REVIEW ARTICLE

Factors influencing psychological status and quality of life in patients with implantable cardioverter-defibrillators

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Abstract

Various mental and social problems can negatively impact the quality of life and overall health in patients with implantable cardiac defibrillators (ICD). In this report, we review and summarize the main studies and research related to this topic. Depression, anxiety, panic attacks, stress and post-traumatic stress are the most common symptoms of ICD-related disorders that can negatively impact mental status. Factors than can influence the impact of these psychological disorders include socio-demographic variables (younger age, gender, and employment), variables related to the ICD (number of ICD shocks, generator size, time from ICD implant, etc.) and psycho-social variables (negative coping strategies, lack of social support and personality type). Fortunately, these disorders, and their symptoms, can be prevented, treated or managed, if recognized.

Abbreviations:
BID	- Beck Depression Inventory
DIPS	- Diagnostic Interview for Psychological Symptoms
HADS	- Hospital Anxiety and Depression Scale
ICD	- Implantable Cardioverter-Defibrillator
QoL	- Quality of Life
SCD	- Sudden Cardiac Death
SDS	- Self-Rating Depression Scale
TMAS	- Taylor Manifest Anxiety Scale

INTRODUCTION

In developed countries, cardiovascular diseases are responsible for more than 50% of deaths. Recently, a significant decline in hospitalization mortality has been observed due to the development of non-pharmacological treatment of cardiovascular diseases, mainly coronary interventions. However, surviving patients with impaired left ventricular function form a cohort with significantly increased risk of sudden cardiac death (SCD). Implantable cardioverter-defibrillators (ICD) have developed as a powerful tool to prevent SCD since mid-1970s. An ICD is an implantable device that can reliably diagnose and treat life-threatening arrhythmias using a high-voltage shock (defibrillation) and/or overdrive pacing. In the last two decades the size of

these devices has diminished significantly due to technological developments. Moreover, indication criteria for implantation of an ICD have widened, mainly for high-risk patients in primary prevention, i.e. when no life-threatening arrhythmias or syncope have occurred, but when significant risk factors are present. Several clinical trials have shown the mortality benefit of ICDs in these patients (Moss *et al.* 1996, 2004; Bardy *et al.* 2005).

A goal of the paper is to review main factors influencing a psychological status and a quality of life in ICD patients.

ICD AND PSYCHOSOCIAL DISTRESS

The number of studies and clinical trials related to the psychosocial distress caused by implantable cardioverter-defibrillators has increased significantly since the beginning of the 1990s. They have reported a high incidence of psychological disorders which negatively impact well-being and quality of life. It has been shown that mental imbalances, such as anxiety and depression, may increase the risk of cardiovascular diseases including life-threatening ventricular arrhythmias (Carney *et al.* 2002) and lead to increased one-year mortality after ICD implantation (Habibović *et al.* 2013). Some studies have shown that education and cognitive behavioral therapy can significantly improve the mental status of some ICD patients (Chevalier *et al.* 2006, Irvine *et al.* 2011). Kohn *et al.* (2000) demonstrated that cognitive

behavioral therapy can not only decrease anxiety and depression but also reduce the number of arrhythmias resulting in ICD discharges. Dickerson *et al.* (2000) and Thomas *et al.* (2001) demonstrated the positive impact of supportive group therapy, which can increase feelings of security and allow patients to discuss their fears and expectations. Supportive group therapy is particularly useful in younger patients that may not have any friends in the same age group with whom they can discuss their problems (Sears *et al.* 2001).

Dunbar *et al.* (2012) demonstrated that there is a close relationship between ICD satisfaction and the prevalence of mental problems. In our ongoing survey patients may describe themselves as 'satisfied' with the results of the ICD implant but may display signs of anxiety and depression (inverse correlation). A qualitative study from one UK center (Tagney *et al.* 2003) identified a tendency for ICD patients to conceal their concerns.

PSYCHOLOGICAL DISORDERS IN PATIENTS WITH ICDS

There is a broad spectrum of mental symptoms and diagnoses in patients with ICDs (Table 1). However, research quality has been hindered by patient selection biases, non-standardized assessment measures, lack of baseline assessment and the lack of long-term follow-up (Sears *et al.* 1999). Methodological limitations remain a problem in more recent research, but the results have been demonstrated on larger sample sizes and with a broader spectrum of mental disorders. Anxiety is the most common psychological illness and its prevalence in ICD patients varies between 7.6% and 46% depending on study (Dunbar *et al.* 2012).

