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Effects of education and support on self-care and resource utilization in patients with heart failure

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Aims To test the effect of education and support by a nurse on self-care and resource utilization in patients with heart failure.

Methods A total of 179 patients (mean age 73, 58% male, NYHA III-IV) hospitalized with heart failure were evaluated prospectively. Patients were randomized to the study intervention or to 'care as usual'. The supportive educative intervention consisted of intensive, systematic and planned education by a study nurse about the consequences of heart failure in daily life, using a standard nursing care plan developed by the researchers for older patients with heart failure. Education and support took place during the hospital stay and at a home visit within a week of discharge. Data were collected on self-care abilities, self-care behaviour, readmissions, visits to the emergency heart centre and use of other health care resources.

Results Education and support from a nurse in a hospital setting and at home significantly increases self-care behaviour in patients with heart failure. Patients from both the intervention and the control group increased their self-care behaviour within 1 month of discharge, but the increase in the intervention group was significantly more after 1 month. Although self-care behaviour in both groups decreased during the following 8 months, the increase from baseline remained statistically significant in the intervention group, but not in the control group. No significant effects on resource utilization were found.

Conclusions Intensive, systematic, tailored and planned education and support by a nurse results in an increase in patients' self-care behaviour. No significant effects were found on use of health care resources. Additional organisational changes, such as longer follow-up and the availability of a heart failure specialist would probably enhance the effects of education and support.
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Key Words: Heart failure, readmission, self-care, resources, education.

See page 632 for the Editorial comment on this article

Introduction

Heart failure is increasingly recognised as a major public health problem in industrialized countries[1,2–4]. With the ageing of the population, more patients are expected to present with heart failure[5,6]. Heart failure has a major impact on the lives of patients and their families. Severe symptoms, such as dyspnoea or oedema and increased exercise intolerance effect important aspects of a person's life. In addition, patients often have to adjust their lifestyle by adhering to a complex medication regimen, changing their diet and fluid intake, adapting their activities, and monitoring symptoms of worsening heart failure[7]. To make these adjustments and to care for themselves effectively, patients need particular knowledge and skills. Patient education and support are essential for enhancing self-care abilities, improving outcomes and decreasing unnecessary hospitalizations[7,8]. Teaching patients to enhance their self-care behaviour by education and support can have a positive effect on lifestyle modification (for example diet, exercise), on response to worsening symptoms, and on coping with chronic illness. To enhance the effectiveness, education should be tailored for each patient and their family[9,10]. Support and education must be maintained for as long as necessary in the home setting to cover the transition from hospital to home[11,12]. Potential non-compliance with advice and failure to seek medical attention when symptoms occur are related to

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rehospitalization. Thus it can be expected that patients who are able to care for themselves effectively will encounter fewer problems leading to rehospitalization or unnecessary visits to the emergency department[10,13–18]. However, because of increased knowledge about the disease, it is also possible that education and support leads to an increase in health care resource use. Teaching patients to be more alert in identifying symptoms could result in an increased number of contacts with a general practitioner or cardiologist[19]. For the education of heart failure patients, several main points have been suggested[20], but research on the effects of education and support is scarce. In different multi-modal interventions, education is an important aspect of other interventions, such as the availability of a heart failure clinic or a heart failure team[15,21]. The specific contribution of education and support alone to such programmes is seldom isolated. The purpose of this study was to describe the effect of education and support by a nurse on self-care and resource utilization.

Methods

Patients

Patients who were admitted to the cardiology ward of the University Hospital in Maastricht, the Netherlands, with symptoms of heart failure were potentially eligible. To confirm a diagnosis of heart failure the Boston scoring system was used[22]. In this scoring system, the various signs and symptoms documented in the history, physical examination and chest X-ray are given a score. The score ranges from 0 to 12, with a score of 8 and higher being designated as heart failure. After verifying the diagnosis with the Boston scoring system, patients were included in the study if they met the following criteria: New York Heart Association (NYHA) functional class III and IV, a diagnosis of heart failure at least 3 months before, aged at least 50 years and literate in Dutch. Patients were excluded from the study if they suffered from a co-existing, severe, chronic debilitating disease, if they resided in, or planned to be discharged to a nursing home, if they had a psychiatric diagnosis, if they had had a CABG, PTCA or valve replacement in the last 6 months or were expected to have such a treatment within 3 months, or if they refused to give informed consent. The institutional review boards approved the study.

