



Significance of psychosocial factors in cardiology: update 2018

Position paper of the German Cardiac Society

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Abstract

Background Psychosocial factors in cardiovascular diseases are increasingly acknowledged by patients, health care providers and payer organizations. Due to the rapidly increasing body of evidence, the German Cardiac Society has commissioned an update of its 2013 position paper on this topic. The German version was published in 2018 and the current manuscript is an extended translation of the original version.

Methods This position paper provides a synopsis of the state of knowledge regarding psychosocial factors in the most relevant cardiovascular diseases and gives recommendations with respect to their consideration in clinical practice.

Results Psychosocial factors such as low socioeconomic status, acute and chronic stress, depression, anxiety and low social support are associated with an unfavorable prognosis. Psychosocial problems and mental comorbidities should be assessed routinely to initiate targeted diagnostics and treatment. For all patients, treatment should consider age and gender differences as well as individual patient preferences. Multimodal treatment concepts should comprise education, physical exercise, motivational counseling and relaxation training or stress management. In cases of mental comorbidities, brief psychosocial interventions by primary care providers or cardiologists, regular psychotherapy and/or medications should be offered. While these interventions have positive effects on psychological symptoms, robust evidence for possible effects on cardiac outcomes is still lacking.

Conclusions For coronary heart disease, chronic heart failure, arterial hypertension, and some arrhythmias, there is robust evidence supporting the relevance of psychosocial factors, pointing to a need for considering them in cardiological care. However, there are still shortcomings in implementing psychosocial treatment, and prognostic effects of psychotherapy and psychotropic drugs remain uncertain. There is a need for enhanced provider education and more treatment trials.

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Keywords Cardiology · Psychosocial risk factors · Patient care · Psychotherapy · Psychopharmacology

Preamble

This position paper is an updated version of the 2013 publication, „Position paper on the importance of psychosocial factors in cardiology“, by the German Cardiac Society (Deutsche Gesellschaft für Kardiologie, DGK [94]). In 2017, the DGK Committee on Clinical Cardiovascular Medicine approved a comprehensive revision due to significant developments, growing scientific evidence and an increase in acceptance of psychosocial factors in cardiology.

The position paper provides the current state of knowledge and aims to guide physicians, psychotherapists and their patients in making decisions regarding reasonable diagnostic and therapeutic measures.

Introduction and methods

Psychosocial factors such as low socioeconomic status, acute or chronic stress and depression or anxiety are highly prevalent in cardiac patients and are linked to behavioral and biological risk factors. Thus, they are related to a higher risk of cardiovascular disease and to an unfavorable course of illness. Due to available evidence as well as societal relevance, not only patients, care providers (cardiologists, general practitioners) and benefactors become more aware of these factors, but national and international guidelines and position papers have also increasingly taken such factors into account [18, 20, 22, 136, 138]. Table 1 summarizes the key arguments regarding the relevance of psychosocial factors in clinical care.

Our aim is not to provide a systematic review or strictly evidence-based guideline, but we rather summarize our expert opinion based on clinical experience and a focused literature review on psychosocial aspects for the most important cardiac diseases.

Table 1 Key arguments regarding the relevance of psychosocial factors in clinical practice

Psychosocial risk factors are
Highly prevalent in cardiac patients
Linked to behavioral and biological risk factors
Associated with increased risk of mortality and morbidity
Associated with lower quality of life
Barriers to lifestyle change and medication adherence

Psychosocial aspects in the onset and course of selected cardiovascular diseases

General aspects

The onset and course of the most frequent cardiovascular diseases can be described well on the basis of a biopsychosocial model: cardiovascular diseases develop based on individual genetic makeup in interaction with interpersonal experiences during childhood and adolescence as well as various environmental stressors, within a certain socioeconomic and cultural milieu [5].

Here environmental and behavioral factors play a larger role than genetic risk factors: through a healthy lifestyle, persons with high genetic risk can reduce their individual risk to that of persons with low genetic risk [82]. The onset of cardiovascular diseases is closely tied to a certain lifestyle (smoking, poor diet, inactivity, preventable exposure to stress) and could be avoided by most people, when compared to the extent of the present-day pandemic [1].

Age

While chronological age is a risk factor for myocardial infarction, the actual risk is substantially determined by modifiable risk factors [39]. Accordingly, the risk factor profile of a young heart attack patient differs clearly from that of an older patient: while younger heart attack patients are in fact more often male with a more frequent familial genetic predisposition, they are above all more frequently smokers [155]. In the INTERHEART study, psychosocial risk factors such as depression, critical life events, stress symptoms and financial problems accounted for 43.5% of the population attributable risk in younger patients (proportion of the population in whom myocardial infarction could be prevented if the risk factor could be completely eliminated), compared to 25.2% in older patients [188].

Frailty, social isolation and cognitive impairment become more important in advanced age, for example, for older patients with chronic heart failure who often later require palliative care [138]. Starting at 50 years of age, the prevalence of atrial fibrillation continuously increases with age [86]. In contrast, genetically conditioned and often life-threatening cardiac arrhythmias become manifest before age of 40, which means that handling the heredity of such a disease is an important aspect of psychosocial care [13].

Gender

The available evidence supports a differentiation of gender-specific aspects with regard to the aetiopathogenesis and prognosis of cardiovascular diseases [18, 128, 141, 172].

In males, coronary heart disease (CHD) prevalence is consistently higher and increases exponentially starting at age 45 [62]. In females, the prevalence increases on average at age 55, but for females with low social status at age 45 [62]. For myocardial infarction, females are approximately 10 years older, present acutely with longer time latency, more frequently with atypical symptoms, have more comorbidities and receive less often optimal guideline-based therapy. Accordingly, post-infarction mortality is higher [2], especially in younger females [110].

In addition to older age, women have a higher prevalence of depression and posttraumatic stress disorder (PTSD), which in turn is associated with higher cardiovascular risk [173]. Early stress experiences in socially disadvantaged women as well as increased familial and professional demands in terms of gender-specific role conventions likely contribute as well [118]. Moreover, studies suggest higher stress vulnerability and exposure to stress in women, which are associated with atypical cardiovascular pathologies such as microvascular dysfunction or vasospasm [172]. Noteworthy also is the fact that approximately 90% of patients with Takotsubo cardiomyopathy are postmenopausal women. Further, gender-specific aspects are found in congestive heart failure (CHF), which manifests more frequently as tiredness and exhaustion in women [142] and in turn can be misinterpreted as depression. Arrhythmias, such as paroxysmal supraventricular tachycardia (SVT), are more often misinterpreted in women as panic attacks or other psychogenic symptoms, which results in delayed treatment (as with acute coronary syndrome) [25].

Socioeconomic status

Socioeconomic status is a significant predictor of cardiovascular morbidity and mortality [79, 165]. Indicators of social status are education, income, profession and place of residence. In high-income populations, it is especially persons with lower social status who are affected by cardiovascular diseases [163]. Constant lower social status across one's lifespan is associated with a twofold increased cardiovascular mortality [163].

Low social status is characterized by a cluster of work-related factors (either no or precarious work contracts, unqualified work), environmental factors (low-grade housing, high crime rates, traffic noise, pollution) and high mental stress [118, 130].

Social support

Objective or subjective lack of social support is associated with a higher risk of developing cardiovascular diseases and a higher risk of mortality [174]. Lack of social support and loneliness are significant factors in single men for overall and cardiovascular mortality [162]. The effect of loneliness on mortality is comparable to that of heavy smoking (15 cigarettes per day; [187]).

