Psychological Status and Health-Related Quality of Life and Associated Factors in Heart Failure Patients with Implantable Cardioverter Defibrillator

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Abstract

Introduction: Heart Failure (HF) patients receive Implantable Cardioverter Defibrillator (ICD) to improve survival rate from sudden cardiac death. Poor psychological condition and Health-Related Quality of Life (HRQoL) were reported in those patients. However, these two areas are under-reported in this specific population.

Objective: To examine psychological status (depression and anxiety) and HRQoL and identify associated factors in HF patients with ICD.

Methods: A cross-sectional design was conducted using a convenience sampling to recruit eligible patients at two acute general hospitals. Data were collected through the structured face-to-face interview. The self-reported Hospital Anxiety and Depression Scale (HADS) and Short Form-36 Health Survey (SF-36v2) were used for measuring anxiety and depression and HRQoL respectively.

Results: About 11.8% and 22.1% of HF patients with ICD reported significant levels of anxiety and depression respectively. The results showed that physical component summary was poorer than mental component summary. Moreover, numerous factors were identified but only depression was negatively associated with both physical and mental health. Self-care dependence had positive association with both anxiety and depression.

Conclusion: HF patients with ICD may perceive significant clinical anxiety and depression. Self-care dependence was significantly associated with anxiety and depression. Depression was the significant factor negatively associated with both physical and mental quality of life. However, anxiety was not associated with both physical and mental quality of life. The findings enrich the knowledge on psychological condition and HRQoL. Strategies targeting associated factors with psychological distress and HRQoL are crucial to improve care for this specific population.

Keywords: Heart failure; Cardiac nursing; Depression; Anxiety; Health-related quality of life; Associated factors
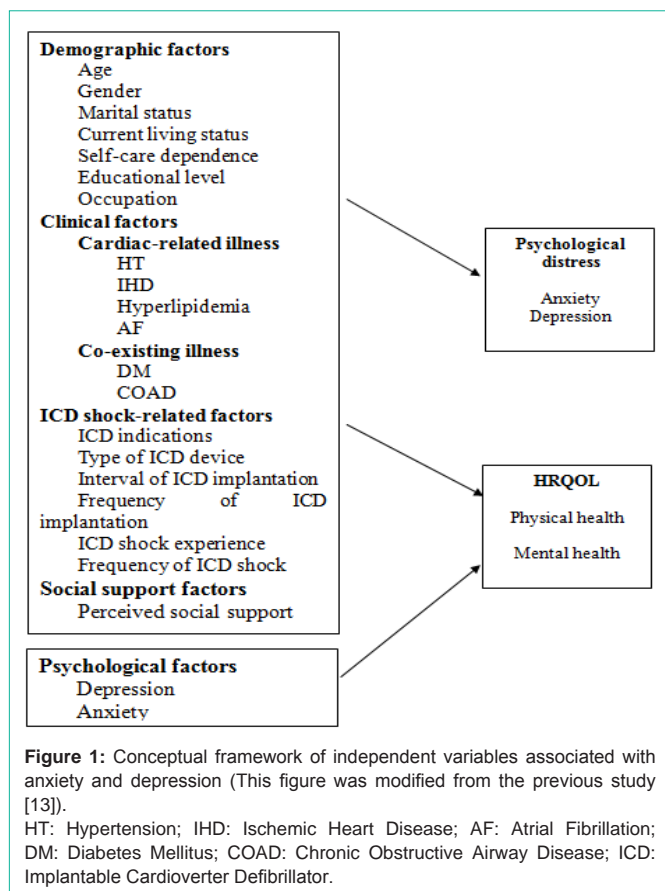
Abbreviations

AF: Atrial Fibrillation; AHA: American Heart Association; ATP: Anti-Tachycardia Pacing; B: Regression Coefficient; CRP: Cardiac Resynchronization Therapy; DM: Diabetes Mellitus; SE: Standard Error; CRT-D: Cardiac Resynchronization Therapy Defibrillator; HADS: Hospital Anxiety and Depression; HF: Heart Failure; HRQoL: Health-Related Quality of Life; ICD: Implantable Cardioverter Defibrillator; MCS: Mental Composite Summary; PCS: Physical Composite Summary; SCD: Sudden cardiac Death; SF-36v2: Short Form-36 Health Survey; SSQ6: Short Form Social Support Questionnaire; VF: Ventricular Fibrillation; VT: Ventricular Tachycardia