Study design

From May 1994 to March 1997 a researcher and a research assistant screened patients admitted to the cardiology unit for their potential eligibility to the study. The attending physician determined the Boston score and whether the patient met the inclusion criteria. The researcher/research assistant obtained informed consent and collected baseline data from the medical chart and by interview. By drawing from an envelope, patients were randomly assigned to receive either 'care as usual' or the supportive–educative intervention. All patients were followed for 9 months. The researcher/research assistant telephoned the patient 1 month after discharge, and visited the patient 3 months and 9 months after discharge for data collection.

Intervention group

The supportive–educative intervention consisted of intensive, systematic and planned education by a study nurse about the consequences of heart failure in daily life, using a standard nursing care plan developed by the researchers for heart failure patients in older age[23]. Important topics were discussed with every patient, for example, recognition of warning symptoms of worsening heart failure, sodium restriction, fluid balance, and compliance. In addition, individual problems were discussed, for example problems in social interaction, sexual function or limited access to the general practitioner.

During hospital stay, the study nurse assessed the patients' needs, provided education and support to the patient (and family), gave the patient a card with warning symptoms and discussed discharge. Within 1 week after discharge the study nurse telephoned the patient to assess potential problems and to make an appointment for a home visit. During the home visit the study nurse reinforced and continued education as warranted by the patient situation. If needed, the information was given to a carer about specific patient needs. Between discharge and the home visit, patients could call the study nurse in case of problems. After the home visit, the patient was advised to call their cardiologist, general practitioner or emergency heart centre in case of difficulties. The intervention lasted from hospital admission to 10 days after discharge from hospital.

Patients assigned to the care as usual (control group) received all standard care. This meant that they were not provided with structured patient education, a follow-up telephone call or a home visit by a nurse. Dependent on the insight of an individual nurse or physician the patient received information (in writing or oral) about medication and lifestyle. Patients from the control and intervention groups were never assigned to the same room on the nursing unit. The two study nurses were involved in data collection as researcher and research assistant. However, the person who collected the data and the nurse who visited the patient for the intervention were never the same.

Data collection

End-points of the study are self-care ability, self-care behaviour and resource utilization. To describe the

population and correct for possible differences, additional clinical and demographic data were collected.

Clinical and demographic data

At the time of enrolment, clinical data were collected from the patient's medical chart. These included: patient's medical history, co-morbidities, laboratory data, left ventricular ejection fraction, New York Heart Association (NYHA) classification, weight and height, and medication prescribed. At the same time, the patient was interviewed to collect demographic data including age, gender, marital status, socio-economic status, social support and living situation.

Self-care

The Appraisal of Self-care Agency Scale[24] was used to assess the patient's ability to care for him/herself. On this 24-item self-appraisal instrument, scores range from 24–120. Cronbach's alpha in this study ranged from 0·80 to 0·87. The scale was administered at the time of enrolment, and 3 and 9 months after discharge.

Specific heart failure-related behaviour was assessed using the Heart Failure Self-care Behaviour Scale. This is a 19-item questionnaire, with each item listing a specific activity related to heart failure. For example, 'In case of dyspnoea, I call a doctor' or 'I restrict my sodium intake'. For each item, the patient is asked to respond with yes or no. A total score is calculated by all positive answers. Content validity of this scale was established by a panel of experts in the field of caring for heart failure patients. Data on self-care behaviour were collected at the time of enrolment, and at 1, 3 and 9 months after discharge. Cronbach's alpha for this scale ranged from 0·62 to 0·68. Based on the importance of the content of the items for heart failure patients, it was decided to use this scale.

Using health care resources

During the follow-up interviews (1, 3, and 9 months after discharge) patients reported on the number, and reason for, contacts with the general practitioner, cardiologist, medical specialists, physical therapist, social services or alternative health care providers. They also reported on using home care and meals on wheels. Additional information on readmission and visits to the outpatient clinic were obtained from the hospital computer database. Reasons for readmission were collected from the patient's medical chart.

Statistical analysis

Descriptive statistics are expressed as means ± SD. The control and study group were compared by Chi-square test for discrete variables and by Student's t-test for normally distributed continuous variables. Correction for multiple testing was performed using a modification of Holm[25]. Relationships were examined by Pearson correlation.