Importance of early stress experience

Experiencing stress in early childhood such as violence, neglect, sexual and emotional abuse as well as social discrimination increases the risk for developing mental, cardiovascular and metabolic illnesses and as a result leads to increased mortality [72, 164]. Longitudinal studies show an inverse relationship between psychosocial well-being in childhood and adolescence and the incidence of atherosclerosis in adulthood [77].

Biopsychosocial mechanisms

Psychosocial factors such as low socioeconomic status, chronic stress or mental comorbidity are associated with an increased risk of cardiovascular morbidity and mortality [5]. Patients with severe mental disorders have a reduction of life expectancy by 10 years on average [55, 179]. A summary of psychosocial risk factors in selected cardiovascular diseases is given in Table 2. Important to note is that several of these factors are also negatively influenced by the experience of suffering from a cardiovascular disease itself.

The association between psychosocial factors and cardiovascular illnesses is mediated by behavioral and psychobiological mechanisms [5]. It is important to note that the respective factors and mechanisms interact with one another in a complex manner that is to some extent not yet fully understood.

Human behavior is based predominantly on environmental experiences even though genetic disposition also plays a role [46]. The social environment is of crucial importance for acquiring health-related knowledge, attitudes and behavioral patterns (health literacy) [158]. For example, low health literacy is particularly common for persons with lower socioeconomic status, which is in turn associated with disease-promoting behavior (e.g., smoking, poor diet, physical inactivity, medical non-adherence) [186].

Another important factor is the individual ability to adjust to mental and health-related demands. This comprises the ability to cope emotionally with diseases including adapting and/or maintaining favorable health-related behavior.

Table 2 Established psychosocial risk factors in selected cardiac diseases

Disease	Risk factor
Coronary heart disease	Acute and chronic stress Low socioeconomic status Low social support Depression; vital exhaustion Anxiety Posttraumatic stress disorder Type D personality, hostility
Congestive heart disease	Depression Anxiety Cognitive impairment
Cardiac arrhythmias	Acute stress Depression Anxiety Type D personality Posttraumatic stress disorder
Arterial hypertension	Social isolation Chronic stress
Takotsubo cardiomyopathy	Acute stress Comorbid depression Comorbid anxiety
Somatoform and functional disorders	Acute stress Chronic stress
Adults with congenital heart disease	Comorbid depression Comorbid anxiety

Despite high demands, several individuals are able to adequately adjust (high resilience), while others develop maladaptive, disease-promoting behavioral patterns.

For example, people with traumatic childhood experiences, chronic stress or mental comorbidities (e.g., depression, anxiety) exhibit more disease-promoting behavior [121]. The same holds for people with certain personality characteristics like the “Type D personality” [37] or chronic hostility [28].

In addition, dysfunctional activation of the neuroendocrine and stress axes have been described, which can result in reduced heart rate variability, increased inflammatory

markers and activated coagulation [105, 180, 185]. Moreover, findings from animal experiments suggest additional epigenetic factors after biographical traumatization, but this must be confirmed by human studies [50]. Table 3 summarizes the main biological mechanisms related to psychosocial risk factors in selected cardiovascular diseases.

Quality of life

For chronic illnesses, for which symptom treatment is the central focus, health-related quality of life (QoL) is especially important and is significantly influenced by mental factors [101, 153]. QoL includes physical, social and mental dimensions of well-being and coping with everyday life. Patients with CHF show reduced health-related QoL, which is affected more by the existence of depressive symptoms than biomedical variables [153]. This also applies to patients with CHD [83]. Older age, female gender, a higher level of functional impairments, stronger comorbidity and hospitalization due to illness were predictors for lower QoL in patients with CHF [30]. For healthy individuals, psychological and physical QoL was an independent predictor of new onset of CHD and cerebrovascular events [17].

Coronary heart disease

Psychosocial stress and CHD risk

Chronic stress at the workplace can increase the risk for developing CHD [42, 134]. Moreover, shift work with night shifts or excessive overtime is associated with higher CHD risk [80].

Pronounced acute stress situations (e.g., anxiety, anger, grief) can lead to plaque ruptures via the acute response of stress hormones, the immune and the coagulation system, and thus trigger an acute myocardial infarction [124]. A large epidemiological study found that especially in the first 24 h after experiencing severe stress, such as the loss of a

Table 3 Main biological mechanisms related to psychosocial risk factors

Altered systems or mechanisms	Measures or symptoms
Autonomic nervous system dysfunction	Elevated plasma/urine catecholamines Reduced vagal activity Reduced heart rate variability Elevated resting heart rate Reduced heart rate recovery
Hypothalamic–pituitary adrenal axis dysfunction	Flattened diurnal cortisol slope Altered cortisol awakening response Hyper-/hypocortisolism
Endothelial dysfunction	Reduced flow-mediated dilatation
Proinflammatory state	Elevated C-reactive protein Elevated interleukin-6 and tumor necrosis factor alpha
Prothrombotic state	Elevated fibrinogen, clotting factors, and fibrin D-dimer Increased platelet activity

loved one, the relative risk of a heart attack for the bereaved person is 21 times higher [122]. In contrast, social support or cohabitating with a spouse and family can serve as protective factors and reduce risk of illness and mortality after CHD manifestation [64].

Mental disorders and CHD risk

According to several meta-analyses, depressive disorders are associated with a higher risk for developing CHD (RR 1.6–1.9) as well as higher cardiovascular morbidity and mortality (OR 1.6–2.4) [32, 120]. Patients with schizophrenia die 10 years earlier from CHD than the normal population [183], and there is an increased cardiovascular risk for bipolar disorders [32]. A recent meta-analysis found for patients with the syndrome of “vital exhaustion” a relative risk of 1.5 for developing CHD and of 2.03 for re-infarction in patients with manifest CHD. The syndrome of “vital exhaustion” is characterized by symptoms such as fatigue and strong apathy, but lacks cognitive symptoms typical for depression (e.g., helplessness and hopelessness, self-incrimination) [51]. Depressive mood combined with exhaustion also yields an increased risk for cardiovascular mortality (RR 1.52; [92]). Acute, severe anxiety and anxiety disorders are associated with a higher risk for cardiovascular mortality (RR 1.4) and for CHD (RR 1.41) [44]. Phobic anxiety and panic disorders have the strongest link to an increased CHD risk [48]. Posttraumatic stress disorder (PTSD) is also associated with a higher risk of CHD [173].

Mental comorbidities in clinically manifest CHD

Depression following clinical manifestation of CHD and pronounced anxiety following myocardial infarction negatively influence survival and course of the disease [160]. A meta-analysis found that anxiety after a heart attack significantly predicts reoccurring myocardial infarction events and mortality (HR 1.38; [27]). In addition to several somatic comorbidities, depression is a meaningful factor for long-term impairments in patients following a heart attack [85].

PTSD symptoms occur in 12% of patients after myocardial infarction, but note that the prevalence strongly varies between 0 and 32% [47]. The risk of mortality and/or re-infarction is doubled for post-infarction patients with PTSD symptoms compared to patients without PTSD symptoms (RR 2.0; [47]).

Patients that suffer from depressive symptoms before bypass surgery have a higher risk of death than patients without depression (HR 1.46; [159]). Pronounced depressive and anxiety symptoms following coronary bypass surgery significantly increase the 5-year risk for cardiovascular events (HR 3.79; [171]).

