-occur with traditional risk factors of CVD.⁷⁰ For instance, low SES is often associated with social isolation, depression and unhealthy lifestyle behaviors. Stress may be correlated with smoking, increased alcohol consumption and excessive body weight, those with low social support are less likely to stop smoking or adhere to medical regimens. The total CVD risk is reflected by the additive effect of traditional risk factors and PSRFs.⁷¹

In cardiac prevention, PSRFs of CHD are usually given attention as distinct constructs,¹⁹ an approach that has been supported by several factor analyses.⁷²⁻⁷⁵ However, there also is substantial overlap in PSRFs, in particular along the negative affect spectrum, suggesting that there might be a general disposition toward negative affect that may be more important for CHD risk than any specific negative affect state.^{76,77} In agreement with this reasoning, an increasing number of studies suggest that combining PSRFs may increase their predictive value for the progression and poor prognosis of CHD.⁷⁸⁻⁸⁰

Screening for psychosocial risk factors in cardiac rehabilitation

The recently issued European guidelines on CVD prevention in clinical practice recommend based on the available evidence⁸¹⁻⁸³ that PSRFs should be assessed and tailored clinical management should be considered in order to enhance health-related quality of life (HRQOL) and CHD prognosis.¹⁹ A recent meta-analysis showed CR significantly reduced depressive mood in patients with CHD.²² Studies on psychological interventions for CHD

patients in settings other than CR have found small-to-moderate improvements in depression and anxiety, a small reduction in cardiac mortality risk,⁸⁴ and a reduction in all-cause mortality risk for men but not women.⁸⁵ An assessment of PSRFs in patients with CHD is crucial as a means to stratify preventive efforts according to the individual risk profile of the patient. It is in keeping with good clinical practice to deliver a therapy only after a formal diagnosis has been made. Accordingly, individual psychotherapy sessions should be in line with the individual psychosocial needs and PSRFs of the patient. Moreover, it might not be ideal to address a PSRF in a group setting if some patients do not perceive that particular PSRF as being relevant to them, while high-risk patients with regard to their PSRF profile can only be identified if screening is in place. In the case of clinically significant symptoms of depression, anxiety and hostility, psychotherapy, medication or collaborative care^{81,86} could be considered to reduce mood symptoms and enhance HRQOL, but the evidence for a definite beneficial effect on cardiac endpoints is inconclusive.¹⁹

It has been debated whether the cardiologist or other members of the multidisciplinary team are best placed to be trained to screen for PSRFs in CR.^{87,88} Our perspective is that the decision should depend upon each institution's resources and preferences provided that adequate quality control is in place. As previously outlined,⁸⁹ a two-step evaluation of PSRFs in CR is proposed: first, to ask the patient single-item questions about distinct PSRFs (Table 3) and then to apply standardised questionnaires (Table 1).⁸⁹ If potential psychosocial problems are identified, patients should be referred to qualified health professionals (i.e. psychologists, behavioural experts) to establish diagnoses of, for instance, major depression or anxiety disorders (Table 1).^{4,89} There is no consensus about the most valid psychosocial evaluation instruments for this patient population⁹⁰. However, evidence suggests that

applying psychometric scales to assess PSRFs such as depression, anxiety, and anger/hostility provides useful information for CR.⁷⁵

It should be noted that a recent systematic review found no evidence that routine screening for depression in patients with CHD improves depression or cardiac outcomes, but randomized controlled trials on this issue are currently lacking.⁹¹ This review stated: *“depression screening can benefit patients only to the extent that it identifies depressed patients not already diagnosed or treated for depression, successfully enrolls those patients in treatment, and achieves positive treatment results.”*⁹¹ Therefore, it is highly desirable that routine screening for PSRFs translates into improved healthcare models.¹⁹ Future research is clearly needed to determine whether screening for PSRFs improves HRQOL and other outcomes in CR patients.