Results

Study patients

During the period May 1994 to March 1997, 828 admissions for heart failure were registered in the cardiology ward of the University Hospital in Maastricht. Of these 828 admissions, 184 (22%) were readmissions. Since patients could only enter the study once, 644 patients were screened. Among the remaining 644 patients, 458 (71%) were excluded. Among them, 171 (37%) were excluded because they were diagnosed with heart failure of less than 3 months, because heart failure was not confirmed by the Boston score (n=12, 3%) or because they died before the interview took place (=14, 3%). Other reasons for exclusion were dementia, a psychiatric or terminal illness (n=31, 7%), a cardiac intervention was planned or had taken place recently, NYHA was <III (n=22, 5%), or for demographic reasons (nursing home, age, language) (n=26, 6%). In addition, 76 patients (17%) were excluded for more than one reason (mostly a combination of inadequate length of heart failure plus another reason), 66 (14%) for logistic reasons (most commonly the inability to screen before discharge) and 40 (9%) because the patient did not want to participate as they felt too ill to do so. The age and gender of these 40 patients did not differ from the patients who participated in the study. In total, 186 patients were enrolled in the study; however, before discharge seven (five in the intervention group, two in the control group) patients died. Analyses were performed on data of the remaining 179 patients. The study population consists of a general heart failure population since the University Hospital in Maastricht is the only hospital in the town of Maastricht.

The baseline demographic and clinical characteristics of the patients are shown in Table 1. The mean age of the patients was 73 years; 58% were male and most lived independently at time of enrolment. Most of the participating patients were in NYHA functional class IV during admission and the mean ejection fraction was 34%. At the time of discharge, most of the patients were using diuretics (91%), nitrates (84%), and vasodilators (78%) (70% on ACE inhibitors). Digoxin was prescribed to 47% of the patients. Two patients had a Boston score (6 and 7) indicating possible heart failure and the other patients had a score higher than 8, indicating definite heart failure. The underlying reasons for heart failure, as mentioned in the medical chart, were ischaemic heart disease (52%), valvular disease (46%), cardiomyopathy (23%) and hypertension (23%). Patients could be classified with more than one underlying reason for heart failure. Of the total sample, 35 patients were considered as having predominantly diastolic left ventricular dysfunction. There were no statistically significant differences in demographic and clinical variables between the control group and study group, although there was a trend towards increased severity of symptoms (NYHA IV) in the intervention group (70% vs 54%, chi-square=4·9, P=0·087). During the study period,

Table 1 Demographic and clinical characteristics at baseline of the patients in the study (n=179)

	Total (n=179)	Control group (n=95)	Intervention group (n=84)	*P* value
Demographics				
	X ± SD	X ± SD	X ± SD	
Age in years	73 ± 9	73 ± 9	73 ± 9	ns
Persons providing:				
Emotional support	1·1 ± 2·1	1·2 ± 2·5	0·9 ± 1·5	ns
Practical support	3·5 ± 2·6	3·6 ± 2·7	3·4 ± 2·5	ns
	n (%)	n (%)	n (%)	
Gender				
Male	103 (58%)	56 (59%)	47 (56%)	
Female	76 (42%)	39 (41%)	37 (44%)	ns
Marital status				
Married	96 (54%)	51 (54%)	45 (54%)	
Single/widowed	83 (46%)	44 (46%)	39 (46%)	ns
Dependent living	19 (11%)	12 (12%)	7 (8%)	ns
Clinical characteristics				
	X ± SD	X ± SD	X ± SD	
Length of heart disease in years	9 ± 8	9 ± 8	9 ± 8	ns
Length of stay (days)	13·6 ± 8·4	12·9 ± 8·3	14·5 ± 8·5	ns
Quetelet index (kg . m^{-2})	24·7 ± 4·8	24·5 ± 4·2	24·9 ± 5·4	ns
Weight loss during admission (kg)	3·7 ± 4·7	3·3 ± 4·2	4·2 ± 5·1	ns
LVEF (%)	34·4 ± 14	34·5 ± 14	34·3 ± 12	ns
No previous admissions	3·3 ± 2·5	3·4 ± 2·6	3·3 ± 2·4	ns
	n (%)	n (%)	n (%)	
Prior MI	105 (59%)	56 (60%)	49 (58%)	ns
Prior CABG	46 (26%)	23 (25%)	23 (27%)	ns
Co-morbidity	1·2 ± 1·0	1·2 ± 0·9	1·2 ± 1·0	
Diabetes mellitus	54 (30%)	27 (28%)	27 (32%)	ns
Hypertension	51 (29%)	29 (31%)	22 (26%)	ns
Lung disease	42 (24%)	24 (25%)	18 (21%)	ns
Rheumatoid arthritis	11 (6%)	5 (5%)	6 (7%)	ns
Sodium (mEq . l^{-1})	138·7 ± 3·5	138·7 ± 3·5	138·7 ± 3·6	ns
BUN (mg . dl^{-1})	13·0 ± 7·8	12·6 ± 7·5	13·5 ± 8·1	ns
Creatinine (μmol . l^{-1})	141·4 ± 68·6	139·0 ± 70·4	144·2 ± 66·9	ns
NYHA III	31 (17%)	19 (20%)	12 (14%)	
NYHA III-IV	37 (21%)	24 (26%)	13 (16%)	
NYHA IV	110 (61%)	51 (54%)	59 (70%)	ns

LVEF=left ventricular ejection fraction; MI=myocardial infarction; CABG=coronary artery bypass grafting; BUN=blood urea nitrogen.

