Burden of treatment in patients with chronic heart failure − A cross-sectional study

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A R T I C L E   I N F O

A B S T R A C T

Background: Patients with heart failure (HF) must manage both a demanding treatment regimen and self-care, which may lead to a burden of treatment. The purpose of this study was to assess the levels of burdens from treatment and self-care and its associations with psychological distress and health-related quality of life.
Methods: In this cross-sectional study we collected self-report data from 125 patients diagnosed with HF, New York Heart Association classification II and III, who received care in a nurse-led HF outpatient clinic. Clinical variables were collected from the medical records. Data analyses comprised descriptive statistics and partial correlations.
Results: The participants mean age was 67 (±9.2), most were male (74,4%) and the majority had reduced ejection fraction (EF 35.4 ± 10.8). The highest mean burden scores emerged for insufficient medical information (34.65, range 0−86), difficulty with health care service (34.57, range 0−81), and physical and mental fatigue (34.12, range 0−90). Significant positive associations were observed between physical and mental fatigue from self-care, role and social activity limitation, and psychological distress, and health-related QoL.
Conclusion: Burden of treatment is an important aspect of HF treatment as it contributes to valuable knowledge on patient workload. This study emphasizes the need to simplify and tailor the treatment regimens to alleviate the burden.

Introduction

Heart failure (HF) is a chronic progressive syndrome with multiple aetiologies, affecting approximately 2% of the western adult population in general, increasing to 5-9% in age > 65 years.[1] The syndrome is characterised by the heart's inability to meet the body's metabolic demands, associated with activation of numerous neurohormonal compensation-mechanisms.[2] Advances in terms of treatment, prevention, and rehabilitation have improved the prognosis for HF and the patients' quality of life.[3] Yet, HF requires the patient to adhere to a challenging medical treatment regimen and lifestyle changes, in addition to managing symptoms and coordinating care.[4] The treatment and self-care tasks may contribute to a burden of treatment (BoT), defined as the "workload" assigned to long term ill patients by health care professionals and its impact on the patients' well-being and functioning.[5−7] BoT refers to the imbalance between treatment-related workload placed on patients by the health care system and the patients' capacity to engage in additional self-care.[5,8] Qualitative research on BoT among patients with chronic illness, including cardiovascular disease, reveals that BoT is a multi-dimensional concept that may change over time, according to illness severity and control, and may increase with the number of treatment tools and the occurrence of co-morbidity.[9] Consequently, increased BoT may result in less understanding of the disease and its treatments, non-adherence to treatment regimens (e.g., medications and dietary recommendations), disease deterioration, and thus, reduced health-related quality of life (HRQoL).[8] In HF, BoT seems to reduce the patients' capacity to follow treatment plans [10] and induces poor adherence.[7,11,12] Taken together, studies suggest that BoT may contribute to worsening of the disease and more frequent episodes of decompensation.[13,14] Despite the growing interest in BoT, few instruments to measure the

concept exists, and few studies have measured the level of BoT among people with HF.[7,8,15] Therefore, one purpose of this study is to assess the BoT in patients with HF.

Psychological distress (e.g., symptoms of depression and anxiety) is common among patients with HF. Symptoms of anxiety and depression were higher among patients with HF than controls of healthy older individuals and other cardiovascular conditions.[16,17] Moreover, psychological distress is associated with and might be a determinant of HF self-care behavior and poorer HF outcomes.[18–20] The link between BoT (e.g., experienced self-care workload) and psychological distress is less examined. Some studies indicate a correlation between greater BoT and distress.[15,21] However, no studies have evaluated these associations in HF populations. Additionally, increased levels of psychological distress in HF are associated with lower levels of health-related quality of life (HRQoL) and poor treatment adherence.[18,22] Yet, few studies have addressed the contributions of BoT to HRQoL in patients with HF. Therefore, the second purpose of this study is to evaluate the associations of dimensions of BoT, with psychological distress and HRQoL in patients with HF.

Methods

Study design

The study used a cross-sectional design and a postal survey was conducted. The recipients were patients with HF who received care in a nurse-led HF outpatient clinic in a Norwegian university hospital. This clinic provides time-limited follow-up care for patients with HF in need of titration to optimize HF medication and includes healthcare education, lifestyle modification, and symptom assessments. These services are provided by a specialist HF nurse in collaboration with a cardiologist.

