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Compliance in heart failure patients: the importance of knowledge and beliefs

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Aims Non-compliance in patients with heart failure (HF) contributes to worsening HF symptoms and may lead to hospitalization. Several smaller studies have examined compliance in HF, but all were limited as they only studied either the individual components of compliance and its related factors or several aspects of compliance without studying the related factors. The aims of this study were to examine all dimensions of compliance and its related factors in one HF population.
Methods and results Data were collected in a cohort of 501 HF patients. Clinical and demographic data were assessed and patients completed questionnaires on compliance, beliefs, knowledge, and self-care behaviour. Overall compliance was 72% in this older HF population. Compliance with medication and appointment keeping was high (>90%). In contrast, compliance with diet (83%), fluid restriction (73%), exercise (39%), and weighing (35%) was markedly lower. Compliance was related to knowledge (OR = 5.67; CI 2.87–11.19), beliefs (OR = 1.78; CI 1.18–2.69), and depressive symptoms (OR = 0.53; CI 0.35–0.78).
Conclusion Although some aspects of compliance had an acceptable level, compliance with weighing and exercise were low. In order to improve compliance, an increase of knowledge and a change of patient's beliefs by education and counselling are recommended. Extra attention should be paid to patients with depressive symptoms.

Introduction

Heart failure (HF) is a serious health care problem not only for patients and their family but also for society, as it contributes significantly to the enormous costs associated with the care of HF patients. Nearly 6.5 million people in Europe, five million people in the USA, and 2.4 million people in Japan suffer from HF. Overall, it appears that HF affects 1–3% of the general population and ~10% of the elderly. Hospital admissions and costs for HF have increased over the past two decades to the point where HF now accounts for ~2% of the total health care expenditure.[1] The greatest contributor to the costs of treatment and care for HF patients is hospitalization, which accounts for almost 70% of total costs.[1]

Non-compliance with medication and diet contributes to worsening HF symptoms, in many cases leading to hospitalization.[2–4] Compliance is often defined as 'the extent to which a person's behaviour (in terms of taking medication, following diet, or executing life style changes) coincides with the clinical prescription'.[5] Although other terms are used (adherence and concordance), the term compliance is widespread, despite the negative connotation of the one-way direction from the describing health care provider to the obeying patient. A recent definition is defined by the World Health Organization (WHO) and includes the active role of the patient. In this definition, compliance is the extent to which the behaviour corresponds with agreed recommendations from a health care provider.[6]

Factors associated with compliance can be divided into patient-related factors, regimen-related factors, and factors related to the health care provider. In this study, only patient-related factors are included. Important patient-related factors that are known to be related to compliance are, knowledge on HF and the HF regimen, benefits and barriers (beliefs) about the HF regimen, and clinical and demographic factors, including age, gender, marital status, educational level, severity of the disease, and depressive symptoms.[7] Although knowledge alone does not insure

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compliance, patients can only comply when they possess some minimal level of knowledge about the disease and the health care regimen. In a meta-analysis of the effects of anxiety and depression, DiMatteo *et al*.[8] showed that depression is an important risk factor for non-compliance with medical treatment. Possible explanations for these findings are that mood disorders can affect motivation and patient's willingness and ability to follow the health care regimen. Furthermore, depression is associated with social isolation and with reduction of cognitive functioning, which both can have influence on compliance.

According to the Health Belief Model, attitudes and beliefs of individuals can explain health behaviour. Important constructs of the model are perceived benefits and barriers about the health care regimen. Perceived benefits consist of the believed effectiveness of strategies designed to reduce the threat of illness; perceived barriers are the potential negative consequences that may result from taking particular health actions.[9]

Because barriers to certain health care behaviours are known to be highly related to non-compliance,[10] it is important that patients believe that it is possible to obtain control over the disease. The aim of the present study was to determine which variables were related to compliance among HF patients.

Therefore, the following research questions were formulated: (i) what are self-reported compliance rates of HF patients, (ii) what is the level of knowledge of patients on HF related issues, (iii) what are patients beliefs about compliance with medication and diet, and (iv) which variables are associated with compliance?