20 patients changed their home situation from independent living to an assisted living environment, six patients from the control group and 14 patients from the intervention group.

Attrition

During the 9-month period of follow-up, 16 patients (17%) in the control group died, compared to 22 (26%) in the intervention group. Attrition due to non-response was the same (5%) in both groups. Comparing the baseline characteristics of the patients who died or did not respond (n=47) with the patients who completed all three follow-up measurements (n=132), it was found that patients who dropped out were significantly older, lived more often in a home for the elderly, had been diagnosed with hypertension and had cardiomyopathy more often as the underlying reason for heart failure. Laboratory results showed higher levels of serum sodium, BUN and creatinine at baseline. When the baseline characteristics of the control and intervention patients who dropped out of the study were compared, we found that no selective attrition had occurred. The baseline characteristics of the 74 control and 58 intervention patients remained comparable.

Self-care abilities

Analyses were restricted to subjects with valid scores at all three measurements (baseline, 3 and 9 months). Figure 1 shows baseline and follow-up scores on the general self-care abilities of 111 of the 132 patients responding after 9 months. The ability of patients to care for themselves in general was not significantly

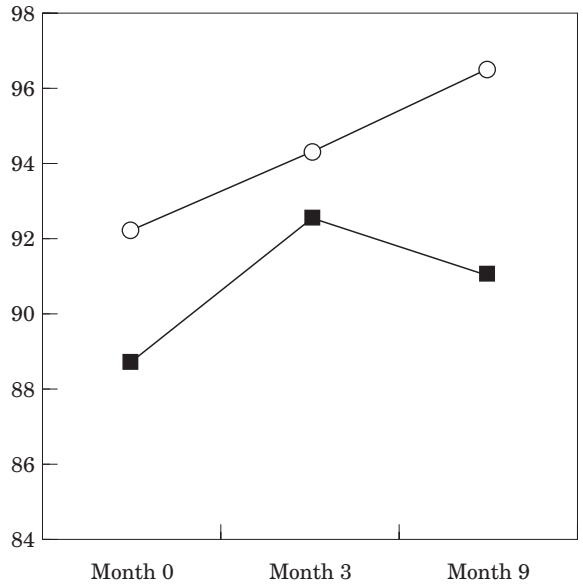

Figure 1 **Self-care abilities (ASA) n=111 (theoretical range 24–120). ○=control group; ■=intervention group.**

different between the two groups at any time. Patients in the control group increased their self-care abilities between baseline and 9 months follow-up (t=2·5, P=0·013). Patients in the intervention group increased their self-care abilities between baseline and 3 months follow-up (t=2·4, P=0·020). After correction for multiple testing, these increases were not statistically significant.

Heart failure-related self-care behaviour

Analyses were restricted to 128 of the 132 patients responding after 9 months with valid scores on all four measurements on the Heart Failure Self-care Behaviour Scale (baseline, 1, 3, and 9 months). Patients in the intervention group had slightly lower self-care behaviour scores than patients in the control group, but this difference at baseline was not statistically significant (t=1·3, P=0·208) (Fig. 2). On average, patients complied with nine of the 19 items of self-care behaviour. One month after discharge, patients from both the control and the intervention group reported significantly higher self-care behaviour compared with their baseline score (t=6·1, P<0·001, t=11·4, P<0·001). Patients from the intervention group, however, reported complying with 14 of the 19 self-care behaviours compared to 12 in the control group (t=3·8, P=0·001). Both control and intervention patients decreased their self-care behaviour over time. However, patients from the intervention group still reported complying with more behaviours than control patients at 3 months (12·2 vs 10·6, t=2·9, P=0·005) and at 9 months (11·2 vs 10·3, t=1·6, P=0·106). The increase in self-care behaviour between baseline and 9 months was statistically significant in the intervention group (t=4·9, P<0·001), but not in the