Pathophysiological mechanisms

As described in “General aspects”, psychosocial risk factors negatively affect CHD via behavioral factors as well as direct biological mechanisms [105, 180, 185]. Stress and mental comorbidity promote the formation of plaques as well as their instability and rupture, but the exact mechanisms have not yet been clarified [23, 180].

Clinical manifestation and demands for medical care

Psychosocial factors can significantly affect the clinical presentation of CHD as well as the utilization of medical care. Old age, female gender, low socioeconomic status as well as denial, avoidance and/or underestimation of the relevance of heart-related symptoms of an acute coronary syndrome (ACS) are linked to delayed medical care [93].

In contrast, mental comorbidities may also lead to increased use of medical care. It can be difficult thereby to differentiate between anxiety-related physical symptoms or the somatic syndrome occurring as part of a depressive disorder and an acute coronary syndrome [157].

Special considerations for coronary interventions

Macroscopically successful coronary interventions do not always show the expected clinical improvement, which is primarily attributable to functional impairments of coronary vasomotion and microvascular function [126]. Placebo research could show that coronary physiology can be modulated by verbal suggestions [148].

After an acute coronary syndrome (ACS) or emergency percutaneous coronary intervention (PCI), acute stress reactions occur in approximately 13% of patients [147], and 4% develop a PTSD [37]. While an acute stress reaction subsides within the first 24–48 h after an ACS, PTSD develops up to 6 months later.

Up to a third of coronary bypass patients develop delirious symptoms [61]. Psychosocial factors such as old age, preexisting cognitive impairments and preexisting mental disorders are linked to a higher risk for delirium [61].

Congestive heart failure

Mental comorbidity

The prevalence of depressive disorders is 2–4 times higher for congestive heart failure (CHF) patients than in the normal population [59]. Independent of “classical” prognostic predictors such as the left ventricular ejection fraction (LVEF) or N-terminal pro brain-derived natriuretic peptide (NTproBNP), depressive symptoms significantly increase overall mortality and cardiac mortality risk [56]. Anxiety

symptoms occur frequently in people with CHF (ca. 30%), however, they do not seem to have a clear prognostic relevance [178].

Depression and anxiety disorders can be easily overlooked, because symptoms such as difficulties in concentrating, fatigue, lethargy, loss of appetite and sleeplessness can also be due to CHF. Heart failure patients frequently suffer from a considerable reduction in QoL [20, 138]. With increasing clinical severity of CHF, the incidence of depression increases and self-reported physical as well as psychological QoL decreases [152].

Patients with CHF often show reduced adherence regarding necessary lifestyle changes and medication [138]. Lack of adherence is an important cause for cardiac decompensation, recurrent hospitalization, frequent doctor visits and loss in productivity at work [31]. Mental disorders such as anxiety, depression and cognitive impairment reduce adherence and the ability to quickly perceive changes in health status and take action accordingly [20]. Up to 50% of CHF patients suffer from at least slight cognitive impairments, which are related to low cerebral perfusion resultant from—among other things—generalized arteriosclerosis, as well as a reduced cardiac output and inflammatory processes [67].

Heart transplantation and ventricular assist devices

A thorough evaluation of psychosocial stressors or symptoms is necessary before heart transplantation or ventricular assist device (VAD) implantation [26]. Mental disorders such as depression or anxiety disorders should be identified and treated beforehand [26]. The implantation itself imposes a severe psychological burden on both the patients and their families. Even though most patients report better QoL, permanent dependence on a VAD, fear of organ rejection or the feeling of a foreign organ in one's own body, which is possibly even associated with feelings of guilt, are very burdensome for patients [156]. Family members are granted great importance and can play a major role in the patients' prognosis [14].

Despite possible burdens, the implantation of a VAD can improve the health-related QoL of both the patient and family members. This seems to be independent of the type of VAD system used (pulsatile or non-pulsatile) [26]. However, results on QoL and mental comorbidity are substantially worse for patients with VADs than for heart transplant patients [90]. Especially for younger patients, decreased adherence despite high QoL plays a meaningful role and should be improved using specific support programs [19]. Unlike nicotine abuse, preexisting addiction, anxiety, depression or non-adherence do not seem to be linked to higher 1-year mortality after VAD implantation [109]. Depression and anxiety, however, lead to higher re-hospitalization rates [109].

Cardiac arrhythmias

Strong negative as well as positive emotions can trigger arrhythmias, which in turn lead to mental stress [96]. The basis for the interdependency between emotions and cardiac electrophysiology is the interaction between long-term, stable individual predisposing traits such as depressiveness, tendency towards anger and hostility (psychological substrate) and temporary, short-term psychosocial stimuli (psychological triggers; [133]).

Paroxysmal supraventricular tachycardia (SVT) sometimes causes severe anxiety states that can be mistaken for panic attacks. This is because they are often not documented in the electrocardiogram due to their short duration and spontaneous termination. Possible psychological triggers of SVTs have not yet been sufficiently examined [54].

The influence of psychosocial factors on the development and course of atrial fibrillation (AF) is still insufficiently researched. Acute triggers such as anxiety, despair or anger have been identified as predictors for new symptomatic AF [97]. Regarding predictors for recurrent AF, only one small prospective study exists, which found—in addition to various somatic factors—depressiveness, but not anxiousness or the combination of negative affect and social inhibition (“Type D personality”), to be predictive [98].

According to prospective cohort studies, psychological factors such as depressiveness, anxiety and the Type D personality significantly increase the vulnerability for ventricular tachyarrhythmia (VT) in heart patients [96]. Pronounced, acute stress can, however, elicit a VT, irrespective of acute ischemia or structural myocardial alterations [96]. The same applies for other acute major stressors such as terrorist attacks and earthquakes [96].

An implantable cardioverter defibrillator (ICD) implantation is very demanding on heart patients' ability to adjust mentally, which is reinforced by insufficient social support from family members, limited mobility (driving license) or sexual activity [75]. Approximately, one-fifth of patients suffer from symptoms such as anxiety and depression that is shock associated or that may occur as a result from traumatically experienced medical interventions [111]. These symptoms in turn are relevant predictors for adequate ICD shocks and mortality [175]. PTSD symptoms in ICD patients are associated with an unfavorable course of illness and higher mortality [91]. Moreover, there is evidence that problems in coping with illness can to some extent first appear with considerable delay and present as persisting symptoms of anxiety and depression and/or an ongoing increased vigilance towards the device [75].

Arterial hypertension

Psychosocial factors such as loneliness, sleep disorders and especially stress at work can contribute to the development of arterial hypertension [33]. For instance, 10 h of overtime work per week increases the incidence of hypertension by 3.2 times per year [33]. For patients that objectively suffer from insomnia, the risk of developing arterial hypertension is increased by more than 3 times [12]. However, data on the relationship between anxiety and the development of arterial hypertension are inconsistent [29]. From a clinical perspective, hypertension and its symptoms like, e.g., headaches and impaired vision can play a role in terms of the vicious cycle of anxiety in anxiety and panic disorders. Depression is currently being discussed as an independent risk factor for arterial hypertension [73].

From a psychobiological perspective, the activation of the renin–angiotensin system, especially the neuromodulator angiotensin II, does not only lead to high blood pressure, but also elicits worsening of mood and anxiety through oxidative stress in the central nervous system mediated via the nicotinamide adenine dinucleotide phosphate (NADPH) oxidase [107]. At the same time, there are findings that increased blood pressure can lead to emotional ease via baroreceptor stimulation [65, 66].

