TILBURG ◆ ◆ UNIVERSITY

Tilburg University

Type D personality is associated with increased anxiety and depressive symptoms in patients with an implantable cardioverter defibrillator and their partners

Pedersen, S.S.; van Domburg, R.T.; Theuns, D.A.; Jordaens, L.; Erdman, R.A.M.

Published in:
Psychosomatic Medicine

Publication date:
2004

Document Version
Publisher's PDF, also known as Version of record

Link to publication in Tilburg University Research Portal

Citation for published version (APA):
Pedersen, S. S., van Domburg, R. T., Theuns, D. A., Jordaens, L., & Erdman, R. A. M. (2004). Type D personality is associated with increased anxiety and depressive symptoms in patients with an implantable cardioverter defibrillator and their partners. *Psychosomatic Medicine*, *66*(5), 714-719.

Type D Personality Is Associated With Increased Anxiety and Depressive Symptoms in Patients With an Implantable Cardioverter Defibrillator and Their Partners

Susanne S. Pedersen, PhD, Ron T. van Domburg, PhD, Dominic A. M. J. Theuns, MSc, Luc Jordaens, MD, PhD, and Ruud A. M. Erdman, PhD

Objective: We investigated the prevalence of anxiety and depressive symptoms in patients with an implantable cardioverter defibrillator (ICD) and their partners, and the role of personality factors and social support as determinants of distress. **Methods:** Of all surviving patients ($n = 221$) having had an ICD implanted between October 1998 and January 2003, 182 patients and 144 partners completed the Hospital Anxiety and Depression Scale, the Type D Personality Scale, and the Perceived Social Support Scale. Type D personality defines those who tend to experience increased negative distress and who do not express these negative emotions in social interactions. Clinical variables for the patients were obtained from medical records. **Results:** Thirty-one percent of patients versus 42% of partners suffered from symptoms of anxiety ($p = .048$); symptoms of anxiety were particularly prevalent in male partners. Twenty-eight vs. 29% suffered from depressive symptoms ($p = .901$). In patients, Type D personality was independently related to anxiety (OR: 7.03; 95% CI: 2.32–21.32) and depressive symptoms (OR: 7.40; 95% CI: 2.49–21.94) adjusting for all other variables. Underlying cardiac disease pathology did not explain differences in patient distress. In partners, Type D personality was independently associated with increased symptoms of anxiety (OR: 8.77; 95% CI: 3.19–24.14) and depression (OR: 4.40; 95% CI: 1.76–11.01). **Conclusion:** Partners experienced similar levels of depression but higher levels of anxiety compared with ICD patients. Personality was an important explanatory factor of distress in both ICD patients and their partners. Research is now warranted to investigate the implications of this finding for the clinical course of ICD patients, as Type D personality has been associated with adverse prognosis in patients with coronary artery disease. **Key words:** anxiety, coronary artery disease, depressive symptoms, implantable cardioverter defibrillator, Type D personality.

CAD = coronary artery disease; **ICD** = implantable cardioverter defibrillator; **MI** = myocardial infarction.

INTRODUCTION

Indications for and clinical application of the implantable cardioverter defibrillator (ICD) have expanded since the introduction of the device to prevent sudden cardiac death in patients with ventricular arrhythmias, and current guidelines now also advocate prophylactic use (1,2). The medical benefits of the ICD are unequivocal, but living with an ICD may adversely affect psychosocial functioning and the quality of life of a subgroup of patients and their partners (3–6). In turn, psychological mood states, such as anxiety and anger, have been shown to precipitate arrhythmic events in ICD patients (7,8). Identification of determinants of psychological distress in patients and their partners is therefore crucial for the management of distress and the improvement of quality of life, health, and clinical outcomes.

Number of ICD discharges deemed as inappropriate by the patient, shocks, diminished physical activity, younger age, and clinical variables (eg, lower ejection fraction, prior myocardial infarction (MI), and higher NYHA class) have been identified as determinants of psychological distress in ICD patients (9–11). In partners, the use of psychotropic medication and emotion-focused coping have been associated with more distress, and the use of challenge appraisal with less distress (4).

Partners of patients who have experienced shocks or who have had a prior MI have also been shown to report more distress (10,11).

