

Determinants of Self-management Capacity in Patients with Congestive Heart Failure

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ABSTRACT

Title: Determinants of Self-management Capacity in Patients with Congestive Heart Failure

Background: Self-management is an important part of congestive heart failure (CHF) treatment; patients who are able to manage their health and health care have better survival and less hospital readmissions. Little is still known about determinants that influence self-management capacity.

Objective: The purpose of this study was to identify which patient characteristics are associated with (poor) self-management capacity in patients with CHF.

Method: A quantitative cross-sectional study was conducted, and 238 patients with CHF (60% male, mean age 74(SD± 10), were recruited from outpatient clinics and primary care settings in the Netherlands. Self-management capacity was measured by the generic Patient Activation Measure (PAM) and a disease specific measurement tool: the European Heart Failure Self-care Behaviour scale (EHFScBs). Sixteen determinants related to self-management were obtained from patient-survey and chart review. The survey contained low-burden questions and consisted of validated measurement tools.

Results: Mean PAM-scores indicated “lack of knowledge and confidence to take action” while mean EHFScBs-scores of 25,3(SD 8,9) showed good self-management behaviour. No correlation between the two was found. The only common determinant was social support. In multiple regression analysis 18% of the variance in PAM-scores was explained by illness perception (IPQ), quality of life (SF12), social support (MSPSS), and anxiety and depression (HADS) ($R^2=0.179$; $p < 0.001$). Only 9.5% of the variance in EHFScBs-scores could be explained by social support (MSPSS), and disease severity (NYHA) ($R^2=0,095$; $p < 0,001$).

Conclusion: There seems to be a substantial difference in the two concepts that measured self-management capacity. Confidence may be an important factor in self-management. Further research is needed to explore the associations between different aspects of self-management and the impact on health outcomes for patients with CHF.

Keywords: self-care, chronic, social support, heart failure

SAMENVATTING

Titel: Determinanten van zelfmanagement capaciteit in patiënten met hartfalen

Achtergrond: Zelfmanagement is belangrijk in de behandeling van patiënten met chronisch hartfalen (CHF); patiënten die in staat zijn hun gezondheid en gezondheidszorg goed te managen hebben betere overlevingskansen en minder ziekenhuisopnames. Weinig is nog bekend over determinanten die van invloed zijn op zelfmanagement capaciteit.

Doel: Het doel van dit onderzoek was het identificeren van patiënten karakteristieken die geassocieerd zijn met (slechte) zelfmanagement capaciteit bij patiënten met CHF.

Methode: Een kwantitatief, cross-sectioneel onderzoek werd uitgevoerd bij 238 patiënten met CHF (60% man, gemiddelde leeftijd 74(SD± 10) uit huisartspraktijken en hartfalen poliklinieken in Nederland. Zelfmanagement capaciteit werd gemeten met een generiek (Patient Activation Measure-PAM) en een ziekte-specifiek meetinstrument (European Heart Failure Self-care Behaviour scale - EHFScBs). Zestien aan zelfmanagement gerelateerde determinanten werden onderzocht met behulp van vragenlijsten en dossieronderzoek. De vragenlijst bestond uit gevalideerde meetinstrumenten en niet-belastende vragen.

Resultaten: De gemiddelde PAM-scores duiden op “gebrek aan kennis en vertrouwen om actie te ondernemen”, terwijl de gemiddelde EHFScBs-scores van 25,3(SD 8,9) juist wezen op goed zelfmanagement gedrag. Tussen de twee metingen werd geen verband aangetoond. Alleen sociale steun was geassocieerd met beide uitkomsten. In multipele regressie analyse kon 18% van de variantie in PAM-scores worden verklaard vanuit ziekteperceptie, kwaliteit van leven, sociale steun, angst en depressie ($R^2=0.179$; $p < 0.001$). Slechts 9,5% van de variantie in EHFScBs-scores kon worden verklaard vanuit sociale steun en ziekte ernst (NYHA) ($R^2=0,095$; $p < 0,001$).

Conclusie: Er lijkt een substantieel verschil te zijn tussen de twee aspecten van zelfmanagement capaciteit. Vertrouwen lijkt een belangrijke factor te zijn. Ver onderzoek is nodig om associaties tussen verschillende aspecten van zelfmanagement te verkennen en de impact ervan om gezondheidsuitkomsten van patiënten met CHF.

Trefwoorden: zelfmanagement, chronisch, sociale steun, hartfalen

INTRODUCTION

Congestive heart failure (CHF) is a clinical syndrome characterised by failure of the pump function of the heart to meet the metabolic needs of the body. As a result of global population aging, and improved preventive and curative care of acute coronary events, CHF has reached epidemic proportions in both developed and developing countries(1). Its increase places a tremendous burden on society in terms of mortality, morbidity and healthcare costs(2-4) Among adults older than 65, CHF is a primary risk factor for hospital readmissions within 60 days of discharge(5). Research has shown that 50% of these readmissions are potentially preventable through better adherence to self-management practices(6-8)^{0}.

