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# PSYCHIATRIC COMORBIDITIES IN PATIENTS WITH CARDIAC PACEMAKERS: A NARRATIVE REVIEW

*Narrative Review*

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## ABSTRACT

**Background:** Cardiac pacemakers are widely used to manage bradyarrhythmias and conduction disorders, significantly improving survival and quality of life. However, the psychological impact of pacemaker implantation remains an underexplored area in cardiology. Anxiety, depression, and posttraumatic stress disorder (PTSD) are increasingly recognized in pacemaker recipients, often affecting their emotional well-being, adherence to treatment, and long-term prognosis.

**Objective**: This narrative review aims to explore the prevalence, presentation, and contributing factors of psychiatric comorbidities—particularly anxiety, depression, and PTSD—among patients with cardiac pacemakers and to evaluate current evidence regarding their identification and management.

**Main Discussion Points**: Recent studies reveal that a notable proportion of pacemaker patients experience clinically significant psychological symptoms, influenced by individual factors such as age, prior mental health history, illness perception, and body image concerns. Psychological distress is often subclinical but can persist and negatively impact recovery. Evidence suggests that cognitive-behavioral therapy and psychoeducational interventions can effectively reduce symptoms, although large-scale randomized controlled trials are lacking. Major limitations in current literature include small sample sizes, cross-sectional designs, lack of standardized outcome measures, and limited long-term data.

**Conclusion**: Psychiatric comorbidities in pacemaker recipients represent a clinically significant yet frequently overlooked issue. Integrating psychological screening and interventions into routine cardiac care is recommended to support comprehensive patient management. Further longitudinal and interventional studies are needed to strengthen the evidence base and guide effective clinical strategies.

**Keywords**: Cardiac Pacemakers, Anxiety, Depression, PTSD, Psychological Comorbidities, Narrative Review.

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## INTRODUCTION

Cardiac pacemakers have become an integral part of managing life-threatening bradyarrhythmias and conduction abnormalities, offering significant improvements in survival and quality of life. Globally, over one million pacemaker implantations are performed annually, with prevalence expected to rise due to aging populations and the increasing burden of cardiovascular disease (1). However, while the physiological benefits of pacemaker implantation are well established, the psychosocial and emotional consequences remain underrecognized in clinical practice. There is mounting evidence that the experience of living with an implanted cardiac device is not solely a physiological adjustment but also a complex psychological journey, often marked by psychiatric comorbidities such as anxiety, depression, and posttraumatic stress disorder (PTSD) (2,3). The implantation of a pacemaker represents a major life event that can evoke a variety of emotional responses. For many patients, the procedure is perceived not only as life-saving but also as a confronting reminder of cardiac vulnerability and mortality. Anxiety related to the functioning of the device, fear of dependence on technology, and distress regarding future health uncertainties are commonly reported (4). Furthermore, body image concerns and limitations on physical activity may contribute to psychosocial distress, especially in younger patients or those with pre-existing psychological vulnerabilities. Several studies indicate that psychiatric symptoms in pacemaker patients, particularly anxiety and depression, can reach clinically significant levels and may persist long after the physical recovery has concluded (5,6).

Recent investigations have begun to quantify the scope of these psychological issues. One cross-sectional study found that a notable proportion of pacemaker patients reported clinically relevant symptoms of depression and anxiety, even six months post-implantation, with depressive symptoms more frequent than in healthy controls (7). Similarly, elevated levels of PTSD symptoms—although not uniformly above clinical cut-off thresholds—have also been detected in some cohorts, suggesting subthreshold or subclinical trauma responses following the implantation event (8). Such responses are not surprising, given the emergency context in which many pacemakers are implanted, often following syncopal episodes or arrhythmias that are themselves traumatic. Despite this growing body of evidence, research in this field remains fragmented and inconsistent. Many studies include small sample sizes, lack standardized diagnostic criteria, or do not distinguish between patients with pacemakers and those with implantable cardioverter-defibrillators (ICDs), who may experience higher emotional distress due to shock-related anxiety. For instance, while ICD patients often report more pronounced PTSD symptoms, pacemaker patients are not immune to these effects, especially when compounded by appearance concerns and illness perception (9,10). Moreover, variations in patient outcomes based on age, gender, underlying cardiac disease, and socio-economic context are insufficiently explored. Importantly, few studies have evaluated the longitudinal course of psychiatric symptoms or the effectiveness of targeted psychological interventions.