Methods

This study used a descriptive cross-sectional design. The sample consisted of consecutive patients hospitalized for HF and participating in the Co-ordinating study evaluating Outcomes of Advising and Counselling in HF (COACH), a multicentre study in the Netherlands, on the effect of education and counselling in HF patients.[11] Patients were included in the COACH-study between November 2002 and February 2005 when they were hospitalized for symptomatic HF, confirmed by the cardiologist, and had documented underlying heart disease. Important reasons for exclusion were invasive intervention within the last 6 months, inclusion in a study requiring additional visits to a research nurse, or evaluation for heart transplantation. All eligible patients were approached by the research nurse and the cardiologist. After written informed consent, patients were interviewed by an independent data collector who was not involved in care for the patient. The study complies with the Declaration of Helsinki. The Ethics Committee has approved the research protocol.

In this substudy, we examined compliance with the HF regimen before hospitalization. To confirm that patients had HF prior to the index hospitalization, they were required to meet the following criteria: (i) documented use of diuretics before hospitalization and (ii) documented HF symptoms at least 1 month before hospitalization.

During admission, patients completed questionnaires on compliance, HF knowledge, beliefs (about medication and diet), and depressive symptoms.

Study measurements

Clinical and demographic variables

Clinical and demographic data were collected from patient's medical records and by interviews. Data were collected on factors related to compliance in other studies. These factors consist of demographic variables (age, gender, educational level, and marital status),[3,12,13]clinical variables (LVEF, previous HF hospitalization, and duration of HF),[12–14] and other variables related to compliance (knowledge, beliefs, and depressive symptoms).[13–15] Depressive symptoms were measured using the Centre for Epidemiology Surveys-Depression scale (CES-D).[16] This is a 20-item scale, measuring depressive feelings and behaviours on a 4-point Likert scale ranging from 0 (rarely or none of the time) to 3 (most or all of the time). A score $\geq$16 indicates the presence of depressive symptoms.

Revised HF compliance questionnaire

To assess compliance, the Revised Heart Failure Compliance Scale was used.[15] In this questionnaire, the following six health behaviours were identified; appointment-keeping, medication, sodium restriction, fluid restriction, daily weighing, and exercise. Patients were first asked to state how important the health behaviour was by using a 5-point scale ranging from 0 (not at all important) to 4 (highly important). Subsequently, patients were asked to identify whether they had difficulty complying with the behaviour. For the nature of the difficulty, patients could choose from six options. Finally, compliance was measured on a 5-point Likert scale (0, never; 1, seldom; 2, half of the time; 3, mostly; and 4, always). Patients were asked to rate their compliance the last week (medication, diet, fluid restriction, and exercise), the last month (daily weighing), or the last 3 months (appointment keeping) before hospitalization.

For this questionnaire, only content validity, which is a limited part of validity was established in a HF population. For the Dutch version of the scale, two HF nurses experienced in the field of compliance assessed face validity. Internal consistency of the instrument was tested by using Cronbach's α (0.68).[15] Patients were divided into two groups based on being either compliant (following recommendations on appointment keeping, medication, diet, fluid restriction, and exercise 'always' or 'most of the time') or non-compliant (following recommendations 'half of the time', 'seldom', or 'never'). Patients who weighed daily or at least three times a week were defined as 'compliant'. Patients were considered 'overall compliant' when they were compliant with four or more of the six specific recommendations.

Dutch HF Knowledge Scale

The Dutch HF Knowledge Scale is a 15-item multiple-choice scale on knowledge of HF patients. The scale consists of items on HF, symptom recognition, diet, fluid restriction, medication, and exercise and is a self-administered questionnaire. For each item patients can choose from three options, with one of the options being the correct answer. The scale has a minimum score of 0 and a maximum score of 15 points. Questions on the scale were based on the content of the CD-programme that is used in HF clinics in Sweden,[17] from a knowledge test of the Netherlands Heart Foundation and from issues of the European Heart Failure Self-Care Behaviour-scale.[18] The scale was found to be a reliable and valid instrument to test knowledge of HF patients.[19]

HF Belief Scale

The HF Belief Scale consists of two 12-item subscales on benefits and barriers about compliance with medication and diet. Benefits are perceived positive aspects of performing a health behaviour, whereas barriers are perceived negative aspects of performing that behaviour.[10] The subscale on beliefs about medication consists of six benefits and six barriers; the subscale on beliefs about diet consists of seven benefits and five barriers. Each item can be rated on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). The Belief Scale is a reliable and valid instrument to measure beliefs about medication and dietary compliance of HF patients.[20] For the Dutch situation, only content validity of the

scale, which is a limited part of the dimensions of validity, was assessed by two experienced HF nurses.