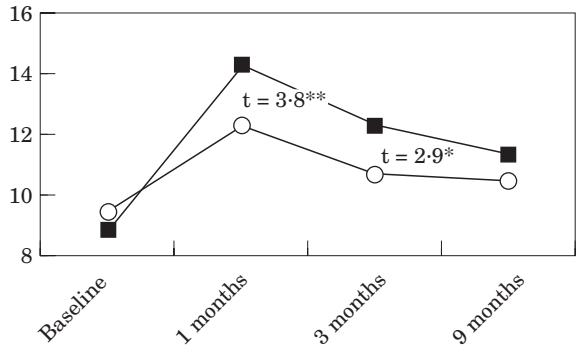

Figure 2 **Heart Failure self-care behaviour n=128 (theoretical range 0–19). *P<=0·005; **P=0·001. ○=control group; ■=intervention group.**

control group (t=1·9, P=0·058). These differences remain statistically significant after correction for multiple testing.

Readmission

All patients — total study period

During the 9 months follow-up, patients from his study had had 1629 days of readmission (Table 2). The patients in the control group (n=95) accounted for 861 readmission days, compared to 768 days in the intervention group (n=84). This means an average of 9 readmission days in both groups. Of the 95 patients in the control group, 47 (50%) were readmitted at least once during the study period, compared to 31 (37%) in the intervention group (chi-square=2·9, P=0·06).

Cardiac reasons accounted for 681 readmission days (mean 7·1 ± 15) in the control group and 427 (mean 5·1 ± 11) in the intervention group, involving 37 patients (39%) in the control group and 24 (29%) in the intervention group (chi-square=2·1, P=0·096). No statistically significant differences were found in mean readmission days or number of readmissions between the two groups at the end of the 9-month study period.

Short term: 1 month, 3 months

To determine the short-term effects of the intervention, data from the 1 and 3 month follow-up were considered. Within 1 month of discharge, 25 patients (14%) were readmitted to the hospital, leading to 377 days of hospitalization. Cardiac causes were the underlying reason for readmission in 19 patients, leading to 285 days of hospitalization (183 control group, 102 intervention group).

The number of patients readmitted within 3 months of discharge accumulated to 29 (31%) in the control group and 22 (26%) in the intervention group. The mean number of readmission days after 3 months was 5·1 in both groups. The number of patients readmitted for cardiac causes were 23 (24%) in the control group and 18 (21%) in the intervention group. Readmission for cardiac causes at 3 months accounted for 393 days (mean

Table 2 Number of patients readmitted and readmission days of all included patients (n=179)

	All causes		Cardiac causes	
	Control (n=95) No. (%)	Intervention (n=84) No. (%)	Control (n=95) No. (%)	Intervention (n=84) No. (%)
Patients readmitted				
Within 1 month	14 (15%)	11 (13%)	11 (12%)	8 (10%)
Within 3 months	29 (31%)	22 (26%)	23 (24%)	18 (21%)
Within 9 months	47 (50%)	31 (37%)*	37 (39%)†	24 (29%)
	No. (mean ± SD)	No. (mean ± SD)	No. (mean ± SD)	No. (mean ± SD)
Readmission days				
Within 1 month	207 (2·3 ± 7)	170 (2·2 ± 7)	183 (1·9 ± 7)	102 (1·2 ± 4)
Within 3 months	485 (5·1 ± 11)	430 (5·1 ± 11)	393 (4·1 ± 10)	252 (3 ± 7)
Within 9 months	861 (9 ± 18)	768 (9 ± 18)	681 (7·1 ± 15)	427 (5·1 ± 11)

*Chi-square=2·8. P=0·061.
†Chi-square=2·1, P=0·096.

Table 3 Readmissions of patients who completed follow-up and patients who died within 9 months

	Surviving patients (n=132)		Patients who died within 9 months (n=38)	
	Control (n=74) No. (%)	Intervention (n=58) No. (%)	Control (n=16) No. (%)	Intervention (n=22) No. (%)
All causes				
1 month	8 (11%)	6 (10%)	5 (31%)	5 (23%)
3 months	21 (28%)	14 (24%)	6 (38%)	7 (32%)
9 months	39 (53%)	23 (40%)*	**	**
Cardiac causes				
1 month	5 (7%)	5 (9%)	5 (31%)	3 (14%)
3 months	15 (20%)	12 (21%)	6 (38%)	5 (23%)
9 months	29 (39%)	18 (31%)	**	**

*Chi-square=2·2, P=0·094.
**Data are not available because patients were not alive at 9 months.

4·1) in the control group compared with 252 (mean 3·0) in the intervention group. No differences between the two groups as regards readmission rate or readmission days were found at 1 and 3 months after discharge.