According to the guideline of the European Society of Cardiology, self-management ability is an essential component in controlling symptoms and improving health status of patients with CHF(9,10). Consistent with this guideline, current health policy encourages greater involvement of chronically ill individuals in their own health care through participation in self-management programmes. The effects of these programmes have been evaluated in several studies(11-15), and although they have been proven to be effective in managing CHF, they are not beneficial for all patients(16,17). The American Heart Association (AHA) even stated that there is surprising little evidence on the direct relationship between heart failure self-care and health outcomes, as in many intervention studies self-care was only one of several intervention components(18-20)^{0}.

Confusing in self-care literature is the use of inconsistent terminology: *self-care* and *self-management* are used interchangeably.^{0}(21,22) Barlow(23) defines *self-management* as “the individual’s ability to manage symptoms, compliance with professional advice, physical and psychosocial consequences and life style changes inherent in living with a chronic condition”. Patients who are ready to engage in self-management and believe they have important roles to play in self-managing care, are called “*activated*” by Hibbard and colleagues. In their Self-care of Heart Failure Model, Rockwell and Riegel(24) distinguish *self-care maintenance*: symptom monitoring and treatment adherence; and *self-care management*: recognizing and responding to symptoms. The whole self-care process is thought to be importantly influenced by confidence(21). (Figure 1)

Insert figure 1

Self-care behaviour for patients with CHF means predominately treatment adherence (taking medication, keeping a low-salt diet, fluid restriction, limiting alcohol, quit smoking, staying physically active) and self-monitoring of changes in signs and symptoms (daily weighing, recognising worsening symptoms)(25). These are complex demands that have a major influence on the patients' lives. Although self-care is primarily a patient responsibility, guidance from a healthcare professional (e.g. nurse) is needed. Nurses can use interventions that enhance the capacity for self-management of patients with CHF. In order to develop effective interventions, it is necessary to understand who is capable of self-management and who is not, and why this is the case.(20,24,26)^{} Experts highlight the dynamic relationship between individual patient characteristics and self-management behaviours, but little is still known about why some patients are capable of managing their disease, while others are not(12,27). Identifying characteristics of patients who are at highest risk for poor self-management capacity will help to develop tailored interventions that improve outcomes for patients with CHF.

The choice for the determinants to be analysed in this study was based on the literature and clinical expertise. (2,6,24,27,28)

Problem statement

Self-management programmes can be effective, but are not beneficial for all patients with CHF. Why some patients are better than others in practicing self-management, is not clear. Little is still known about patient characteristics associated with self-management capacity, and patients who are at highest risk for poor self-management capacity have not been clearly identified yet.

Aim

The purpose of this study was to describe which patient characteristics are associated with self-management capacity, in order to better understand self-care deficits of patients and to make it possible to improve healthcare interventions. Therefore determinants of two aspects of self-management capacity are analysed: CHF-specific self-care behaviours and patient level of activation. We hypothesised that characteristics identified by these two measurements would be corresponding.

Primary research questions:

1. Which patient characteristics are associated with disease-specific self-care behaviour in

adult patients with CHF?

2. Which patient characteristics are associated with activation for self-management behaviour in adult patients with CHF?

Secondary research questions:

1. What are characteristics of patients at highest risk for poor self-care behaviour?
2. What are characteristics of patients with the least potential for activation for self-management?

METHOD

2.1 Design, setting and population

A descriptive correlational study was conducted, using a cross-sectional research design. This design is eligible to examine the association between determinants and outcome simultaneously, at a fixed point in time(29,30). The local ethics committee approved the research protocol.

The target population were adult patients diagnosed with CHF. Patients were selected from primary care settings and outpatient heart failure(HF)clinics in different regions in the Netherlands. Selection was based on the following inclusion criteria: (1) a diagnosis of CHF confirmed by clinical signs and symptoms and documented by a physician; (2) able to read and write in Dutch; (3) age >18 years; (4) no diagnosis of psychiatric or cognitive problems as determined by medical record review; (5) participation should not be too burdensome for the patient according to the judgment of the physician or heart failure nurse.

In the four primary care settings patients were selected by means of the General Practitioners Information System (Huisarts Informatie Systeem HIS), with permission from their general practitioner(GP). Patients who visited the outpatient HF-clinic of a large non-university general hospital or a small community hospital within the 12 months prior to the study were recruited by their cardiologists.

2.2 Measures

2.2.1 Dependent variables

Self-care behaviour was measured using the European Heart-Failure Self-care

Behavior scale (EHFScBs), developed by Jaarsma et al.(31). The instrument consists of 12 items with answers on a 5-point Likert scale. Overall score ranges from 12 to 60; lower scores indicate better self-care behaviour. Items address self-care maintenance (e.g. regular weighing, diet and fluid restriction), self-care monitoring and self-care management (e.g. warn a healthcare provider in case of weight gain). The scale was psychometrically tested in the Netherlands, Sweden and Italy, and Cronbach's α ranged from 0,69-0,93..

