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Anxiety and Depression in Patients Undergoing Cardiac Surgery and Cardiac Rehabilitation: A Systematic Review of Prevalence, Associated Factors, and Psychological Outcomes

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ADMINISTRATIVE INFORMATION**Support** - Ministero della Salute Ricerca Corrente.**Review Stage at time of this submission** - Preliminary searches.**Conflicts of interest** - None declared.**INPLASY registration number:** INPLASY2026100051**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 11 October 2026 and was last updated on 11 October 2026.**INTRODUCTION**

Review question / Objective This systematic review aims to systematically examine the prevalence, severity, and temporal patterns of anxiety and depression among adults undergoing cardiac surgical procedures and/or participating in cardiac rehabilitation programs. Specifically, the review seeks to identify demographic, clinical, anthropometric, psychosocial, and behavioral characteristics associated with psychological disturbances, evaluate the assessment instruments employed across studies, and investigate changes in anxiety and depressive symptoms following cardiac surgery or rehabilitation interventions. Additional objectives include exploring potential relationships between psychological well-being, cardiovascular disease characteristics, functional recovery, physical activity, and health-related quality of life. By critically appraising and synthesizing the available evidence, this review intends to identify methodological limitations, highlight gaps in

current knowledge, and inform the development of more comprehensive and individualized psychological assessment strategies within cardiovascular care.

Rationale Anxiety and depression are frequently encountered in patients undergoing cardiac surgery or participating in cardiac rehabilitation and may adversely affect emotional well-being, functional recovery, treatment adherence, and engagement in secondary prevention. Nevertheless, the reported frequency and clinical correlates of these psychological disturbances vary considerably across cardiovascular populations, reflecting differences in underlying cardiac conditions, surgical procedures, rehabilitation settings, psychometric instruments, diagnostic thresholds, and assessment timing. Although previous investigations have examined psychological outcomes in selected cardiac populations, an integrated evaluation of patients undergoing surgical treatment and those receiving structured rehabilitation remains limited. Furthermore, the potential contributions of

demographic characteristics, cardiovascular comorbidities, functional limitations, and psychosocial vulnerability have not been consistently characterized. Available studies also provide insufficient information regarding the relationship between psychological disturbances and objective measures of cardiac structure and function. A comprehensive synthesis of existing evidence is therefore warranted to clarify the burden and evolution of anxiety and depression, identify potentially relevant clinical and psychosocial correlates, critically evaluate methodological limitations, and highlight areas requiring further investigation. Such evidence may support more systematic psychological screening and personalized multidisciplinary management throughout cardiovascular treatment and recovery.

Condition being studied The conditions investigated in this systematic review are anxiety and depression, including clinically diagnosed psychiatric disorders and psychological symptoms identified through validated assessment instruments, among adults undergoing cardiac surgery and/or participating in cardiac rehabilitation programs. These psychological disturbances may occur before surgical intervention, during postoperative recovery, at rehabilitation enrollment, or throughout subsequent follow-up. The review encompasses patients with various cardiovascular conditions, including coronary artery disease, previous myocardial infarction, valvular heart disease, heart failure, and other cardiac disorders requiring surgical treatment or structured rehabilitation. Particular attention is given to the prevalence and severity of anxiety and depressive manifestations, their evolution over time, and their associations with demographic, clinical, psychosocial, and lifestyle-related characteristics. Psychological outcomes are evaluated according to the definitions, diagnostic criteria, and psychometric thresholds adopted in the original investigations.

METHODS

Search strategy A comprehensive literature search was performed in PubMed/MEDLINE, Scopus, and Embase, covering all available records from database inception through October 2026. The search was designed to identify original investigations examining anxiety, depression, and related psychological outcomes among adults undergoing cardiac surgical procedures or participating in structured cardiac rehabilitation programs.

The search strategy combined cardiovascular and procedural terms, including “cardiovascular disease”, “coronary artery disease”, “coronary heart disease”, “cardiac surgery”, “coronary artery bypass grafting”, “CABG”, “valve surgery”, “mitral valve surgery”, “mitral valve repair”, “cardiac rehabilitation”, and “postoperative rehabilitation”, with psychological terms such as “anxiety”, “depression”, “depressive symptoms”, “psychological distress”, “psychiatric disorders”, “mental health”, and “psychosocial factors”.

