Applied Nursing Research 26 (2013) 239–244

Contents lists available at ScienceDirect

Applied Nursing Research

journal homepage: www.elsevier.com/locate/apnr

Effectiveness of nursing interventions in heart failure patients in home care using NANDA-I, NIC, and NOC

Karina Azzolin, RN, ScD [a], Claudia Motta Mussi, RN, MSc [b,c], Karen Brasil Ruschel, RN, ScD [b,c], Emiliane Nogueira de Souza, RN, ScD [b,d], Amália de Fátima Lucena, RN, ScD [a], Eneida Rejane Rabelo-Silva, RN, ScD [a,b,c,*]

[a] Graduate Program - School of Nursing, Federal University of Rio Grande do Sul, 90620-110 Porto Alegre, Brazil
[b] Graduate Program in Cardiovascular Science, Federal University of Rio Grande do Sul, 90035-903 Porto Alegre, Brazil
[c] Hospital de Clínicas de Porto Alegre - Cardiology Division: Heart Failure Clinic, 90035-903 Porto Alegre, Brazil
[d] Fundação Universitária de Cardiologia, 90620-000 Porto Alegre, Brazil

ARTICLE INFO

Article history:
Received 20 December 2012
Revised 8 August 2013
Accepted 10 August 2013

Keywords:
Nursing processes/classification
Home care visits
Evaluation of outcomes (healthcare)/classification
Cardiac failure

ABSTRACT

Objective: The objective of the study is to evaluate the effectiveness of nursing interventions (NIC) using nursing outcomes (NOC) and based on NANDA-I nursing diagnoses in patients with heart failure in home care.
Method: In this longitudinal study, 23 patients with heart failure were followed for 6 months, in four home visits. During the visits, nursing diagnoses were established, outcomes assessed, and interventions implemented.
Results: Of the 11 NIC interventions implemented, eight proved effective, that is, showed significant improvement between the first and the fourth visit, according to scores obtained for six outcomes: knowledge: treatment regimen, knowledge: medication, compliance behavior, symptom control, activity tolerance, and energy conservation.
Conclusion: NIC interventions health education, self-modification assistance, behavior modification, teaching: prescribed medication, teaching: disease process, nutritional counseling, telephone consultation, and energy conservation showed effective outcomes based on NOC scores, suggesting that the NANDA-I, NIC, and NOC linkage is useful in patients with heart failure in home care.

1. Introduction

Nursing practice is currently seeking to implement evidence-based interventions in clinical settings, with a specific focus on the evaluation of outcomes (Mendes, Silveira, & Galvão, 2008; Rojas-Sánchéz et al., 2009). In this scenario, nursing classification systems have been used to standardize the language used to classify diagnoses, interventions, and expected outcomes.

A review of studies describing the use of nursing classification systems in different countries has shown that the NANDA-International (NANDA-I), the Nursing Interventions Classification (NIC), and the Nursing Outcomes Classification (NOC) are among the systems most widely used. These three systems were present in 50% of the publications reviewed; however, less than half of the studies reported the adoption of the instruments in nursing practice (Furuya et al., 2011).

Studies assessing patients with heart failure have applied different taxonomic classifications either combined (Azzolin, 2011; Guevara, Estupiñan, & Díaz, 2011) or separately (Martins et al., 2011) to test their applicability in clinical practice, and have described several benefits. In addition, some authors have referred to poor knowledge of care and self-care in heart failure as predictors of clinical instability and subsequent hospital readmission (Castro et al., 2010; Betihavas, Davidson, Newton, Frost, Macdonald and Steward, 2011). In fact, the difficulties faced in establishing diagnoses and interventions according to the health and knowledge behavior domain in heart failure patients provide grounds for concern and deserve further investigation, especially in home care (another field scarcely explored in nursing).

A randomized clinical trial of chronic patients receiving home care showed that the NIC interventions was associated with an improvement in expected NOC ratings in comparison to control patients who received the usual care routine. These results corroborate the effectiveness of interventions aimed at improving diagnoses, especially through the use of standardized instruments such as NANDA-I, NIC, and NOC (Rojas-Sánchéz et al., 2009).

The objective of the present study was to evaluate the effectiveness of nursing interventions (NIC) using nursing outcomes (NOC) and based on NANDA-I nursing diagnosis in patients with heart failure in home care.