Core competencies to manage psychosocial risk factors in cardiac rehabilitation

The professional knowledge and skills needed for the effective management of PSRFs in patients with stable CHD in CR have been proposed in previous position papers.^{20,21} Core competencies should include a screen for stress and PSRFs to identify clinically relevant levels of depression, anxiety, anger/hostility, relationship stress and low social support. Patients with CHD often have difficulty in communicating their stress and have identified gaps in the professional support available to help them to address stressors.^{92,93} Stress management should be offered to patients on an individual basis or in small groups. Whenever possible, significant others should be included and patients should be helped to obtain effective social support. In case of work stress, vocational counseling should be provided. Referrals to psychiatric or other behavioral healthcare providers are to be considered if patients' needs are beyond the scope of the psychosocial care that can be

offered in the context of CR.²¹ Strategies to effectively change unfavorable health behaviors should integrate best research with clinical expertise and take account of patients' needs and preferences.²¹ The expected outcomes of psychosocial management in CR are absence of clinically relevant psychosocial problems and acquisition of stress management skills,²⁰ enhanced HRQOL and improved CHD prognosis.¹⁹ It has been shown that, after only two half-day sessions of psychosocial management training, CR staff gain significant knowledge in psychosocial issues and cognitive behavioral treatment techniques.⁸⁷

Educational interventions can affect a patient's psychological state positively and reduce misconceptions about CHD and its outcomes.^{20,94} Frank discussions of the patient's concerns, fears and health beliefs are helpful. Group sessions, led by trained mental health specialists, allow patients to share common concerns, provide mutual support, obtain educational information and receive guidance regarding the progressive resumption of activities. Individual counseling sessions by trained psychologists or other mental health professionals are more specific, tailored to the individual's problems and can apply educational elements.

In summary, there is a clear need for CR programmes to screen for PSRF and to have established links with mental health care professionals (i.e. psychologists, psychiatrists or experts in psychosomatic medicine). Ensuring that at least one CR team member has special training related to mental health issues would improve levels of relevant expertise on PSRF assessment and management within CR and would likely lead to better patient outcomes.

Synopsis of psychosocial risk factors for poor prognosis of coronary heart disease

In the following paragraphs, we describe individual PSRFs for adverse outcomes in patients with established CHD and then weight their impact on CHD prognosis through data

from systematic reviews and meta-analyses or individual prognostic studies. We also provide suggestions for the screening and assessment of PSRFs with single-item questions, standardized and validated questionnaires, and clinical interviews.⁸⁹ Finally, we selectively review the literature about the effects of CR on PSRFs. It is beyond the scope of this position paper to discuss studies which probed for an effect of biobehavioural interventions on PSRFs and CVD risk outside the CR setting.

Acute and Chronic Stress

Intense emotions like outbursts of anger⁹⁵ and *acute life "stressors"* commonly accompanied by intense emotions can trigger cardiovascular events and increase mortality within a few hours to several months, e.g. following the death of a loved one,^{96,97} natural disasters,⁹⁸ military/ terrorist attacks,⁹⁹ or even major football tournaments.^{100,101} The triggering of acute coronary syndromes as well as fatal arrhythmias and sudden cardiac death is particularly observed in patients with pre-existent CHD.^{98,102}

There also is an association between *stressful life events* such as financial strain and recurrent CHD events among women.¹⁰³ Moreover, compared to men with CHD, women with CHD reported more stressful life events and other PSRFs in the year following hospital discharge.¹⁰⁴ Financial stress and social isolation predicted worsening of depression and persistent anxiety.¹⁰⁴ Hence patients with these PSRFs and female patients might constitute high-risk CHD patients who might particularly benefit from CR.^{102,105}

Concern is increasing about the adverse effects of chronic *work stress*, particularly on CHD risk.¹¹ Two models identifying stressful components of the psychosocial work environment have received particular attention, that is the job strain model (high work demands and low job control) and the effort-reward imbalance model (high efforts and low

reward).^{106,107} Cross-sectional findings controlling for age, gender, and socio-economic status (SES) show people with job strain are more likely to have traditional CVRFs, including diabetes, smoking, physical inactivity, and obesity.¹⁰⁸ Nonetheless, independent of traditional CVRFs, in patients who returned to work after a first MI, chronic job strain was a prognostic factor for recurrent CHD events,¹⁰⁹ and effort/reward imbalance predicted poor prognosis in women.¹¹⁰