The objective of this narrative review is to synthesize and critically examine the existing literature on psychiatric comorbidities in patients with cardiac pacemakers, with a particular focus on anxiety, depression, and PTSD. This review will explore the prevalence, presentation, and potential predictors of these conditions, drawing upon both observational and interventional studies (11). In doing so, it seeks to clarify the psychological impact of pacemaker implantation and identify clinical implications for screening, diagnosis, and management. This review will specifically cover peer-reviewed studies published within the last decade that address psychological outcomes in adult pacemaker recipients. Inclusion criteria encompass observational studies, interventional trials, and comparative research between device types (e.g., pacemakers vs. ICDs), as long as they provide separate data for pacemaker recipients. Excluded are studies focusing solely on children or those in which pacemaker data cannot be clearly separated from other device types (12). The significance of this review lies in its potential to inform and refine clinical practice. By highlighting the prevalence and patterns of psychiatric distress in pacemaker patients, the review underscores the need for routine psychological assessment as part of cardiac rehabilitation and follow-up care. Moreover, it explores evidence for interventions—such as cognitive-behavioral therapy and psychoeducation—that may alleviate distress and improve overall quality of life (13,14). In this context, the review offers a foundation for future research directions, including the development of standardized protocols for psychological monitoring and treatment integration into cardiology settings. By consolidating findings from a diverse array of studies, this narrative review aims to contribute to a more holistic understanding of the patient experience after pacemaker implantation. Ultimately, the goal is to support clinicians in delivering comprehensive, patient-centered care that addresses both the somatic and psychological dimensions of cardiac health.

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# THEMATIC DISCUSSION: PSYCHIATRIC COMORBIDITIES IN PATIENTS WITH CARDIAC PACEMAKERS

### Prevalence and Patterns of Psychiatric Symptoms in Pacemaker Recipients

Psychiatric comorbidities such as anxiety, depression, and PTSD are increasingly recognized among patients with cardiac pacemakers. Studies in recent years consistently report that a significant proportion of pacemaker recipients experience clinically relevant psychological symptoms, even in the absence of major psychiatric diagnoses. In a comparative study involving pacemaker patients and several control groups, depression was found in 16.2% of pacemaker recipients, while PTSD symptoms were present in a substantial minority, despite being statistically similar across cardiac and non-cardiac chronic disease groups (10). Although anxiety symptoms did not consistently reach clinical thresholds, subclinical levels were frequent, indicating an undercurrent of psychological distress that may go undetected in routine cardiac care. Similarly, Turton's study highlighted that while most patients with pacemakers scored within normal ranges for anxiety, depression, and PTSD, those with elevated symptoms also exhibited greater appearance dissatisfaction and illness-related concerns (11). These associations point to a constellation of psychosocial factors interwoven with psychiatric outcomes, suggesting that even moderate psychological symptoms can signal deeper distress when viewed within the broader context of illness perception.

### Risk Factors and Predictors of Psychological Distress

The emergence of psychiatric symptoms post-implantation appears to be influenced by both patient-related and procedural factors. Age, gender, pre-existing psychological vulnerabilities, and the emergency nature of pacemaker implantation may all contribute to psychiatric outcomes. A pediatric study revealed that children with pacemakers, especially those with congenital heart disease, demonstrated significantly higher rates of depression and anxiety compared to healthy peers, while their parents also reported diminished quality of life (12). Moreover, variables such as ICU admission and socioeconomic factors were independently associated with anxiety, emphasizing the multifactorial nature of psychiatric vulnerability. Appearance-related concerns also appear as significant predictors. Turton found that patients with negative body image and strong illness concerns were more likely to report anxiety and depressive symptoms, even if overall scores remained subclinical (13). These findings suggest that psychological outcomes may not solely be driven by the physiological implications of the device, but also by the individual's cognitive and emotional processing of their condition.