Additional search terms addressed psychological assessment methods and relevant outcomes, including “Hospital Anxiety and Depression Scale”, “HADS”, “State-Trait Anxiety Inventory”, “STAI”, “Generalized Anxiety Disorder-7”, “GAD-7”, “Patient Health Questionnaire”, “PHQ-9”, “prevalence”, “risk factors”, “predictors”, “quality of life”, “functional recovery”, and “treatment outcomes”.

Search concepts were connected using the Boolean operators AND and OR, with appropriate adaptations to the indexing conventions and search functionalities of each database. Reference lists of potentially relevant articles and eligible studies were additionally examined to identify publications not retrieved through electronic searches. No initial restrictions were applied regarding publication language, geographical origin, or clinical setting. Study selection was subsequently performed according to predefined eligibility criteria, following PRISMA 2020 recommendations.

Participant or population The target population comprises adults aged 18 years or older with established cardiovascular disease who have undergone cardiac surgical procedures and/or participated in structured cardiac rehabilitation programs. Eligible participants include patients receiving coronary artery bypass grafting, valvular surgery, or combined cardiac interventions, as well as individuals enrolled in inpatient or outpatient rehabilitation following myocardial infarction, acute coronary syndromes, coronary revascularization, cardiac arrest, or other cardiovascular conditions. Studies involving heterogeneous cardiac populations are considered eligible when relevant psychological outcomes can be identified and extracted. Participants are included irrespective of sex, geographical origin, or cardiovascular risk profile, provided that anxiety, depression, or related psychological disturbances have been evaluated using validated psychometric instruments or standardized psychiatric diagnostic methods. Pediatric populations and individuals

without a relevant cardiac surgical or rehabilitation context are excluded.

Intervention This systematic review does not evaluate a single predefined therapeutic intervention. Instead, it examines psychological outcomes among adults exposed to different cardiovascular treatment pathways, including cardiac surgical procedures and structured cardiac rehabilitation programs. Surgical interventions comprise coronary artery bypass grafting, valvular repair or replacement, and combined cardiac operations. Rehabilitation interventions include inpatient or outpatient multidisciplinary programs incorporating supervised physical exercise, cardiovascular risk-factor management, patient education, and psychosocial support. Where available, additional psychological or supportive interventions delivered during postoperative recovery or rehabilitation are considered. The review evaluates the prevalence, severity, and longitudinal evolution of anxiety and depressive symptoms in these clinical settings without assuming that observed psychological changes are directly attributable to the interventions received.

Comparator A specific comparator is not mandatory for inclusion in this systematic review, as the primary objective is to characterize anxiety and depression across cardiac surgical and rehabilitation populations rather than to determine the comparative efficacy of individual interventions. When available, comparisons include psychological assessments performed before and after cardiac surgery, measurements obtained at rehabilitation enrollment and subsequent follow-up, and differences between patients receiving structured cardiac rehabilitation and those undergoing usual care or alternative management strategies. Studies comparing participants with and without clinically relevant anxiety or depressive symptoms are also considered to investigate associated demographic, clinical, psychosocial, and behavioral characteristics. Investigations without a formal control group are eligible when they provide sufficient quantitative information regarding the psychological outcomes of interest. Comparisons are interpreted according to the original study design, assessment methods, and available data, without assuming causal relationships.

Study designs to be included This systematic review includes original quantitative investigations employing observational or interventional study designs. Eligible observational studies comprise prospective and retrospective cohort studies,

cross-sectional investigations, case-control studies, longitudinal follow-up studies, and analyses derived from clinical registries. Randomized controlled trials are also considered when they provide relevant information on anxiety, depression, or related psychological outcomes among patients undergoing cardiac surgery or participating in cardiac rehabilitation.

Eligibility criteria Studies are eligible for inclusion if they investigate adults aged 18 years or older undergoing cardiac surgery and/or participating in structured cardiovascular rehabilitation and provide original quantitative findings concerning anxiety, depression, or related psychological disturbances. Eligible populations include patients treated with coronary artery bypass grafting, valvular surgery, or combined cardiac procedures, as well as individuals receiving rehabilitation following myocardial infarction, acute coronary syndromes, coronary revascularization, cardiac arrest, or other cardiovascular conditions.