Statistical analysis

Descriptive statistics were used to characterize this sample. For factors that are known to be related to compliance in other studies, univariate analyses on the relation with compliance were conducted. Normality of continuous variables was assessed by Kolmogorov–Smirnov test. χ^2 tests were used for categorical variables and Mann–Whitney tests for continuous variables that were not normally distributed. In addition, a multivariable model was constructed with variables significant at a *P*-value of 0.05. Linearity of the continuous variables with respect to the response variable was assessed by determining the quartiles of their distribution. In case of a linear trend in the odds ratios, the variable was introduced in the model as a continuous variable. If no linearity was demonstrated, the variable was categorized by taking together the quartiles with odds ratios that were similar in magnitude. No correction has been made for multiple hypothesis testing as this study was designed to assess the association between previously reported risk factors and different aspects of compliance with the HF regimen in this Dutch HF population. All analyses were performed with SPSS 12.0.

Results

Clinical and demographic data

Between November 2002 and February 2005, approximately 4300 patients were screened for the study. A total of 1050 patients met the criteria of the COACH study, agreed to participate in the study, and gave informed consent. In total, 528 of these 1050 patients were on a diuretic and had HF symptoms at least 1 month before hospitalization. Twenty-seven of these patients, however, did not complete the compliance questionnaire. Therefore, the sample in this substudy consisted of 501 HF patients. There were no significant differences in age, gender, or LVEF between the 501 patients in the study and the 27 patients who met the criteria of the substudy, but did not complete the compliance questionnaire. No significant differences in gender and LVEF were found between the 501 patients in the substudy and the 522 patients who participated in COACH but were not included in the substudy. These 522 patients, however, were significantly younger, which was to be expected because those patients had a shorter history of HF, because of the inclusion criteria of the substudy.

The mean age ($n = 501$) was 72 with a range from 23 to 93 (*Table 1*). Almost all patients (94%) were in New York Heart Association (NYHA) class II or III at hospital discharge. Forty-one per cent of the patients had depressive symptoms during admission.

Table 1 Demographic and clinical characteristics of the study population (*n*)

Age (years ± SD)	72 ± 11 (501)
Sex (female)	40% (198)
Living with a partner	60% (296)
LVEF ± SD	34 ± 14 (412)
Aetiology of HF	
CAD	41% (205)
Cardiomyopathy	22% (109)
Hypertension	14% (69)
Valvular disease	14% (69)
Others	10% (48)
NYHA functional class at discharge	
II	38% (184)
III	56% (270)
IV	6% (27)
Co-morbidities	
Hypertension	42% (208)
Diabetes	35% (175)
COPD	31% (157)
Medication at admission	
ACE-inhibitor/ARB	71% (355)
Beta-blocker	51% (254)
Spironolacton	27% (137)
Digoxin	26% (130)
Previous HF admissions	
No admission	42% (208)
1	32% (163)
>1	26% (129)
Length of HF symptoms (months) (median/interquartile range)	40 (11–79)

Compliance rates of HF patient

According to our definition of 'overall compliance', 72% of the patients were compliant (*Figure 1*). Reported compliance with medication was very high in this population; 98.6% of the patients reported that they always or most of the time took their prescribed medication.

Most patients (83%) indicated that following a low-sodium diet is important and 79% reported to be compliant. Six per cent of the patients reported motivational problems and 6% practical problems with the diet. Thirteen per cent had difficulties with their diet because the sodium-restricted diet was not palatable.

A total of 73% of patients reported complying with their recommended fluid restriction. More than one-third of the patients (39%) had problems with their fluid restriction. The most important problem was thirst (27%). Furthermore, 11% of the patients reported not knowing that they had a fluid restriction.