1.1. Background

The NANDA-I, NIC, and NOC taxonomies are well described in the literature but still require further testing in clinical practice, especially

* Corresponding author. Escola de Enfermagem da Universidade Federal do Rio Grande do Sul, Rua: São Manoel, 963 - Rio Branco - Porto Alegre/RS - Brazil - ZIP code 90620-110. Tel./fax: +55 51 33598017/33598657.
E-mail addresses: eneidarabelo@gmail.com., esilva@hcpa.ufrgs.br (E.R. Rabelo-Silva).

0897-1897/$ – see front matter © 2013 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.apnr.2013.08.003

with regard to their applicability and effectiveness. The present study investigates the use of those taxonomies in patients with heart failure in home care.

The home care setting allows investigation of the effectiveness of taxonomies with no significant interference from other disciplines. This is an advantage of home care in relation to the hospital environment, where cointerventions may hinder the evaluation.

Johnson et al. (2012) have suggested the use of these three classification systems in some clinical conditions, including heart failure. According to those authors, heart failure is characterized by many and varied signs and symptoms that usually produce impaired function and poor quality of life. Prescribing appropriate medications, following a specific diet, and managing fluid intake can lessen the symptom burden. Moreover, treatment can often increase the patient's life expectancy and quality of life. Finally, studies have also shown that comprehensive discharge planning improves heart failure self-management and reduces the number of hospital readmissions (Rodriguez-Gasquez, Arredonho-Holguin & Herrera-Corte, 2012).

1.2. Research question

The question for this study is as follows:

- Does the use of the NANDA-I, NIC, and NOC linkage allow us to evaluate the effectiveness of nursing interventions in the home care setting?

2. Methods

This study is nested in a larger open-label randomized clinical trial conducted in two research centers (HELEN NCT-0121386). In the present prospective longitudinal study, patients with heart failure in home care were followed by means of four home visits and four telephone calls after hospital discharge.

During home visits, patients were evaluated and nursing diagnoses determined according to NANDA-I; NIC interventions were implemented, and nursing outcomes were measured. Diagnoses, interventions, and outcomes employed in the study were established previously by consensus among the investigators, as described elsewhere (Azzolin et al., 2012). Briefly, six NANDA-I nursing diagnoses were used: readiness for enhanced self health management; ineffective self health management; ineffective family therapeutic regimen management; excess fluid volume; risk for imbalanced fluid volume; and fatigue (NANDA, 2011). Also, 11 NIC interventions and their respective activities were adopted, as follows: health education; behavior modification; self-modification assistance; telephone consultation; nutritional counseling; teaching: prescribed medication; teaching: disease process; family involvement promotion; family mobilization; fluid monitoring; and energy management (Dochterman & Bulechek, 2008). Finally, eight NOC outcomes (and their indicators) were evaluated: knowledge: treatment regimen; symptom control; compliance behavior; family participation in professional care; fluid balance; knowledge: medication; activity tolerance; and energy conservation (Moorhead, Johnson, Maas and Swanson, 2004).

2.1. Sample

Participants were patients with decompensated heart failure aged 18 years or older. Patients with communication difficulties, with severe disease that might limit life expectancy, and those who lived further than 20 km from the institution or who did not have a telephone number were excluded from the sample.

Outcome improvement was defined as a one-point improvement in NOC scores, according to data from a pilot study (Rojas-Sánchéz et al., 2009). In that study, a 0.5-point difference between two consecutive NOC evaluations was used to indicate outcome improvement. In order to achieve a confidence interval of 90%, an alpha of 1%, a 0.7 standard deviation for the scores, and an estimated correlation of 0.5 between the first and fourth visit, and considering a 20% loss, a minimum sample size of 17 patients was calculated.

2.2. Procedures

Data were collected from April 2010 to September 2011 from patients previously admitted to two institutions that serve as referral centers for heart failure. Sociodemographic and clinical data were collected during the hospital stay. Data on clinical evaluations, outcomes, and interventions were collected during home care visits.

Home care visit no. 1 was carried out 7 to 10 days after hospital discharge. During the visit, the patient was assessed to establish diagnoses according to NANDA-I, and was asked to rate nursing outcomes using NOC (baseline data). Based on the data collected, NIC interventions were planned, including the recommended activities (applied in all visits). During visits no. 2, 3, and 4, diagnoses, interventions, and outcomes were all reevaluated.

The activities and interventions implemented at each home care visit varied according to patient needs. The indicators of each outcome were evaluated by the principal investigator at each visit using a five-point Likert scale (1 = worst, to 5 = best). The operational definition for each five-point classification was established prior to measurement. Scores were determined at the end of each visit.