The study was approved by the Norwegian Regional Medical Ethics Committee (REK no. 2017/75) and conducted in accordance with the ethical guidelines of the World Medical Association's Declaration of Helsinki.[23] All participants signed a written informed consent. Information about the study, the possibility of withdrawing at any time, and confidentiality were included in a letter accompanying the questionnaire. Inclusion criteria were the following: (1) diagnosis of HF confirmed by echocardiography at least 3 months prior to inclusion, (2) New York Heart Association (NYHA) functional class II or III, (3) ability to read and communicate in Norwegian and (4) aged 18-80 years at the time of the study. Exclusion criteria were: (1) heart transplant, (2) participation in other studies, and (3) impaired cognitive condition determined by screening the ICD-diagnosis codes or acute illness.

Data collection

Eligible participants were recruited by a research nurse between September 2017 and April 2019 by the screening of the patient list at the HF outpatient clinic. Data were collected through a questionnaire on BoT, psychological distress and HRQoL posted to patients with all types of HF (e.g., HF reduced ejection fraction (HFrEF), HF middle range EF (HFmrEF), and HF preserved EF (HFpEF)) and from medical records. A reminder was sent to recipients who failed to return the questionnaire by the stated deadline.

Measurements

Demographic and clinical variables

Demographic characteristics were collected by self-report in the questionnaire and included sex, age, educational level, marital and employment status. Clinical variables were collected by the researchers at the time of enrollment, and included comorbidity, time since diagnosis, number of medications (e.g., all medications taken daily), and NYHA functional class, and were obtained from the respondents' medical records.

Burden of treatment

To measure BoT, the Patient Experience with Treatment and Self-management (PETS) instrument was used.[15] It consists of 9 dimensions and 48 items assessing the burden from chronic illness treatment and self-care experienced the last four weeks in the dimensions: *medical information* (7 items), *medications* (7 items), *medical appointments* (6 items), *monitoring health* (2 items), *relationships with others* (4 items), *health care expenses* (4 items), *difficulty with health care services* (7 items), *role and social activity limitations due to self-care* (6 items), and *physical and mental fatigue due to self-care* (5 items). The participants provide responses on either a 4-point or a 5-point categorical ordered scale, depending on content domain (e.g. very easy to very difficult, not at all to very much, strongly agree to strongly disagree, and never to always). For some of the items, a 'not applicable' option is available. PETS domains have a score range of 0−100, with a higher score suggesting greater perceived BoT. Each dimension is scored separately. PETS has been validated in a population of mixed chronic conditions,[15] and people with diabetes.[21] This study used the Norwegian version of PETS.[24] The internal consistency was good [25] in the present study (Cronbach's alpha, ranging from 0.72 to 0.91 across dimensions).

Psychological distress

Psychological distress was assessed with the validated Hopkins Symptom Checlist (HSCL-10).[26] It comprises 10 questions regarding symptoms of depression and anxiety experienced the previous week.[27] The participants provide responses on a 4-point Likert scale ranging from "not troubled" (1) to "heavily troubled" (4), yielding a total score ranging from 1 to 4. Higher total score indicate higher level of psychological distress. The average item score is used as a measure of psychological distress with a cut-off set at 1.85, frequently used in adults.[26] The internal consistency was high in the present study (Cronbach's alpha = 0.91).[25]

Health-related quality of life

HRQoL was measured by the validated Minnesota Living with Heart Failure Questionnaire (MLHFQ).[28] It is a disease-specific 21-item scale measuring the subjective perception of the effect of HF and its treatment on patients' daily lives as experienced the last month. Each item response is scored from 0 ("no impact") to 5 ("extremely negative impact") yielding an overall total score range between 0 and 105. Higher scores indicate poorer HRQoL and higher adverse effects of HF on patients' lives. The instrument has been widely used to measure HRQoL among HF patients.[29–31] The internal consistency was high in the present study (Cronbach's alpha = 0.92).[25]