Compliance with regularly weighing was considerably lower with 35% of the patients who weighed at least three times a week (*Figure 2*). Reasons for not weighing were related to motivation (6%), forgetting (5%), and not knowing that they should weigh (14%).

Although 80% of patients stated that it is important to engage in some exercise, only 39% of the patients reported doing so. Reasons for having problems with activity were physical symptoms (27%) and a lack of energy (25%).

Level of knowledge on HF

The total score on the Dutch HF Knowledge Scale theoretically ranges from 0 to 15 points. The mean knowledge score in this population was 11.0 (±2.4). Percentages of the different knowledge categories are presented in *Table 2*.

Patients scored particularly low on the question of how often those with severe HF should weigh themselves; 52% knew that it is important to weigh daily and 20% of the patients thought they should weigh every now and then. There was also a knowledge deficit on the cause of

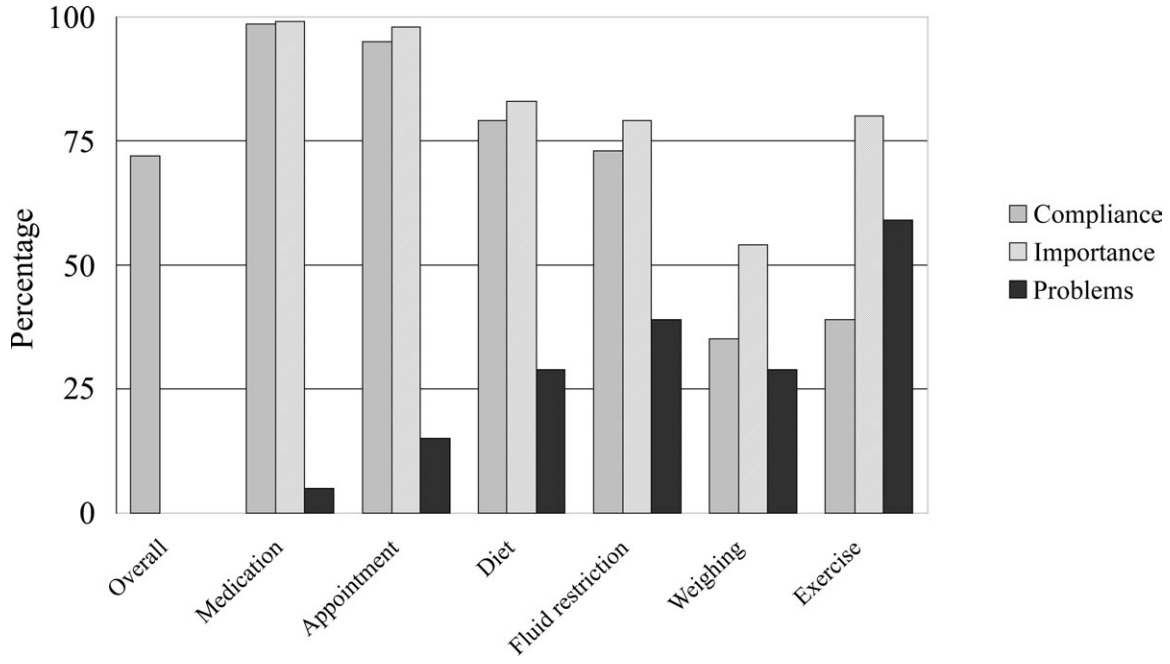

Figure 1. Compliance (%), perceived importance (% of patients), and percentage of patients who experience problems with the HF regimen.

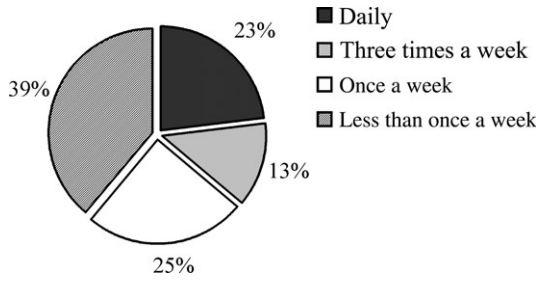

Figure 2. Weighing behaviour of HF patients ($n = 491$).

worsening HF (30% of the patients knew a cold or the flu could provoke this) and fluid restriction. Twenty-eight per cent of the patients answered they should drink more in case of thirst.