To our knowledge, no studies have investigated the role of personality and social support as determinants of distress in ICD patients and their partners. Personality factors may have much explanatory power of differences in outcome, as indicated by recent research on Type D personality—also called the *distressed personality*. Type D is a taxonomy based on the two stable personality traits of negative affectivity and social inhibition and denotes those individuals who experience increased negative distress and who do not express these negative emotions in social interactions (12). Type D personality has been associated with a variety of emotional and social difficulties, and increased morbidity and mortality in patients with established heart disease (12–15). A recent study of patients with a first myocardial infarction also showed that personality factors may mediate the buffering effect of social support on psychological distress (16).

Little is also known about the distress levels of partners compared with ICD patients. Previous studies have been based on relative small sample sizes (10,17,18) or only focused on the reactions of family members (4). Partners may experience as much distress as patients, as evidenced in a study of cancer patients and their partners (19). Increased distress in partners would have important clinical implications and may indicate whether psychosocial programs should also be extended to partners of ICD patients.

The objectives of the current study were a) to investigate the prevalence of anxiety and depressive symptoms in ICD patients and their partners, and b) to examine the role of Type D personality and social support as determinants of distress in ICD patients and their partners.

METHODS

Study Population

All surviving patients ($n = 225$) having had an ICD implanted at the Erasmus Medical Center Rotterdam between October 1998 and January 2003 and their partners were asked as part of routine clinical practice to fill in a number of questionnaires to assess their psychological health. Four patients were excluded due to terminal illness, brain damage, age below 16 years, or too many missing values on questionnaires. Of the remaining 221 patients, 182 (82%) participated together with 144 partners.

Measures

Clinical Variables

Information on time since implantation (in months), coronary artery disease (CAD), chronic heart failure, previous MI, previous bypass surgery, previous cardiac arrest, the use of antiarrhythmic drugs at baseline, and shocks (no shocks vs. ≥1 shock) were obtained from the medical records of the patients.

Psychological Variables

We used the Hospital Anxiety and Depression Scale (HADS) to measure *symptoms of anxiety* and *depression* (20). The scale consists of 14 items that are answered on a four-point Likert scale (0–3). The score range for both the anxiety and depression subscales is 0 to 21. The HADS has been validated in the general population, somatic, psychiatric, and cardiac patients, and has been shown to be a valid and reliable instrument with Cronbach's alpha ranging from 0.67 to 0.93 for the two subscales (20–23). We used a score of ≥8 to determine caseness on both subscales, as a recent review has suggested that this cut-off score yields an optimal balance between sensitivity and specificity (22).

The 14-item Type D Personality Scale (DS14) assessing *negative affectivity* (eg, "I often feel unhappy") and *social inhibition* (eg, "I am a closed kind of person") was included to assess the potential role of Type D as a determinant of anxiety and depression (24). The 14 items are answered on a 5-point Likert scale: (0 = false), (1 = mostly false), (2 = neutral), (3 = mostly true), (4 = true). Those scoring high on both subscales according to a cut-off ≥10 are categorized as Type D. The reliability of both subscales is adequate with Cronbach's $\alpha = 0.88$ and $\alpha = 0.86$ for the negative affectivity and social inhibition subscales, respectively (24).

The Perceived Social Support Scale (PSSS) was included to evaluate the role of social support as a determinant of distress (25). The PSSS consists of 12 items that are scored on a 7-point Likert scale from (1 = very strongly disagree) to (7 = very strongly agree). The scale yields three subscale scores for *Family*, *Friends*, and *Significant other*, and a total score. For the purpose of the current study, we only used the total score. A low score on the PSSS indicates low social support. The psychometric properties of the scale are adequate with a test–retest reliability of 0.85 and Cronbach's $\alpha = 0.88$ for the total scale (26).

Statistical Analyses

Discrete variables were compared with the chi-square test (Fisher's Exact test when appropriate) and continuous variables with Student's t test for independent samples. Logistic univariate and multivariate regression analyses were performed to examine determinants of anxiety and depression (using a cut-off of ≥8) in patients and partners. For patients in adjusted analyses, gender, age, use of psychotropic medication, shocks, Type D personality, the interaction term Type D × shocks, and social support were selected a priori and retained in the model without regard to statistical significance together with all clinical variables significant at $p < .05$. For partners in adjusted analyses, gender, age, use of psychotropic medication, Type D personality, and social support were selected a priori and entered in the model without regard to statistical significance. All tests used were two-tailed. $p < .05$ was used for all tests to indicate statistical significance. All statistical analyses were performed using SPSS 11.5 for Windows.