Because a previously established protocol was employed (Azzolin et al., 2012), all interventions were implemented and all the outcomes were measured, regardless of the nursing diagnosis established during the visits. The follow-up period lasted for 6 months and comprised a total of four home care visits, with four contacts by telephone in-between. Telephone contact was carried out using a protocol based on NIC guidelines for telephone consultation.

2.3. Data analysis

Data were analyzed using the Statistical Package for the Social Sciences version 18.0 (SPSS Inc., Chicago, USA). Continuous variables with a normal distribution were expressed as mean and standard deviation; variables not normally distributed were expressed as median and interquartile intervals. Categorical variables were expressed as absolute and relative frequencies.

The indicators of the eight outcomes evaluated at each visit were analyzed by summing overall NOC scores (Likert scale) obtained at each visit. Subsequently, mean NOC scores were calculated for each visit and each indicator. Overall mean NOC scores and mean scores obtained for each indicator were compared using generalized estimating equations (GEE). Significance was set at $p < .05$ (two-tailed).

3. Results

Eighty-seven visits were made to the households of 23 patients over a 6-month period. Diagnoses were established (NANDA-I), outcomes measured (NOC), and interventions implemented (NIC) for all patients. In two cases, data are not available for visit no. 3 data (one case due to death and the other due to travel). Three patients were not available in visit no. 4 (two due to death and one because the patient had moved to a different city). Patients were predominantly male (15; 65%); mean age was 63 years (±11). Of the total sample, 30% had been hospitalized more than once in the year preceding the study.

3.1. NANDA-I diagnoses, related risk factors, and frequent characteristics in home care visits

A total of six nursing diagnoses were made in the patients assessed. Ineffective self health management was the most frequent

Table 1
NANDA-I nursing diagnoses and related factors.

Nursing diagnosis	HV1 ($n = 23$)	HV2 ($n = 23$)	HV3 ($n = 21$)	HV4 ($n = 20$)
Ineffective self health management (00078)	14 (60.9)	7 (30.3)	6 (28.6)	–
Related factor: knowledge deficit	12 (85.6)	6 (87.5)	4 (66.7)	–
Excess fluid volume (00026)	10 (43.5)	11 (47.8)	8 (38.1)	4 (20.0)
Related factor: compromised regulatory mechanism	7 (70.0)	9 (81.8)	6 (75.0)	3 (75.0)
Readiness for enhanced self health management (00162)	8 (34.8)	15 (65.2)	12 (57.1)	11 (55.0)
Fatigue (00093)	3 (13.0)	–	2 (9.5)	1 (5.0)
Related factor: disease status	2 (66.7)	–	1 (50.0)	1 (50.0)
Ineffective family therapeutic regimen management (00080)	1 (4.3)	1 (4.3)	1 (4.8)	–
Related factor: family conflict	1 (100)	1 (100)	–	–
Related factor: complexity of therapeutic regimen	–	–	1 (100)	–

Data expressed as *n* (%).
Diagnoses described according to titles and respective codes.
HV = home visit.

nursing diagnosis in visit no. 1 (60.9%), especially the related factor knowledge deficit of prescribed regimen (85.6% of cases in this diagnostic category). The most frequent defining characteristics were 'choices of daily living ineffective for meeting the goals of treatment or prescription program,' 'verbalization by patient that he or she did not follow prescribed regimen,' and 'verbalized desire to manage illness.'

In visits no. 2, 3, and 4, the most frequent diagnosis was readiness for enhanced self health management (65.3, 57.1, and 55%, respectively); this is a wellness nursing diagnosis and does not have related factors. The most frequent defining characteristics in these three visits were 'describes reduction of risk factors,' 'choices of daily living are appropriate for meeting goals,' and 'expresses desire to manage the illness (e.g., treatment, prevention of sequelae).' Other diagnoses made over the four visits are described in Table 1.

Risk for imbalanced fluid volume was a prevalent diagnosis considering all patients and visits: 56.5% in visit no. 1; 52.2% in visit no. 2; 61.9% in visit no. 3; and 75% in visit no. 4. Because the risk factors listed in NANDA-I for this diagnosis do not include patients at risk for excess fluid volume, the following related factors were considered as risk factors: compromised regulatory mechanism, excess fluid intake, and excess sodium intake.