Beliefs about compliance with medication and diet

The most important benefits patients experienced with their diuretics were lessening of swelling (84%) and improvement in quality of life (73%). Although 58% of the patients agreed with the statement that taking diuretics lowers their chance of being hospitalized, 26% of the patients disagreed with this statement. The most important barriers to medication taking were waking up at night to go to the bathroom (58%) and problems with leaving home when taking diuretics (46%). Important benefits to a low-sodium diet were a decrease in fluid retention (86%), keeping one healthy (69%), or keeping the heart healthy (61%). The most important barriers to the low-sodium diet were the taste of the food (53%) and restricting ability to eat out at a restaurant (32%). Frequencies of the belief scores are presented in *Table 2*.

Table 2 Knowledge and beliefs of the study population (*n*)

Knowledge[a]	
0–9	27% (134)
10–13	59% (292)
14–15	14% (71)
Benefits diet[b]	24.3 ± 3.2 (493)
Barriers diet[c]	
Low barriers (<12)	29% (144)
High barriers (≥12)	71% (345)
Benefits medication[d]	
Low benefits (<22)	45% (224)
High benefits (≥22)	55% (269)
Barriers medication[e]	
Low barriers (<14)	48% (234)
High barriers (≥14)	52% (255)

Theoretical range: [a]0–15; [b]7–35; [c]5–25; [d]6–30; [e]6–30.

Which clinical and demographic factors are related to compliance?

Patients with a higher 'overall compliance' score had significantly more knowledge, had a lower educational level, and experienced more benefits to diet and medication. Compliant patients tended to have less depressive symptoms. In a multivariable analysis, only benefits to diet and medication and a lower educational level remained associated with compliant behaviour (*Table 3*).

Because there are very few patients who were non-compliant with medication taking (1.4%), no analysis was conducted on the differences between compliant and non-compliant patients.

No differences were found between patients who were compliant and non-compliant with appointment keeping.

Table 3 Univariate and multivariable logistic regression analysis for factors associated with compliance

Different components	Univariate related	OR (95% CI)	*P*-value	Multivariable related	OR (95% CI)	*P*-value
Overall	Benefits diet	1.10 (1.03–1.17)	0.03	Benefits diet	1.08 (1.01–1.16)	0.02
	Benefits medication			Benefits medication		
	0–22	1		0–22	1	
	≥22	1.90 (1.27–2.84)	0.00	≥22	1.55 (0.99–2.38)	0.05
	Knowledge			Knowledge		
	0–9	1		0–9	1	
	10–13	1.47 (0.94–2.29)	0.08	10–13	1.24 (0.77–2.01)	0.37
	14–15	2.35 (1.17–4.74)	0.02	14–15	1.97 (0.94–4.14)	0.07
	Lower educational level	1.80 (0.99–3.29)	0.05	Lower educational level	2.23 (1.19–4.17)	0.01
Diet	Benefits diet	1.19 (1.11–1.28)	<0.01	Benefits diet	1.19 (1.11–1.28)	<0.01
	Barriers diet			Barriers diet		
	<11	1		<11	1	
	≥11	0.37 (0.20–0.68)	<0.01	≥11	0.41 (0.23–0.76)	<0.01
Fluid restriction	Knowledge			Knowledge		
	0–9	1		0–9	1	
	10–13	1.79 (1.15–2.80)	0.01	10–13	1.87 (1.18–2.96)	<0.01
	14–15	2.56 (1.27–5.16)	<0.01	14–15	3.15 (1.50–6.59)	<0.01
	Lower educational level	2.28 (1.25–4.14)	<0.01	Lower educational level	2.67 (1.44–4.93)	<0.01
Weighing	Knowledge			Knowledge		
	0–9	1		0–9	1	
	10–13	2.90 (1.74–4.83)	<0.01	10–13	2.72 (1.62–4.57)	<0.01
	14–15	6.47 (3.37–12.42)	<0.01	14–15	5.67 (2.87–11.19)	<0.01
	Age	0.98 (0.96–0.99)	0.03	Age	0.99 (0.98–1.02)	0.83
	Benefits diet	1.06 (1.00–1.13)	0.03	Benefits diet	1.06 (0.99–1.13)	0.06
Exercise	Benefits medication			Benefits medication		
	0–22	1		0–22	1	
	≥22	2.15 (1.47–3.14)	<0.01	≥22	1.78 (1.18–2.69)	<0.01
	Depressive symptoms	0.54 (0.37–0.80)	<0.01	Depressive symptoms	0.53 (0.35–0.78)	<0.01
	Benefits diet	1.07 (1.01–1.13)	0.01	Benefits diet	1.05 (0.99–1.12)	0.11

Compliance with diet was associated with more benefits and less barriers to diet in univariate and in multivariable analysis.