RESULTS

Patient and partner characteristics are presented in Table 1.

Prevalence of Anxiety and Depressive Symptoms

Symptoms of anxiety were significantly more prevalent in partners than in patients (42% vs. 31%; $p = .048$), whereas

TABLE 1. Sociodemographic and Clinical Characteristics of Patients and Partners

	Patients ($n = 182$)		Partners ($n = 144$)	
	n (%)	Mean (SD)	n (%)	Mean (SD)
Females	35 (19)		125 (87)	
Age		62 (13)		60 (12)
Education				
University or equivalent	8 (4)		7 (5)	
College	56 (31)		35 (24)	
High school/A-levels	64 (35)		57 (40)	
Basic education (up to grade 6)	47 (26)		44 (30)	
Not known	7 (4)		1 (1)	
Working	26 (14)		61 (42)	
Using psychotropic medication	47 (26)		28 (20)	
Coronary artery disease	131 (72)		—	
Chronic heart failure	44 (24)		—	
Previous myocardial infarction	110 (60)		—	
Previous cardiac arrest	89 (49)		—	
Previous bypass surgery	51 (28)		—	
Antiarrhythmic drug therapy at baseline	130 (72)		—	
Time since ICD implantation (months)		55 (35)	—	
Shocks received since implantation[a]				
1 shock	14 (8)		—	
>1 shock	41 (23)		—	

[a] As read by the data stored by the ICD.

depressive symptoms were equally prevalent in patients and their partners (28% vs. 29%; $p = .901$).

Group Differences on Anxiety and Depression

When stratifying by gender and patient status, a statistically significant difference was found between groups on symptoms of anxiety ($p = .040$) (Figure 1). Since the prevalence of anxiety was higher in male partners, we undertook a further comparison of male partners vs. a pooled group of male patients, female patients, and female partners. Male partners had significantly more symptoms of anxiety than the pooled group ($p = .036$). No statistically significant differences were found between groups on depressive symptoms ($p = .99$) (Figure 1). Patients who had experienced ≥1 shock were more likely to be anxious than patients who had experienced no shock ($p = .005$). No differences were found between the shock vs. no-shock patients on depressive symptoms ($p = .160$). Patients using psychotropic medication were more likely to suffer from anxiety ($p < .001$) and depressive symptoms ($p < .001$) than patients using no medication. Similar results were found for partners using psychotropic medication vs. partners using no medication (anxiety: $p = .01$; depression: $p = .003$). We found no statistical significant difference between patients and partners on perceived social support ($p = .761$).

Patients and partners with the Type D personality were more likely to suffer from symptoms of anxiety than their non-Type D counterparts (Figure 2). Similarly, Type D patient and partners were more likely to suffer from depressive symptoms than their non-Type D counterparts (Figure 2). When stratifying patients by personality type and shocks, anxiety and depressive symptoms were more prevalent in Type D patients with and without shocks compared with non-Type D patients with and without shocks (Figure 3).