Introduction

Heart Failure (HF) is one of the most concerned cardiac problems because its incidence and mortality rates are high and these two areas have been increasing at an alarming rate in many regions globally [1-4]. According to the Statistical Report from American Heart Association (AHA) in 2016, an estimated 5.1 million Americans have had HF. The prevalence of HF was projected to increase by 46% from 2012 to 2030 [1,5]. The mortality of HF still remains high as about 50% HF patients die within five years of diagnosis [5]. Current healthcare service will have a huge rise in the total cost of healthcare service and rehabilitation aiming to prolong survival, reduce hospitalization period and re-hospitalization, and maintain optimal Health-Related Quality of Life (HRQoL) [1,3].

HRQoL encompasses multidimensional aspects, including physical, mental, and social domains that affect health of individual or a group over time considering various correlates, such as health risks and socioeconomic status [6]. It is an important tool to evaluate the effectiveness of medical treatment and healthcare service [7]. Previous studies reported that patients with HF commonly experience

Figure 1: Conceptual framework of independent variables associated with anxiety and depression (This figure was modified from the previous study [13]).
HT: Hypertension; IHD: Ischemic Heart Disease; AF: Atrial Fibrillation; DM: Diabetes Mellitus; COAD: Chronic Obstructive Airway Disease; ICD: Implantable Cardioverter Defibrillator.

poor HRQoL, particularly in physical aspects, [8-10] and more psychological distress, especially anxiety and depression [8,11,12]. It was attributed to physical restriction and disability resulting from insufficient cardiac function in HF [8,11]. As a result, self-care ability declines and affects daily activities of living [3,8,13].

Anxiety and depression are psychological distress commonly found in patients with HF [11,14]. Anxiety refers to an unpleasant and abstract negative emotional reaction that results from the perception of a particular situation being threatened [15,16]. Depression refers to a mental condition with depressed mood, loss of interest, feelings of guilt, low self-worth, disturbed sleep, loss of appetite, low energy and poor concentration [17]. These two emotions can adversely affect health status [18-21] and are closely associated with mortality in cardiac patients [22,23].

Patients with HF are reported to be at higher risk of Sudden Cardiac Death (SCD) [1,2]. SCD refers to an unexpected death that occurs within an hour of onset of symptoms or within 24 hours without prior symptoms [24,25]. SCD is caused by life-threatening ventricular arrhythmias, commonly Ventricular Tachycardia (VT), or Ventricular Fibrillation (VF) [25]. To reduce SCD occurrence in HF patients, an Implantable Cardioverter Defibrillator (ICD) is commonly used as a favourable medical treatment for SCD [24,26]. Apart from the delivery of ICD shock, current ICD's are built as a combination of two important functions: Anti-Tachycardia Pacing (ATP) and Cardiac Resynchronization Therapy (CRT). ATP is a function that delivers a faster rhythm to override the tachycardia

and CRT delivers impulses to stimulate both ventricles to contract simultaneously to improve cardiac performance. This device is called Cardiac Resynchronization Therapy Defibrillator (CRT-D) [27-29].

Despite its mortality reduction, ICD was reported to increase psychological distress and lower HRQoL [30-32]. The HF population was reported to have a poorer psychological status [12,15,26] and HRQoL [8-10]. Although the application of ICD in the HF population has increased, there is still insufficient knowledge about psychological status and HRQoL among HF patients who have received ICD. Therefore, this study aimed to 1) understand psychological status and HRQoL perspectives of this specific population and 2) identify associated factors in order to formulate strategies targeting risk factors for optimizing HRQoL outcomes.

To facilitate the understanding of factors associated with psychological distress (anxiety and depression) and HRQoL (physical and mental health), a modified conceptual framework (Figure 1) was used based on the original version was developed by Wong et al. [13].