Activation for self-management was measured by the Dutch version of the Patient Activation Measure (PAM), validated in the Netherlands by Rademakers(32). It was used with permission from Insignia Health, License Package 2011 (www.insigniahealth.com). Hibbard et al. have conceptualized readiness to engage in self-management using the term *patient activation*, defining it as people's ability to take on the role of managing their health and health care(33). The PAM aims to assess an individual's knowledge, skill, behaviour and confidence in managing one's health(34). It consists of 13 items, with scores on a 4-point Guttman-like scale. The summed raw score (range 13-52) is converted to a 0-100 activation score. Higher scores mean higher level of activation (figure 2).

Insert figure 2

The PAM is a valid and reliable instrument with strong psychometric properties(35). Internal consistency was good (Cronbach's $\alpha=0.88$). The inter-item correlations ranged from 0.14-0.63. Item-rest correlations were moderate to strong (0.46-0.66). The test-retest reliability was moderate on item level with correlations between 0.25 and 0.49 ($p < .001$); for the scale as a whole, the correlation was 0.47 ($p < .001$). The PAM questionnaire has been used for CHF patients in an American study where a Cronbach's $\alpha=0.88$ was reported(4).

2.2.2 Independent variables

Self-reported quality of life was measured by the 12 item Short-Form Health Survey(SF-12)(36), which measures physical and mental health on a scale from 0-100. Higher scores indicate better health.

Depressive symptoms and anxiety were measured by the Hospital Anxiety and Depression Scale(HADS)(33). The two subscales have 7 items each and are answered on a four point Likert scale, both with a final score range of 0-21. Scores on the subscales $>10/11$ indicate a psychiatric state image(37). The HADS is a valid and reliable instrument (Cronbach's $\alpha=0.67-0.93$)(38,39). The subscales do not measure independent constructs: Pearson correlations ranged from 0.43-0.73($p<0.001$) in different groups(40).

Illness perception was measured by the Brief-Illness Perception Questionnaire(B-

IPQ)(41,42), with eight items measured on a 0–10 point scale. A higher score reflects a more threatening view of the illness. Reproducibility showed moderate to good reliability with coefficients between 0.51-0.68. The concurrent validity needs further investigation(42).

Social support was assessed using the Multidimensional Scale of Perceived Social Support (MSPSS), divided into three constructs: Family members, Friends and Significant Others (internal consistency: $\alpha=0.74-0.89$)(43). Responses are given on a 7-point Likert scale. Higher scores indicate higher levels of perceived support. Test-retest reliability in non-clinical samples for subscales and total scales range from 0.72-0.85; Cronbach's α ranges from 0.81-0.98. The MSPSS has good construct validity(44-46). The validity and reliability of the MSPSS were confirmed in a group of cardiac patients and their partners(43). The validated Dutch versions of all measurement instruments were used.

Sociodemographic and clinical data:

The following data were retrieved from the questionnaire: age; gender; ethnicity; Body Mass Index (BMI=weight in kilograms/(height in meters)²); living situation(alone/with others); education; work status; financial situation; smoking; duration of CHF in years; disease severity measured by the New York Heart Association(NYHA) class. The number of comorbidities a patient was presently suffering from were collected from the medical files and counted. Counting was based on the 19 medical conditions as described in the International Classification of Disease(ICD)-10 version of the Charlson Comorbidity Index (CCI). The index itself was not used.

2.3 Data collection

Data collection took place between February and May 2013. All eligible patients were sent an invitation letter, signed by their GP or cardiologist. In another letter research information was provided by the investigators. The voluntary nature of participation was emphasized. The aim and content of the study were explained and permission was asked to search for additional information in the patient's medical file. Both letters and an informed consent form signed by the researcher were sent to the patients, together with the questionnaire and a stamped envelope. The questionnaire consisted of low-burden questions and took ± 40 minutes to complete. To enhance recruitment rates, patients who did not reply within three weeks received the same package again, including a reminding letter from the GP or cardiologist.

2.4 Data analysis

The sample size was calculated based on the number of 16 determinants that were correlated with the dependent variables. For each variable 10-20 participants were needed to reach sufficient power for multiple regression analysis(29,30). A response rate of 50-60% was expected, based on prior studies using mailed questionnaires in similar populations in the Netherlands(47-49). Statistical analysis was performed using SPSS version 20.0 software. Means, standard deviations and percentages were used to describe demographic and clinical characteristics of the sample. All variables were tested for gender differences, using chi-square, independent samples t-test, or Mann Whitney U-test depending on the level of measurement. Correlation matrixes and scatterplots were made with all variables to check for linearity and to make sure no highly correlated variables would be selected for the model in order to avoid multicollinearity.

Summary scores on the two aspects of self-management capacity, self-care behaviour (EHFScBs) and activation (PAM), were compared using bivariate analyses (Pearsons r).

