

The Impact of Defibrillator Discharges on Psychological Functioning of Implantable Cardioverter Defibrillator Recipients

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A lag exists with respect to our understanding of the psychological demands and rehabilitation needs of individuals who have undergone implantable cardioverter defibrillator (ICD) implantation. The ICD is designed to transmit an electric shock to the heart to treat a potentially life-threatening arrhythmia. This study specifically examined the impact of defibrillator discharges on the psychological functioning of ICD recipients. A questionnaire was self-administered to 33 individuals who have been living with the ICD for at least 6 months. Results revealed that levels of anger and depression were significantly higher in those subjects who reported a lower discharge rate, while sense of well-being was significantly higher in those subjects who reported a greater discharge rate. Possible explanations for our findings were proposed as well as implications for clinical intervention were discussed.

KEY WORDS: psychosocial adaptation; implantable cardioverter defibrillator (ICD) recipients; discharges.

INTRODUCTION

Cardiac arrhythmias are the number one cause of death in the United States. It is estimated that approximately 400,000 individuals die of sudden ventricular arrhythmias each year, with one death occurring every two min-

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utes (Teplitz, Egenes, & Brask, 1990). Significant technological strides have been made resulting in the development of the implantable cardioverter defibrillator (ICD), a device which is capable of detecting life-threatening arrhythmias and automatically delivering electrical shock to the heart to terminate the unstable heart rhythm and thereby prevent sudden cardiac death. In individuals in whom suppression of ventricular tachycardia induction has been successfully accomplished with drug therapy, the mortality rate has diminished to 2–10%. In contrast, in those individuals who do not have effective suppression of the arrhythmia with pharmacological therapy, there is a 26% mortality rate at 1 year and 36% mortality rate at 2 years (Horowitz, 1987; Ruskin, DeMarco, & Garam, 1980; Swerdlow, Winkle, & Mason, 1983). The ICD has become the dominant strategy for prevention of sudden death in high risk patients, resulting in a mortality rate of less than 1% per year.

Individuals who have undergone ICD implantation have been exposed to multiple stressors (Fricchione & Vlay, 1994). These include but are not limited to exposure to one or more episodes of life-threatening arrhythmias, lengthy hospitalizations, extensive diagnostic tests, and many drug therapy trials. Having undergone device implantation, the ICD recipient lives with the unpredictably painful firing of the device. Thus, although the ICD provides a degree of protection and comfort, it is also a constant palpable physical reminder to the patient of fear associated with the initial shock of the defibrillator. Some individuals are concerned that they will receive a shock in a public place, which they associate with humiliation and embarrassment. In addition, individuals have expressed concern associated with the pain of discharges (Fricchione & Vlay, 1994).

A lag exists with respect to our understanding of the psychological demands required of individuals who have undergone ICD implantation. Particularly, there is little understanding of the coping demands placed on the individual who must adapt to the potential threat as well as actual firing of the device. The research completed to date with individuals who have undergone ICD implantation is characterized by small subject samples and poorly controlled research design (Pycha, Gullledge, Hutzler, Kadri, & Maloney, 1986; Vlay, Olson, Fricchione, & Friedman, 1989; Keren, Aarons, & Veltri, 1991). In their review of the literature, Fricchione and Vlay (1994) concluded that a dearth of studies has been completed which address psychological adaptation in individuals who have undergone ICD implantation. This research attempts to add to the sparse but much needed literature focusing specifically on the emotional sequelae of defibrillator discharges, one of the most difficult adaptational tasks associated with ICD implantation.