Survivors

To gain more insight into readmission of patients still alive after 9 months compared with patients who died during the study period, separate analyses were performed for these groups. As Table 3 shows, patients who died during the study period were more often readmitted for all causes and specifically for cardiac causes within 1 month of discharge than surviving patients. In the control group 31% of the patients who died during the study period were readmitted within 1 month of discharge (all for cardiac causes), compared with 11% (7% for cardiac causes) readmission of the surviving patients. In the intervention group this was 23% vs 11% for all causes and 14 vs 9% for cardiac causes.

Health care resources

Over the 9-month study period, more patients in the control group (38%) than in the intervention group (24%) made a visit to the Emergency Heart Centre (Table 4). This difference did not reach statistical significance (chi-square=2·7, P=0·074). Of the patients who visited the Emergency Heart Centre, patients from the intervention group made more visits (2·6 vs 1·4) than did the control patients (t=2·2, P=0·051). Slightly more than half of the patients (57%) visited their outpatient cardiologist for a scheduled check-up within a month of discharge. Most of the patients (92%) had a scheduled appointment with their cardiologist within 3 months after discharge. Five percent of the patients had to wait

Table 4 Number of patients (%) using of health care resources of responding patients (n=132)

	Control (n=74)		Intervention (n=58)		T/chi-square, *P*-value
	n (%)†	Mean ± SD	n (%)†	Mean ± SD	
Visiting emergency heart centre					
Within 1 month	3 (4%)		3 (5%)		
if visited, mean no. of visits		1·0		1·3 ± 0·6	
Within 3 months	15 (22%)		10 (17%)		
if visited, mean no. of visits		1·0		1·8 ± 1·0	T=2·5, *P*=0·037
Within 9 months	26 (38%)		14 (24%)		Chi-square=2·7, *P*=0·074
if visited, mean no. of visits		1·4 ± 0·86		2·6 ± 2·1	T=2·2, *P*=0·051
Visiting outpatient cardiologist					
Within 1 month	42 (57%)		33 (57%)		
Within 3 months	68 (92%)		54 (93%)		
Within 9 months	72 (97%)		57 (98%)		
Visiting outpatient 'internist'					
Within 1 month	10 (15%)		14 (24%)		
Within 3 months	20 (29%)		22 (38%)		
Within 9 months	32 (47%)		27 (47%)		
Visiting other specialist*					
Within 1 month	23 (33%)		20 (35%)		
Within 3 months	35 (51%)		37 (64%)		
Within 9 months	51 (74%)		45 (78%)		
Contacting general practitioner**					
Within 1 month	48 (67%)		34 (62%)		
Within 3 months	62 (87%)		45 (83%)		
Within 9 months	69 (96%)		51 (94%)		
Using home nursing care or home help (0–9 months)	25 (34%)		26 (45%)		
Home nursing care	9 (12%)		13 (22%)		
Home help	22 (30%)		22 (38%)		
Using other facilities (0–9 months)					
Arrangements for meals	27 (37%)		23 (40%)		
Physical therapist	22 (30%)		13 (22%)		
Pastor	15 (20%)		11 (19%)		
Social service	2 (3%)		2 (3%)		
Dietician	4 (5%)		1 (2%)		
Alternative healer	1 (1%)		1 (2%)		

*Other specialists as registered at the outpatient department of the hospital.
**Contacts with general practitioner, either by telephone, home visit or appointment.
†Valid percentages.

more than 3 months to obtain such an appointment. A considerable number of patients also visited an internist or another medical specialist. Within the follow-up period of 9 months, 47% visited an internist and 72% another medical specialist at the outpatient department. Of the 57 patients (43%) who did not visit the cardiologist within a month, 10 (8%) had contact with their internist within a month and an additional 34 (26%) had contact with their general practitioner within a month. Only 10 patients did not have a scheduled contact with their cardiologist, their internist or their general practitioner within a month. During the 9-month follow-up period, almost all patients contacted their general practitioner at least once.

In total, 81 of the 132 patients (62%) did not use home nursing care or home help. Further analysis revealed that only 16% of the patients used home nursing care (control group: 13%, intervention group: 22%). About one third of the patients (38%) had made arrangements for meals (e.g. meals on wheels, home-help prepared meals). Patients were restrictive in their use of services from other health care providers (Table 4). No significant differences were found in resource utilization between the control and intervention patients.

Relationships between self-care and readmission, using Emergency Heart Centre, and contacts with general practitioners

It can be expected that a relationship exists between self-care and resource utilization. Since patients in the intervention group learned how to react to worsening symptoms and comply with the medical regimen, this relationship was part of the intervention. Therefore separate correlation coefficients were calculated for the intervention group and control group.