Consequences for cardiac rehabilitation

Exposure to chronic or acute stress has to be assessed formally not only as a potential risk factor for CVD but also as a barrier for successful treatment and lifestyle changes in CR. For individual patients, it may be more important to change their existing stressors, or to enhance their coping mechanisms for existing stressors, than to change unhealthy lifestyle habits. Therefore, it is essential to identify stressors with patients and support them in finding ways to attenuate stressors. This ideally should be carried out by trained personnel in dedicated sessions dealing with stress. Stress management can be a first line intervention but may also be a prerequisite for successful, sustained CR and secondary prevention. It has been shown that job stressors can successfully be reduced through CR.¹¹¹

Social factors

Low SES such as indexed by low income, education, and occupational class (e.g., manual vs. non-manual), is a major contributor to health inequalities world-wide,¹¹² including lower survival in those with CHD.¹¹³ Post-MI patients with both low income and low education are particularly at risk of premature mortality.¹¹⁴ Whilst some components of SES are not modifiable, CR can address some of the correlates, such as functional recovery and

traditional CVRFs which have been shown to account for much of the association between low SES and mortality after MI.^{115,116}

Social support is a function of the breadth of an individual's social network as well as the perceived benefit reaped from their network's members. A meta-analysis showed that low functional support more than low structural support (i.e. the size of the social network) predicts an increase in risk of cardiac and all-cause mortality controlling for other prognostic factors in patients with CHD.⁹ Although low social support and depression are often found in combination, a very high level of social support may serve as a buffering variable against the impact of depression on mortality in post-MI patients,¹¹⁷ although these data are not uniform.¹¹⁸

Social support during CR can stem from various sources such as health professionals, family members, and employers¹¹⁹ and, by its association with depression may contribute to post-rehabilitation QoL.¹²⁰ Marital and family concerns should be addressed in support interventions.¹²¹ Marriage satisfaction was higher in CHD patients who participated in CR compared to non-participants.¹²² Perceived employer support, more than family and physician support, predicted better work adjustment in CR patients¹²³ and social support has also been associated with higher exercise tolerance in CHD patients during CR.¹²⁴ However, whilst in the randomised controlled ENRICHD trial, a cognitive behavioral therapy-based psychosocial intervention increased social support in post-MI patients with low perceived social support, this effect did not translate into better cardiac outcomes.¹²⁵

Consequences for cardiac rehabilitation

In CR it is important to assess SES and, in particular, address the issue of social support. Measurement of the latter is variable and a multidimensional approach is

proposed.¹¹⁹ All actions that appear to pragmatically attenuate individual social stressors in CR should be considered as therapeutic and preventive. Participation in long-term supervised exercise training groups (“heart clubs”) or other outpatient prevention groups may provide social contact that actively enhances social support and reduces social isolation.

Personality factors

Various personality types or characteristics have been considered over time as being risk factors for CHD: these include the Type A behavior pattern and Type D personality as well as anger-proneness and hostility.

The Type A “coronary prone” behavior pattern includes ambitious and competitive behaviour, impatience, hostility and intolerance. Early findings of an association between Type A behaviour and CHD^{126,127} were challenged by more recent studies^{128,129} and a meta-analysis concluding that Type A behaviour has no impact on the development of CHD.¹³⁰ While there is little evidence that Type A personality is a prognostic factor in patients with CHD,¹³¹ it may be a risk marker for psychological distress.¹³² About 25% of patients in CR with a recent MI present with Type A behaviour,¹³³ and CR programmes targeting type A behaviour may reduce psychological distress.¹³⁴