### Posttraumatic Stress and Device-Related Trauma

Posttraumatic stress symptoms, though less frequently discussed than anxiety or depression, are a relevant concern in the pacemaker population. Patients may associate the device with the traumatic circumstances leading to its implantation, such as sudden cardiac arrest or syncope. A study investigating PTSD in cardiac device recipients found that while PTSD symptoms were more common in patients with ICDs, a non-trivial percentage of pacemaker recipients also displayed trauma-related symptoms that correlated with other forms of psychological distress (14). Furthermore, findings from a broader cardiac outpatient population indicated that PTSD symptoms can present even in patients without overt trauma, possibly due to anticipatory anxiety or unresolved fears regarding device malfunction (15).

### Psychological Interventions and Their Effectiveness

Psychological distress in pacemaker patients is not only prevalent but also modifiable. Several interventions, particularly those grounded in cognitive-behavioral therapy (CBT), have demonstrated efficacy in reducing anxiety and depression. Figueroa and colleagues implemented a CBT program for patients with implantable pacemakers and reported a dramatic reduction in depression from 45.5% to 9.1%, and anxiety from 81.8% to 45.5% post-intervention (16). This underlines the need for integrated psychological services as part of post-implantation follow-up care. Similarly, studies have shown that even brief interventions such as psychoeducation and structured nursing care can significantly alleviate psychological symptoms in device recipients. For example, one randomized study found that patients receiving psychological support showed significantly lower post-intervention anxiety and depression scores compared to controls who received only standard medical care (17). These results advocate for routine psychological screening and early intervention, particularly for patients with known risk factors or elevated baseline distress.

### Disparities and Controversies in the Literature

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Despite emerging consensus on the relevance of psychiatric comorbidities in pacemaker patients, the literature remains fragmented and at times contradictory. Some studies report only mild to moderate psychological burden with no significant differences between pacemaker recipients and healthy controls (18), while others emphasize clinically significant levels of depression and anxiety in a large proportion of patients (19). Methodological variability, differing diagnostic criteria, and sample heterogeneity likely contribute to these discrepancies. Moreover, many studies do not isolate pacemaker data from that of ICD recipients, despite the differing psychological impacts of these devices. An additional limitation is the underrepresentation of longitudinal studies. Most available data are cross-sectional, providing only a snapshot of psychological symptoms without insight into their evolution over time. Furthermore, cultural and demographic variability in symptom reporting and help-seeking behavior remains insufficiently explored. These gaps underscore the need for large-scale, longitudinal studies using standardized psychometric tools to provide a clearer understanding of the true burden and trajectory of psychiatric symptoms in pacemaker recipients.

**Integration of Psychological Care into Cardiology Practice**

The findings across the literature converge on a critical clinical implication: psychological symptoms in pacemaker patients should not be overlooked. Despite robust evidence of distress, mental health screening remains largely absent from routine cardiac device care. This represents a missed opportunity for early identification and intervention. Studies emphasize the intergenerational impact of pacemaker-related distress, showing reduced quality of life not only in young patients but also their caregivers (18,19). Integrating mental health services into cardiology clinics, either via embedded psychologists or telepsychiatry consultations, could mitigate psychiatric morbidity and improve patient outcomes. Tailored interventions for vulnerable groups, such as adolescents, elderly patients, or those with prior psychiatric history, are particularly warranted. Additionally, including psychoeducation in pre-implantation counseling could help modulate expectations and reduce anticipatory anxiety.