3.2. Nursing outcomes identified during home care visits

Of the eight outcomes selected and measured during the visits, four belonged to the health & knowledge behavior domain (50%), as follows: knowledge: treatment regimen; compliance behavior; knowledge: medication; and symptom control. Significant increases were observed in this domain for all outcomes when comparing mean scores obtained at visits no. 1 and 4 (Table 2 & Fig. 1; $p < .001$ for all comparisons).

The other four outcomes assessed belong to three different NOC domains, namely, functional health (activity tolerance and energy conservation), physiologic health (fluid balance), and family health (family participation in professional care). The scores obtained for activity tolerance and energy conservation increased significantly from visits no. 1 to visit no. 4 ($p = .004$ and $p < .001$, respectively). Fluid balance and family participation in professional care did not show statistically significant differences ($p = .848$ and $p = .101$, respectively) (Table 2 & Fig. 2).

3.3. Nursing interventions implemented during home care visits

Of the 11 NIC interventions implemented, the most frequent ones were from the behavior domain, in categories patient education and behavior therapy, as follows: health education; self-modification assistance; behavior modification; teaching: disease process; and teaching: prescribed medication. The following interventions were also implemented: nutritional counseling; family involvement promotion; family mobilization; energy management; fluid monitoring; and telephone consultation. Because NIC interventions followed a previously established protocol, all 11 interventions were implemented in all visits; the only variation across visits was the number of activities implemented. Out of the 11 interventions applied, eight showed a statistically significant improvement when comparing mean outcome scores obtained for visits no. 1 and 4 (Table 3).

4. Discussion

This study tested in a home care setting the effectiveness of nursing interventions in patients with heart failure in home care. Interventions were implemented using a previously established protocol (Azzolin et al., 2012) based on the combined use of NANDA-I, NIC, and NOC taxonomies.

Table 2
Mean scores obtained for nursing outcomes according to NOC.

NOC outcomes/indicators	HV1 ($n = 23$)	HV2 ($n = 23$)	HV3 ($n = 21$)	HV4 ($n = 20$)
Compliance behavior (1601)*	3.05 (0.18)	3.42 (0.18)	3.57 (0.19)	3.95 (0.18)
Knowledge: treatment regimen (1813)*	2.33 (0.14)	2.75 (0.12)	3.13 (0.14)	3.59 (0.14)
Knowledge: medication (1808)*	2.28 (0.14)	2.67 (0.14)	3.00 (0.17)	3.55 (0.16)
Symptom control (1608)*	1.74 (0.14)	2.21 (0.13)	2.67 (0.12)	3.18 (0.16)
Fluid balance (0601)†	4.49 (0.07)	4.57 (0.07)	4.45 (0.09)	4.58 (0.06)
Energy conservation (0002)‡	3.87 (0.14)	4.00 (0.14)	4.14 (0.13)	4.27 (0.13)
Activity tolerance (0005)‡	3.39 (0.25)	3.80 (0.22)	4.05 (0.23)	4.17 (0.19)
Family participation in professional care (2605)§	3.23 (0.37)	3.82 (0.27)	4.38 (0.24)	4.33 (0.52)

Data expressed as mean (standard error).
* Domain: health & behavior knowledge.
† Domain: physiological health.
‡ Domain: functional health.
§ Domain: family health.

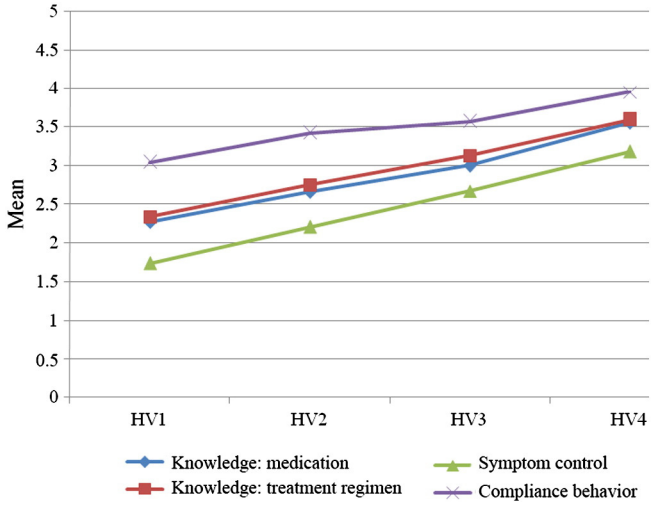

Fig. 1. Nursing outcomes measured over 6 months (health & knowledge behavior domain): knowledge: medication (95% CI −1.66 to −0.87, $p < .001$); knowledge: treatment regimen (95% CI −1.53 to −0.98, $p < .001$); symptom control (95% CI −1.93 to −0.95, $p < .001$); and compliance behavior (95% CI −1.24 to −0.56, $p < .001$). HV = home visit.