REVIEW OF THE LITERATURE

Pycha *et al.* (1986), based on observations of 18 subjects who had undergone ICD implantation, concluded that emotional lability, depression, fear, and hyperarousal with night wakefulness were psychological sequelae related to implantation. They observed that rehabilitation of the ICD recipient was related to severity of illness and ability to return to work. Similarly, Cooper, Luceri, Thurer, and Myerburg (1986) found that ICD implantation was associated with psychosocial consequences requiring intensive medical, nursing, and psychological counseling both pre- and postimplant. The authors reported that fear was the predominant emotion expressed by the 17 participants in the study. Vlay *et al.* (1989) studied eight individuals who had undergone ICD implantation and found a higher degree of anger and anxiety in subjects preimplantation compared to controls. Postimplantation, significant decreases in anxiety were reported, while anger levels remained unchanged. It was also found that individuals were able to return to psychological baseline at a mean time of 3.6 months postimplantation, that is, individuals reported that they had become "accustomed" to the ICD. Two subsequent studies (Fricchione & Vlay, 1989; Keren *et al.*, 1991) assessed psychological adjustment to the ICD, and reported incidents of anxiety, depression, dependence, and abuse syndrome. Keren *et al.* (1991) assessed differences in adaptation in those individuals who experienced discharges in comparison to those who did not, in addition to those individuals who were treated with antiarrhythmic drugs exclusively. No difference emerged in the three groups with respect to anxiety and depression after a mean time of 18 months postimplantation. These results must be viewed with caution given that there were six subjects in each of the three experimental conditions. The findings of Konstam, Colburn, and Butts (1995) replicate those of Keren *et al.* (1991), indicating that a significant minority of individuals, who have been living with the ICD for at least 6 months, continue to experience psychological difficulties, including feelings of anger, depression, and diminished sense of well-being.

This research attempts to add to the sparse but much needed literature focusing on the psychological sequelae of discharges on individuals with implantable defibrillators. Coping with the occurrence of discharges appears to be one of the most difficult adaptational tasks associated with ICD implantation, yet there exists only one study in the literature which specifically addresses this issue (Keren *et al.*, 1991) with conclusions based on a small number of subjects. Our research investigates the impact of discharges on psychological functioning in ICD recipients.

Table I. Characteristics of ICD Recipients

Age	$x = 66.48$ (SD = 10.14)
Sex	8 females (24.25%), 25 males (75.75%)
Mean number of children	2.64
Total number of cardiac-related hospitalizations	$x = 12.50$
Number of discharges since implantation	42% (no discharge) 21% (1-5 discharges) 24% (6-10 discharges) 6% (11-20 discharges) 6% (over 20 discharges)
Work status	69.7% retired 18.2% part-time employment 12.1% full-time employment
Mean number of years since implantation	$x = 1.61$ (SD = 1.27)
Mean number of years since first cardiac illness	$x = 11.45$ (SD = 9.52)

METHOD

Subjects

Fifty-two consecutive subjects were notified by a nurse engaged in their care of the purpose of the study. In response to the information provided regarding the study, 33 subjects agreed to participate in the study. Each of the 33 subjects underwent extensive evaluation and therapy of life-threatening ventricular arrhythmias at a teaching hospital in Boston. Table I describes the clinical characteristics of the population.

Materials

The ICD Questionnaire, closely modeled after the questionnaire developed by Keren *et al.* (1991), is a 17-item Likert scale instrument designed to assess attitudes toward the ICD implantation. For the scope of this study, subjects were asked to respond to 5 of the 17 questions of the ICD Questionnaire addressing mood state. Specific mood states assessed include anger, anxiety, depression, and overall sense of well-being. For example, with respect to the assessment of anger, subjects were provided with five choices to the question "To what extent do you feel anger as a direct result of your experiences with your ICD?" ranging from significantly more angry to significantly less angry. Questions specific to this study are presented in the Appendix. Subjects received a score ranging from 1 to 5 for each of the questions assessing mood state. No reliability and validity data on the ICD Questionnaire have been generated to date.

Procedure

Each subject who received an ICD implantation at least 6 months prior was informed of the study by the nurse engaged in his/her care. Six months postimplantation was used as a criterion for participation, given that research to date suggests that individuals require a mean period of 3.6 months to adapt to the device and return to baseline psychological functioning (Vlay *et al.*, 1989). If interest in participation was expressed, subjects were mailed a questionnaire, modeled after Keren *et al.* (1991), along with a consent form. Concise clear instructions were given to each subject regarding completion of the questionnaire and consent form. Subjects were provided with an addressed stamped envelope to return to the first author.

RESULTS

Four analyses of variance were performed to determine the effect of number of discharges on affect and perceived well-being. A discharge was defined as an electrical shock to the heart delivered by the ICD device in response to a life-threatening arrhythmia, resulting in temporary loss of consciousness or symptoms such as palpitations or presyncope which were consistent with an arrhythmia before ICD discharge. Individuals participating in the study were divided into high and low discharge groups, with more than five discharges constituting the high rate of discharge group and five or fewer discharges constituting the low rate of discharge group. Analysis of a series of *t* tests revealed no significant differences in the two groups with respect to baseline characteristics, including age, work status, mean number of years since implantation, and mean number of years since first cardiac illness.