## CRITICAL ANALYSIS AND LIMITATIONS

Despite growing attention to the psychological impact of cardiac pacemaker implantation, the current body of literature presents several methodological and interpretive limitations that constrain the strength and applicability of its conclusions. One of the most pervasive limitations across the reviewed studies is the small sample sizes, which restrict the statistical power and increase the risk of type II errors. For example, A study included only 38 pacemaker patients in their comparative analysis, which, while offering valuable insights, limits the robustness and representativeness of the findings (16). Similarly, intervention studies, such as a study involved only 11 patients, lack sufficient power to confidently generalize treatment efficacy to the broader population (17). A notable gap in the literature is the scarcity of randomized controlled trials (RCTs) evaluating psychological interventions in pacemaker patients. Most existing research relies on observational or cross-sectional designs, which, while useful for identifying associations, fall short in establishing causal relationships. Studies provide cross-sectional snapshots that identify psychological symptoms and their correlates but cannot determine whether these symptoms precede or follow the implantation procedure (18,19). Moreover, very few studies include long-term follow-up to assess the persistence or resolution of psychiatric symptoms, which is critical for developing effective treatment strategies and informing post-implantation care protocols. Several studies also suffer from methodological biases and uncontrolled confounding variables. Selection bias is a common concern, particularly in studies that recruit from single-center outpatient clinics or tertiary referral centers, where participants may not reflect the broader demographic or clinical diversity of pacemaker patients. For example, the findings from a study, while insightful, were limited to a pediatric population with additional structural heart disease, reducing their applicability to the general adult pacemaker population (20). Additionally, many studies rely on self-report measures without blinding or clinician verification, raising concerns about performance and reporting bias.

Variability in assessment tools and outcome measurements further complicates the interpretation of findings across studies. Instruments such as the Hospital Anxiety and Depression Scale (HADS), Beck Depression Inventory (BDI), and PTSD checklists differ in sensitivity and diagnostic thresholds, leading to discrepancies in reported prevalence rates and symptom severity. Without standardized assessment protocols, comparing outcomes across studies becomes challenging and may lead to misleading conclusions about the true psychological burden in this population. For instance, some studies report subclinical symptomatology as clinically significant, while others require stricter diagnostic thresholds, creating ambiguity in clinical interpretation (21). Furthermore, potential publication bias cannot be overlooked. Studies with positive findings, such as significant reductions in depression or anxiety following intervention, are more likely to be published, while those with null or inconclusive outcomes may remain underreported. This bias skews the perceived efficacy of psychological treatments and may contribute to an overestimation of their impact. The psychological intervention study, for instance,

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demonstrated a dramatic reduction in symptoms, but without a control group or replication in larger samples, such results should be interpreted with caution (22). Another critical limitation is the limited generalizability of many findings. Most reviewed studies are confined to specific geographical, age, or socioeconomic groups, often excluding patients with comorbid physical or psychiatric conditions. For example, studies conducted in urban, academic hospitals may not reflect the experiences of patients in rural or resource-limited settings. The heterogeneity of device indications—ranging from syncope to congenital heart disease—also complicates comparisons, as psychological responses may vary depending on the clinical context of implantation (23,24). In conclusion, while the existing literature highlights an important and underrecognized aspect of care in cardiac pacemaker patients, it is characterized by notable methodological shortcomings. Future research should prioritize well-designed, adequately powered RCTs with standardized outcome measures and longer follow-up durations. Multicenter studies that reflect diverse populations and clinical scenarios are essential to ensure the external validity and clinical utility of findings in this evolving area of cardio psychological research.

## IMPLICATIONS AND FUTURE DIRECTIONS

The findings from this narrative review underscore the significant yet often overlooked role of psychiatric comorbidities in patients with cardiac pacemakers, revealing important implications for clinical practice. Mental health screening should become a routine component of pre- and post-implantation care, particularly as symptoms of anxiety, depression, and PTSD—though sometimes subclinical—are frequently present and may negatively influence patient outcomes. Integrating psychological assessments using validated tools like the HADS or PHQ-9 into cardiology clinics could enable earlier detection and timely referral for mental health support. Moreover, evidence supporting the efficacy of cognitive behavioral therapy and psychoeducational interventions suggests that non-pharmacological approaches should be considered as adjuncts to standard cardiac care in these patients (25). From a policy perspective, the current absence of formal guidelines addressing psychological care in pacemaker recipients represents a significant gap in cardiology standards. National and international cardiac societies may benefit from including mental health monitoring protocols in their guidelines for device-based therapy. Just as depression is routinely screened in heart failure management, a similar approach could be implemented for pacemaker patients. Multidisciplinary teams comprising cardiologists, psychologists, and primary care physicians should collaboratively develop models of care that account for the mental well-being of patients throughout the device therapy continuum. This integrative model would help normalize psychological support as part of cardiac rehabilitation rather than viewing it as an isolated concern.