Methods

This is a cross-sectional study using convenience sampling. Eligible subjects were recruited at two acute regional hospitals. Patients who 1) were Chinese adults (≥18 years old); 2) were diagnosed with HF and received with ICD implantation; 3) were able to communicate in Chinese; and 4) had no cognitive problems were invited to participate in the study when they visited their medical consultation.

Procedure

The study was commenced after approval from the Research Ethic Review Committee was obtained. All eligible patients were requested to sign a written informed consent after the purpose and study information were explained. Then, a set of questionnaires, including one demographic and clinical form, the Chinese-Cantonese version of Hospital Anxiety and Depression Scale (HADS) and the Chinese (Hong Kong) version of the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36v2) through a structured face-to-face interview, was given out by the researcher. Clinical and electrogram interrogation of ICD data were obtained from the patients' medical records.

Instruments

Demographic data were collected including marital status, living status, self-care dependence, educational level, and employment status. The clinical data consisted of six questions for cardiac-related illnesses and four questions for co-existing illnesses. ICD-related data such as ICD implantation, type of ICD device implanted, interval of ICD implantation, frequency of ICD implantation, and ICD shock experience were collected.

The HADS was chosen because it is a simple and widely used tool to measure anxiety and depression of cardiac patients in both hospitals and communities [33,34]. The HADS consists of an Anxiety Subscale (HADS-A) and a Depression Subscale (HADS-D), with seven items for each subscale. Each item is rated by a four-point Likert scale ranging from 0 (absence of symptoms) to 3 (severe symptoms). The total scores for each subscale range from 0 to 21 and the overall score ranges from 0 to 42. A cut-off score of ≥8 for each subscale indicates clinically significant levels of depression and anxiety [35].

Table 1: Clinical and ICD-related characteristics of the heart failure patients with implantable cardioverter defibrillator (n=68).

	Mean (SD) / n (%)
Demographic characteristics	
Age (years)$^\psi$	67.24(5.66)
≥70 years old	33(48.5)
Male	53(77.9)
Married / cohabiting	52(76.5)
Living with family	63(92.6)
Self-care independence	64(94.1)
Educational level	
Primary or below	30(44.1)
Secondary	28(41.2)
Post-secondary or above	10(14.7)
Clinical characteristics	
Types of HF	
Ischemic	19(28.0)
Non-ischemic	49(72.0)
LVEF (<30%)	23(33.8)
Hypertension (HT)	27(39.7)
Ischemic Heart Disease (IHD)	33(48.5)
Hyperlipidemia	26(38.2)
Atrial Fibrillation (AF)	21(30.9)
Diabetes Mellitus (DM)	25(36.8)
Chronic Obstructive Airway Disease (COAD)	6(8.8)
ICD-related characteristics	
CRT-D	44(64.7)
First timer of implantation	56(82.4)
Mean implantation period (years)$^\psi$	3.62(2.42)
Implantation period >12 month	52(76.5)
With ICD shock experience	3(4.4)
Frequency of ICD shock	
Once	2(2.9)
≥Twice	1(1.5)

Data marked with ψ are presented as mean (standard deviation), whereas the others are presented as frequency (%).

The SF-36v2 was used because no validated ICD-specific HRQoL tool was available. Although it is a generic tool, SF-36v2 has been well-developed with good reliability and validity [36] and is widely used to measure the HRQoL perspectives of Chinese cardiac patients in Hong Kong [37,38]. It includes eight subscales, and two component summary scores. A higher score represents a better perceived HRQoL level [39].

The Chinese (Hong Kong) version of the Short Form Social Support Questionnaire (SSQ6) was used to assess social support. It had been used in Chinese patients in different studies [40,41]. This instrument was developed by Chang [42] with very good reliability (Cronbach's alpha 0.94). There are six items with a six-point Likert scale ranging from 1 (very dissatisfied) to 6 (very satisfied) to

Table 2: Psychological status and health-related quality of life outcomes of heart failure patients with implantable cardioverter defibrillator (n=68).