Determinants of Anxiety and Depressive Symptoms in Patients

Shocks received since implantation (OR: 2.58; 95% CI: 1.32–5.03), Type D personality (OR: 8.25; 95% CI: 3.91–17.40), and use of psychotropic medication (OR: 9.36; 95% CI: 4.37–19.66) were related to an increased risk of anxiety in patients in univariate analyses. No other clinical or psycho-
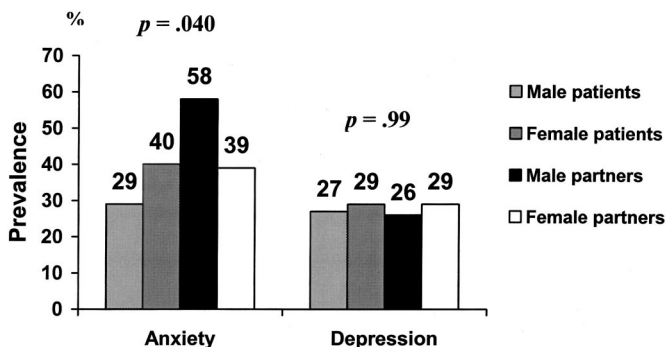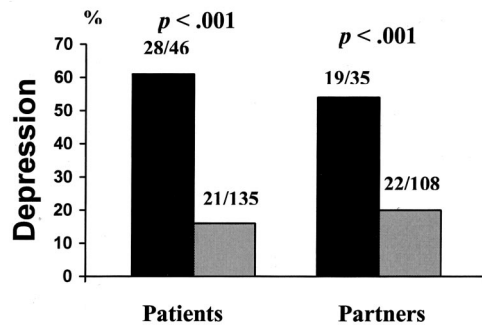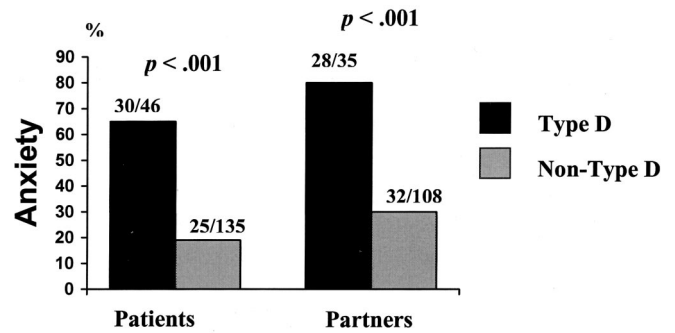

Figure 2. Prevalence of anxiety and depression in ICD patients and their partners stratified by Type D personality. Number of patients/partners is given at top of bars. A score on the Type D personality scale could not be calculated for 1 patient and 1 partner.
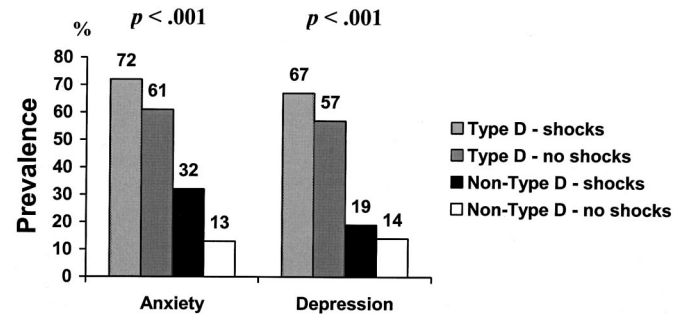

Figure 3. Prevalence of anxiety and depression in ICD patients stratified by Type D personality and shocks (no shocks vs. ≥1 shock)

logical variables were significant. In multivariate analyses, Type D personality (OR: 7.03; 95% CI: 2.32–21.32), use of psychotropic medication (OR: 8.16; 95% CI: 3.25–20.48), and lack of social support (OR: 0.97; 95% CI: 0.95–0.99) were independent determinants of symptoms of anxiety, adjusting for all other factors including the interaction term Type D personality × shocks. No other statistically significant determinants were found, although there was a trend for shocks ($p = .06$).

Type D personality (OR: 8.44; 95% CI: 3.98–17.93) and use of psychotropic medication (OR: 5.16; 95% CI: 2.50–10.64) were also related to a higher risk of depressive symptoms in patients in univariate analyses. Neither any of the clinical variables nor social support was associated with depressive symptoms. When adjusting for gender, age, experi-

Figure 1. Prevalence of anxiety and depression in ICD patients and their partners stratified by gender

enced shocks, the interaction term Type D × shocks, and social support, Type D personality (OR: 7.40; 95% CI: 2.49–21.94) and use of psychotropic medication (OR: 4.00; 95% CI: 1.65–9.67) remained significant determinants of depressive symptoms.

Determinants of Anxiety and Depressive Symptoms in Partners

In partners, Type D personality (OR: 9.50; 95% CI: 3.77–23.97) and low perceived social support (OR: 0.96; 95% CI: 0.94–0.99) were associated with an increased risk of anxiety in univariate analyses. Type D personality (OR: 8.77; 95% CI: 3.19–24.14) remained an independent determinant of anxiety correcting for gender, age, and the use of psychotropic medication, whereas social support was no longer significant.

Type D personality (OR: 4.64; 95% CI: 2.06–10.47) and low social support (OR: 0.96; 95% CI: 0.94–0.98) were also related to depressive symptoms in partners. Adjusting for gender, age, psychotropic medication, and social support, Type D (OR: 4.40; 95% CI: 1.76–11.01) was still associated with increased levels of depression in partners. Although low social support (OR: 0.97; 95% CI: 0.95–0.99) was also significantly related to increased levels of depressive symptoms, this increased risk may not be clinically relevant.