Anger-proneness and *hostility* have been identified as the “pathogenic” components of the Type A personality behaviour pattern, and they negatively impact on both CHD development and prognosis in patients with CHD.¹² Hostility can be described as a cognitive attitude of cynical and suspicious thinking about others. There is some overlap between hostility and anger-proneness; hostile behaviours may show in overt expression of angry feelings and verbal aggressiveness.⁴ CR may decrease hostility and anger significantly.^{135,136} Hostility has been shown to contribute to lower baseline and follow-up HRQOL in CR.¹²⁰ A

reduction in psychological stress, including symptoms of hostility, through exercise-based CR, has been shown to explain, in part, a reduced mortality risk for CHD patients.²⁴

Type D personality is characterised by increased levels of negative emotions (i.e., negative affectivity), such as worrying, depressive feelings and irritability, with a greater use of maladaptive coping strategies plus a tendency towards social inhibition and isolation.^{137,138} Type D is present in approximately one third of patients with CVD. It seems to be significantly more prevalent in hypertensive patients (53%) than in CHD patients (28%) and healthy controls (20%).¹³⁸ Multiple studies and meta-analyses have shown that patients with this personality profile and with established CVD have a poorer prognosis than non-Type D patients.¹³⁹⁻¹⁴¹ However, some of the more recent studies failed to find a prognostic value of Type D personality for poor outcome in cardiac patients.^{142,143} Type D personality has also been associated with impaired patient-reported physical and mental health status in patients with CVD.¹⁴⁴ A CR programme focusing on Type D characteristics led to reduced Type D scores at the one-year follow-up in CHD patients who had high baseline scores: this effect was attributed mainly to a reduction in social inhibition.¹⁴⁵ Another, although uncontrolled, study found CR decreased social inhibition scores to a greater extent in women than in men with CHD.¹⁴⁶ Compared to non-Type D's, Type D patients were shown to benefit less from CR in terms of psychological well-being, including depressive mood and anxiety.¹³⁷

Consequences for cardiac rehabilitation

Evaluation of personality factors may be important in the secondary prevention of CHD and direct psychological intervention focusing on anger and hostility may be appropriate. The prognostic effect of such interventions has not been studied systematically in CR. Thus a strong recommendation to include these in CR cannot be made. Few studies

have investigated Type D patients following CR but where they have, it has been shown that many of these patients, despite an overall improvement in psychological well-being, continue to show clinically relevant levels of anxiety, depression, impaired psychophysical well-being, perceived psychophysical stress, interpersonal difficulties and social anxiety. To date, there is no scientific evidence regarding how best to treat type D patients with these characteristics.

Negative affect

Anxiety: A recent meta-analysis including post-MI patients demonstrated that anxiety symptoms were predictive for all-cause mortality, cardiac mortality and new cardiac events over an average follow-up period of 3 years.¹⁴⁷ Most of the included studies had assessed anxiety symptoms with the State Trait Anxiety Inventory (STAI) or the anxiety subscale of the Hospital Anxiety and Depression Scale (HADS-A).¹⁴⁷ More recently, cardiovascular prognosis was also found to be impaired in CHD patients with, versus those without, a general anxiety disorder.¹⁴⁸

Regarding the prevalence of clinically significant anxiety in CHD populations, a prospective study on patients with acute MI showed elevated STAI scores in 27%, 42%, and 40%, respectively, during hospitalisation, after 4 months and after one year.¹⁴⁹ In another study, 29% of patients were identified with anxiety or depression or both, according to the HADS, at three months after a first MI.¹⁵⁰ Of these, only 30% and 21% respectively had received psychosocial support or used antidepressants, indicating that there is a need for longer-term CR with a focus on mental health issues.¹⁵⁰ Further work reported that 45% of CHD patients commencing CR had at least one anxiety disorder and the majority of those with a depressive disorder also had an anxiety disorder.¹⁵¹ The prevalence of clinically significant symptoms of a PTSD attributable to the traumatic experience of an acute coronary

event is 16%; there is cumulative evidence that PTSD symptoms also worsen the cardiovascular prognosis in patients with CHD.¹⁵²