The influence of high blood pressure on the development of cognitive impairment and/or dementia has also been documented [113]. While executive dysfunctions are detectable in approximately 30% of older persons, the prevalence in hypertensive patients is much higher (around 50%). In patients with therapy-refractory arterial hypertension, clinically relevant depressive symptoms could be found for 21% of patients, and elevated anxiety for 17% [102].

Several studies show that QoL can decline during anti-hypertensive therapy, especially at the beginning of therapy [169]. However, medical antihypertensive therapy can contribute to improvement of psychosocial factors, for example, cognition [113]. First findings indicate that cognitive function, QoL as well as anxiety and depressive symptoms can be improved by catheter-based renal sympathetic denervation [84, 102].

Takotsubo cardiomyopathy

According to a large registry study, a third of all Takotsubo (or stress) cardiomyopathy cases are triggered by mental factors, in which a “broken-heart-syndrome” as well as isolated cases of “happy-heart-syndrome” have been described [166]. In another third, physical triggers were solely named. However, in many cases, these physical triggers were severe physical diseases or interventions that obviously include emotional stress. Based on criteria of the Diagnostic and Statistical Manual of Mental Disorders, 4th revision (DSM-IV),

a current or previous mental disorder could be diagnosed in 45% of the patients in that cohort [166]. Most frequent were mood (23%) or anxiety disorders (11%). Seventeen percent of patients were currently taking antidepressants (mostly selective serotonin reuptake inhibitors; SSRIs). An excessive catecholamine release, impaired neuronal reuptake of norepinephrine, the formation of free radicals as well as the distribution of sympathetic nerves in the left ventricle with resulting damage to the myocardium via cytotoxic effects or microcirculation disorders are assumed to be the pathomechanisms involved [57]. Thus, it is discussed whether norepinephrine reuptake inhibition by certain antidepressants possibly increases the risk of this disease [57].

The rate for acute in-hospital complications is similar to that of acute coronary syndromes, with a seemingly better prognosis for older patients and for those with a primarily emotional trigger than patients with a physical trigger or those without an identifiable trigger [161]. Although left ventricular pump function is usually restored within days or weeks, future cardiovascular events are to be expected for 10% of Takotsubo cardiomyopathy patients, including relapses for 5% [58]. The risk of relapse is possibly higher for patients with a preexisting mental disorder [125].

Recently, an international expert group introduced a novel clinical score (InterTAK Diagnostic Score) to differentiate Takotsubo syndromes from acute coronary syndromes [57, 58] to reduce underdiagnosis and treatment.

Adults with congenital heart disease

Depending on the complexity of the heart disease, adults with congenital heart disease may require lifelong intensive medical care including repeated highly specialized cardiac surgery. Life expectancy is affected in particular by congestive heart failure and cardiac arrhythmias. Medical trauma, limited daily-life participation, and reduced life expectancy require enormous adaptability from patients and their families [24, 144]. In most studies, these burdens increase the risk of mental disorders [36, 89, 114]. A third of the patients have a mental disorder [89]. Every second patient desires psychosocial support, mostly to deal with stress and burdens caused by their heart disease [89]. Without systematic screening, psychosocial problems are mostly overlooked [182], which leads to negative consequences regarding QoL and prognosis [41]. This is why cooperation with psychosomatic/psychocardiological care is a quality indicator for centers treating adults with congenital heart disease [78].

Functional and somatoform disorders

The spectrum of cardiovascular functional and somatoform symptoms ranges from vegetative cardiac complaints in the context of stress or anxiety to the now obsolete term of

“cardiac neurosis” and to somatoform autonomous dysfunctions of the cardiovascular system (ICD 10: F 45.30; [3]).

The typical clinical picture is characterized by high psychological strain combined with high expectations regarding rapid symptom relief, which in many cases leads to disappointment and devaluation, which in turn leads to inadequate utilization of the medical system [3, 9].

According to current data, one in six patients presenting to German family physicians with nonspecific/functional complaints has cardiopulmonary complaints as their primary complaint [8]. Note that the etiology of these complaints is, however, mostly complex and imprecise. Traditionally, developmental psychological deficits that make it difficult for patients to distinguish between affective and physical experiences are considered to cause the symptoms. More recent aetiopathogenetic models are based on interactions between psychosocial, biological, iatrogenic/medical system-related and sociocultural factors that can lead to neurobiological alterations [3, 9].

Diagnosis and therapy of psychosocial factors and mental comorbidity

Person-centered communication and basic psychosomatic care

Patient (or person)-centered communication is the basis for developing a successful, trusting and cooperative doctor–patient relationship. As shown in Table 4, person centeredness comprises seven components [119], which are important to consider for high-quality care. Empathetic and supportive communication is of special importance to

patient centeredness. Table 5 displays four simple communicative techniques that have been proven useful to establish an effective person-centered communication [99].

A recent meta-analysis has shown that person-centered communication has positive effects on patient satisfaction, adherence, utilization of medical care as well as outcome, e.g., a better reduction in blood pressure and reduced sensation of pain [144]. Hence, person-centered communication is recommended for everyday practice and can be learned with the help of specific training [76, 99, 104].

On the basis of patient-centered communication, cardiologists should also acquire the qualification in basic psychosomatic care to be able to cope with challenging situations, for example, mental comorbidity. The goals of basic psychosomatic care are [52]:

- Identifying mental and psychosomatic disorders and problems, also for complex cardiac illnesses (diagnostic competence),
- Limited offers for counseling, for example, during rounds, in informed consent conversation, before hospital discharge, for support in disease management or lifestyle modification, in crises and for information and advice, also including partners and family members (communicative competence),
- Indication for and referral to outpatient or inpatient psychotherapy and/or indication for psychosomatic or psychiatric consultation (competence for differentiated indications).

First evidence for the efficacy of trainings in basic psychosomatic care is available [16, 53].

Table 4 Components of person centeredness in health care [119]

1. Explore the patient’s subjective experience with the disease
2. Perceive the patient as a whole person in his/her everyday reality
3. Make medical decisions together (“shared decision making”)
4. Develop preventive and healthy activities together (i.e., more physical exercise, healthy food choice)
5. Strengthen the doctor–patient relationship by empathetic and supportive communication
6. Consider the physician’s and the patient’s available time frame and limited resources to avoid unrealistic goals
7. Consider the physician’s personality, especially how he or she regulates emotional response, and need for specific training

Table 5 Basis communicative techniques in person-centered communication [99]

Waiting	Leave a 1–3 s break after your own questions or important statements from the patient
Repeating	Repeat important sentences or key words in the patient’s last statement
Reflecting	Name emotions and moods (e.g., anxiety, insecurity) stated by the patient
Summarizing	Summarize important passages of the conversation to signal understanding and prevent misunderstandings

Screening for psychosocial risk factors and mental comorbidity

The German national disease management guideline (“Nationale VersorgungsLeitlinie”, NVL) for chronic CHD generally recommends the simultaneous assessment of psychological, social and somatic information during diagnosis. Overall, screening for depression is recommended for patients with various underlying cardiac diseases [18, 22, 136, 138]; for patients with increased cardiovascular risk, CHD or ICD shocks, additional screening for anxiety and posttraumatic symptoms is recommended. According to the guideline, further mental disorders relevant for prognosis, for instance, schizophrenia or bipolar disorder, should be recorded. Additionally, the presence of psychosocial risk factors such as low socioeconomic status, social isolation, stress at work or family life, should be assessed during the consultation or via psychometric questionnaires. Specific suitable self-report questionnaires and/or questions on psychosocial risk factors are named in the German guideline [22] and the ESC prevention guideline [136]. Even though the informative value of the screening questions recommended by the ESC guideline as part of medical history taking is partly uncertain due to low sensitivity for personality factors [176], a suspicious screening result should generally prompt an expert clinical assessment using diagnostic interviews, as screening measures have been shown to have high sensitivity but low specificity [22, 136]. Table 6 displays core questions recommended by the Sixth Joint Task Force of the European Society of Cardiology and Other Society on Cardiovascular Disease Prevention in Clinical Practice [136] and selected psychometric questionnaires suitable for routine screening of psychosocial risk factors and mental comorbidity.