DISCUSSION

In the current study, the prevalence of anxiety was significantly higher in partners of ICD patients than in the ICD patients, whereas the prevalence of depressive symptoms was similar in the two groups. Stratification by gender and patient status showed that anxiety was particularly prevalent in male partners. Type D personality was identified as a significant independent determinant of anxiety and depressive symptoms in both patients and partners.

The prevalence of anxiety and depression in ICD patients was consistent with that found in other studies (3,6). However, levels of anxiety were significantly higher in partners than in ICD patients. This corroborates results of earlier and relatively smaller studies that partners may experience similar levels of distress as ICD patients (10,18). It is particularly noteworthy that male partners of ICD patients had comparatively higher levels of anxiety compared with all other groups. Male partners may be less used to discussing their feelings with others and as a result have less recourse for sharing their emotions compared with female partners, which in turn may result in manifest anxiety. In general, men may also be more helpless without their partner than women. Alternatively, females may be more likely to use psychotropic medication to alleviate their anxiety, although subsequent analyses showed no statistically significant differences between male (11%) and female partner (21%) use of medication. Except for De Groot and colleagues (11), to our knowledge nobody has looked at differences in distress according to gender and patient status in an ICD population. Although De Groot and colleagues found no significant difference in anxiety between male and female partners, 25% male vs. 11% female partners suffered from

anxiety (11). In the current study, 58% male vs. 39% female partners suffered from anxiety. Since male partners made up a relatively small proportion of the total sample in both studies (De Groot et al: $n = 25$; current study: $n = 19$), these results should be interpreted with caution. Nevertheless, future research should not overlook the possibility that there may be female/male ICD patient/partner differences in distress, as distress in subgroups of patients or partners may otherwise remain unidentified and untreated.

Type D personality was a significant independent determinant of anxiety and depressive symptoms in both patients and partners. This finding is consistent with previous studies showing that cardiac patients with the Type D personality experience increased emotional and social difficulties that may in the end lead to hard medical outcomes (12–14). Of note, in ICD patients Type D personality was associated with a seven-fold increased risk of anxiety, adjusting for all other factors including shocks. In a prospective study, Dunbar and colleagues found that anxiety was a precipitant of shocks, but shocks were not associated with increased anxiety at follow-up (7). By contrast, in the Antiarrhythmics Versus Implantable Defibrillators (AVID) trial and the Canadian Implantable Defibrillator Study (CIDS) shocks were related to more psychological distress and impaired quality of life (5,27). However, the CIDS trial showed that there may be a dose–response relationship between shocks and distress as only patients who had received ≥5 shocks were at risk of adverse outcome (27). The fact that we used the categorization none vs. ≥1 shock may in part explain why shocks were not related to increased anxiety in the current study. Alternatively, other factors, such as, for example, personality, may be a more important determinant of distress than shocks with the caveat in mind that our results are based on cross-sectional data. A recent meta-analysis also challenges the belief that all distress relates to shocks, but it was performed before the AVID and CIDS trials and is based on studies with relatively small sample sizes (28). Nevertheless, it may be time to expand our focus beyond looking at only shocks as a potential determinant of distress.

We also found that the buffering effect of social support on anxiety and depressive symptoms in ICD patients, and on anxiety in partners, was mediated by Type D personality. In a recent study of patients with MI, the personality trait of neuroticism was also found to mediate the effects of social support on psychological distress and health complaints (16). In other words, the underlying personality disposition of an ICD patient and their partner may be more important in determining levels of distress than perceived social support.

Except for ICD shocks, we found no relationships between any of the other clinical variables and psychological distress in patients, which suggests that differences in distress cannot be accounted for by underlying cardiac pathology. This is counter to the results of De Groot and colleagues, who found previous MI, lower left ventricular ejection fraction (LVEF), and higher NYHA functional class to be associated with increased dis-

tress (10). However, in the current study, we had no information on LVEF and NYHA class.