Included investigations must report at least one relevant outcome, such as the prevalence or severity of anxiety and depressive symptoms, formally diagnosed psychiatric disorders, associated demographic, clinical, or psychosocial characteristics, longitudinal changes in psychological status, or relationships with functional capacity, physical activity, treatment adherence, and health-related quality of life. Psychological outcomes must be assessed using validated questionnaires, standardized psychometric scales, or structured diagnostic interviews, with sufficient numerical information available for extraction.

Prospective and retrospective observational studies, cross-sectional investigations, longitudinal cohorts, case-control studies, clinical registries, and randomized controlled trials are considered eligible. No restrictions are imposed regarding geographical location, publication language, or clinical setting.

Studies are excluded if they exclusively involve pediatric participants, lack relevant psychological assessments, provide insufficient extractable quantitative data, or investigate populations unrelated to cardiac surgery or rehabilitation. Reviews, meta-analyses, editorials, commentaries, case reports, and conference abstracts without adequate original data are excluded. Publications involving overlapping patient cohorts are assessed to prevent duplicate inclusion of participants or outcomes.

Information sources The principal information sources for this systematic review are three electronic bibliographic databases: PubMed/MEDLINE, Scopus, and Embase. These databases were systematically searched from their inception through October 2026 to identify peer-reviewed original research addressing anxiety, depression, and other psychological disturbances in adults undergoing cardiac surgery or participating in cardiac rehabilitation programs. Database-specific search strategies were developed using combinations of controlled vocabulary, where applicable, and free-text terms related to cardiovascular conditions, surgical procedures, rehabilitation interventions, psychological disorders, psychometric assessment, and clinical outcomes. Additional potentially eligible publications were identified through manual examination of the reference lists of relevant articles and studies selected for inclusion. Full-text publications served as the primary sources for extracting demographic, clinical, methodological, and psychological outcome data. No restrictions concerning language, country of origin, or healthcare setting were applied during the initial identification of records. The literature identification and selection process was documented in accordance with PRISMA 2020 recommendations.

Main outcome(s) The primary outcomes of this systematic review are the prevalence and severity of anxiety and depressive symptoms among adults undergoing cardiac surgery and/or participating in cardiac rehabilitation programs. Psychological disturbances are evaluated using validated psychometric instruments, standardized questionnaires, or structured psychiatric interviews, according to the definitions and diagnostic thresholds established in the original studies.

Outcome measures include the proportion of participants presenting clinically relevant anxiety or depression, the distribution of psychological symptom scores, and changes in psychological status between baseline and subsequent assessments. Particular attention is given to the evolution of anxiety and depressive manifestations following surgical treatment or during rehabilitation, including the persistence, improvement, or worsening of symptoms over time.

Prevalence estimates are expressed as percentages, whereas psychological symptom severity is characterized using the numerical scores reported for individual assessment instruments. Given the substantial variability in study populations, psychometric scales,

diagnostic cutoffs, and assessment intervals, findings are summarized descriptively using unweighted medians of available study-level estimates and their corresponding ranges, without calculating pooled prevalence estimates or conducting a formal meta-analysis.

Additional outcome(s) Secondary outcomes include the identification of demographic, anthropometric, cardiovascular, psychosocial, and lifestyle-related characteristics associated with anxiety and depressive symptoms in patients undergoing cardiac surgery or participating in cardiac rehabilitation. Variables of interest comprise age, sex, body mass index, cardiovascular risk factors, underlying cardiac conditions, previous cardiovascular interventions, comorbidities, and available echocardiographic measurements, particularly left ventricular ejection fraction.

Additional outcomes concern the relationships between psychological disturbances and perceived social support, educational attainment, marital status, health-related quality of life, functional capacity, physical activity, sedentary behavior, and adherence to rehabilitation or secondary prevention strategies. Where available, associations are characterized according to their direction, magnitude, statistical significance, and adjustment for potential confounding factors.

The review also examines differences in psychological assessment methods, including the instruments employed, diagnostic thresholds, and timing of evaluations. Methodological quality and risk of bias are assessed to identify limitations affecting the reliability and interpretation of the available evidence. Particular attention is given to gaps in cardiovascular phenotyping and the limited availability of direct comparisons between different cardiac surgical populations. These secondary outcomes are synthesized descriptively without formal statistical pooling or causal inference.