Even though an immediate benefit from screening per se is not sufficiently proven [167], subsequent referral to effective treatments that lead to improvement of mental symptoms, stress management and QoL—and that possibly can lower barriers against preventative behavioral changes—seems reasonable. Providing structured feedback on the screening results may positively influence the health status in the medium term [108].

Behavior modification and promotion of medication adherence

The current guideline on cardiovascular disease prevention from the European Society for Cardiology [136] provides the following recommendations for reduction of risk behavior and development of health-promoting behavior:

- “Established cognitive-behavioral strategies (e.g., motivational interviewing) to facilitate lifestyle change are recommended” [136]
- “Involvement of multidisciplinary healthcare professionals (e.g., nurses, dietitians, psychologists) is recommended” [136]
- “In individuals at very high CVD risk, multimodal interventions integrating medical resources with education on healthy lifestyle, physical activity, stress management and counseling on psychosocial risk factors, are recommended” [136]

Furthermore, the following principles of effective communication for promoting health behavior are recommended ([136], Table 7):

Frustration arises when behavior modification programs are offered to patients without considering their motivation, for example, when all smokers in a rehabilitation center are automatically assigned to the smoking cessation group. Instead, a step-by-step approach is recommended, e.g., the current German S3 guideline on smoking cessation [10]: for patients who are primarily not yet motivated to change their behavior, “motivational interviewing” is suitable to develop motivation to change [106]. First, smokers who are willing to quit but who are not able to without support should be offered a short or telephone-based consultation. Only when a more intensive treatment is needed or desired should individual or group behavioral therapy in conjunction with medication be offered [10].

A good practical example for a short consultation on smoking cessation is the “5A-method” (Table 8):

Structured counseling for smokers should begin in the acute care clinic and continue after discharge [11, 146], for example, by offers for telephone counseling [10]. Interventions with a longer duration have been proven to be more effective. There is evidence for increasing the effect by supplementary use of nicotine replacement therapy, but not for additional administration of bupropion or vareniclin [146]. There is evidence that counseling is more effective when conducted by the treating physician and not by nurses [140].

The information provided in Sect. “General aspects” on person-centered communication provides the foundation to improve medication adherence [34, 189]. A trusting doctor–patient relationship can increase adherence by about 30% [81]. The consultation should be structured on the basis of “shared decision making” [34, 115, 123].

For patients with cognitive impairments, e.g., in the context of CHF, dosing aids are an effective method to support adherence and to reduce re-hospitalization rates and mortality [34, 100].

Table 6 Core questions [136] and selected psychometric questionnaires suitable for routine screening of psychosocial risk factors and mental comorbidity

Risk factor	Core questions	Questionnaires			
		Name	Cutoff	Time to administer (min)	Time for staff to score (min)
Low SES	What is your highest educational degree? (not more than mandatory) Are you a manual worker?	n.a.	n.a.	n.a.	n.a.
Social isolation	Are you living alone? Do you lack a close confidant? Have you lost an important relative or friend over the last year?	ESSI (5 items)	Yes	2	1
Work/family stress	Do you lack control over how to meet the demands at work?	ERI (23 items)	No	10	10
	Is your reward inappropriate for your effort?	JCQ (42 items)	No	15	10
	Do you have serious problems with your spouse?				
Depression	Do you feel down, depressed and hopeless?	HADS-depression (7 items)	Yes	3	1
	Have you lost interest and pleasure in life?	PHQ-2 (2 items)	Yes	1	1
		PHQ-9 (9 items)	Yes	3	1
Anxiety	Do you suddenly feel fear or panic?	HADS- anxiety (7 items)	Yes	3	1
	Are you frequently unable to control worrying?	GAD-7 (7 items)	Yes	3	1
Posttraumatic stress disorder	Have you been exposed to a traumatic event? Do you suffer from nightmares or intrusive thoughts?	IES-R (22 items)	Yes	10	5
Anger/hostility	Do you frequently feel angry over little things? Do you often feel annoyed about other people's habits?	STAXI—(44 items)	Yes	15	10
Type D personality	In general, do you often feel anxious, irritable, or depressed? Do you avoid sharing your thoughts and feelings with other people?	DS-14 (14 items)	Yes	5	5
Cognitive impairments	Do you have the impression that your memory or other mental abilities have decreased?	MOCA (12 tasks)	Yes	10	1
Other mental disorders	Do you suffer from any other mental disorders? (e.g., bipolar disorder, schizophrenia)	n.a.	n.a.	n.a.	n.a.

n.a. not applicable, *SES* socioeconomic status, *ESSI* Enriched Social Support Questionnaire, *ERI* Effort–Reward Imbalance Scale, *JCQ* Job Content Questionnaire, *HADS* Hospital Anxiety and Depression Scale, *PHQ* Patient Health Questionnaire, *STAI* State Trait Anxiety Inventory, *GAD* Generalized Anxiety Assessment Scale, *IES-R* Impact of Event Scale—Revised, *STAXI* State Trait Anger Inventory, *DS-14* Type D Scale 14 items, *MOCA* Montreal Cognitive Assessment

Table 7 Principles of effective communication to facilitate behavioral change [136]

Spend enough time with the individual to create a therapeutic relationship—even a few more minutes can make a difference
Acknowledge the individual's personal view of his/her disease and contributing factors
Encourage expression of worries and anxieties, concerns and self-evaluation of motivation for behaviour change and chances of success
Speak to the individual in his/her own language and be supportive of every improvement in lifestyle
Ask questions to check that the individual has understood the advice and has any support he or she requires to follow it
Acknowledge that changing lifelong habits can be difficult and that sustained gradual change is often more permanent than a rapid change
Accept that individuals may need support for a long time and that repeated efforts to encourage and maintain lifestyle change may be necessary in many individuals
Make sure that all health professionals involved provide consistent information

Table 8 The “Five As” for a smoking cessation strategy for routine practice [136]

A—ASK	Systematically inquire about smoking status at every opportunity
A—ADVISE	Unequivocally urge all smokers to quit
A—ASSESS	Determine the person’s degree of addiction and readiness to quit
A—ASSIST	Agree on a smoking cessation strategy, including setting a quit date, behavioral counseling and pharmacological support
A—ARRANGE	Arrange a schedule of follow up

Multimodal interventions

Multimodal interventions include medication, education, sports and exercise-based therapies as well as psychosocial approaches (especially motivational support, stress management [22, 136]). The goal is to improve somatic, mental and social health, especially regarding emotional coping with cardiac events (i.e., reducing depressiveness and anxiety), to comprehensively encourage healthy behavior (lifestyle, stress management) and to improve QoL [5, 136]. Multimodal interventions do not primarily treat mental comorbidity (e.g., depression or anxiety disorders); this is treated by psychotherapy, complex psychosomatic–psychotherapeutic treatment and/or medication [5, 136].