This study has a number of limitations. First, the cross-sectional nature of the design does not allow for the determination of cause and effect. Hence, we cannot deduce whether, for example, the use of psychotropic medication leads to increased distress or vice versa, although it seems more likely that increased distress will lead to reliance on psychotropic medication than the other way around. Second, we had no information on previous psychiatric history and the use of psychotropic medication in both patients and partners before implantation. Therefore, we do not know whether the use of psychotropic medication is related to the ICD implantation or some other life-event. Third, assessment of psychological distress was based on a self-report measure, although the sensitivity and specificity of this measure has proven adequate. Fourth, no corrections were made for multiple comparisons in the statistical analyses. Despite these limitations, compared with existing studies this study is based on a relatively large sample of ICD patients and their partners, the response rate is relatively high with 82%, and it is the first to demonstrate that Type D personality may be of value not only in CAD but also in arrhythmia research.

In conclusion, the results of the current study indicate that partners are at equal risk of suffering from psychological distress as ICD patients and that personality may be an important explanatory factor of distress in both ICD patients and their partners. These results have implications for clinical research and practice. Future prospective studies investigating psychological adjustment after ICD implantation should not only focus on ICD patients but also their partners, as this may provide us with some indications as to whether psychosocial programs should be extended to this group. Moreover, the role of personality in determining distress in both ICD patients and their partners should not be overlooked. In patients with CAD, Type D personality has been associated with adverse clinical outcome (12–14) and increased emotional and social difficulties (15). See Pedersen and Denollet for a comprehensive review (15). In the current study, we were able to show that Type D also may be of value in arrhythmia research, although studies are warranted to investigate the implications of this finding for the clinical course of ICD patients. However, is further research into a construct that is considered stable and therefore not amenable to change at all useful? Just because personality traits or the combination of traits, such as Type D, are considered to exert a stable effect on behavior, this does not imply that the levels of distress of Type D patients cannot be reduced (29). A recent preliminary randomized controlled trial has shown that comprehensive cardiac rehabilitation comprising exercise, education, and a behavioral cognitive intervention is safe for ICD patients, and leads to a reduction in psychological distress and improved exercise ability compared with usual care (30). A similar intervention could prove successful in reducing the distress of ICD patients and partners with a Type D personality.

REFERENCES

1. Hauer RNW, Aliot E, Block M, Capucci A, Lüderitz B, Santini M, Vardas PE. Indications for implantable cardioverter defibrillator (ICD) therapy. Study Group on Guidelines on ICD of the Working Group on Arrhythmias and the Working Group on Cardiac Pacing of the European Society of Cardiology. Europace 2001;3:169–76.
2. Moss AJ, Zareba W, Hall WJ, Klein H, Wilber DJ, Cannom DS, Daubert JP, Higgins SL, Brown MW, Andrews ML. Prophylactic implantation of a defibrillator in patients with myocardial infarction and reduced ejection fraction. N Engl J Med 2002;346:877–83.
3. Hegel MT, Griegel LE, Black C, Goulden L, Ozahowski T. Anxiety and depression in patients receiving implanted cardioverter-defibrillators: a longitudinal investigation. Int J Psychiatry Med 1997;27:57–69.
4. Marx A, Bollmann A, Dunbar SB, Jenkins LS, Hawthorne M. Psychological reactions among family members of patients with implantable defibrillators. Int J Psychiatry Med 2001;31:375–87.
5. Schron EB, Exner DV, Yao Q, Jenkins LS, Steinberg JS, Cook JR, Kutalek SP, Friedman PL, Bubien RS, Page RL, Powell J, and the AVID Investigators. Quality of life in the antiarrhythmics versus implantable defibrillators trial: impact of therapy and influence of adverse symptoms and defibrillator shocks. Circulation 2002;105:589–94.
6. Sears SF, Conti JB. Quality of life and psychological functioning of ICD patients. Heart 2002;87:488–93.
7. Dunbar SB, Kimble LP, Jenkins LS, Hawthorne M, Dudley W, Slemmons M, Langberg JJ. Association of mood disturbance and arrhythmia events in patients after cardioverter defibrillator implantation. Depress Anxiety 1999;9:163–8.
8. Lampert R, Joska T, Burg MM, Batsford WP, McPherson CA, Jain D. Emotional and physical precipitants of ventricular arrhythmia. Circulation 2002;106:1800–5.
9. Burgess ES, Quigley JF, Moran G, Sutton FJ, Goodman M. Predictors of psychosocial adjustment in patients with implantable cardioverter defibrillators. PACE 1997;20:1790–5.
10. Dougherty CM. Psychological reactions and family adjustment in shock versus no shock groups after implantation of internal cardioverter defibrillator. Heart Lung 1995;24:281–91.
11. De Groot NMS, Bootsma M, van der Wall EE, Schalij MJ. The impact of an implantable cardioverter defibrillator: the Leiden follow-up study of ICD patients and their partners. Netherlands Heart J 2003;11:154–8.
12. Denollet J, Sys SU, Stroobant N, Rombouts H, Gillebert TC, Brutsaert DL. Personality as independent predictor of long-term mortality in patients with coronary heart disease. Lancet 1996;347:417–21.
13. Denollet J, Brutsaert DL. Personality, disease severity, and the risk of long-term cardiac events in patients with decreased ejection fraction after myocardial infarction. Circulation 1998;97:167–73.
14. Denollet J, Vaes J, Brutsaert DL. Inadequate response to treatment in coronary heart disease: adverse effects of type D personality and younger age on 5-year prognosis and quality of life. Circulation 2000;102:630–5.
15. Pedersen SS, Denollet J. Type-D personality, cardiac events, and impaired quality of life: a review. Eur J Cardiovasc Prevention Rehab 2003;10:241–8.
16. Pedersen SS, Middel B, Larsen ML. The role of personality variables and social support in distress and perceived health in patients following myocardial infarction. J Psychosom Res 2002;53:1171–5.
17. Dougherty CM, Benoliel JQ, Bellin C. Domains of nursing intervention after sudden cardiac arrest and automatic internal cardioverter defibrillator implantation. Heart Lung 2000;29:79–86.
18. Dunbar SB, Warner CD, Purcell JA. Internal cardioverter defibrillator device discharge: experience of patients and family members. Heart Lung 1993;22:494–501.
19. Hagedoorn M, Buunk BP, Kuijer RG, Wobbes T, Sanderman R. Couples dealing with cancer: role and gender differences regarding psychological distress and quality of life. Psycho-Oncology 2000;9:232–42.