Data analysis

Data were examined for their distributional properties, outliers, and missing data. Descriptive statistics were used to summarise the demographic and clinical characteristics of the sample, and levels of BoT, psychological distress, and HRQoL. Pearson correlation coefficients were calculated to determine the correlations among BoT, psychological distress, and HRQoL. Partial correlation analyses were performed to determine the statistical associations between BoT, psychological distress and HRQoL when adjusting for age, sex, and dichotomised NYHA classes II and III. The data were analysed using the Statistical Package for Social Science (SPSS) version 25 (SPSS Inc, Armonk NY, USA). The significance level was set at $p < 0.05$ for all statistical tests. The sample size was calculated based on the rule-of-thumb by Green,[32] with the following calculations: minimum

number of cases (N) = 50 + 8 per independent variable. For this study, the minimum number of cases would be 122 (50 + 8 × 9).

Results

Study population

The demographic and clinical charactesistics of the study sample are summarised in Table 1. Of the 199 eligible participants, 125 returned the questionnaire, a response rate of 63%. The average age (SD) of the participants was 67 (± 9.2) years, (range 42−80), 74.4% were men, and 69.6% lived with a partner. The majority of the participants had HF with reduced EF. The mean EF was 35.4 (±10.8, range 15−70), the average time since diagnosis of HF was 3.7 years; and 66.4% had NYHA class II. Most participants (69,6%) had comorbid conditions and the most frequent was arrhythmia (27,8%), diabetes type 2 (26,2%) and kidney failure (23,8%). Participants took an average of 8 ± 3.1 medications daily.

Table 1
Demographic and clinical characteristics (n = 125).

Participants (n = 125)	
Mean age, mean (± SD) range	67 (9.2) 42−80
Median age	68.0
Gender, n (%)	
Male	93 (74.4)
Female	32 (25.6)
Living conditions, n (%)	
Living alone	35 (28)
Living with partner	87 (69.6)
Living with others	3 (2.4)
Education, n (%)	
Primary school	49 (39.2)
High school	36 (28.8)
College/University	38 (30.4)
Missing	2 (1.6)
Currently employed, n (%)	
Yes	17 (13.6)
Yes, part time	8 (6.4)
No	97 (77.6)
Missing	3 (2.4)
Time since diagnosis, mean years (±SD)	3.75 (5.5)
EF, mean (±SD) range	35.4 (10.8) 15−70
Missing, n (%)	26 (20.8)
Type of HF, n (%)	
HFrEF	67 (67.6)*
HFmrEF	19 (18.8)*
HFpEF	13 (12.8)*
NYHA classification, n (%)	
NYHA II	83 (66.4)
NYHA III	42 (33.6)
Comorbidity, n (%)	
Yes	87 (69.6)
No	38 (30.4)
Comorbid conditions, n (%)	
Arrhythmia	35 (27.8)
Asthma	6 (4.8)
Autoimmune disease	12 (9.5)
Cancer	12 (9.5)
COPD	20 (15.9)
Diabetes type 2	33 (26.2)
Kidney failure	30 (23.8)
Neurological disease	7 (5.6)
Medication, mean (±SD) range	8 (3.1) 3−19

Notes: Primary school, nine years in Norway
Abbreviations: SD, standard deviation; EF, ejection fraction; HFrEF, heart failure reduced EF; HFmrEF, heart failure middle range EF; HFpEF, heart failure preserved EF; NYHA, New York Heart Association Classification; COPD, chronic obstructive pulmonary disease.
  * the percentage is calculated on the basis of 99 cases with documented EF.

BoT, psychological distress and HRQoL in heart failure

Table 2 shows the descriptive information and internal consistency for BoT (PETS), psychological distress (HSCL-10), and HRQoL (MLHFQ). Of the nine BoT dimensions, the highest mean (SD) scores were obtained for the dimension *medical information* (34.65 ± 18.2), *difficulty with health care services* (34.57 ± 19.0), and *physical and mental fatigue* (34.12 ± 21.0). *Monitoring health* also had a relatively high mean score (30.86 ± 21.1). These results indicate that patients experience BoT because of their workload (e.g., medical information, monitoring health), external stressors (e.g., difficulty with health care service) and that the treatment and self-care affect their physical and mental well-being (e.g., physical and mental fatigue). Relatively low BoT scores were found for *medications* (16.16 ± 17.3), *medical appointments* (16.87 ± 16.85), and *relationships with others* (14.23 ± 18.34). The mean level of psychological distress was 1.65 (±.58), and 25.6% of the participants scored ≥1.85, a valid cut-off point for symptoms of depression and anxiety.[26] The mean HRQoL scores were 38.30 (±21.6).