Compliance with fluid restriction was related to a lower educational level and more knowledge in both univariate and multivariable analysis.

Patients who were compliant with weighing behaviour had significantly more knowledge, were younger, and experienced more benefits related to their diet. In a multivariable analysis, however, only knowledge was related with compliant weighing behaviour. Compliance with advice about activity was related to perceiving more benefits towards medication and diet and having less depressive symptoms in univariate analysis, but multivariable, only depressive symptoms and benefits about medication were significantly associated with compliance (*Table 3*).

Discussion

Although there have been several smaller studies on the individual aspects of self-reported compliance (medication, appointment keeping, diet fluid restriction, weighing, and exercise), this is the first study that examines all dimensions of compliance including their related factors in one HF population. In contrast to the definition of compliance of the WHO in which the behaviour corresponds with agreed recommendations from the health care provider, we did not check in this study if patients were aware of the prescription of the specific aspect of the treatment.

In this study, we found that 72% of all patients were compliant with four out of six aspects of the HF regimen. At this moment, there is no information available about which aspects of compliance are superior and this might even differ between individual patients. We, therefore, did not use a weighing factor for the assessment of 'overall compliance'.

We demonstrated high compliance rates in medication taking (98.6%) and appointment keeping (95%) in this older HF population.

Evangelista *et al.*[15,21] who used the same questionnaire, also found a high medication compliance (91–96%). From other studies, it is known that medication compliance in HF patients can range from 10% as reported by Monane *et al.*[22] to 93% as reported by Artinian *et al.*[12] Even after education and counselling in a HF clinic, compliance with medication measured by a Medication Event Monitoring System (MEMS) was lower (84%) compared with compliance in our study.[23] It must be taken into account that the measurement of compliance by the MEMS is a more objective method than self-reported medication compliance.

Our high compliance with medication rate may reflect patients' over-reporting of their compliance. Because patients in our study were hospitalized for HF, it is possible that it was difficult for them to admit that they did not

comply with their medication. Another reason for the high compliance in our study is that it is possible that patients thought they were compliant, but in fact were not taking the medication as prescribed because of misunderstandings and wrong interpretation of the regimen. One of the reasons for non-compliance is a lack of knowledge and misunderstanding of the medication regimen.[24]

In contrast to the high medication compliance, compliance with sodium restriction was considerably lower (79%). Similar results were found in other studies,[13–15,25] although lower compliance rates between 28 and 56% also have been reported.[12,26–28] The difference in measurement instruments and populations might explain this different outcome.

Compliance with fluid restriction in our study (73%) was considerably higher than the rates in other studies (23–45%).[12,27–29] An important reason for this difference might be the difference in recommended fluid restriction. Before the start of our study, the new Dutch HF guidelines were implemented. In these guidelines, the fluid restriction was much less stringent (1500–2500 mL) than the restriction in other studies (mostly 1500 mL) and, therefore, it was easier for patients to comply with the recommended restriction.

The lowest compliance rate in this study was found in regularly weighing; only 35% of this population weighed daily or at least three times a week. This low compliance rate has been reported in other studies.[12,25,28,29]

Although most of the patients (80%) recognized the importance of exercise, the compliance rate was, as in other studies[12,15,25] low, with only 39% of the patients complying with advice to exercise. The major reason for this lack of compliance was the physical condition of the patients.

We also found that many older HF patients have problems with their HF related regimen. A total of 29% of patients had problems with diet, 29% with daily weighing, and 39% with fluid restriction. More than a quarter of patients were thirsty due to their fluid restriction and 13% found the sodium restriction not palatable.