Exercise- and educationally-based CR, including lectures on psychological distress and teaching of stress-reduction techniques have markedly reduced symptoms of anxiety with greatest improvements seen in those with high levels of anxiety.²³ Compared to in-hospital anxiety levels, anxiety scores, measured with the HADS, had significantly decreased after 18 months in women who had participated in formal CR compared to those who had not.¹⁵³ Other controlled studies also showed CR to significantly reduce anxiety in CHD patients.^{122,135} Compared to older women, younger women showed higher anxiety levels at the start of CR,¹²⁷ and higher baseline anxiety and depression scores were found in defaulters of CR than in completers.¹⁵⁴

Consequences for cardiac rehabilitation

The onset of a cardiac event, sudden disease progression and acute hospitalisation to an intensive care unit or cardiac surgery can be frightening and stressful.⁶⁷ The initial reaction to MI in many patients comprises feelings of anxiety, and this is a normal human reaction; however, very high levels of distress related to fear of dying and helplessness may impact prognosis after MI in their own right.⁶⁶ Some patients may be anxious about their prognosis, and about possible physical, sexual, social and occupational incapacity. Some may avoid any physical activity, emotional exertion, sex and other activities, fearing that these may be harmful to their health. Therefore, assessing anxiety at the beginning of CR is important. Despite recent critique,¹⁵⁵ the HADS is a standardized, validated, and frequently used questionnaire for the assessment of anxiety and/or depression.¹⁵⁶ However, it is probably

more effective in measuring general psychological/emotional distress than in clearly differentiating between symptoms of anxiety and depression in CVD patients.¹⁵⁷

Depression: An overview of the literature on the depression-CHD link from the last 25 years concluded from about 50 prognostic studies that depression is associated with a 1.6- to 2.2-fold increased risk of adverse outcomes;¹⁵⁸ this result is bolstered by several systematic reviews and meta-analyses of the last decade of research.^{9,14,159,160} Poor outcomes relate to significantly higher rates of future cardiac events, including re-infarction, cardiac arrest and cardiac mortality, including sudden death. Cardiac disease severity and other prognostic factors like health behaviors may account for some of this risk.^{158,161} A recent meta-analysis showed that somatic/affective symptoms of depression (e.g. sleep and fatigue) have a greater predictive value for cardiovascular prognosis in CHD patients than cognitive/affective symptoms (e.g. sad mood).¹⁶²

Depression is associated with increased dropout rates from CR¹⁵⁴ and at least three times more common in patients after acute MI than in the general population.¹⁵⁹ About 15-25% of patients with MI meet the Diagnostic and Statistical Manual of Mental Disorders Fourth Edition (DSM-IV) criteria for major depression, and even a higher proportion (40-65%) show elevated levels of depressive symptoms.^{163,164} National Health Interview Survey data of 30,801 adults found the 12-month prevalence of major depression to be 9.3% in individuals with cardiac disease compared with 4.8% in those without comorbid medical illness.¹⁶⁵ Also, depression in the general population and among CHD patients is twice as common in women than in men.¹⁶⁶ Recent evidence suggests that young women may be at particularly high risk for depression after acute MI.¹⁶⁷

Patients with CHD and depression have more severe cardiac symptoms, adhere less to medical therapy and CR and have slower resumption of activities and social readjustment,

with lower rates of return to work and poorer HRQOL following MI and bypass surgery.^{40,41} The prevalence of depression and depressive symptoms in patients hospitalized for unstable angina, angioplasty, bypass surgery, and valve surgery are similar to those observed in patients with MI, and are even higher than in CHD patients with congestive heart failure.^{168,169} Depression immediately before and after bypass surgery is linked to higher rates of re-hospitalisation, longer recovery and surgical complications, lower HRQOL and slower return to work.¹⁶⁵ The coexistence of depression with CHD is associated with more frequent emergency department and ambulatory care visits, more days spent in bed because of illness, functional disability and additional health care costs.¹⁶⁵ Studies on the effect of depression on prognosis in CR patients are rare but one study which compared CHD patients with and without depression after CR, showed that those with depression had markedly higher mortality after 4 years of follow-up.¹⁷⁰