Current meta-analyses on multimodal interventions for CHD patients show that exercise-based interventions (with or without psychosocial interventions) significantly improve health-related QoL and reduce the risk of re-hospitalization and cardiovascular mortality, compared to control conditions [6, 139].

An additional current meta-analysis investigated the influence of psychological interventions with or without exercise-based interventions on CHD patients [143]. Compared to the control group, there was a 21% reduction of cardiovascular mortality as well as a decrease in depressive, anxiety and stress symptoms. Supplementing with psychosocial elements, however, had no significant effect on overall mortality, revascularization or non-lethal infarctions. However, the authors criticize the moderate to low quality of the studies. Questions remain regarding specificity of the therapy elements and which patients benefit the most from which psychological interventions [143].

According to an older meta-analysis, structured education for disease coping reduces the risk for re-hospitalization by 34% in CHF patients [116]. Dependent on the individual disease state of the patient, exercise training has weak positive effects on depression, QoL and physical performance [15]. According to current reviews, the so-called “mind–body interventions” (e.g., Tai chi, yoga, meditation, etc.) have weak to moderate positive effects on subjective and objective parameters such as QoL, depressiveness, resilience, heart rate and brain natriuretic peptide (BNP) [60].

Psychotherapy and collaborative care

The goals of psychotherapeutic interventions include decreasing mental symptoms, promoting disease management and modifying psychosocial risk factors. At the same time, barriers towards lifestyle change and to some extent biological risk factors can also be reduced [5, 6, 69].

Already in the acute phase after myocardial infarction, short-term therapies in the hospital can yield a positive effect [6]. Several studies on individual psychotherapy with 3–5 sessions and with the objective to convey a realistic understanding of the illness, to process heart-related and mental symptoms and to promote individual strategies of action, report significantly reduced depression and/or anxiety symptoms, more heart-related knowledge and reduced physical impairment [6]. A current study on highly burdened patients with ACS could show that even one focused talk on coping with ACS-related burdens has a significant effect on depressive symptoms [177].

In the post-acute phase after myocardial infarction, group psychotherapy with 20 sessions for outpatient women with the goal of coping with stress as well as disease management was found to be linked to an almost 70% reduction of overall mortality after 7 years [131]. A replication of this concept showed a significant reduction by 41% for cardiovascular events for both women and men [63].

It is unclear whether, and if so which, psychotherapeutic interventions are helpful for CHD patients with mental comorbidity (especially depression, anxiety disorders). According to a meta-analysis, cognitive behavioral therapy is moderately effective with respect to depressive symptoms, but no study to date has shown an improvement of cardiac prognosis [151]. However, across all studies, a “number needed to treat” of 84 was shown for the reduction of overall mortality and non-fatal events [151]. Therefore, there is moderate evidence that anti-depressive psychotherapy can improve the prognosis for CHD patients.

Regarding other psychotherapy approaches, a German research group could recently show that, compared to a conventionally treated control group, depressive CHD patients with Type D personality tended to profit more than patients without Type D personality from a stepwise, combined

cognitive behavioral and psychodynamic therapy, in terms of their depressive symptoms [68].

A particularly promising outpatient therapy approach for depressive comorbidity in CHD is the so-called “collaborative care” [71], which coordinates various established treatment approaches (i.e., supportive talks and, if necessary, psychotherapy and/or antidepressants) parallel to cardiology basic treatment. There exist several controlled studies that report significant positive effects on mental health and to some extent on cardiac prognosis [170]. Stepwise, tailored selection of therapy methods as well as orientation on the patient’s treatment preferences are considered to be fundamental elements [71]. The so-called “care managers” take on a central role in coordinating care; they screen all patients for depressive symptoms, when needed provide continuous support and bring in a psychotherapist and/or psychiatrist if symptoms are pronounced and/or sustained [71].

While Internet-based psychotherapy methods are generally effective for depression [87], there is limited evidence for CHD patients regarding improvements in QoL and lifestyle [38].

With respect to arterial hypertension, interventions such as relaxation techniques or biofeedback can reduce increased blood pressure. According to a meta-analysis [40], effects are on average about 5 mmHg systolic/diastolic, thus being comparable to medical monotherapy. The evidence base is however weak.

While patients with CHF and comorbid depression or anxiety disorders profit from psychotherapy in terms of reduced depressiveness and anxiety as well as better QoL, an effect on cardiac prognosis could not be shown so far [74].

For patients with cardiac arrhythmias, there are only relatively few studies available. According to a systematic review, cognitive behavioral therapy improves depression and anxiety- or trauma-associated symptoms in ICD patients [112]. For ICD patients with PTSD, trauma-specific interventions (e.g., eye movement desensitization and reprocessing, EMDR) do not seem to be connected to a higher risk of cardiac arrhythmias [135]. In controlled studies with small numbers of cases, meditative forms of yoga could reduce the number of arrhythmia episodes, anxiety and depressiveness, and increase quality of life for ICD patients and patients with paroxysmal AF [95, 168].

No meaningful data are available on the effectiveness of psychotherapeutic treatment regarding recurrence prevention for patients with Takotsubo cardiomyopathy. Subjectively, patients are faced with the task of avoiding stress situations in the future, which is difficult, especially in cases of preexisting mental comorbidity. Therefore, it follows that patients with sustained mental disorders and/or stress should primarily be recommended psychotherapeutic treatment for their mental disorder and/or encouragement for stress management.

Psychotropic drugs

For CHD patients, selective serotonin reuptake inhibitors (SSRIs) such as sertraline or citalopram are the first choice, whose effectiveness for severe or recurrent depressive syndromes could be documented [21, 151]. However, there is no robust evidence for an improvement in prognosis [21, 151]. In two randomized controlled trials (RCTs), neither sertraline nor escitalopram proved to be better than placebo for depressed patients with congestive heart failure [7, 127].

Due to its least amount of drug interactions, sertraline is considered to be relatively safe, compared to escitalopram and citalopram [21]. The latter received a warning in 2011 due to dose-dependent effects on the QT interval, which increases the risk for Torsades-de-pointes-tachycardia [21]. Anticholinergic effects of paroxetine, the long half-life of fluoxetine as well as the interactive potential of fluvoxamine are unfavorable for patients with heart disease [21].

SSRIs increase, however, bleeding risk, especially in combination with antiplatelet therapy, following gastrointestinal bleeding and in the perioperative setting [149]. Second-choice antidepressants such as mirtazapine, venlafaxine, bupropion and agomelatine partly have adverse effects on cardiovascular risk factors such as increase in appetite under mirtazapine and increased blood pressure under venlafaxine and bupropion [21]. Agomelatine has a favorable cardiac side-effect profile, if liver values are under control. Tricyclics should be avoided due to their quinidine-like adrenergic and anticholinergic effects [21]. Hypericum (St. John’s Wort) interacts with multiple somatic medications [21].