Missing data ranged from 0% to 5.6% in all scales, except in PETS dimensions *monitoring health* (9.6%), *medical expenses* (10.4%), and *difficulties with health care services* (23.2%). Several PETS dimensions have the response alternative "not applicable" which is treated as missing together with un-answered items. When scoring PETS, missing data within each dimension are replaced with the mean of remaining items as long as more than 50% are completed.[15] In HSCL-10 and MLHFQ, missing was handled by mean imputation if 80% of the items were answered. Follow-up analysis of cases with no missing data was conducted. The pattern of results remained the same. Included variables were tested for skewness and kurtosis. All data were in a referenced normal area of skewness and kurtosis except for the PETS dimension *relationships with others* (skewness 1.7 and kurtosis 3.0). We performed a log transformation, and a normalised score of the dimension *relationships with others* was calculated (skewness 0.54; kurtosis 1.5) to assess correlations for the transformed score to psychological distress and HRQoL. This procedure produced the same results on correlations (psychological distress; $r = 0.68^{**}$, HRQoL; $r = 0.56^{**}$). Results for correlations were interpreted in accordance with Cohen's suggestions,[33] which define 0.50 as a strong correlation, 0.30 as medium, and 0.10 as weak.

Associations between BoT, psychological distress and HRQoL

As shown in Table 3, partial correlations (r_p), controlling for age, gender, and dichotomised NYHA class II and III, were statistically significant for the relationships between all BoT dimensions ($p < 0.05$) except for *difficulty with healthcare services,* and HRQoL. Most correlations were in the medium-to-large range of magnitude (e.g., $r_p \geq 0.30$). The BoT dimensions showing the strongest associations with psychological distress were *physical and mental fatigue* ($r_p = 0.75$), *relationships with others* ($r_p = 0.65$), and the *role and social activity limitations* ($r_p = 0.62$). For HRQoL, the strongest associations were found for the BoT dimensions *physical and mental fatigue* ($r_p = 0.53$) and *role and social activity limitation* ($r_p = 0.51$). All correlations were positive, indicating that greater burden worsens the psychological distress and HRQoL. The BoT dimensions *medical information* and *medications* showed weaker associations to psychological distress and HRQoL

Discussion

In this study, BoT dimensions assessing patient workload (e.g., medical information, monitoring health), stressors (e.g., difficulty with health care service), and the impact of treatment and self-care causing physical and mental fatigue had the highest scores and reflected greater burden. Burden from limitations of social lives and

Table 2

Descriptive statistics and reliability of nine BoT dimensions (PETS), psychological distress (HSCL-10) and HRQoL (MLHFQ).

	Mean (95% CI)	SD	Median (IQR)	Range	Cronbach's α
PETS dimensions (no of items)[a]					
Medical information (7)	34.65 (31.38, 37.92)	18.24	32.14 (22)	0−86	0.88
Medication (7)	16.16 (13.05, 19.28)	17.36	12.50 (25)	0−75	0.91
Medical appointments (6)	16.87 (13.88, 19.85)	16.85	16.67 (29)	0−63	0.90
Monitoring health (2)	30.86 (26.92, 34.80)	21.13	25.00 (38)	0−88	0.77
Relationships with others (4)	14.23 (10.89, 17.57)	18.34	6.25 (25)	0−88	0.82
Medical expenses (4)	23.94 (20.09, 27.79)	20.54	25.00 (38)	0−81	0.91
Difficulty with health care services (7)	34.57 (30.72, 38.42)	19.01	33.33 (20)	0−81	0.81
Role and social activity limitations (6)	27.53 (23.04, 32.03)	24.87	22.92 (36)	0−100	0.91
Physical and mental fatigue (5)	34.12 (30.30, 37.93)	21.00	35.00 (30)	0−90	0.89
HSCL-10[b]	1.65 (1.55, 1.76)	.589	1.5 (0.69)	1.00−3.80	0.91
MLHFQ[c]	38.30 (34.41, 42.19)	21.60	38.00 (35)	0−94	0.92

Abbreviations: SD, standard deviation; CI, confidence interval; IQR, inter quartile range; PETS, Patient Experience with Treatment and Self-Management; HSCL, Hopkins Symptom Checklist; MLHFQ, Minnesota Living with Heart Failure Questionnaire.