Consequences for cardiac rehabilitation

Depression and depressive symptoms are highly relevant to CR. The most widely used screening tools for depression are the HADS¹⁵⁶ and the Patient Health Questionnaire (PHQ).¹⁷¹ The PHQ-2 provides 2 questions, recommended for screening for current depression: if the answer is “yes” to both questions, a full psychological assessment is recommended.¹⁷² Identifying and treating depression and/or depressive symptoms is a major challenge. Treatment options include psychological counseling (including cognitive-behavioral therapy), antidepressants (primarily selective serotonin reuptake inhibitors) and physical activity.^{84,173} In patients with CHD and elevated depressive symptoms, four months of aerobic exercise training three times/week was shown to be as effective as antidepressants for improving depressed mood.¹⁷⁴ However, while psychological and antidepressant treatment

can reduce depressive symptoms, their impact on the reduction of cardiac mortality, rate of MI, need for cardiac surgery or reduction of total mortality is less clear.^{22,84,175,176}

Health-related quality of life

Despite that HRQL is not understood as a PSRF, it is a well defined predictor of mortality in patients with CHD,¹⁷⁷ and its improvement is considered a desirable outcome parameter of CR, reflecting patients' physical and psychological well-being. In recent years HRQOL and patient-reported health status have gained considerable interest on various levels.¹⁷⁸ Cardiac patients with poor self-reported HRQOL tend to have higher rates of re-infarction and re-hospitalisation,^{179,180} and they are less likely to be invited to, or to attend CR.¹⁸¹ A systematic review clearly demonstrates that CR improves HRQOL,¹⁸² and, for patients with elevated depressive mood, there was greater improvement in physical quality of life during CR if they were provided stress management in addition to exercise than exercise only.¹⁸³ Better baseline scores of HRQOL predicted fewer early dropouts from CR, although this effect was not independent of other variables.¹⁸⁴ Notably, a CR programme tailored for women significantly improved global HRQOL compared with traditional CR.¹⁸⁵ Comorbid psychiatric disorders and the distressed (Type D) personality are both associated with diminished HRQOL in CR populations.^{151,137}

Consequences for cardiac rehabilitation

As CR aims to ultimately improve a patient's HRQOL, it is important to assess their HRQOL status and to monitor it during the programme. Readily available valid and reliable instruments for this purpose are the Dartmouth COOP, the MacNew, and the Kansas City

Cardiomyopathy Questionnaire.¹⁸⁶⁻¹⁸⁸ A newer instrument - the HeartQoL questionnaire provides a single reliable and valid core CHD-specific tool for comparing HRQOL outcomes in patients with CHD across European language groups. HeartQoL comprises 14-items (10-item physical and a 4-item emotional subscales with a global score if needed. An international cohort of 6384 patients, from 22 countries, speaking one of 15 languages provided the basic psychometric basis for the measure.^{189,190} It should be noted that different questionnaires assess different aspects of QoL so that the changes in HRQOL during CR will depend on the type of instrument used and the patient's baseline status.^{120,191}

Conclusions

Research in recent decades has demonstrated that PSRFs, such as low SES, lack of social support, chronic stress, anger and hostility, Type D personality, anxiety and depression are associated with adverse patient and clinical outcomes in patients with established CHD. Core behavioural factors related to an unhealthy lifestyle, pathophysiological mechanisms and poor adherence to therapy may contribute to this association. A goal of CR is to identify patients with PSRFs and offer tailored interventions by a core CR team, including expertise in psychosocial care. In general, psychological support is intended to reduce cardiovascular risk, improve HRQOL, and facilitate the patient's return to regular family, social and work-related life. It should be a component of every CR programme and delivered in line with robust scientific evidence by trained staff.