Psychosocial status	Mean (SD)	Health-related quality of life	Mean (SD)
HADS-Depression: (Score ≥8)	15 (22.1)	Physical functioning subscale score	67.6(28.20)
HADS-Anxiety: (Score ≥8)	8 (11.8)	Role physical subscale score	67.3(35.60)
HADS-D$^\psi$	4.15 (3.78)	Bodily pain subscale score	86.5(23.42)
HADS-A$^\psi$	3.26 (3.74)	General health subscale score	49.5(24.62)
HADS total$^\psi$	7.41 (6.72)	Vitality subscale score	48.4 (29.56)
		Social functioning subscale score	89.3(22.47)
		Role emotional subscale score	91.7(21.79)
		Mental health subscale score	78.1(20.75)
		Physical Component Summary (PCS) score	37.8(14.94)
		Mental Component Summary (MCS) score	56.0(9.92)

determine the satisfaction level regarding the quality of support received from the persons who were named as supporters.

Data analysis

All data analysis was performed using the IBM SPSS Statistics 20.0 (IBM Corporation, Armonk, New York, USA). Normality of the continuous variables was assessed by their skewness statistics and normal Q-Q plots. There was no continuous variable found to violate the normality assumption. Descriptive statistics were applied to summarize and present the independent variables related to patient characteristics, HRQoL subscales, anxiety and depression. Univariate analyses between the independent variables and HRQoL subscales (Physical Component Summary [PCS] and Mental Component Summary [MCS]), depression level, or anxiety level were assessed using Pearson's correlation coefficient, independent-samples t-test, or one-way ANOVA. Those independent variables with p values <0.25 in univariate analyses [43] were selected as candidate independent variables for stepwise multivariable regression analysis to delineate predictors independently associated with either anxiety, depression, or HRQoL subscales (PCS and MCS). All statistical tests involved were two-sided and the type I error rate (level of significance) was set at 0.05.

Results

A total of 68 Chinese HF patients with ICD were recruited. Their age range was from 23 to 88 years with mean age 67.24±5.66 years old. Of the 68 ICD patients, 53 (77.9%) were males, 63 (92.6%) were living with family, and 64 (94.1%) were self-care independent. All HF patients who received their ICD were for secondary prevention (having previous experience of SCD). Details of demographic characteristics, clinical and ICD-related characteristics are showed in (Table 1).

Psychological status was measured using HADS. Among 68 patients, 11.80% (n=8) had significant levels of anxiety (HADS-A ≥8) and 22.1% (n=15) reported significant levels of depression (HADS-D ≥8), the mean scores of HADS-D and HADS-A were 4.15 (SD=3.78) and 3.26 (SD=3.74), respectively. The results are showed in (Table 2). The Cronbach's alphas for HADS-A, HADS-D, and overall HADS

Table 3: Analytic results of comparison between young and old ICD patients and between ICD patients with and without ischemic heart failure.

PCS	mean	SD	t	p
Age				
<60 years old	47.77	6.71	4.53	<0.001
≥ 60 years old	35.26	15.44		
Types of Heart Failure				
Non-ischemic	40.17	15.32	0.80	0.43
Ischemic	36.93	14.86		
MCS	**mean**	**SD**	**t**	**p**
Age				
<60 years old	55.88	6.34	-0.04	0.97
≥60 years old	55.98	10.70		
Types of Heart Failure				
Non-ischemic	57.62	8.81	0.86	0.40
Ischemic	55.32	10.33		
Anxiety	**mean**	**SD**	**t**	**p**
Age				
<60 years old	2.36	2.31	-1.02	0.31
≥60 years old	3.50	4.01		
Types of Heart Failure				
Non-ischemic	2.32	1.83	-1.31	0.20
Ischemic	3.63	4.21		
Depression	**mean**	**SD**	**t**	**p**
Age				
<60 years old	2.36	2.27	-2.77	0.009
≥60 years old	4.61	3.96		
Types of Heart Failure				
Non-ischemic	3.58	3.72	-0.77	0.44
Ischemic	4.37	3.82		

t: mean difference.

in this study were 0.80, 0.72, and 0.84 respectively, indicating good reliability.