[a] All PETS domain scores are standardised to a 0 (lower burden) to 100 (highest burden) scale.

[b] HSCL-10 has a total score ranging from 1− 4.

[c] MLHFQ has an overall total score ranging between 0-105.

relationships, and physical and mental fatigue due to treatment and self-care was also associated with higher psychological distress and decreased HRQoL. Our results are consistent with observations of other patient populations with chronic conditions. For example, Eton et al.[15] and Rogers et al.[21] indicated a correlation between greater BoT and overall physical and mental health in patients with multi-morbidity and diabetes. Our study advances knowledge of this field as it suggests that BoT dimensions assessing patient "work" have less influence on emotional stress and HRQoL, and imply that the BoT dimensions assessing the "impact" from treatment and self-care have the greatest influence on well-being in patients with HF.

Our results suggests that access to and understanding of medical information (e.g., learning about and understand your health problem and related medications, understand advice from health care providers) create a substantial workload for patients with HF. Confusion about medical information potentially may interfere with patients' self-care efforts.[34,3] According to Kristiansen et al.,[35] patients' learning needs are connected to and triggered by their everyday life and context, highlighting the need for health care professionals to be aware of the patients' every day as a starting point of learning needs. Finding more efficient educational strategies is of importance in HF as access to sources of understandable medical information could contribute to a sense of control over one's treatment regimen and lessen the BoT.[21]

In the forms of BoT domains, our findings suggest that patients with HF may experience BoT from difficulties with health care services, seeing multiple health care providers who often communicate ineffectively, and experience problems with filling out forms and getting medical appointments in time. Especially, dealing with different health care providers is observed as a challenge to the continuity of care[36,37] and may result in a higher risk of readmission[34] and lack of medication adherence.[38] HF suggests a substantial need for support.[39,40] Frequent patient-centered visits to a nurse-led HF outpatient clinic may be valuable to patients[41] and may assist patients with HF to improve their self-care and thus decrease their risk of readmission.[42,43] However, excessive hospital and primary care appointments may also increase the BoT, and there is a risk of burdening patients through complex treatment regimens with multiple health care providers. A careful appraisal of the individual patients' health care interaction may contribute to evaluating BoT. Clinical practice should focus on how to simplify and tailor the treatment regimens to fit into the daily lives of patients with HF, perhaps by so-called one-stop HF services.[7] Interventions studying the effects of different models of care on BoT in HF is warranted.

Our findings also suggest that the treatment and self-care burden patients physically and mentally, making them feel angry, preoccupied, depressed, worn out and frustrated. These findings are aligned with previous research reporting that HF self-care is burdensome[4,18,44,45] and BoT is emotionally challenging.[7,12] For patients with HF, adherence to treatment and self-care is important for optimal functioning and well-being.[3] Still, HF treatment and self-care work may add additional stress to patients, as they require energy that patients with HF may lack. More research on how BoT affects patients' physical and mental well-being is needed. Furthermore, more knowledge on how an individualized and tailored care may ameliorate BoT is of importance.[46]

The current study revealed significant associations between BoT, psychological distress and HRQoL, and most strongly with the burdens leading to physical and mental fatigue, and limiting social activity and relationships. Unlike previous research on HF, this study revealed that BoT might play a significant role in impaired HRQoL and psychological distress. However, as BoT is not a part of the outcome assessments of patients with HF in clinical practice, health care professionals may underestimate the patients' BoT and overlook the

Table 3

Associations among BoT (PETS), psychological distress (HSCL-10) and HRQoL (MLHFQ).