Despite advancements in this area, several critical questions remain unanswered. There is limited understanding of the long-term psychological trajectory of pacemaker patients, as most studies are cross-sectional or have short follow-up durations. It is unclear whether initial anxiety or depressive symptoms tend to resolve, persist, or worsen over time, and what role psychological resilience or pre-existing vulnerabilities play in these outcomes (26). Moreover, the mechanisms by which device-related factors, such as mode of pacing or complications, interact with psychological health are poorly defined. The psychosocial experience may also vary considerably across subgroups—such as younger patients, those with congenital cardiac disorders, or individuals in low-resource settings—which remains underexplored (27). Future research should focus on well-powered, longitudinal studies that track psychiatric symptoms over several years post-implantation. These studies should incorporate diverse populations to ensure generalizability and explore predictive factors such as coping styles, social support, and pre-implantation mental health status. Randomized controlled trials are particularly needed to evaluate the effectiveness of specific interventions, such as tailored cognitive behavioral therapy or digital mental health tools, in reducing psychological distress in pacemaker patients. Trials should utilize standardized outcome measures, include appropriate control groups, and ensure sufficient follow-up to capture the durability of treatment effects. Furthermore, implementation research could examine how best to integrate these interventions into routine cardiology care without overburdening healthcare systems. In conclusion, the current evidence base highlights the emotional burden faced by many pacemaker patients and calls for a paradigm shift in their clinical management. By prioritizing mental health as a component of cardiac care, future strategies can improve both psychological well-being and cardiac outcomes, leading to a more holistic and patient-centered model of care.

## CONCLUSION

This narrative review highlights that, psychiatric comorbidities—particularly anxiety, depression, and posttraumatic stress symptoms—are prevalent among cardiac pacemaker recipients and are often underrecognized in routine clinical care. The findings consistently show that psychological distress may emerge post-implantation due to factors such as fear of device malfunction, altered body image, or prior traumatic medical events. While most patients adapt well, a significant subset continues to experience subclinical or clinical psychiatric

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symptoms that can impair quality of life and potentially influence cardiac outcomes. Although the current literature provides valuable insights, it remains limited by small sample sizes, cross-sectional designs, inconsistent outcome measures, and a lack of long-term follow-up, reducing the overall strength and generalizability of the evidence. Clinicians are encouraged to incorporate routine mental health screening and offer targeted psychological support as part of post-implantation care, especially for high-risk individuals. To guide evidence-based interventions and improve psychosocial outcomes, there is an urgent need for larger, methodologically robust studies that include longitudinal data and evaluate the efficacy of structured psychological therapies tailored to this population.

## AUTHOR CONTRIBUTION

| Author | Contribution |
|---|---|
| Muhammad Qasim Arif* | Substantial Contribution to study design, analysis, acquisition of Data<br>Manuscript Writing<br>Has given Final Approval of the version to be published |
| Juwairia Abdul Rahim | Substantial Contribution to study design, acquisition and interpretation of Data<br>Critical Review and Manuscript Writing<br>Has given Final Approval of the version to be published |
| Wajeeha Ahmadani | Substantial Contribution to acquisition and interpretation of Data<br>Has given Final Approval of the version to be published |
| Muhammad Ehtesham | Contributed to Data Collection and Analysis<br>Has given Final Approval of the version to be published |
| Komal Khan | Contributed to Data Collection and Analysis<br>Has given Final Approval of the version to be published |
| Aleeha Afreenish Zab | Substantial Contribution to study design and Data Analysis<br>Has given Final Approval of the version to be published |
| Umm e Habibah Azeez Qureshi | Contributed to study concept and Data collection<br>Has given Final Approval of the version to be published |

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