General self-care abilities

Three months after discharge, the self-care abilities of the intervention patients were related to the number of

contacts with their general practitioner and the number of readmission days in the following 6 months. Higher scores on self-care abilities meant less contact with their general practitioner ($r = -0{\cdot}33$, $P = 0{\cdot}018$) and fewer readmission days in the following 6 months for cardiac causes. These relationships are not found in the control group.

Heart failure-related self-care behaviour

Self-care behaviour showed little or no relationship with the number of readmissions for cardiac causes. In the control group a significant correlation existed between self-care behaviour at 1 month after discharge and the number of readmission days for cardiac reasons at 3 months after discharge ($r = -0{\cdot}30$, $P < 0{\cdot}01$). Patients with higher scores on self-care behaviour had fewer readmission days for cardiac causes.

Discussion

This study demonstrates that education and support by a nurse in a hospital setting and at home significantly increases self-care behaviour in patients with heart failure. The 19-item questionnaire was developed from literature. The authors recognised that it was important to define an objective outcome measure for which the intervention was accountable and which at the same time gave additional clues for improvement of care. Therefore, a practical and concrete instrument was developed. Despite the low internal consistency of the scale the authors decided to report the results, since they contained valuable information for health care providers. Patients from both the intervention and the control group increased their self-care behaviour within 1 month of discharge, probably as a result of hospitalization. The increase in the intervention group, however, was significantly more after 1 month. Although both groups decreased self-care behaviour during the following 8 months, the increase from baseline remained statistically significant in the intervention group, while this was not the case in the control group. As can be expected, the effects of the intervention was most powerful on short-term behaviour, which is reflected in significant differences in self-care behaviour between the two groups both 1 month and 3 months after discharge. After 9 months, the effect of the intervention decreased. The supportive–educative intervention in this study focused on various aspects of self-care, for example, adherence to medication and diet, adapting activities to their condition, knowledge on symptoms of worsening heart failure and adequate reaction to these symptoms. The extra dimension of the intervention lies in items that, while appearing rather futile, can be of major importance to a patient with heart failure, for whom weight gain or consumption of a high salt product can make a vital difference. It can be expected that certain aspects, for example those related to adapting activities, are not affected by education and support. In general, most patients already rested during the day, spread activities throughout the day and decreased activities when needed. This was often due to their poor physical condition. The intervention probably did not change this behaviour. Interventions that encourage regular exercise at their own pace may be needed, because it has been shown that exercise can improve functional capacity and attitudes[26].

With the questionnaire, we assessed patients' behaviours as reported by them. This can raise the question whether patients really performed the behaviour specified, or if they only knew they should perform the behaviour. As described by other researchers, providing patients with information does not guarantee their knowledge and in addition, increasing knowledge may not automatically lead to increased self-care behaviour[27,28]. It is therefore important to use interventions that include behavioural strategies.

Even though patients from the intervention group were sensitized to symptoms and encouraged to call their general practitioner or come to the Emergency Heart Centre in case of worsening heart failure, resource utilization did not increase. In fact, the trend was that intervention patients had fewer visits to the Emergency Heart Centre. Perhaps this was because they identified symptoms earlier and were more compliant regarding self-care. It has to be noted, however, that telephone calls to the Emergency Heart Centre were not registered in this study.

It was also found that patients in the intervention group used the Emergency Heart Centre more frequently than patients in the control group in the subgroup of patients who visited the Emergency Heart Centre. Probably more unstable patients from the intervention group visited the Emergency Heart Centre, resulting in more visits from a smaller group, while in the control group more patients went to the Emergency Heart Centre, but did not need to return.

The intervention did not have a significant effect on readmission rates in this study. In other studies[10,15,21,29], large reductions in readmission rates were found, as a result of various intensive interventions. The absence of effects on readmission in our study may be due to several reasons. First, comparing our overall 3-month readmission rate (26% and 31%) to other studies, we noticed that readmission rates in our study were lower than those reported by other groups that found 90-day/3 month readmission rates for all causes in 29% and 42%[15,30]. Specifying this for readmissions for cardiac reasons, we notice that readmission after 90 days (23%) was close to the 17% readmission rate of the intervention group in the study of Rich *et al.*, who evaluated a multidisciplinary comprehensive discharge programme[15]. Control patients in that study had a readmission rate for heart failure of 39%. Other studies reported that 50% of the heart failure patients were readmitted within 6 months[10,31]. This is comparable to our 9-month findings (37% and 50%). Our 23% readmission rate for cardiac reasons in surviving patients after 9 months can also be compared to the 19%

readmission rate reported in non-transplanted patients after an intensive comprehensive heart failure management programme[21]. This strongly suggests that readmission rates in the United States are not comparable to European readmission rates, probably as a result of a different health care system. Our 90-day readmission rate is comparable to a Dutch epidemiological study of heart failure patients, in which it was reported that the percentage of patients readmitted for heart failure within 6 months after their first discharge was 14%[32].