HRQoL outcomes were measured by SF-36v2. Following the subscales of SF-36v2 from highest to lowest among 68 patients, the mean scores of role emotional (91.67±21.79), social functioning (89.34±22.48), bodily pain (86.51±23.42), mental health (78.09±20.75), physical functioning (67.57±28.20), and role physical (67.28±35.60) were higher than 60. The mean scores of general health (49.54±24.62) and vitality (48.43±29.56) were relatively lower. Comparatively, the PCS score was relatively lower than MCS. The Cronbach's alphas of the eight domains of SF-36v2 ranged from 0.78 to 0.98 in this study, which indicated good to excellent internal consistency and reliability.

Anxiety, depression, and HRQoL between young and old ICD patients and between those with and without ischemic HF (Table 3)

Independent T-tests were performed to identify differences between young and old ICD patients and between those with and without ischemic HF. The results showed that PCS and depression

Table 4: Patient characteristics significantly associated with the PCS and MCS of the SF-36 among heart failure patients with implantable cardioverter defibrillator.

	PCS			MCS		
	B	**SE**	**p**	**B**	**SE**	**p**
Demographic factors						
Self-care dependence						
No (ref)						
Yes	-13.93	6.05	0.025			
Clinical factors						
AF						
No (ref)						
Yes	-9.84	2.98	0.002			
DM						
No (ref)						
Yes	-7.51	2.99	0.014			
ICD-related factors						
Implantation duration				4.56	2.01	0.27
Psychological factors						
Depression	-1.76	0.40	<0.001	-0.78	0.28	0.008
Anxiety				-1.30	0.29	<0.001

B: Regression Coefficient; SE: Standard Error of the Regression Coefficient; ref: Reference Group.

were significantly different between young (<60 years old) and old (≥60 years old) ICD patients (t=4.53, p<0.001; depression: t= -2.77, p=0.009). According to the descriptive results between young and old ICD patients with HF, PCS was better in younger ICD patients (mean 47.77 and SD 6.71) but anxiety and depression were higher in older ICD patients with HF (anxiety: mean 3.50 and SD 4.01; depression: mean 4.61 and SD 3.96). However, there was no significant difference found in MCS and anxiety between young and old ICD patients. Moreover, there was no significant difference found in anxiety, depression, and HRQoL (PCS and MCS) between those with and without ischemic HF.

Factors Associated with HRQoL (Table 4), and anxiety and depression (Table 5)

According to multivariable regression results, self-care dependence (regression coefficient [B]=-13.93, Standard Error [SE]=6.05, p=0.025), Atrial Fibrillation (AF) (B=-9.84, SE=2.98, p=0.002), Diabetes Mellitus (DM) (B=-7.51, SE=2.99, p=0.014), and depression (B=-1.76, SE=0.40, p<0.001) were found to be significantly and negatively associated with PCS [F(4,63)=14.26, p<0.001]; whereas, implantation duration (B=4.56, SE=2.01, p=0.027) had significant positive association but anxiety (B=-1.30, SE=0.29, p<0.001) and depression (B=-0.78, SE=0.28, p=0.008) had significantly negative association with MCS [F(3,64)=23.23, p<0.001].

The results also showed that self-care dependence (B=4.23, SE=1.87, p=0.027) had positive association with anxiety [F(1,66)=5.13, p=0.27]; whereas age (≥70 years old) (B=2.02, SE=0.83, p=0.018), self-care dependence (B=3.91, SE=1.78, p=0.032), and DM (B=2.43, SE=0.89, p=0.008) were significantly and positively associated with depression [F(5,62)=4.09, p=0.003].

Table 5: Patient characteristics significantly associated with anxiety and depression of the HADS among heart failure patients with implantable cardioverter defibrillator.

	Anxiety			Depression		
	B	SE	p	B	SE	p
Demographic factors						
Age						
>50 years old (ref)				0.37	1.91	0.848
50-59 years old				0.87	1.70	0.609
60-69 years old				2.02	0.83	0.018
≥70 years old						
Self-care dependence						
No (ref)						
Yes	4.23	1.87	0.027	3.91	1.78	0.032
Clinical factors						
DM						
No (ref)						
Yes				2.43	0.89	0.008

B: Regression Coefficient; SE: Standard Error of the Regression Coefficient; ref: Reference Group.