In order to answer the primary research questions univariate linear regression analysis was performed with all determinants to establish which characteristics could significantly identify self-management capacity. Analyses were conducted for self-care behaviour and activation separately. A manual backward selection procedure was conducted, as suggested by Babyak(50), including all determinants with p values ≤ 0.20 . Dummy variables were built for all ordinal determinants and entered as blocks. Subsequently, determinants with a p value ≥ 0.10 after their entrance in the equation were excluded, until only statistically significant ($p \leq 0.05$) determinants remained and the combination that provided the most predictive power was identified. Distributions of the residuals were examined for normality by means of histograms and P-P plots.

To answer the secondary research questions, the dependent variables were dichotomized into a “poor” and “good” category. Poor self-care behaviour was defined as a EHFScBs-score >30 , representing the upper quartile of the study sample. Patients with a level 1 score on the PAM were considered to have the least potential for activation for self-management. Dummy coding (0 or 1) was used for nominal and ordinal determinants, continuous determinants were not changed. Univariate logistic regression analyses were performed, to detect determinants that could significantly identify poor self-management capacity.

Insert figure 3

RESULTS

3.1 Characteristics of sample

Of the 373 eligible patients with CHF who were invited in the study, 238 patients responded (response rate 64%). Table 1 summarizes the socio-demographic and clinical characteristics of the participants. The mean age of the study sample was 74(SD 10), the majority were male(60%), retired(83%) and did not live alone(63%). Participants were predominantly Dutch (95%). Many patients had one or more comorbidities(65%) and half of the patients suffered from CHF for more than 8 years (mean 12.3;SD12.4). Women were lower educated ($\chi^2=6.92$; $p=0.03$), more often living alone ($\chi^2=20.35$; $p<0.001$), (had) smoked less often ($\chi^2=12.6$; $p=0.002$), had lower BMI's ($r=2.76$; $p=0.006$) and reported less quality of life ($r=3.97$; $p<0.001$). Inter-correlations were all <0.70 . Missing data were not imputed, because of the large sample size and less than 10% missings(51). Patterns in missing data were not detected. None of the determinants were highly correlated, and tolerance was >8 in all cases.

Insert table 1

3.2 Determinants of self-care behaviour

The mean summary score for self-care behaviour for the total sample was 25.3(SD8.9). Worse self-care behaviour was associated significantly with less perceived social support($\beta=-0.24$; $p<0.001$). In multiple linear regression analysis a backward selection procedure was conducted and determinants with a p value ≤ 0.20 were entered in the equation: gender, financial situation, disease severity(NYHA), anxiety and depression, and social support. In the final model social support and disease severity(NYHA class) explained 9,5% of the unadjusted variance in self-care behaviour (Table 2a).

Insert table 2a

Univariate logistic regression showed that patients with little social support are more likely to be at highest risk for poor self-care behaviour than patients with more social support (OR 0.96; CI 0.94-0.96; $p=0.001$)(Table 2b).

Insert table 2b

3.3 Determinants of activation for self-management

The mean activation score for the total sample was 53.8(SD11.1), corresponding with PAM-level 2. Lower scores on activation were associated significantly with less perceived social support($\beta=0.23$; $p<0.001$), less quality of life($\beta=0.27$; $p<0.001$), more anxiety and depression($\beta=-0.15$; $p=0.03$) and worse illness perception($\beta=-0.28$; $p<0.001$). A lower PAM-score was also associated with a worse financial situation($p=0.03$), a more severe NYHA class($p=0.02$), less education ($p=0.003$) and with being unemployed($\beta=0.14$; $p=0.045$)(Table 3a)

Insert table 3a

Twelve determinants had p values ≤ 0.20 when correlated with the PAM-scores and were included in the first step of the multiple regression analysis. A backwards selection procedure was conducted. Social support ($\beta= 0.25$;CI 0.10 to -0.30), illness perception($\beta= -0.23$;CI -0.38 to -0.09), quality of life ($\beta=0.26$;CI 0.04 to 0.22) and anxiety and depression ($\beta=0.18$;CI 0.005 to 0.57) explained 17,9% of the unadjusted variance in patient activation. Univariate logistic regression analyses was performed to find associates of poor activation for self-management. The least activated patients were more likely to be living alone (OR 0.49; CI 0.27-0.88; $p=0.02$), have less social support(OR 0.97; CI 0.95-0.99; $p=0.002$) , less quality of life(OR 0.98; CI 0.96-0.99; $p=0.002$), a more threatening view of their illness (OR 1.05; CI 1.02-1.08; $p=0.002$) and to have higher scores on the anxiety and depression scale(OR 01.07; CI 1.02-1.11; $p=0.003$) (Table 3b).

Insert table 3b

There were no differences between men and women in scores for either self-care behaviour or activation. No significant correlation was found between self-care behaviour and activation scores ($r=0.094$; $p=0.17$).

4. DISCUSSION

Self-care behaviour was associated exclusively with social support, and only in multiple regression analysis also partly explained by disease severity. Social support has repeatedly been reported to be an important factor in CHF self-care. (1,52,53) Patients with little social support are more likely to be at highest risk for poor self-care behaviour. Similarly a recent

Australian study (Gallagher 2011) found high level of social support to be the only significant predictor for better self-care behaviour.