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Table 1. Psychosocial risk factors for poor prognosis in patients with coronary heart disease patients

Risk factor	Relevance for prognosis	Psychometric assessment	Effect of cardiac rehabilitation
Low socioeconomic status	++	Hollingshead Two-Factor Index of Social Position ¹⁹²	Not directly influenced
Low social support	+++	ENRICH Social Support Inventory (ESSI, 7 items) ¹⁹³	Positive
Work stress	+	Job Content Questionnaire (JCQ, 42 items) ¹⁹⁴ Effort-Reward Imbalance questionnaire (ERI, 23 items) ¹⁰⁷	Probably positive
Anger and hostility	+	Strait Trait Anger Inventory (STAXI, 44 items) ¹⁹⁵ Cook-Medley Hostility Scale (CM Ho Scale, 50 items) ¹⁹⁶	Positive
Type D personality	++	Type D Scale-14 (DS 14, 14 items) ¹⁴⁸	Probably positive
Depression	+++	Hospital Anxiety and Depression Scale (HADS, 7 items) ¹⁵⁶ Patient Health Questionnaire-9	Clearly positive

		(PHQ-9, 9 items) ¹⁹⁷ Beck Depression Inventory (BDI, 21 items) ¹⁹⁸ Composite International Diagnostic Interview (CIDI) ¹⁹⁹	
Anxiety	++	Hospital Anxiety and Depression Scale (HADS, 7 items) ¹⁵⁶ State-Trait Anxiety Inventory (STAI, 40 items) ²⁰⁰ Composite International Diagnostic Interview (CIDI) ¹⁹⁹	Clearly positive

Level of importance: +++ high, ++ medium, + low

The time required to administer the above questionnaires is between 5 and 15 min and time for staff to score them between 1 and 10 min. Except the questionnaires for work stress, all others provide clinical cutoffs.⁸⁹

Table 2. Mechanisms linking psychosocial factors with coronary heart disease

Behavioral mechanisms	Pathophysiological mechanisms
<ul style="list-style-type: none"> • unhealthy lifestyle (unhealthy diet, smoking, drinking excess alcohol, being sedentary)^{39,40} • reduced chances of successful modification of risk factors (such as smoking cessation)^{39,41} • decreased adherence to medical treatment regimens⁴²⁻⁴⁵ • lower rates of participation in cardiac rehabilitation and reduced quality of life⁴⁶⁻⁴⁹ 	<ul style="list-style-type: none"> • hypothalamic-pituitary-adrenal axis and autonomic nervous system dysfunction: increased sympathetic activity and/or reduced vagal activity, hypercortisolemia with raised corticotropin-releasing factor (increased free fatty acids); reduced heart rate variability⁵⁰⁻⁵² • reduced serotonin, leading to platelet dysfunction, hyperactivity^{53,54} and hypercoagulability⁵⁵ • Ω-3 fatty acid deficiency^{56,57} • elevated homocysteine levels⁵⁶ • endothelial dysfunction^{58,59} • stress-induced myocardial ischemia^{60,61} • elevated inflammatory biomarkers (C-reactive protein, interleukin-6, intercellular adhesion molecule-1)^{62,63}

Table 3. Simple screening questions to identify potential psychosocial problem areas

Psychosocial risk factor	Closed questions (yes/no answers)
Low socioeconomic status	Do you have more than the mandatory level of education? Are you a manual worker?
Low social support	Are you living alone? Do you have a close confidant? Do you have any person to help you in case of illness? Do you have serious problems with your partner?
Work stress	Do you have enough control over how to meet the demands at work? Is your reward appropriate for your effort?
Hostility/anger	Do you frequently feel angry over little things? If someone annoys you, do you regularly let him or her know? Do you often feel annoyed about habits other people have?
Depression	During the past month, have you often been bothered (i) by feeling down, depressed, or hopeless? (ii) by little interest or pleasure in doing things?
Panic-like anxiety	During the past month, have you had an anxiety attack, i.e., suddenly feeling fear or panic?
Posttraumatic stress	During the past month, have you experienced the following regarding your heart disease: (i) that you had nightmares about it or thought about it when you did not want to? (ii) tried hard not to think about it or to avoid situations that reminded you of it?