Discussion

The results revealed that HF patients with ICD perceived more clinically significant levels of depression (~20%) than anxiety (~12%). Despite this, most of the patients had lower anxiety and depression by their perception of their device as a lifesaver [44] to protect them from SCD recurrence. Therefore, it can also be explained that they had better mental health, supported by other studies [21,30,45]. Moreover, most of the patients who received CRT-D felt that it has improved their cardiac condition. Thus, their better mental health can be due to their confidence in the ICD device. However, poorer physical health was reported probably due to relatively poorer cardiac function than other ICD patients [21,30,45]. Most of the HF patients had poorer cardiac function with LVEF, leading to poorer physical health even though they had received CRT-D. Considering psychological distress and HRQoL between ICD patients with ischemic and non-ischemic HF, there was no significant difference probably due to the large difference between two groups (ischemic: n=19 and non-ischemic: n=49). Moreover, ICD patients who were older (≥60 years old) perceived poorer Physical health (PCS) and heightened depression [13]. In this study, psychological distress and HRQoL were compared between young (<60 years old) and older (≥60 years old) ICD patients with HF. Physical health (PCS) and depression were found to be significantly different between two groups. The results also showed that older ICD patients with HF perceived poorer physical health and more depression. It is probably due to relative poorer cardiac function in ICD patients with HF, leading to more physical intolerance and easier fatigue. Depression can be due to insufficient physical ability. A larger sample is recommended to make a more concrete conclusion in future study.

Regarding factors associated with psychological distress (anxiety and depression) and HRQoL in HF patients with ICD, self-care dependence, AF, DM, and depression were significantly associated

with poorer physical health. Whereas duration of ICD implantation had a significant positive correlation but depression had negative correlation with mental health. It is important to note that depression was found to be the most significant factor negatively associated with both physical and mental health. To consider the influence on psychological distress, only self-care dependence was positively associated with anxiety. Whereas, older age, self-care dependence, and DM had positive correlation with depression. It is important to note that self-care dependence was found to be a significant factor associated with both anxiety and depression. Moreover, HF patients with ICD having history of DM may perceive heightened depression probably due to poor management of the illness and physical functioning [13,46].

Self-care independence is the individual's self-control and achievement of daily activities, maximizing both physical and mental health quality of life [47]. Failure to maintain self-care independence increases physical restrictions and self-care inability [48]. Generally, HF patients perceive poor physical functioning that reduces self-care ability and degree of physical tolerance [8-10]. In this study, about 34% of HF patients with ICD had remarkably poor cardiac function (LVEF <30%). Moreover, about 78% of all HF patients with ICD had at least one or more co-existing illnesses, such as AF and DM, which further increase physical intolerance and reduce physical health resulting from insufficient cardiac performance attributing to abnormal heartbeats [49] and poor glucose control [46,50]. Depression is an emotional state in which the depressive symptoms increase fatigue and physical disability [16].

Considering factors associated with mental health among HF patients with ICD, the duration of ICD implantation significantly exerts positive effect but depression and anxiety have a negative effect. Patients with ICD need to adapt to living with their device for life and the longer the implantation period, the better the adaptation of patients living with the device and the more confident they are in self-managing life with their ICD [51-53]. In this study, most of the patients had received their ICD device for less than one year, indicating that they might still be in the adaptation period [51-53]. However, when HF patients with ICD have higher level of psychological distress, they may have poorer mental health [21,54]. HF patients perceive a higher anxiety level due to lifestyle changes, especially in the maintenance of normal daily activities, and a high risk of occurrence of a severe cardiac condition [29]. Depression can also exert significant negative effect on mental health, most likely due to increased psychological effects with coping inability [55].

Older age (≥70 years old), self-care dependence, and DM were determined to be significant factors associated with depression and self-care dependence was negatively associated with anxiety. Older patients are generally more depressed due to deteriorated health condition, co-morbidities [56-58], reduced physical ability and self-care ability [59-61]. In addition, they may feel more depressed due to role changes and retirement [62]. HF patients with ICD may have even poorer perception of those situations. As discussed previously, self-care dependence is closely associated with poorer physical health, leading to heighten negative emotions, particularly depression, when HF patients with ICD perceive limited self-care ability [13,14].