Depression is another typical disorder occurring in ICD patients with a prevalence of 14–41%, again depending on study (Dunbar *et al.* 2012). Depression and anxiety may appear together (Pedersen *et al.* 2007), but this is not a common finding. In a group of cardiopulmonary resuscitation survivors, post-traumatic stress disorder occurred in 21% (Kapa *et al.* 2010; Irvine *et al.* 2011; Habibović *et al.* 2012) and stress in 20% (Dunbar *et al.* 2012). Panic attacks (Bourke *et al.* 1997) and psychosexual disorders were rare and occurred in only a minority of patients. Some less common quality-of-life measures such as anger, sadness, fatigue, insomnia, absence of emotions, pessimism, anxiety about being a burden for a family, etc. have also been identified (Heller *et al.* 1998).

VARIABLES INFLUENCING PSYCHOLOGICAL STATUS IN PATIENTS WITH IMPLANTED ICD

There are multiple variables that can negatively impact the psychological status of ICD patients. The most important variable is fear of ICD discharges (Thomas *et*

Tab. 1. Depression and anxiety prevalence.

Disorder	Prevalence	Size	Scale	Study
Anxiety	22.7%	44	TMAS	Francis *et al.* 2009
	16.7%	90	DIPS	Godeman *et al.* 2004b
	42.0%	221	HADS	Pedersen *et al.* 2004
	30.0%	182	HADS	Pedersen *et al.* 2007
	46.0%	91	HADS	Bilge *et al.* 2006
	24.0%	119	HADS	Crössmann *et al.* 2010
	7.6%	395	State Anxiety Inventory	Habibović *et al.* 2012
Depression	29.0%	221	HADS	Pedersen *et al.* 2004
	41.0%	91	BID	Bilge *et al.* 2006
	27.3%	44	BID	Francis *et al.* 2009
	25.0%	16	Interview	Maryniak *et al.* 2009
	25.0%	90	Zung SDS	Suzuki *et al.* 2010
	21.0%	236	HADS	Tzeis *et al.* 2011
	14.0%	386	HADS	Pedersen *et al.* 2011
	25.1%	430	HADS	Mastenbroek *et al.* 2014

Abbreviations: BID, Beck Depression Inventory; DIPS, Diagnostic Interview for Psychological Symptoms; HADS, Hospital Anxiety and Depression Scale; SDS, Self-Rating Depression Scale; TMAS, Taylor Manifest Anxiety Scale

Tab. 2. Variables that negatively impact mental status of ICD patients.

Factors	Variable	Study
Socio-demographic	Age <50	Francis *et al.* 2009; Thomas *et al.* 2006; Cho *et al.* 2012
	Female gender	Bilge *et al.* 2006; Irvine *et al.* 2011
	Unemployment	Heller *et al.* 1998
	Ethnic group	Wilson *et al.* 2013
ICD related	ICD size	Bourke *et al.* 1997; Freedenberg *et al.* 2011
	Number of shocks	Thomas *et al.* 2006; Freedenberg *et al.* 2011
	Negative cognitive appraisal of ICD discharges	Godemann *et al.* 2004b
	Operation under anaesthesia	Petrowski *et al.* 2013
	Previous resuscitation	Ladwig *et al.* 2008; Francis *et al.* 2009
	Comorbidities (symptomatic HF)	Dunbar *et al.* 2012
	Life style measures	Luyster *et al.* 2009
	Time from implant	Freedenberg *et al.* 2011; Petrowski *et al.* 2013
	Inappropriate patient education	Godemann *et al.* 2004b; Sears *et al.* 2011
Psycho-social	Personality type D	Habibović *et al.* 2012; Starrenburg *et al.* 2013
	Personality type D of a partner	Van den Broek *et al.* 2011
	Negative coping strategy	Crancy *et al.* 1997; Sears and Conti 2002
	Social support absence	Sears *et al.* 1999; Pedersen *et al.* 2009
	Hyper-protective family	Sears *et al.* 1999
	Travel outside the home	Heller *et al.* 1998

al. 2001), which are usually painful, unpredictable and uncontrollable (Bourke *et al.* 1997). Anxiety is more likely to occur during certain activities such as sports, employment or when the patient is out in public. Anxiety disorder and/or depression have been shown to be significantly related to the frequency of repeated shocks. Sears and Conti (2003) found that the likelihood of having an impaired psychological status increases when there are more than five electrical shocks per year.