PETS dimensions	HSCL-10 Partial correlation[2]	MLHFQ Partial correlation[2]	N
Medical information	0.24**	0.27**	122
Medications	0.29**	0.21*	122
Medical appointments	0.39**	0.31**	125
Monitoring health	0.32**	0.31**	113
Relationships with others	0.65**	0.48**	118
Medical and healthcare expenses	0.41**	0.43**	112
Difficulty with healthcare services	0.29*	0.16	96
Role and social activity limitations	0.62**	0.51**	120
Physical and mental fatigue	0.75**	0.53**	119

Notes: [1] .10-.29=weak correlations; .30-.49=medium correlations; ≥.50-=strong correlations. (According to Cohen's correlation effect size, Cohen, 1988). [2] Partial correlation; controlling for gender, age and NYHA class.

Abbreviations: PETS, Patient Experience with Treatment and Self-Management; HSCL, Hopkins Symptom Checklist; MLHFQ, Minnesota Living with Heart Failure Questionnaire.

* $p < 0.05$

** $p < 0.01$

effects of the BoT on the patients' daily lives.[47] Our study suggests that future clinical practice should emphasise HF patients' experience of BoT as an important aspect in treatment plans. Future studies assessing BoT can offer insights that would enable the health care system to take practical steps to improve HF care.

Methodological considerations

This study had some limitations. First, the findings should be interpreted with caution due to the cross-sectional design. It is not possible to establish the cause, or the directionality of the associations observed. Second, our results in terms of the burden of medical expenses may be influenced by the fact that the study was conducted in a country whose national health insurance coverage provides health care services almost free of charge. Studies performed in other cultural settings and with different forms of national health insurance coverage found that burden from medical expenses as measured by the PETS was associated with financial difficulty,[15] and a less accessible health care service.[21] Third, patients included in this study were diagnosed with NYHA II and III, indicating mild to moderate physical limitations in symptoms. Inclusion of only patients with NYHA class III might have generated other results. In addition, no patients in NYHA I or NYHA IV were included. Patients classified with NYHA I experience no symptoms and no limitation in physical activity, and patients in class IV are severely ill, experiencing symptoms even at rest and often are bed-bound, normally assigned for transplant or palliative care.[48] Hence, both groups have risks of BoT and future research in all NYHA classes can contribute important insights on levels of burden. Fourth, data were collected from one outpatient clinic with a limited sample with a majority of male participants which could create a gender bias.[49] Fifth, due to missing data in the dimension *difficulty with health care services* (23,2%) there is a risk of potential bias and reduced representativeness of the sample. According to Eton et al.,[50] missing data are expected in PETS due to the response alternative "not applicable" being treated as missing based under the assumption that "burden" cannot be assessed unless the question is personally relevant. Finally, finding on the association between PETS dimension *physical and mental fatigue* and psychological distress should be interpreted with care, due to the likelihood that they measure the same construct, thereby explaining the strong correlation.

Implications for future research

Future studies investigating BoT and its related factors in HF should be conducted using a larger and equal sample of sexes, at various locations to provide a comprehensive representation of patients with HF's BoT experiences and aim for a longitudinal design to capture changes in BoT over time. We also suggest future prospective studies to explore if and how BoT changes during the HF trajectory. Knowing that patients' demographic characteristics, such as education, have an impact on their chronic health conditions, future research should focus on relations between sociodemographic factors and BoT in patients with HF. More research should focus on HF and its relations to different health care modes to mitigate BoT.

Conclusion

BoT is an important aspect in the clinical care of patients with HF. Insufficient medical information, difficulties with health care service, and physical and mental fatigue due to self-care yielded the highest burden scores. Significant associations suggest that BoT is linked to psychological well-being and HRQoL in this patient group. A careful evaluation of the individual patients' treatment workload seems to be vital in HF care.

Author contributions

All authors have made substantial contributions to all parts of this study. OKN, AMLH, IMM and LEB designed the study, handled and analysed the data, prepared, drafted and revised the manuscript. AIL contributed to interpretation of data, preparation, drafting and revision of manuscript.

Declaration of Competing Interest

The authors declare that there is no conflict of interest.

Acknowledgments

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