Implementation of psychocardiological care

Primary care

In light of shorter hospital stays and the increase in age-related illnesses, multimorbidity and mental (co-)morbidity, primary care is becoming more important [35]. The task of a primary care physician is to provide long-term and comprehensive care, e.g., for chronically ill patients and, if necessary, to coordinate between different disciplines and/or professions. In the context of their long-term care, primary care physicians have the chance to identify and address psychosocial risks. Especially after onset of a heart disease, as a secondary preventative measure, primary care physicians can assess the necessity of psychosocial offers and provide concrete referrals. Here we advise close coordination with medical colleagues in the corresponding field (see “[Outpatient cardiological care](#)”).

Therefore, in addition to classical risk factors, factors involving the personal environment, for example, acute or

chronic stress at work or in the family should be assessed during medical history. It is also important to identify negative affect, especially anxiety or depressive mood, as well as social disadvantages or signs for a deficient social network. Appropriate screening measures are helpful for improving the problem of insufficient sensitivity during the diagnostic process (see “[Screening for psychosocial risk factors and mental disorders](#)”).

The overall goal of doctor–patient communication in primary care is to decrease the high rate of unknown and/or untreated accompanying mental illnesses in patients with heart disease, and, ideally, to improve their prognosis. With the help of simple communication techniques, it is possible based on a long-term working alliance—to address burdensome problem situations (see “[Person-centered communication and basic psychosomatic care](#)”). In cases of severe mental comorbidities, for example, major depression, personality disorders or pronounced addiction disorders, patients should be referred to specialized physicians or psychologists (see “[Psychotherapy and collaborative care](#)”).

To improve the implementation of the aforementioned measures, continuing education offers and structured interdisciplinary networking are considered useful (“[Diagnosis and therapy of psychosocial factors and mental comorbidity](#)”).

Outpatient cardiological care

Based on data from the EUROASPIRE IV study [88], the current risk factor control in CVD patients is inadequate. This holds for both primary care and outpatient cardiac care. According to expert’s opinion, a comprehensive preventive approach should include assessment and treatment of psychosocial risk factors such as chronic stress, depressive symptoms, and anxiety [136, 137]. Unfortunately, lifestyle interventions in cardiological outpatients are hampered by a lack of reimbursement and insufficient structures. The health insurance providers’ Disease Management Program (DMP) for CHD includes lifestyle education, but is rarely offered by cardiologists. Referrals to heart exercise groups, psychiatric care or psychotherapy are common, but it remains unclear how many patients are adequately cared for.

From an expert’s point of view, many factors contribute to the increased need for psychosocial care by cardiologists: old age, multimorbidity, limited competence in German, and social isolation in the old age [70]. At the same time, sector boundaries between inpatient and outpatient care and between medical specialties as well as too little available time for consultation with the individual patient hinder adequate care. Local or regional networks, for example, offering meetings for senior citizens are missing, and self-help groups are hardly available. The compensation for structured interviews or screening exists—if at all—only in

some federal states and does not correspond to the required amount of time.

Although evidence is scarce for outpatients, cardiological care may be improved by a consistent implementation of guideline recommendations: simple questions on psychosocial risk factors asked during medical history taking [22, 136] or screening questionnaires, e.g., for depression or anxiety (see “[Screening](#)”) are available. Data on QoL can also be collected with small investments of physicians’ and patients’ time [129, 150]. Recommendations for person-centered communication facilitate effective consultations and measures for encouraging adherence (verbal interventions; see “[Person-centered communication](#)” and “[Behavior modification](#)”). Relaxation techniques such as autogenic training, progressive muscle relaxation or mindfulness-based stress reduction are available for interested patient groups [103]. An outpatient liaison concept with psychotherapy is also possible in a cardiology practice and opens the possibility of low-threshold (group) psychotherapy. Consultations for couples can be integrated into consultation hours, and internet- and smartphone-based behavioral medicine approaches could be helpful regarding health-related behavior for interested CHD patients [132].

From an expert’s point of view, however, a nationwide and adequate compensation for qualified screening and consultation, person-centered communication as well as patient education is a prerequisite for the implementation of psychocardiological care in cardiology practices. Furthermore, regulations regarding advanced training for psychosocial matters are desirable.

Inpatient cardiological care

On cardiological hospital wards, psychocardiological care is structurally problematic due to the short length of stay, but, according to expert’s opinion, it is nonetheless useful.

Psychocardiological care in the context of an acute care hospital should pursue the following objectives:

- Identification of mental and psychosomatic disorders and problems also in patients with complex heart disease (diagnostic competence, see “[Screening](#)”),
- Time-limited consultation offers (communicative competence, see “[Person-centered communication](#)”),
- Indication for and referral to outpatient or inpatient specialist psychotherapy and/or indication for a psychosomatic consultation (competency in differential indication, see “[Psychotherapy and collaborative care](#)” and “[Psychotropic drugs](#)”),
- Classification of the relevance of individual patient risks at the interface to outpatient care (classifying competence, see “[Psychotherapy and collaborative care](#)” and “[Psychotropic drugs](#)”).

Screening for mental comorbidity equivalent to that for somatic factors (see “[Screening](#)”) should be offered, and the clinical relevance of the screening results should be examined. From an expert’s point of view, competence in psychocardiology, comparable to that for psychooncology, is advisable.

Moreover, skills in basic psychosomatic care are advisable even for the cardiologist, because in clinical daily life worrying questions relating the illness are often asked, and inadequate perceptions of the illness need to be corrected. Short verbal interventions, such as correcting unrealistic fears have been shown to be effective [4]. Basic skills in psychosomatic care (see “[Person-centered communication](#)”)—here specifically framed as “psychocardiology”—can be acquired through courses offered by the Academy of the German Society of Cardiology (http://www.akademie.dgk.org/default_home.aspx?navi=&subnavi=).

Competence in psychocardiology is mandatory for personnel working in “Heart-Failure Units” and heart transplantation [20, 49]. To a greater extent, offers for psychosocial support should be established for patients before and after ICD implantation [18].

Psychosocial care before a coronary bypass can improve the clinical course of patients [145]. The complex burden of patients with congenital heart defects also requires psychosocial care [78].

Especially in older patients with long-lasting disease, terminal CHF and poor prognosis, the question arises as to which measures are ethically justifiable [181]. An optimized treatment plan should be individualized, involve patients and their close family members and follow the principles of shared decision making. In this context, a consensus should be reached regarding questions on whether and when pacemakers, ICDs and VADs should be deactivated, as well as regarding palliative care options [117].

Exemplary developments in recent years can be seen in psychocardiological wards, in which a coordinated overarching concept with simultaneous cardiology and psychosomatic treatment is used for patients with pronounced mental comorbidity. The complexity of the illnesses and treatments require high cardiologic and psychotherapeutic competence of the treatment teams as well as regular team meetings and supervision. Such offers remain therefore reserved for highly specialized institutions, but should be developed further given the high need.

Cardiac rehabilitation

Rehabilitation for patients with CVD is a multimodal intervention performed by an interdisciplinary team including somatic, psychological, educative and social aspects (see “[Multimodal interventions](#)”). Besides optimizing medical secondary prevention to reduce morbidity and mortality,

rehabilitation also comprises improving physical abilities and QoL as well as reintegration into social and work life [154].

In 5 controlled cohort studies with 12,556 patients from Germany, it could be shown that rehabilitation after an acute myocardial infarction or coronary bypass surgery significantly reduced the re-infarction rate and hospitalizations over 1–2 years [154]. These national results were confirmed by an international meta-analysis for patients with coronary heart disease [6, 139]. Cardiac rehabilitation is recommended by national and international guidelines for patients after heart valve surgery and intervention, after decompensated heart failure, after heart transplantation as well as after ICD, cardiac re-synchronization therapy (CRT) and VAD implantation [184].