Kuhl *et al.* (2006) demonstrated the clinical utility of the Florida Shock Anxiety Scale for measuring ICD shock-related fear. They introduced "shock anxiety" as a hypothetical construct that can be used to examine the relationship among proposed items of the scale. The number of ICD shocks and their perception are paradoxically increased by ICD shock-related fear (Lampert *et al.* 2002, Baumert *et al.* 2006), which forms a vicious circle – more ICD discharges means more anxiety followed by even more ICD shocks. On the other hand, patients also worry that the ICD device may not work properly or that there was unrecognized battery depletion and that they could die due to ICD failure (Bourke *et al.* 1997; Duru *et al.* 2001). Additional variables that negatively impact the mental status are summarized in Table 2.

Some variables correlate with psychological distress independently of the ICD implant (e.g. women are more anxious then men). However, some variables correlate less tightly with mental status and the clinical trials published are less consistent. Petrowski *et al.* (2013) showed that the 6–24 months post-implantation period is the most critical, whereas McDonough (2009) found that problems generally disappear within the first few months after the ICD implant. Differences between results could have been caused by the variability of the target groups (e.g. age and gender). Other potential factors, such as comorbidities (e.g. diabetes) have received little attention, even though they often occur in ICD patients (Dunbar *et al.* 2012).

CORRELATION BETWEEN QUALITY OF LIFE AND PSYCHOLOGICAL STATUS IN PATIENTS WITH ICDS

There is a clear relationship between quality of life and psychological status in patients with an ICD. Quality of life is negatively influenced by psychiatric symptoms such as depression, anxiety and fear (Godemann *et al.* 2004a; Sears *et al.* 2005), whereas somatic symptoms seem to have little or no influence (Exner *et al.* 2000, Duru *et al.* 2001; Godemann *et al.* 2004a). Several studies have shown that quality of life is severely diminished by ICD shocks (Schron *et al.* 2002, Kamphuis *et al.* 2003). The high prevalence of ICD-related depression

and anxiety can be interpreted as a response to perceived physical and mental disabilities associated with daily activities (Kamphius *et al.* 2003).

Quality of life has been studied extensively in ICD recipients (Namerow *et al.* 1999, Exner *et al.* 2000, Sears *et al.* 2002, 2005, Godemann *et al.* 2004a). A standardized Short-Form Health-Survey questionnaire SF-36 allows a comparison of different studies. Schron *et al.* showed that ICD and antiarrhythmic drug therapy are associated with similar alterations in self-perceived quality of life. The shocks were mostly responsible for the reduced quality of life in ICD recipients, whereas adverse events were responsible for similar changes in patients on antiarrhythmic drugs. Interestingly, despite different medical histories and treatments, patients with pacemakers and ICDs responded similarly to quality of life questionnaires (Duru *et al.* 2001).

Younger patients (<40 years) generally have lower quality of life scores compared to older patients. Younger adults experience unique concerns such as childbearing, cosmetic changes and financial insecurity, whereas older adults perceive an ICD as a life-saving technology (McDonough 2009).

CONCLUSION

Implantable cardioverter-defibrillators are devices that can be implanted under the skin to treat life-threatening arrhythmias in patients with a high risk of sudden cardiac death. A broad spectrum of psychological disorders and diagnoses including anxiety, depression, post-traumatic stress disorder, panic attacks and fear of ICD shocks have been reported in ICD patients. The most significant variable associated with ICD-related anxiety and depression is the frequency of ICD shocks. Treatments, which can improve mental status and quality of life, include patient education, cognitive behavioral therapy and patient support groups.

Every effort should be made to avoid both appropriate and inappropriate shocks by antiarrhythmic medication, optimal ICD programming and identification of possible device malfunctions. Routine screening and possible medical treatment for anxiety, depression and post-traumatic stress disorder should be implemented. Clinicians should provide clear information about the benefits and limitations of the ICD, prognosis and impact on lifestyle including activity, sport and occupation. All patients and their family members should know what to do in the event of a shock. Cognitive behavioural therapy and patient support groups are further strategies to prevent and treat psychological disorders that may occur in patients with an ICD.

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