A second explanation for not finding a significant difference in readmission rates can be found in the length and intensity of the intervention (the 'dose' of the intervention)[33]. During hospital admission, patients were visited several times by the study nurse and after discharge patients were called and visited once. Considering the close need for follow-up, the intervention period seems well chosen[34]. However, it could have been more effective if the intervention had been applied partially in the home situation, and more tailored to the needs of the patient. A recent study reported that a home-based intervention did not have a statistically significant effect on the number of patients experiencing an unplanned readmission or death, but it was effective in preventing individual patients from requiring large numbers of readmissions with acute heart failure[35]. Continued home visits tailored to the patients' needs would be more appropriate. On the other hand, one could ask where the optimal point is between time spent with patients and the effectiveness of that time in modifying patients' behaviour.

The fact that patients' self-care behaviour decreased after 1 month may point to the need for a longer term intervention or reinforcement contacts. Various components of optimal care are described including a heart failure clinic, home health care cardiac specialists, community-based case managers, patient tele-management and hospital-sponsored cardiac rehabilitation[34]. In several studies a combination of these resources was used, for example a special heart failure centre with optimal dosing of drugs, follow-up contact and access to rehabilitation programmes[21], a multidisciplinary comprehensive programme including intense follow-up[15], intensive home-care surveillance[36] and managing by patients' physicians with special expertise in heart failure[29].

In the current study, we found that education and support are effective in improving patients' self-care behaviour; however, it is not enough to decrease readmission. Experiences during the study revealed that although patients knew what to do when symptoms occurred, they sometimes could not get the attention of a health care provider in time, or the health care provider decided to wait for another week to take action because of busy schedules. Changes in the organisation of patient care and the intensity of follow-up are probably indispensable to prevent unnecessary readmission. This could easily be accomplished by a close and longer follow-up by a health care professional (e.g. nurse or general practitioner) and increased accessibility of such a person. Such an increased follow-up and increased accessibility might work as a 'safety net' for patients in case of deterioration.

An important aspect of disease management programmes is the creation of a multidisciplinary culture so that treatment strategies can be undertaken in the patient's home rather than during hospitalization after the fact[11]. Finally, patients in this study were somewhat older than patients in the studies reporting a decrease in readmission rates[15,21,29]. It is known that readmission rates in the elderly are high. Despite a well-structured multidisciplinary approach and careful discharge planning it is estimated that at least 8% of patients will still be readmitted within 3 months[37]. However, in addition to the importance of developing strategies, treatment and prevention of heart failure in older individuals[38], it is also important to improve the care of older heart failure patients. Different aspects of non-pharmacological interventions need to be studied, including content and organisational aspects (e.g. group intervention).

The high numbers of readmissions for diagnoses other than heart failure also have to be considered. Together with other authors, we noticed that co-morbid illnesses are an important cause of adverse outcomes among all hospitalized heart failure patients[39] and that interventions should also focus on other causes of readmissions.

Reviewing the resource utilization in this study, we found that within 1 month of hospital discharge, 75 of the patients (57%) had a follow-up appointment with their cardiologist. Only 10 patients did not have any scheduled appointment with a cardiologist, internist or general practitioner within a month of discharge. Given that the first 30 days after hospital discharge are most important in preventing readmission[34], our findings of no difference in readmission rates may be related to the close medical follow-up patients received. We also found that patients with heart failure use a considerable amount of health care resources within 9 months of discharge. This is reflected by the fact that in addition to scheduled appointments with an internist or cardiologist, 73% visited another specialist. On the other hand, patients showed limited use of home nursing care, home health and other health care services. Comparing our results to a general older population in the Netherlands, patients in this study used slightly more physiotherapy (27 vs 14%), but the use of home nursing care and home help was comparable[40]. This is surprising considering the compromised physical capacity of patients in this study.

In conclusion, the current study suggests that intensive, systematic, tailored and planned education and support by a nurse results in an increase in patients self-care behaviour, especially concerning complying with the heart failure regimen and asking for help if symptoms worsen. No significant effects were found on use of health care resources. Additional organisational changes, such as longer follow-up and the availability of a heart failure specialist, will probably enhance the effects of education and support.

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