In our study, of the 11 NIC interventions applied, eight showed evidence of effectiveness according to mean NOC scores obtained over the 6-month follow-up period: self-modification assistance, behavior modification, health education, teaching: prescribed medication, teaching: disease process, nutritional counseling, telephone consultation, and energy management.

The self-modification assistance intervention first assesses the patient's knowledge and skills and only later suggests the actual implementation of changes. Behavior modification differs from self-modification assistance in that it emphasizes and stimulates the replacement of undesirable habits with healthy ones. Similarly, the interventions health education, teaching: prescribed medication, and teaching: disease process also seemed to converge on the need for changes in behaviors and attitudes that the patients can learn over the course of their disease. All five of these interventions fall within NIC behavior domain, that is, care interventions aimed at providing support for the patient's psychosocial functioning and at facilitating lifestyle changes.

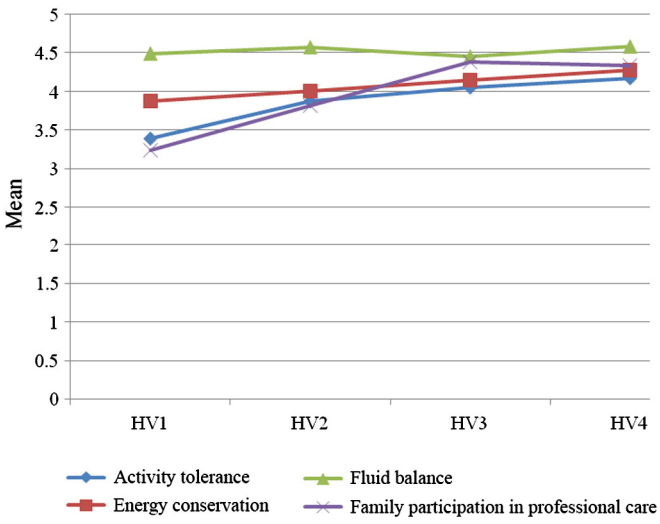

Fig. 2. Nursing outcomes measured over 6 months (other domains): activity tolerance (95% CI −1.38 to −0.18, $p = .004$); energy conservation (95% CI −0.62 to −0.19, $p < .001$); fluid balance (95% CI −0.25 to 0.07, $p = .848$); family participation in professional care (95% CI −2.31 to −0.11, $p = .101$). HV = home visit.

The patient's self-management, attitude to change behaviors, and skills developed to maintain their personal health are usually referred to as self-care (Riegel et al., 2009). Self-care has been the subject of different studies involving patients with heart failure and has shown benefits in controlling and maintaining the disease (Rodriguez-Gasquez, Arredonho-Holguin & Herrera-Corte, 2012; Mussi et al., 2013). Recently, two Latin American studies assessing self-care at home have shown that self-care interventions were effective in improving the patients' knowledge of the disease, self-care, and compliance with treatment (Rodriguez-Gasquez, Arredonho-Holguin & Herrera-Corte, 2012; Mussi et al., 2013). These findings provide further evidence that non-pharmacological, low-cost interventions, based on continuous follow-up, bring benefits to patients, especially when carried out in their real care setting.

Guevara, Estupiñan, and Díaz (2011) used the same taxonomy applied in the present study (NIC) as employed in patients with chronic disease and confirmed the effectiveness of the intervention teaching: disease process in patients diagnosed with knowledge deficit or ineffective self health management. The 246 patients of that study were distributed into three groups, as follows: control group ($n = 91$), patients prepared for hospital discharge only; group 2 ($n = 103$), patients prepared for hospital discharge and receiving telephone interventions during the first and second weeks after hospital discharge; and group 3 ($n = 52$), patients receiving the interventions described above plus one home visit after discharge. The teaching: disease process intervention was among the most frequently employed, but it was less frequent in group 3. Even though this difference was not explained by the authors, it could possibly be due to the more severe conditions observed in this group.

Schneider and Slowik (2009) also assessed patients with different heart conditions in relation to NIC interventions applied during home care. The authors showed that patients with heart failure required more hours and days of home visit than those with coronary artery disease or other heart conditions. In that study, teaching: disease process was among the interventions most frequently implemented, whereas energy management, teaching: prescribed medication, and fluid monitoring were among the 20 most prevalent ones (Schneider & Slowik, 2009).