Data management All records retrieved from PubMed/MEDLINE, Scopus, and Embase were compiled into a unified electronic dataset, and duplicate entries were identified and removed before eligibility screening. Retrieved publications were organized according to their screening status, with potentially relevant articles undergoing full-text assessment based on predefined inclusion and exclusion criteria.

Information from eligible studies was collected using a standardized electronic spreadsheet developed specifically for this review. Extracted

variables included bibliographic details, study design, geographical setting, sample size, demographic and anthropometric characteristics, cardiovascular diagnoses, comorbidities, surgical or rehabilitation procedures, psychological assessment instruments, diagnostic thresholds, and outcome evaluation time points. Quantitative information concerning anxiety, depression, psychometric scores, and associated clinical or psychosocial factors was recorded according to the definitions provided by the original investigators.

Baseline and follow-up measurements were documented separately whenever available. Missing or insufficiently reported variables were classified as not reported, without statistical imputation. Potentially overlapping study populations were examined to minimize duplication of participants and outcomes.

Extracted data were organized into predefined categories to facilitate descriptive comparisons and evidence synthesis. Data processing and summary analyses were conducted using Python and standard scientific computing libraries. Differences in measurement methods, assessment timing, and reporting formats were considered throughout data handling to preserve the accuracy and interpretability of study-level information.

Quality assessment / Risk of bias analysis The methodological rigor of the included investigations was evaluated using established assessment frameworks selected according to study design. Observational studies were appraised using the National Institutes of Health/National Heart, Lung, and Blood Institute (NIH/NHLBI) Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies. This 14-item instrument examines key methodological aspects, including the definition of study objectives and populations, participant selection, sample-size justification, exposure and outcome measurement, temporal relationships, follow-up completeness, blinding, and adjustment for potential confounding factors.

Individual criteria were classified as Yes, No, Cannot Determine, Not Reported, or Not Applicable. Overall methodological quality was categorized as Good, Fair, or Poor through qualitative consideration of the applicable criteria rather than numerical scoring alone. Particular attention was given to selection bias, measurement reliability, incomplete follow-up, and residual confounding.

Randomized controlled trials were evaluated separately using the revised Cochrane Risk of Bias tool (RoB 2), which addresses five domains: randomization, deviations from intended interventions, missing outcome data, outcome measurement, and selective reporting. Domain-specific and overall judgments were classified as Low risk of bias, Some concerns, or High risk of bias.

Findings from the two assessment frameworks were interpreted separately because their methodological domains and classification systems are not directly interchangeable. Quality assessments informed the critical interpretation of the available evidence, particularly regarding the consistency, reliability, and generalizability of reported psychological outcomes and associated factors.

Strategy of data synthesis Given the considerable clinical and methodological diversity of the eligible investigations, evidence will be integrated through a structured descriptive synthesis rather than a conventional meta-analysis. Differences in cardiovascular populations, study designs, psychological assessment instruments, diagnostic thresholds, and follow-up intervals will be considered when determining the comparability of reported findings.

For each outcome, the number of studies providing usable quantitative information will be documented. Continuous variables, including demographic measurements, echocardiographic parameters, and psychometric scores, will be summarized using the median of available study-level central estimates, together with the corresponding minimum–maximum range. Categorical variables, including cardiovascular comorbidities, clinical characteristics, and the prevalence of anxiety and depression, will be described using the median of study-specific percentages and their observed ranges. These summaries will remain unweighted and will not be interpreted as pooled patient-level estimates.

Psychological outcomes will be examined according to the assessment instrument and measurement period. Baseline and follow-up findings will be presented separately, recognizing that different studies or populations may contribute to each assessment. Numerical scores obtained using distinct psychometric scales will not be combined. Findings supported by a single investigation will be reported individually.

Associations between psychological disturbances and demographic, clinical, psychosocial, or behavioral factors will be synthesized narratively, considering the direction, consistency, and statistical significance of reported relationships. Adjusted estimates will be prioritized when available, while differences in confounder adjustment and outcome definitions will be acknowledged.