New knowledge has emerged from the study that HF patients with

ICD perceive higher depression and poorer physical HRQoL; factors associated with these two areas are multifactorial and interrelated. This knowledge can contribute to a new mechanism of associations among factors that affect HRQoL and psychological status; it provides clear direction for developing cost-effective strategies to improve current ICD care. The mechanism emphasizes that self-care dependence is a significant factor associated with psychological distress (anxiety and depression), depression is an important factor associated with poorer HRQoL (Physical Health [PCS] and mental health [MCS]) among HF patients with ICD, and DM is a significant factor influencing physical health and depression.

Limitations

This study has some limitations. Firstly, this study was conducted in the Chinese population; the generalizability of the results is limited due to cultural issues. A cross-sectional design might not be able to provide the causal inference and information about the changes in psychological status and HRQoL in different periods for comparisons. Most of the HF patients received CRT-D but the study design was not able to examine the effects of psychological status and HRQoL outcomes prior to and after CRT-D implantation. Previous studies reported that ICD shock could lower HRQoL and increase psychological distress. However, only a few patients in this study had ICD shock experience. To understand more about ICD shock in HF patients with ICD, a case study is recommended. A large sample size should be adopted in future studies to understand more about psychological distress and HRQoL between HF patients with and without ICD as well as ICD patients with and without HF in order to make more concrete conclusions.

Implication for Practice

Since caring for HF patients with ICD is a long-term endeavour, it is important for healthcare professionals to understand more about risk factors and how they interact with one another. This helps provide clear direction for developing or providing appropriate interventions targeting associated factors to reduce psychological distress and improving HRQoL in the current nursing curriculum, particularly in cardiac nursing.

In this study, various factors were identified as closely associated with anxiety and depression as well as physical and mental HRQoL. It is important for nurses to distinguish the characteristics of factors as modifiable and non-modifiable factors. For the non-modifiable factors associated with psychological distress (anxiety and depression) and HRQoL (physical and mental health), including older age (≥70 years old) and ICD implantation duration, nurses should closely monitor and reduce the vulnerabilities arising from these factors. While tackling modifiable factors, including self-care dependence, co-morbidities (AF and particularly DM), anxiety and depression, nurses may develop strategies to reduce adverse effects arising from these factors. Nurses may assess and closely monitor patients' degree of independence and self-care ability. Family involvement and adequate instructions may help improve self-care ability and adaptation to a new lifestyle [13]. Providing adequate psychological support, clarifying concerns related to lifestyle changes and adaptation while living with an ICD device, improving self-care independence, and better controlling underlying illnesses are helpful to reduce the vulnerabilities resulting from anxiety and depression [51]. Referral to

an occupational therapist may help increase self-care ability [31,32]. To reduce the vulnerability arising from co-morbidities, such as AF and particularly DM, nurses may closely monitor the clinical conditions and encourage patients to strictly follow their medical regimes for better control of underlying illnesses. Nurses should pay more attention to those who are more self-care dependent and have additional co-morbidities. It is important to note that psychological distress is a major concern of poorer HRQoL. Psychological intervention [63,64] and cognitive behavioural intervention [34,65] can be implemented to reduce psychological distress and provide appropriate coping strategies and stress management.

Conclusion

This study enriches the knowledge on psychological status and HRQoL of HF patients with ICD. Factors associated with psychological distress (anxiety and depression) and HRQoL (physical health and mental health) have been identified. Factors such as older age (≥70 years old), self-care dependence, having AF and DM, and depression are found to be associated with physical health; self-care dependence and duration of implantation are found to be associated with mental health. Self-care dependence, old age (≥70 years old), and having DM are also found to be associated with depression; self-care dependence is associated with anxiety. Strategies targeting associated factors with psychological distress and HRQoL are crucial to improve care for HF patients with ICD. Nurses must pay more attention to those who are more self-care dependent and depressed.

Acknowledgement

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