The sixth intervention applied, which was also shown to be effective, was the nutritional counseling intervention. Suggested activities included sodium and fluid restriction in 100% of the patients, emphasized at all visits. Effectiveness of the nutritional counseling intervention had already been shown in another study that followed patients during home care visits. That study showed a significant improvement in the patient's knowledge of diet following educational intervention ($p = .04$) (Bowles, Holland, & Horowitz, 2009).

The seventh effective intervention, follow-up by telephone, has been studied in patients with heart failure as an additional tool for patient management. A study conducted at the Heart Failure Centre of the National Taiwan University Hospital evaluated the effectiveness of telephone interventions in patients with systolic heart failure (divided into intervention and control groups). The intervention was based on telephone consultations carried out by a nurse specialist 48–72 hours following hospital discharge and, subsequently, every 2 weeks for 6 months. Hospital admissions for all causes and for decompensated heart failure were significantly lower in the group that received telephone calls. Among readmitted patients, the duration of hospital readmission was shorter in the telephone intervention group ($p = .002$) (Chen et al., 2010). Conversely, a randomized clinical trial carried out in Brazil failed to find positive effects associated with telephone interventions in relation to clinical events. However, in this case, the two groups that received guidance during hospital stay showed a significant improvement in relation to knowledge of the disease and self-care, independently of contact by telephone (Domingues et al., 2011).

Table 3
Effectiveness of NIC interventions based on NOC outcome evaluation.

NIC interventions	NOC	Difference between mean scores[†]	*p*
Health education	Knowledge: treatment regimen	1.25	<.001
Self-modification assistance	Compliance behavior	0.92	<.001
Behavior modification			
Telephone consultation			
Nutritional counseling			
Teaching: medication	Knowledge: medication	1.27	<.001
Teaching: disease process	Symptom control	1.44	<.001
Energy management	Activity tolerance	0.78	.004
	Energy conservation	0.40	<.001
Family involvement promotion[*]	Family participation in professional care	1.10	.101
Family mobilization[*]			
Fluid monitoring[*]	Fluid balance	0.09	.848

[*] Ineffective interventions according to outcome analysis.
[†] Differences between mean scores obtained for each outcome in visit no. 1 vs. visit no. 4.

The eighth intervention, energy management, despite the low prevalence of the diagnosis of fatigue in this sample, proved to be effective. Other proposed interventions, such as energy control and exercise promotion, were considered relevant in the study by Assis, Barros, and Ganzarolli (2007). The same authors also assessed activity tolerance in patients hospitalized for heart failure and observed improvement in Likert scale results when comparing the first and seventh day of hospitalization. Recognizing energy limitations, which is part of the energy conservation outcome, was present in 75% and 83% of the patients on the first and seventh day of hospitalization, respectively. The same outcome was also assessed in our study and showed improved scores in the fourth visit compared with first visit results.

All the NOC outcomes in the health and knowledge behavior domain showed statistically significant improvement over the 6-month follow-up period. Compliance behavior showed a moderate score in visit no. 1 and a significant improvement in visit no. 4, although still moderate (scores 3.05 and 3.95, respectively). One possible explanation for this result is the fact that our chronic patients had been under treatment for over 3 years. Despite the relevance of this outcome for the goal of improving patients' self-care, it has not been evaluated in other studies to the authors' knowledge.

The outcomes knowledge: treatment regimen and knowledge: medication showed low scores in visit no. 1. Notwithstanding, the scores obtained in visit no. 4 evidenced an evolution toward moderate levels of knowledge (both scores above 3.5 in visit no. 4). Previous studies have also evaluated chronic and/or heart failure patients and shown similar results, that is, despite the long duration of the disease, patients still showed a poor knowledge about pharmacological and non-pharmacological treatment (Yera-Casas et al., 2009; Rojas-Sánchéz et al., 2009). In particular, knowledge of the medication being used has been shown to improve compliance with pharmacological treatment; lack of such knowledge was responsible for 24% of the cases of decompensation (Mangini et al., 2008).

A poor knowledge of treatment may cause the progression of disease symptoms. This may probably explain why the symptom control outcome showed the worst score in visit no. 1. In visit no. 4, in turn, scores were moderate. A previous study assessing self-care in patients with experience of heart failure symptoms versus novice patients showed that experience accounted for 9% of the variance in self-care maintenance scores in novice patients. Novice patients showed an average score of 8 points lower than that of experienced patients (63 ± 16 vs. 71 ± 14, $p = .05$) and were less likely to adopt adequate self-care management (OR, 0.73; 95% CI 0.5 to 0.9) (Cameron et al., 2010).