Table II reveals the results of four one-way analyses of variance between subjects' perception of sense of well-being, anger, anxiety, and depression and number of discharges. Our findings indicate that sense of well-being, anger, and depression were associated with number of discharges postimplantation. That is, the mean level of perceived well-being was significantly higher in those subjects who reported a greater number of discharges. A significant association was also found between number of discharges and level of anger and depression, indicating that the mean level of anger and depression was significantly lower in those subjects who reported a greater number of discharges. No significant relationship was found between anxiety and number of discharges postimplantation.

Table II. One-Way Analysis of Variance of Relationship Between Sense of Well-Being, Anger, Depression, Anxiety and Discharge Rate

	Mean		<i>F</i> ratio	<i>p</i> level
	High discharge	Low discharge		
Sense of well-being	4.17	3.28	5.41	.02
Anger	4.33	2.95	12.67	.001
Depression	3.58	2.81	5.42	.02
Anxiety	3.83	3.33	1.13	ns

DISCUSSION

Our results indicated that mean level of anger, depression, and perceived well-being was significantly related to discharge rate. The direction of our results is somewhat surprising but consistent. Increased number of discharges was associated with decreased levels of anger and depression and increased sense of well-being. Although causal explanation cannot be attributed to our significant findings, number of discharges appears to serve as an important marker in regulating affect in individuals who have undergone ICD implantation.

The question arises why individuals who experienced a greater number of discharges were more likely to report that their sense of well-being had improved since their ICD implantation. In addition, our results raise questions regarding the significant finding between greater number of discharges and lower levels of anger and depression. The experience of a discharge is a powerful emotional process, forcing individuals to confront their own mortality. It may be hypothesized that with more frequent reminders of one's mortality, as evidenced by greater number of discharges, individuals are increasingly likely to engage in a reappraisal and reaffirmation of their lives. Thus, they are more inclined to evaluate their sense of well-being and affective state against real physical and emotional markers (discharges), which reinforce their sense of both vulnerability and mastery. Perhaps discharges serve to intensify one's sense of vulnerability while concomitantly reassuring the individual that he/she has the resources to address and master life-threatening scenarios.

Johnson and Morse (1990) present a theoretical framework for understanding adaptation to myocardial infarction (MI), which may have clinical relevance to individuals adapting to ICD implantation. The authors propose a four-stage theory, reflexive in nature, which focuses on regaining a sense of personal control, including acceptance of limitations, refocusing of issues, and regaining a sense of mastery. The first stage is characterized

by distancing and attempts to minimize the seriousness of the situation. The second stage involves coming to terms with the occurrence of a cardiac assault. Specific phases of the second stage include facing one's mortality, making sense of what has occurred, facing limitations, and looking to the future. The third stage requires that the individual focus on establishing guidelines for living, a task which allows for the ordering and prioritizing of one's life, resulting in an increased sense of self-determination. The fourth stage is characterized by a refocusing and acceptance of limitations, a task which is central to achieving a sense of mastery. Stage 4, the culminating stage, results in the individual's confrontation with the realization that he/she is not living life to its fullest, which in turn leads to a refocusing of every aspect of one's life. It is proposed that stages 3 and 4 may have clinical relevance for individuals who have experienced multiple discharges.

The occurrence of a discharge may serve as a marker with respect to alerting the individual to the need for mastery, placing the individual in stage 3 of the model proposed by Johnson and Morse. In turn, the individual struggles in new ways with the issues of establishing guidelines for living and refocusing. A sense of perspective and equilibrium is gained, resulting in decreased levels of anger and depression. In the process of adapting to the realization that death was averted, individuals may return to the emotional task of confronting and reevaluating their life choices, which in turn may impact on their affective state. Thus discharges, although frightening and traumatic, may serve to assist individuals in reprioritizing and reassessing their lives, resulting in a renewed sense of mastery and emotional well-being. Individuals who have experienced discharges may equate the experience with a sense of renewal and opportunity. Research with heart transplantation recipients has suggested that for many individuals, the experience of addressing the possibility of death and subsequent experience of a second chance at life leads to a reassessment and renewed appreciation of life (Houser, Konstam, & Konstam, 1992; Konstam, 1996; Suszycki, 1988). Further research that attempts to understand the impact of discharges on ICD recipients, with particular emphasis on verifying the model as proposed by Johnson and Morse, would provide a more complete understanding of the unique demands and adaptation required of individuals who have undergone ICD implantation. Such an understanding is essential for realistic planning and formulation of effective interventions.