20. Zigmond AS, Snaith RP. The Hospital Anxiety and Depression Scale. Acta Psychiatr Scand 1983;67:361–70.
21. Spinhoven P, Ormel J, Sloekers PPA, Kempen GIJM, Speckens AEM, van Hemert AM. A validation study of the Hospital Anxiety and Depression (HADS) in different groups of Dutch subjects. Psychol Med 1997;27:363–70.
22. Bjelland I, Dahl AA, Haug TT, Neckelmann D. The validity of the Hospital Anxiety and Depression Scale: an updated literature review. J Psychosom Res 2002;52:69–77.
23. Herrmann C. International experiences with the Hospital Anxiety and Depression Scale—a review of validation data and clinical results. J Psychosom Res 1997;42:17–41.
24. Denollet J. Type D personality and vulnerability to chronic disease, impaired quality of life, and depressive symptoms [abstract]. Psychosom Med 2002;64:101.
25. Blumenthal JA, Burg MM, Barefoot J, Williams RB, Haney T, Zimet G. Social support, type A behavior, and coronary artery disease. Psychosom Med 1987;49:331–40.
26. Zimet GD, Powell SS, Farley GK, Werkman S, Berkoff KA. Psychometric characteristics of the multidimensional scale of perceived social support. J Pers Assess 1990;55:610–7.
27. Irvine J, Dorian P, Baker B, O'Brien BJ, Roberts R, Gent M, Newman D, Connolly SJ, for the CIDS Investigators. Quality of life in the Canadian Implantable Defibrillator Study (CIDS). Am Heart J 2002;144:282–9.
28. Burke JL, Hallas CN, Clark-Carter D, White D, Connelly D. The psychosocial impact of the implantable cardioverter defibrillator: a meta-analytic review. Br J Health Psychol 2003;8:165–78.
29. Denollet J, Brutsaert DL. Reducing emotional distress improves prognosis in coronary heart disease: 9-year mortality in a clinical trial of rehabilitation. Circulation 2001;104:2018–23.
30. Fitchet A, Doherty PJ, Bundy C, Bell W, Fitzpatarick AP, Garratt CJ. Comprehensive cardiac rehabilitation programme for implantable cardioverter-defibrillator patients: a randomised controlled trial. Heart 2003;89:155–60.