The lack of early discharge planning and the low number of guidance sessions on the last day of hospital stay may be possible causes for the patients' lack of knowledge of their own disease and treatment. The last day of hospital stay is a critical time and a potential source of anxiety for the patient. Whereas different types of guidance are usually given in relation to prescription, reevaluations, and exams that have to be taken, proper health care information is often overlooked (Suzuki, Carmona, & Lima, 2011; Aliti et al., 2007).

One possible limitation of this study is the absence of a control group, even though it could be argued that patients were their own controls over the 6-month follow-up period. The methodology here employed proved effective in comparing and measuring the evolution obtained with the interventions implemented. Notwithstanding, the inclusion of a control group could definitely maximize the impact of our findings.

Clinical researches assessing the use of nursing taxonomies are still scarce. The evidence here reported points to the need for additional studies conducted in real clinical settings. We believe that this study can lay the foundation for future, similar investigations.

Conclusions

This study showed the effectiveness of eight NIC interventions, namely, health education, self-modification assistance, behavior modification, telephone consultation, nutritional counseling, teaching: prescribed medication, teaching: disease process, and energy management, of a total of 11 interventions comprising a protocol previously established for the home care of patients with heart failure, in line with NANDA I, NIC, and NOC taxonomies. The effectiveness of these interventions was confirmed based on the improvement of mean NOC scores over a 6-month follow-up period and suggests that the NANDA-I, NIC, and NOC linkage is useful in patients with heart failure in home care.

Acknowledgment

This study received financial support from Hospital de Clínicas de Porto Alegre and from Fundação de Amparo à Pesquisa do Estado do Rio Grande do Sul.

References

Aliti, G. B., Rabelo, E. R., Domingues, F. B., & Clausell, N. (2007). Educational settings in the management of patients with heart failure. *Revista Latino-Americana de Enfermagem*, *15*(2), 344–349.

Assis, C. C., Barros, A. L. B. L., & Ganzarolli, M. Z. (2007). Evaluation of expected outcomes of nursing interventions to address the nursing diagnosis of fatigue among patients with congestive heart failure. *Acta Paulista de Enfermagem*, *20*(3), 357–361.

Azzolin, K. de O. (2011). Effectiveness of implementation of the interventions nursing in outcomes of patients with heart failure in home care. (PhD thesis). Universidade Federal do Rio Grande do Sul, Brazil.

Azzolin, K., Souza, E. N., Ruschel, K. B., Mussi, C., Lucena, A. F., & Rabelo, E. R. (2012). Consensus on nursing diagnoses, interventions and outcomes for home care of patients with heart failure. *Revista Gaúcha de Enfermagem*, *33*(4), 56–63.

Betihavas, V., Davidson, P. M., Newton, P. J., Frost, A. S., Macdonald, O. S., & Steward, S. (2011). What are the factors in risk prediction models for rehospitalisation for adults with chronic heart failure? *Australian Critical Care*, *25*(1), 31–40.

Bowles, K. H., Holland, D. E., & Horowitz, D. A. (2009). A comparison of in-person home care, home care with telephone contact, and home care with telemonitoring for disease management. *Journal of Telemedicine and Telecare*, *15*(7), 344–350.

Cameron, J., Worrall-Carter, L., Page, K., & Stewart, S. (2010). Self-care behaviours and heart failure: Does experience with symptoms really make a difference? *European Journal of Cardiovascular Nursing*, *9*(2), 92–100.

Castro, R. A., Aliti, G. B., Linhares, J. C., & Rabelo, E. R. (2010). Adherence of patients with heart failure to pharmacological and non-pharmacological treatment in a teaching hospital. *Revista Gaúcha de Enfermagem*, *31*(2), 225–231.

Chen, Y. H., Ho, Y. L., Huang, H. C., Wu, H. W., Lee, C. Y., Hsu, T. P., et al. (2010). Assessment of the clinical outcomes and cost-effectiveness of the management of systolic heart failure in Chinese patients using a home-based intervention. *Journal International Medical Research*, *38*(1), 242–252.

Dochterman, J. M., & Bulechek, G. M. (2008). *Nursing interventions classification (NIC)* (5th ed.) St. Louis: Mosby-Elsevier.