Activation for self-management behaviour was significantly associated with half of the determinants under study: social support, quality of life, anxiety and depression, illness perception, financial situation, disease severity, education, and being employed. Patients with the least potential for activation, with level 1 PAM-scores, were also more likely to be living alone. The 16 variables under study were derived from previous research with different populations and settings, which may explain why comparable associations were not always found in this study. Another reason may be the different tools used in other studies to measure aspects of self-management.

The mean EHFScBs-score of 25,3 found in this study indicates good self-care behaviour, which is similar to results from a recent German study with a younger patient group²¹. Less adherence to self-care behaviour (32.6) was reported in a Japanese study, in patients with a mean age of 65 and a shorter history of living with CHF(mean:2.6 years).¹⁹ People living with CHF for a longer period, as in the present study sample, may be better at self-care behaviour because they have more experience, and more severe symptoms force them to adhere(54).

The EHFScBs has predominantly been used for comparing different measurements in time or different patient groups, and not often for the evaluation of determinants of self-care behaviour(55,56). Even though the EHFScBs measures self-care maintenance, monitoring and management, this has not been confirmed by factor analysis. Riegel(57) stated that the EHFScBs captures self-care maintenance items only, and was poorly correlated with self-care management and self-care confidence. This may explain the difference with the mean PAM-score of 53,8(level 2) measured in this study. Contradictory to what was measured by the EHFScBs, this incates that the majority of the CHF-patients do *not* consistently engage in self-management activity, which has also been found in previous research.(31,58)

Apparently the EHFScBs and PAM measure two different concepts, matching only at social support. The patients with high risk for poor self-management behaviour were not the same as the patients with the least activation for self-management. In studies where the EHFScBs was compared to other tools that measure CHF self-care, no correlations were found(59). In a study where self-management was measured by the disease specific Self-Care of Heart Failure Index(SCHFI), no significant correlations with the PAM were found either(22).

An explanation for the better scores on the EHFScBs may be that patients report better self-care behaviour when they recognize the questions of disease specific instruments and know what is expected from them. The items on the EHFScBs are similar to the advices given regularly to CHF-patients by healthcare providers, whereas the items on the PAM may be

less recognizable for patients and therefore be less sensitive to social desirability bias(29). An important aspect of the PAM is the measurement of confidence. Several studies found self-care confidence to be a mediator between social support and self-care behaviour(52,53,60)

A limitation of the study is the cross-sectional design, which makes it unsuitable for reporting causality. Most data were self-assessed, which may have led to information bias. Different than in many other studies, NYHA-classification was self-assessed by the patients as part of the survey. Health care providers tend to report worse NYHA-class scores than patients themselves do, but patients who report less severe symptoms have a better prognosis(61). Convenience sampling was used to approach eligible patients, which may have caused selection bias. On the other hand, patients were invited from different settings, including rich, middle class and poor regions of the Netherlands, which made the sample heterogeneous. A strength of the study was the high response rate, but if the nonresponse consisted of the poor self-managers this study aimed, this may have influenced the findings. We have no information on the non-responders other than gender and age, and therefore we cannot make comparisons between these patients and the study-participants. Patients were mainly (95%) of Dutch origin and results can therefore not be generalized to CHF patients from other ethnic groups in the Netherlands. Finally, even though as many as 16 determinants were used in this study, the multiple regression analyses did not provide adequate models, which makes it likely that other important factors, such as determinants for caregivers or healthcare providers, may also influence self-management capacity for patients with CHF.

6. CONCLUSION

Confidence in one's knowledge and skill is an important factor in improving self-care capacity. Behaviour and activation seem to be two different constructs, even though they aim at the same goal. This underlines the fact that self-management is a complicated issue that has not yet been explored thoroughly enough. As self-management is an important component in the life of patients with CHF, further exploration of the different aspects of this capacity is necessary. This will enable health care professionals to assess patients effectively, including identifying those capable of managing their lives with CHF and others who are less able to do so.