Methodological quality and risk-of-bias judgments will inform the interpretation of the findings. No formal heterogeneity statistics, pooled effect estimates, or inferential comparisons between studies will be calculated. Results will be interpreted cautiously, with particular consideration of incomplete reporting, potential confounding, and the observational nature of most available evidence.

Subgroup analysis No formal statistical subgroup analyses are planned because of the substantial heterogeneity in study populations, research designs, psychological assessment methods, and outcome reporting. Nevertheless, where sufficient information is available, descriptive comparisons will be undertaken across clinically relevant categories, including patients undergoing cardiac surgical procedures and those participating in structured cardiac rehabilitation programs.

Additional exploratory comparisons may consider the type of cardiovascular intervention, underlying cardiac condition, timing of psychological assessment, and specific instruments used to evaluate anxiety and depression. Particular attention will be given to differences between baseline and follow-up psychological outcomes and to the potential influence of demographic, clinical, and psychosocial characteristics.

Subgroup findings will be summarized narratively or through descriptive study-level estimates, without formal interaction testing or pooled subgroup effect estimates. Comparisons will be interpreted cautiously, acknowledging differences in patient selection, diagnostic thresholds, assessment intervals, and the limited availability of directly comparable data.

Sensitivity analysis No formal sensitivity analyses were undertaken, as the substantial heterogeneity across the included studies precluded meta-analytic pooling and the calculation of combined effect estimates. The robustness of the descriptive findings was instead considered through a qualitative examination of methodological differences, study quality, psychological

assessment instruments, diagnostic thresholds, and outcome evaluation periods.

Particular attention was given to the consistency of reported associations across investigations with different designs and clinical populations. The potential influence of studies with limited sample sizes, incomplete outcome reporting, or methodological concerns was considered when interpreting the available evidence. Baseline and follow-up psychological outcomes were evaluated separately, and numerical results obtained using different psychometric instruments were not combined.

No leave-one-out analyses, statistical outlier exclusions, or quantitative sensitivity estimates were calculated. Accordingly, the findings were interpreted as exploratory descriptive evidence rather than statistically validated pooled estimates.

Language restriction No language restrictions were applied during the literature search or initial screening process.

Country(ies) involved Italy.

Other relevant information This systematic review was prepared in accordance with the PRISMA 2020 reporting recommendations and integrates evidence from observational investigations and randomized clinical research addressing psychological disturbances in cardiovascular care. The review focuses on the clinical and psychosocial burden of anxiety and depression in patients undergoing cardiac surgery and/or participating in cardiac rehabilitation, with particular attention to differences in psychological assessment methods, symptom trajectories, and associated patient characteristics.

An additional aspect of interest is the limited availability of comprehensive cardiovascular phenotyping, particularly echocardiographic measurements, in studies evaluating psychological outcomes. This evidence gap highlights the potential value of future investigations integrating standardized psychiatric assessments with detailed cardiovascular imaging, functional evaluation, and longitudinal follow-up.

The review is based exclusively on previously published research and does not involve direct patient recruitment or collection of identifiable personal information. No individual participant data were obtained. The findings are intended to inform future research and support the development of more comprehensive, multidisciplinary approaches

to psychological assessment and cardiovascular rehabilitation.

Keywords Anxiety; Depression; Cardiac Surgery; Cardiac Rehabilitation; Coronary Artery Bypass Grafting; Psychological Distress; Psychometric Assessment; Cardiovascular Disease; Psychosocial Factors; Mental Health.

Dissemination plans The findings of this systematic review are intended for dissemination through publication in an international peer-reviewed scientific journal specializing in cardiovascular medicine, cardiac rehabilitation, or clinical research. The results may also be presented at national and international scientific conferences and shared with healthcare professionals involved in cardiovascular care, including cardiologists, cardiac surgeons, rehabilitation specialists, and mental health professionals.

The review aims to increase awareness of psychological disturbances in cardiac surgical and rehabilitation populations, encourage the integration of standardized psychological assessment into multidisciplinary cardiovascular care, and identify priorities for future clinical research. Where feasible, the extracted study-level dataset and supplementary methodological materials will be made publicly accessible through an open-access research repository to promote transparency, reproducibility, and further scientific investigation.

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