To improve compliance, it is important to gain insight into variables that are related to compliance, in order to take the appropriate actions. Compliance in this study was related to knowledge, benefits and barriers about the regimen, educational level, and depressive symptoms. There were no other clinical or demographic factors that were related to compliance.

Although knowledge is a necessary condition for compliance, in this population only compliance with daily weighing and fluid restriction was significantly related to the level of HF knowledge. A knowledge deficit seems a serious problem; 14% of patients reported that they did not know that it was important to weigh regularly and 30% did not know that the flu can cause a worsening of HF. At the same time, 11% of all patients did not know they had a fluid restriction. From our data, it is not clear whether a fluid restriction was not prescribed or patients were not aware of this restriction. A total of 28% of all patients thought they had to drink more in case of thirst. A knowledge deficit in HF patients was also found in the study of De Geest *et al.*,[28] in which 82% reported a knowledge deficit on HF symptoms and 42% on diet prescriptions.

In addition to knowledge, beliefs about the HF regimen were also related to compliance.

Our results confirm earlier results of Bennett *et al.*[13] and Evangelista *et al.*[15] who found that beliefs about medication and diet are both important factors in compliance.

Recently, the role of depression in patients with HF has been underscored.[30] We found a high percentage (41%) of patients with depressive symptoms in our study. Similar rates were found in other studies on depression in hospitalized HF patients.[30,31] In our study, patients with fewer depressive symptoms were more compliant with recommendations on activity. In addition, there was a tendency for patients with less depressive symptoms to be more overall compliant. Evangelista *et al.*[15] found similar results; patients with better mental health were more compliant with diet, fluid restriction, and exercise. At this moment, it is unclear whether there is a causal relationship between depression and compliance and, therefore, this relationship needs to be further explored.

In this study, we only looked at the association between compliance and patient-related factors. Other factors, for example, factors that are related to the health care provider or the HF regimen can also have a significant association with compliance in HF patients.

Another limitation of the current study was that self-reported questionnaires were used to measure the concepts of interest. It is possible that patients overestimated their compliance because of a tendency to give socially desirable answers. However, with this study we gained more insight into problems with the HF-related regimen and in compliance in HF patients. Although all patients in the study were diagnosed with HF before hospitalization and, therefore, should have been treated according to guidelines (including advises on the HF regimen), it is difficult to find out whether patients actually had the prescriptions or received advice on the regimen. This might have influenced the compliance rates in this study.

Conclusion and implications

In this study, we found that compliance with medication and appointment keeping was surprisingly high in an older HF population. However, compliance with diet, fluid restriction, and especially compliance with advice regarding activity and daily weighing was low. Although only compliance with weighing behaviour and fluid restriction was related to knowledge, many patients in the study reported a knowledge deficit related to HF and the HF regimen, particularly diet, fluid restriction, and daily weighing. It is a major challenge for health care providers to improve knowledge of HF patients on these subjects. Although knowledge is important to improve compliance, knowledge alone is not enough to ensure compliance. Strategies to improve compliance should, therefore, not only be directed at increasing patients' knowledge, but also at changing beliefs about the regimen. Therefore, interventions that can improve perceptions of benefits and reduce barriers to the HF regimen need to be developed and tested.

The emphasis on self-care strategies (e.g. daily weighing) is also important, however, it is probably even more important to explain how a patient should react to weight gain and give extra attention to self-management (e.g. a flexible diuretic regimen) to prevent worsening HF symptoms. Prevention of misunderstandings must be part of the

educational plan for HF patients in order to improve compliance.

Furthermore it is important to improve communication between patient and health care provider in order to discuss the problems patients have with their HF regimen. Interventions need to be directed to actual problems patients experience (e.g. thirst or the taste of the sodium-restricted diet) in order to improve compliance.

As patients with more depressive symptoms show more non-compliant behaviour in this study, extra attention should be paid to those patients. Therefore, it is important for health care providers to learn to recognize depressive symptoms in HF patients and treat depressed patients according to existing psychiatric guidelines.

It is a major challenge for health care providers to improve compliance in HF patients, to identify those patients who are at risk for non-compliance and to integrate several strategies in multidisciplinary HF management programmes.

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