Figure 1. Concepts of self-management capacity

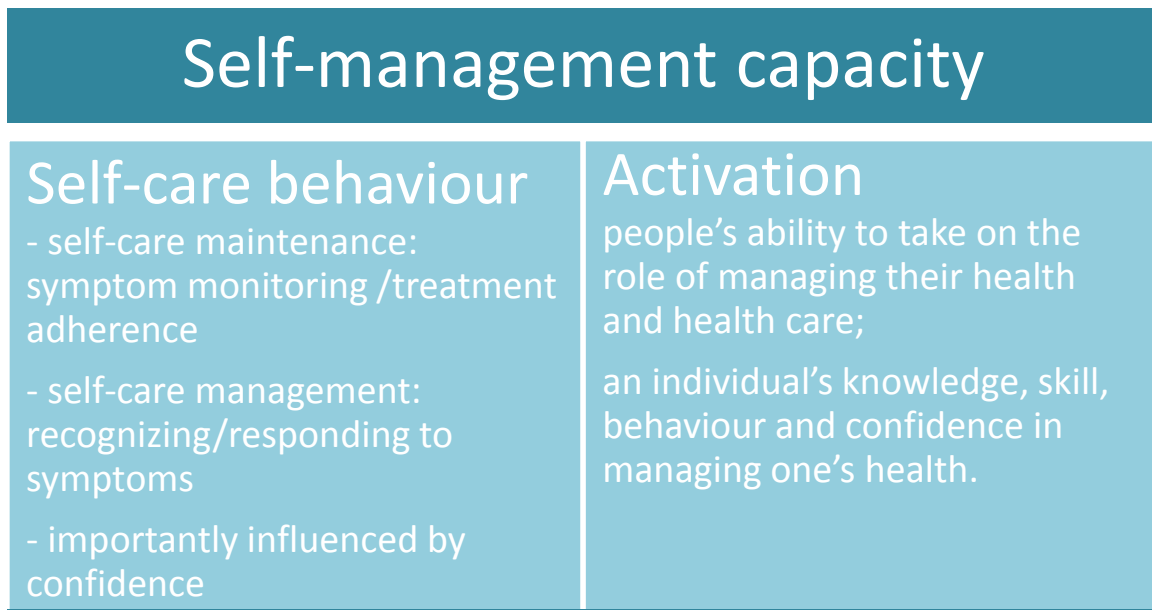


Figure 2. Patient Activation Measure (PAM) level scores

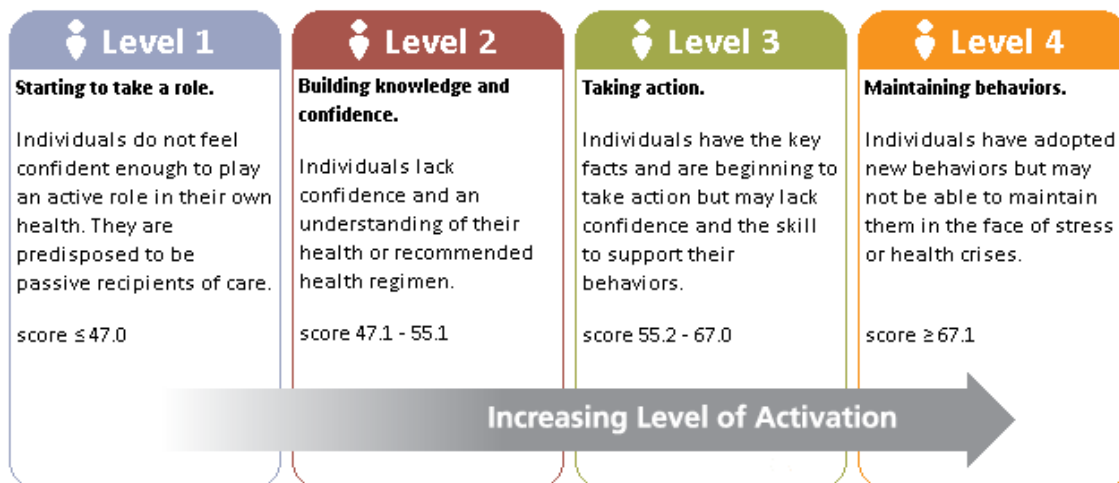


Figure 3. Flowchart

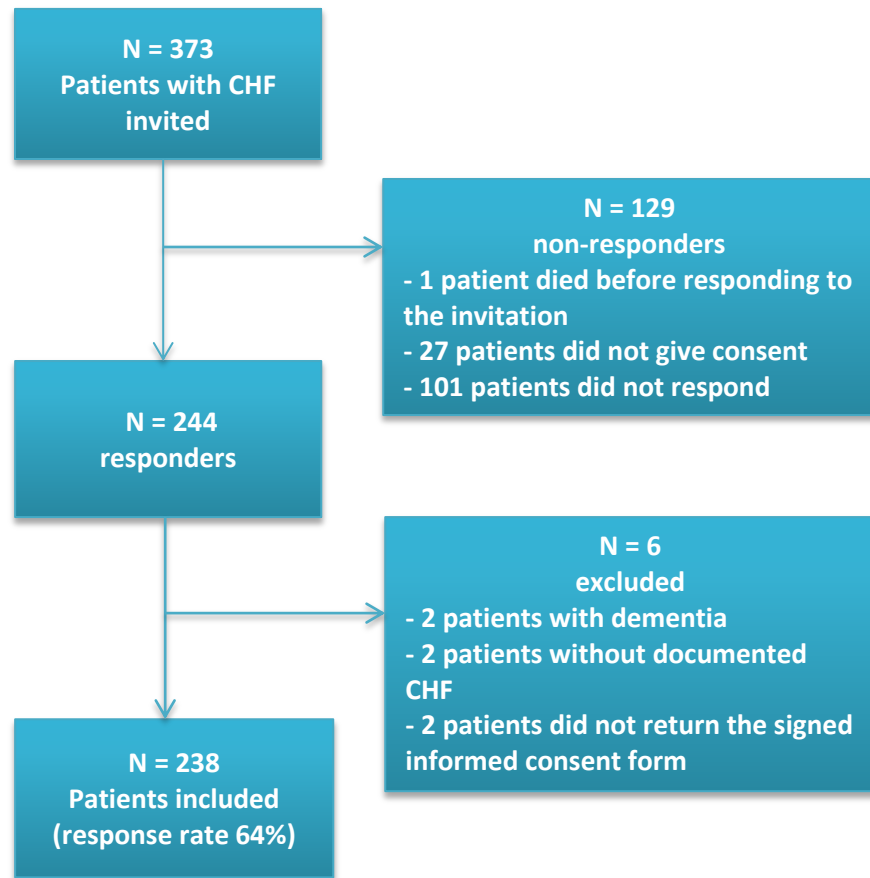


Table 1 Characteristics of the study sample

Characteristics	Total N=238
<i>Mean (\pmS.D.) or n (%)</i>	
Male	143(60%)
Mean age in years	74.2 (10.1)
range	43-96
Years living with CHF (n=189)	12.3 (12.4)
Living alone (n = 235)	88 (37%)
Education (n= 233)	
Low (elementary school)	103 (45%)
Middle (high school; middle-level app. educ.)	79 (34%)
High (higher professional or academic educ.)	48 (21%)
Ethnicity : Dutch (%) (n = 234)	223 (95%)
Retired (or >65 and not working) (n =)	193 (83%)
Financial situation: (n = 229)	
Comfortable	104 (44%)
Just enough	109 (46%)
Insufficient	13 (5.5%)
Smoking: never smoked (n =)	66 (28%)
stopped smoking	141 (60%)
smoker	26 (11%)
NYHA class I (n =229)	57 (24%)
NYHA class II	94 (40%)
NYHA class III	62 (26%)
NYHA class IV	16 (7%)
BMI (SD)	25.6 (6.2)
Active comorbidities 0; 1; \geq 2	80(35%);81(35%);68(30%)
Diabetes mellitus	71 (30%)
COPD	52 (23%)
Renal dysfunction (GFR <60)	79 (35%)
Self-care behaviour (EHFScBs)	25.3 (8.9)
Self-management capacity (PAM)	5.6 (11.1)
Health status (SF-12)	49.2 (22.8)
Anxiety and depression (HADS)	11 (7.1)
Illness perception (B-IPQ)	40.6 (11.2)
Social support (MSPSS)	64.9 (14.8)

Table 2a Linear regression analysis: associates of self-care behaviour