Our findings must be viewed with caution given that they are based on subjects who agreed to comply with the requests of this study design, and we therefore cannot exclude the possibility of selection bias. Our study would be enlightened by the inclusion of variables such as ejection fraction, presenting arrhythmia, and results of EP study to address the question of whether the patient population who had frequent versus infrequent shocks

differed in any significant ways relative to the clinical variables that characterized them. In addition, the assessment of anger, depression anxiety, and sense of well-being was limited in scope. Future studies should include more comprehensive assessment tools of anger, anxiety, depression, and sense of well-being, with demonstrated reliability and validity.

The rehabilitation process of the ICD recipient appears to be quite complex, given the demands of the regimen associated with ICD implantation. The patient typically has experienced lengthy hospitalizations, multiple diagnostic tests, and multiple drug therapy trials preimplantation. Having undergone implantation, the individual must cope with the existence of a visible foreign device, capable of firing unpredictably. Fricchione and Vlay (1994) state that the integration of implantable machinery with respect to meeting the psychological needs of this population is one of the most promising, challenging, and unexplored areas for future research and intervention.

The question arises as to the mediating variables which explain the significant associations found between affective state and discharge rate. Longitudinal studies which explore coping strategies used by ICD recipients, specifically in response to the occurrence of discharges, would prove helpful in understanding its importance in the rehabilitation process. For example, the use of diaries might provide a fruitful tool for exploring in greater depth how individuals process and comprehend a discrete occurrence, a discharge, which alerts them to the possibility of their own mortality and concomitantly assures them that they have mastered a life-threatening occurrence. Our results emphasize the need to identify and delineate more clearly the mediating variables which explain the significant relationships obtained in this study.

The findings of this study suggest that the occurrence of a defibrillator discharge is a clinically significant event in the life of an ICD recipient. The clinician can assist the patient in processing the meaning of the discharge event, and how it may affect the ICD recipient, particularly with respect to regulation of affect and behavior. For example, the use of the coping response of positive reappraisal may assist patients in regulating affect and providing them with an adaptive vehicle for understanding the discharge event and the implantation process. The scant literature on this population suggests that the ICD implantation imposes heavy psychological demands on the patient, frequently requiring psychological clinical intervention.

In conclusion, the significance of discharge rate, a phenomenon unique to ICD recipients, and its relationship to psychological state were studied. Consistent and significant results were obtained, suggesting that discharge rate serves as an important marker in regulating affect. This re-

search identifies a promising direction for both future work and clinical intervention with ICD recipients.

APPENDIX

Selected Questions of the ICD Questionnaire³

1. Since the implantation of your implantable cardioverter defibrillator (ICD), has your general sense of well-being:
 - a. significantly worsened
 - b. somewhat worsened
 - c. remained the same
 - d. somewhat improved
 - e. significantly improved
2. To what extent do you feel anxious as a direct result of your experiences with your ICD?
 - a. I am significantly more anxious.
 - b. I am somewhat more anxious.
 - c. I feel as anxious as before I had the ICD implanted.
 - d. I feel somewhat less anxious.
 - e. I feel significantly less anxious.
3. To what extent do you feel anger as a direct result of your experiences with your ICD?
 - a. I feel significantly more angry.
 - b. I am somewhat more angry.
 - c. I feel as angry as I did before I had the ICD implanted.
 - d. I feel somewhat less angry.
 - e. I feel significantly less angry.
4. To what extent do you feel your mood has been affected as a direct result of your experiences with your ICD?
 - a. I feel significantly depressed.
 - b. I feel somewhat depressed.
 - c. I feel as depressed as I did before I had the ICD implanted
 - d. I feel my mood has somewhat improved.
 - e. I feel my mood has significantly improved.
5. Since your ICD implantation, how many discharges have you experienced?
 - a. None

³Readers may contact the first author directly to obtain an unabridged version of the ICD Questionnaire

- b. 1-5
- c. 6-10
- d. 11-20
- e. Over 20

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