Domingues, F. B., Clausell, N., Aliti, G. B., Domingues, D. R., & Rabelo, E. R. (2011). Education and telephone monitoring by nurses of patients with heart failure: Randomized clinical trial. *Arquivos Brasileiros de Cardiologia*, *96*(3), 233–239.

Furuya, R. K., Nakamura, F. R. Y., Gastaldi, A. B., & Rossi, L. A. (2011). Nursing classification systems and their application in care: an integrative literature review. *Revista Gaúcha de Enfermagem*, *32*(1), 167–175.

Guevara, S. L. R., Estupiñan, J. P. S., & Díaz, L. J. R. (2011). Eficacia de las intervenciones de enfermería mediante un programa para el cuidado en el hogar. *Revista Cubana de Enfermería*, *27*(1), 20–30.

Johnson, M., Moorhead, S., Bulechek, G. M., Butcher, H. K., Maas, M. L., & Swanson, E. (2012). NOC and NIC linkages to NANDA-I and clinical conditions: Supporting critical reasoning and quality care (NANDA, NOC, and NIC linkages) (3th ed.). Maryland, USA: Elsevier Mosby.

Mangini, S., Silveira, F. S., Silva, C. P., Grativvol, O. S., Seguro, L. F. B. C., Ferreira, S. M. A., et al. (2008). Decompensated heart failure in the emergency department of a cardiology hospital. *Arquivos Brasileiros de Cardiologia*, *90*(6), 433–440.

Martins, Q. C. S., Aliti, G. B., Linhares, J. C., & Rabelo, E. R. (2011). Excess fluid volume: Clinical validation in patients with decompensated heart failure. *Revista Latino-Americana de Enfermagem*, *9*(3) [08 telas].

Mendes, K. D. S., Silveira, R. C. deC. P., & Galvão, C. M. (2008). Integrative literature review: A research method to incorporate evidence in health care and nursing. *Texto & Contexto Enfermagem*, *17*(4), 758–764.

Moorhead, S., Johnson, M., Maas, M. J. M., & Swanson, E. (2004). *Nursing Outcomes Classification (NOC)* (4th ed.) St. Louis, MO: Mosby.

Mussi, C. M., Ruschel, K., de Souza, E. N., Lopes, A. N. M., Trojahn, M. M., Paraboni, C. C., & Rabelo, E. R. (2013). Home visit improves knowledge, self-care and adhesion in heart failure: Randomized clinical trial HELEN-I. *Revista Latino-Americana de Enfermagem*, *21*(spe), 20–28.

Nanda, I. (2011). *Nanda international nursing diagnoses: Definitions and classification 2012-2014*. United States: John Wiley and Sons ltd.

Riegel, B., Moser, D. K., Anker, S. D., et al. American Heart Association Council on Cardiovascular Nursing, Council on Cardiovascular Nursing, Council on Clinical Cardiology(2009). State of the science: promoting self-care in persons with heart failure: a scientific statement from the American Heart Association. *Circulation*, *120*, 1141–1163.

Rodriguez-Gasquez, M. A., Arredonho-Holguin, E., & Herrera-Corte, R. (2012). Effectiveness of an educational program in nursing in the self-care of patients with heart failure: Randomized controlled trial. *Revista Latino-Americana de Enfermagem*, *20*(2), 296–306.

Rojas-Sánchéz, O. A., Rueda-Diaz, L. J., Vesga-Gualdrón, L. M., Orozco-Vargas, L. C., Forero-Bulla, C. M., & Camargo-Figuera, F. A. (2009). Eficacia de las intervenciones de enfermería para el diagnóstico "Manejo inefectivo del régimen terapéutico". *Enfermería Clínica*, *19*(6), 299–305.

Schneider, J. S., & Slowik, L. H. (2009). The use of the nursing interventions classification (NIC) with cardiac patients receiving home health care. *International Journal of Nursing Terminologies and Classifications*, *20*(3), 132–140.

Suzuki, V. F., Carmona, E. V., & Lima, M. H. M. (2011). Planning the hospital discharge of patients with diabetes: The construction of a proposal. *Revista da Escola de Enfermagem-USP*, *45*(2), 527–532.

Yera-Casas, A. M., del Olmo, S. M. H., Ferrero-Lobo, J., & Paez Gutiérrez, T. D. (2009). Evaluación de la intervención educativa al paciente anciano con insuficiencia cardíaca, realizada por enfermería a través de un plan de cuidados estandarizado. *Enfermería Clínica*, *19*(4), 191–198.