EHFScBs Variable	Univariate regression			Multiple regression; final model			
	β	95% CI	R^2	p	β	95% CI	p
Age	0.06 (-0.17 to 0.06)		0.004	0.36			
Gender	-0.10 (-4.21 to 0.49)		0.011	0.12			
Living alone or with others	0.02 (-1.95 to 2.85)		0.001	0.71			
Education			0.006	0.51			
Middle	0.08 (-1.13 to 4.19)			0.26			
High	0.05 (-2.06 to 4.14)			0.51			
Financial situation			0.014	0.20			
Middle	-0.21 (-7.86 to 0.45)			0.08			
High	-0.20 (-7.78 to 0.57)			0.09			
Employed	-0.04 (-5.36 to 3.07)		0.001	0.59			
Ethnicity	0.03 (-4.15 to 6.23)		0.001	0.69			
Years living with CHF	0.03 (-0.88 - 0.13)		0.001	0.73			
Body Mass Index	0.05 (-0.11 to 0.26)		0.003	0.45			
Comorbidities			0.004	0.62			
1 comorbidity	0.07 (-1.41 to 4.03)			0.34			
2 or more comorbidities	0.02 (-2.52 to 3.03)			0.79			
Smoking	0.03 (-2.03 to 3.14)		0.001	0.67			
New York Heart Association			0.022	0.19			
class II	-0.12 (5.22 to -0.85)			0.16	-0.17 (-6.00 to -0.11)	0.04	
class III	-0.14 (-6.02 to 0.59)			0.11	-0.18 (-6.80 to -0.43)	0.03	
class IV	0.04 (-3.66 to 6.40)			0.59	0.03 (-3.75 to 5.88)	0.66	
Quality of life (SF12)	0.007 (-0.05 to 0.06)		0.000	0.92			
Anxiety and depression (HADS)	0.11 (-0.03 to 0.31)		0.012	0.11			
Illness perception (B-IPQ)	-0.07 (-0.16 to 0.05)		0.004	0.32			
Social Support (MSPSS)	-0.24 (-0.22 to -0.07)		0.058	< 0.001	-0.27 (-0.25 to -0.09)	< 0.001	

Final model: constant= 38.41; $R^2=0.095$; $F=5.66$; $p<0.001$

Table 2b Linear regression analysis: associates of activation for self-management