Pension insurance providers stipulate that the existence of comorbid mental disorders should be determined at the beginning of rehabilitation [43] (see “[Screening](#)”). Especially undetected cognitive impairments could jeopardize adherence and daily-life skills training. Psychoeducation should highlight factors influencing adequate coping, and explaining and destigmatizing mental disorders can make the utilization of professional help easier.

After the diagnoses of mental and neuropsychological problems and preventative psychoeducation, group interventions including relaxation training are indicated (see “[Multimodal interventions](#)”). These interventions should increase awareness for risk factors such as smoking or physical inactivity as well as help develop motivation for health-promoting behavioral changes [45] (see “[Behavior modification](#)”). From an expert’s point of view, psychotherapy in a strict sense cannot be offered in cardiac rehabilitation. If there is a need for further psychological or neuropsychological treatment, the patient should be referred to an appropriate outpatient or inpatient facility (especially psychosomatic acute care hospitals or psychosomatic specialists, psychiatrists or psychological psychotherapists located near the patient’s place of residence) while the patient is still in rehabilitation [45] (see “[Psychotherapy and collaborative care](#)” and “[Psychotropic drugs](#)”).

For the care of psychologically distressed heart patients, concepts in line with behavioral medicine-oriented rehabilitation (BMR; In German “[Verhaltensmedizinisch orientierte Rehabilitation](#)”) have been established, which take 4 instead of the usual 3 weeks [44]. An indication for BMR exists when a serious cardiac disease is the main illness that is accompanied by a meaningful mental component. If a mental disorder is the main illness, however, BMR is unsuitable. In this case, an indication for a psychosomatic–psychotherapeutic rehabilitation should be assessed [44].

To secure the sustainability of the rehabilitation success, rehabilitation aftercare programs are available. In addition, heart training groups have been established

nationwide in Germany as long-term offers. They combine antidepressant effects of both physical exercise and social support and present therefore a valuable resource from a psychocardiological point of view.

Summary of recommendations

Especially for coronary heart disease (CHD), congestive heart failure (CHF), arterial hypertension and cardiac arrhythmias, there is convincing evidence regarding the significance of psychosocial factors with respect to screening and management in routine care. Table 9 displays a summary of core recommendations for treatment of psychosocial risk factors and mental comorbidity. In detail, we recommend the following:

In general

For all patients with cardiac diseases, the physician–patient interaction should follow the principles of person-centered communication. Age- and sex-specific aspects as well as individual preferences regarding diagnostics and therapy should be considered in accordance with principles of shared decision making [22, 136].

CHD

Psychosocial factors should be considered for all patients with cardiovascular risk factors or manifest CHD. Social factors (low social status, low social support) as well as psychological symptoms (depression, anxiety, posttraumatic stress disorder) should be assessed during the medical examination or with appropriate questionnaires. In case of positive screening, further specialized diagnostics and, if necessary, therapy should follow [2, 136].

All CHD patients should receive an individually tailored treatment plan which includes education, sports and exercise therapy, facilitation of life style change, relaxation techniques and stress management, if indicated [136].

In case of mental comorbidity, psychotherapeutic interventions and/or medications should be offered. If available, these interventions should be combined with basic psychosomatic care provided by the cardiologist or primary care physician. Collaborative care seems currently best suited to yield positive effects [136].

CHF

All patients with CHF should be screened for depression or an anxiety disorder. In case of positive screening, further specialized diagnostics and, if necessary, therapy should follow [138]. In case of comorbid depression, patients should be offered basic psychosomatic care. If this is not sufficient, psychotherapeutic treatment, especially cognitive behavioral

Table 9 Core recommendations for treatment of psychosocial risk factors and mental comorbidity

Risk factor	Treatment
Low SES	Person-centered communication In case of cardiac events, cardiac rehabilitation
Social isolation	Person-centered communication Fostering of social networks, e.g., self-help groups In case of cardiac events, cardiac rehabilitation
Work/family stress	Person-centered communication and basic psychosomatic care Stress management training In case of cardiac events, cardiac rehabilitation
Depression	Person-centered communication and basic psychosomatic care Psychotherapy, antidepressants Collaborative care Heart groups In case of cardiac events, cardiac rehabilitation
Anxiety	Person-centered communication and basic psychosomatic care Psychotherapy, antidepressants Heart groups In case of cardiac events, cardiac rehabilitation
Anger/hostility	Person-centered communication and basic psychosomatic care Stress management training, psychotherapy In case of cardiac events, cardiac rehabilitation
Type D personality	Person-centered communication and basic psychosomatic care Stress management training In case of cardiac events, cardiac rehabilitation

therapy and supplementary exercise training should be considered [138]. The involvement of a psychocardiological liaison service [49] is a mandatory feature of national heart failure centers, with offers for, among others, VAD recipients.

Cardiac arrhythmias

Particularly for paroxysmal atrial fibrillation, it is important to evaluate psychosocial stressors, because the use of relaxation techniques can relieve symptoms [95].

ICD patients

All patients should be screened for psychosocial stressors and mental comorbidity. Special attention has to be given to coping with ICD shocks. In case of mental comorbidity, psychotherapeutic treatment should be offered [18].

Arterial hypertension

If interested, patients should be offered relaxation techniques such as autogenic training, yoga and muscle relaxation [40].

Takotsubo cardiomyopathy

The acute treatment should avoid additional treatment-related stress exposure. Comorbid anxiety or mood disorders should be diagnosed during the acute situation and, if necessary, treated in accordance with relevant guidelines [58].

Cardiac surgery

Both patients with an indication for cardiac surgery and adults with congenital heart defects should be cared for by an interdisciplinary team which is able to address psychosocial aspects, provide general psychosocial support, and correct, e.g., dysfunctional expectations [145]. Psychosocial evaluation and, if necessary, co-treatment of all patients before and possibly after heart transplantation must occur in accordance with German transplantation laws.

Somatoform and functional cardiovascular disorders

Treatment should follow the principles of basic psychosomatic care and should primarily aim for a stable physician–patient relationship. Iatrogenic chronification, which can be promoted by unnecessary—and especially repeated—invasive diagnostics or prescription of cardiac medications, should be avoided. In case of inadequate effects of psychosomatic basic care on the symptoms, psychotherapeutic

approaches and physical training should be recommended [9].

Psychotropic medication

Psychotropic drug therapy should only be given in case of mental comorbidity and under consideration of the underlying disease (e.g., questionable efficacy in patients with congestive heart failure, special caution in Takotsubo cardiomyopathy) and accompanying illnesses (for example, status post-ulcer bleeding, bleeding tendency under anticoagulation or antiplatelet therapy). Selective serotonin reuptake inhibitors (SSRIs) should be preferred. Tricyclic antidepressants should not be prescribed to patients with cardiovascular disease [21].

Continuing education and training

Psychocardiological issues should increasingly be included in continuing education and training programs. In particular, training in person-centered communication and basic psychosomatic care are suitable for improving the care of patients with psychosocial risk factors on a broad scale.

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Compliance with ethical standards

Conflict of interest The conflicts of interest of all authors are displayed online at the homepage of the German Cardiac Society (<http://leitlinien.org/>), linked to the original German version of this article.

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