PAM Variable	Univariate regression			Multiple regression; final model		
	β 95% CI	R^2	p	β	95% CI	p
Age	-0.11 (-0.28 to 0.02)	0.013	0.09			
Gender	-0.04 (-4.00 to 2.16)	0.002	0.56			
Living alone or with others	0.07 (-1.43 to 4.85)		0.35			
Education		0.052	0.003			
Middle	-0.07 (-4.97 to 1.84)		0.23			
High	0.19 (1.42 to 9.24)		0.007			
Financial situation		0.032	0.03			
Middle	-0.04 (-6.13 to 4.53)		0.20			
High	0.15 (-1.95 to 8.70)		0.66			
Employed	-0.14 (-11.16 to -0.13)	0.018	0.045			
Ethnicity	0.05 (-4.23 to 9.68)	0.003	0.44			
Years living with CHF	0.05 (-0.09 to 0.20)	0.003	0.47			
Body Mass Index	-0.12 (-0.47 to 0.03)	0.014	0.08			
Comorbidities		0.019	0.12			
1 comorbidity	0.009 (-3.32 to 3.75)		0.90			
2 or more comorbidities	-0.13 (-7.13 to 0.39)		0.08			
Smoking	0.09 (-5.52 to 1.10)	0.012	0.19			
New York Heart Association		0.044	0.02			
class II	-0.26 (-9.60 to -2.03)		0.006			
class III	-0.22 (-9.60 to -1.36)		0.01			
class IV	-0.04 (-8.08 to 4.61)		0.60			
Quality of life (SF12)	0.27 (0.07 to 0.20)	0.079	< 0.001	0.26 (0.04 to 0.22)		0.003
Anxiety and depression (HADS)	-0.15 (-0.45 to -0.02)	0.023	0.03	0.18 (0.005 to 0.57)		0.046
Illness perception (B-IPQ)	-0.28 (-0.41 to -0.15)	0.083	< 0.001	-0.23 (-0.38 to -0.09)		0.002
Social Support (MSPSS)	0.23 (0.07 to 0.27)	0.056	0.001	0.25 (0.10 to -0.30)		< 0.001

Final model: constant= 40.85; $R^2=0.179$; $F=11.15$; $p<0.001$

Table 3a

Univariate logistic regression analysis

EHFScBs

Variable	Categories	Wald	p	OR	Confidence Interval	
					lower	upper
Age	continuous	0.421	0.52	0.99	0.96	1.02
Gender	male/female	1.163	0.28	0.70	0.36	1.34
Living situation	alone/with others	0.302	0.58	0.84	0.44	1.58
Education	low/high	1.821	0.18	1.55	0.82	2.94
Financial situation	low/high	0.893	0.35	0.55	0.16	1.91
Employed	yes/no	0.166	0.68	0.80	0.27	2.34
Ethnicity	Dutch/other	0.813	0.37	1.77	0.51	6.13
Years living with CHF	continuous	0.127	0.72	1.01	0.98	1.03
Body Mass Index	continuous	0.171	0.68	1.02	0.95	1.09
Comorbidities	yes/no	0.063	0.80	1.09	0.57	2.08
Smoking	yes/no	0.216	0.64	1.18	0.58	2.40
New York Heart Association	I,II/III,IV	0.103	0.75	0.90	0.47	1.72
Quality of life (SF12)	continuous	0.028	0.87	1.00	0.99	1.02
Anxiety and Depression (HADS)	continuous	0.642	0.42	1.02	0.97	1.07
Illness perception (B-IPQ)	continuous	1.102	0.29	0.99	0.96	1.01
Social Support (MSPSS)	continuous	12.012	0.001	0.96	0.94	0.98

Table 3b**Univariate logistic regression analysis****PAM**

Variable	Categories	Wald	p	OR	Confidence Interval	
					lower	upper
Age	continuous	3.224	0.07	1.03	0.997	1.06
Gender	male/female	0.041	0.84	1.06	0.592	1.91
Living situation	alone/with others	5.740	0.02	0.49	0.27	0.88
Education	low/high	0.217	0.64	1.15	0.64	2.06
Financial situation	low/high	1.741	0.19	0.47	0.15	1.45
Employed	yes/no	1.582	0.21	2.27	0.63	8.11
Ethnicity	Dutch/other	0.038	0.85	0.87	0.22	3.4
Years living with CHF	continuous	1.971	0.16	1.02	0.99	1.05
Body Mass Index	continuous	1.909	0.17	1.04	0.99	1.09
Comorbidities	yes/no	0.643	0.42	1.28	0.7	2.36
Smoking	yes/no	0.317	0.57	1.21	0.63	2.31
New York Heart Association	I,II/III,IV	2.079	0.15	0.64	0.35	1.17
Quality of life (SF12)	continuous	9.44	0.002	0.98	0.96	0.99
Anxiety and Depression (HADS)	continuous	8.579	0.003	1.07	1.02	1.11
Illness perception (B-IPQ)	continuous	9.716	0.002	1.05	1.02	1.08
Social Support (MSPSS)	continuous	9.335	0.002	0.97	0.95	0.99

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